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EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING N W

FLORENCE AREA

SECTIONAL DATA SHEET
LINE NO. R 1
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: JUNE 1966

FOR

GUNNEX LTD.

HEINRICHS GEOEX
GEOPHYSICAL CONSULTANTS
TUCSON, ARIZONA

INDUCED POLARIZATION SURVEY
THE S.O.B. CLAIM GROUP, SUPERIOR AREA
PINAL COUNTY, ARIZONA

for

GUNNEX, LIMITED

June 1966

by

HEINRICHS GEOEXPLORATION COMPANY
P. O. Box 5671 Tucson, Arizona

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Induced Polarization Location Plan
Sectional Data Sheets:

- Line 15 N
- Line 0 E
- Line 12 E
- Line 24 E
- Line 30 E
- Line 54 E
- Line 84 E
- Line D-1
- Line 30 N

INTRODUCTION

At the request of Gunnex Ltd., of Toronto, Canada and with on site direction by Mr. John Walker, Gunnex geologist, Heinrichs Geoexploration Company conducted and completed an induced polarization survey on the S.O.B. Claim Group near Superior, Arizona. All field work was completed in the interim May 18 to June 23, 1966.

One induced polarization set-up each on nine separate lines were run, eight utilizing 1,000 ft. dipole spreads and one a 600 ft. dipole spread. Six of these set-ups made use of the existing N 45° E claim lines and Gunnex line identification number except for Line 30N which bears N 45° W and Lines D-1 and 84E which are located as shown on the enclosed plan map.

All work done on this project was the dual frequency induced polarization system using 0.05 and 3.0 cps. Future reference herein to I.P., PFE, MCF, ρa, and SP will mean respectively: induced polarization, precent frequency effect, metallic conduction factor, apparent resistivity, and self potential which were measured as described in "Basis of the Induced Polarization Method" bound with this report.

The data presented on sectional data sheets, one for each spread, showing ρa, PFE, and MCF, contoured in section and SP plotted in profile form.

Heinrichs personnel involved in the field work were John McLean, crew chief; Mike Fraker, sender operator; Randy Bushman, field technician; and at various times, at no charge to Gunnex, Douglas Stewart and Steve Cruze, extra helpers and as trainee personnel. Technical supervision and interpretation was by Paul A. Head, research geophysicist.

CONCLUSIONS AND RECOMMENDATIONS

The anomalism detected on this project has not been completely defined in areal extent, particularly on the northeast side. This is primarily because a steep cliff limits accessability to the northeast and because it was felt that a test drilling program should be carried out first to determine if possibly economic mineral zones are contained within already known portions of the anomaly. If this is demonstrated, then detailing the entire zone with I.P. to guide a full exploration drilling program will be justified.

Our general impression is that the anomalous zone has somewhat irregular gradational boundaries on the southwest and

that some sort of cross structure limits the anomaly to the southeast. The zone of major anomalism is in excess of 1,000 ft. wide and persists for at least 7,000 ft. in a NW-SE direction. Continuity has been disrupted between Lines 54E and 84E, possibly offset to the northeast. The anomaly is somewhat weaker to the northwest, but is much wider and completely open ended. Pending the outcome of initial test drilling, the I.P. anomaly should be closed off on all sides not now defined. Based on a rule of thumb estimate, the strong MCF zones may represent 3% total sulfides averaged through large volumes of rock in the vicinity of station 0.6SE on Line 30N.

We propose five drill holes to test various portions of the anomalous zone all of which should intersect sulfides within 500 ft. of the collar. The first test hole should be drilled vertically at station 0.6 SE on Line 30 N. The second and third drill hole should be collared at station 3.0 NE on Line 30 E and drilled 60° from the horizontal, one leading southwest and the other to the northeast. The fourth hole should be collared near Station 1.0 NE on Line 15 W and drilled vertically. The fifth drill hole has been located in a general area near 3.75 NE, 7.00 SE. The exact location is to be determined by additional field work. Specific details about these selections are described in the Interpretation section of this report.

INTERPRETATION

Line 15 W

The amount and quality of data obtained on this line was somewhat restricted by topography and high SP noise. The single spread of 1,000 ft. dipoles revealed a moderate anomaly between stations 2.0 and 3.0 NE and weak anomalism that continues both directions beyond the limits of this line. There is, however, fairly strong evidence from the PFE pattern that the anomaly is rapidly closing on each end. A fairly good contact is interpreted at station 1.0 NE. No positive SP correlation can be determined that will fit the I.P. anomaly.

A vertical drill hole has been proposed on the weak anomaly to test for possible economic mineral halos near strong anomalism. The site for this drill hole is not critical but should be between the indicated contact and the moderate anomalism boundary.

Line 0 E

A single spread of 1,000 ft. dipole separations was run on this line. A strong anomalism detected hints at a fairly flat structure dipping to the NE. This zone of strong anomalism

is between station 1.5 and 2.5 NE with a weak anomaly continuing NE, apparently disappearing under the cliff.

Another anomalous zone beginning at station 1.0 SW and continuing off the line to the southwest may represent the feature that caused the anomalism on Line 15 W to be very wide. It seems to be deeper than the main anomaly, but additional geophysical work or drilling is needed to properly locate and determine its depth. Very weak SP correlation to the I.P. anomaly is shown, but is not considered an interpretational aid on this line. A good resistivity contrast at station 1.0 NE may indicate the boundary of the mineralized zone detected by I.P.

No drilling is recommended on this line because the same features will be checked by proposed test holes on other lines.

Line 12 E

Results from the single spread of 1,000 ft. dipoles on this line were restricted because of topography on the NE and by excessive SP noise. The data obtained indicates very strong anomalism beginning at station 2 NE and continuing NE beyond the readings obtained.

The southwest side of this anomalous zone has a very weak to moderate fringe and the anomaly decreases with increased "n" spacings, possibly indicating either a nearly flat, thin body or two comparatively isolated bodies having very little depth continuity.

A sharp resistivity contrast has been detected at station 1.0 SW that may also be the edge of a mineralized or altered zone. No SP correlation is noted.

No drill holes are proposed on this line as the important features are considered the same as suggested drill targets on adjacent lines, or at least sufficiently similar, that other drilling will provide adequately representative testing for the time being.

Closing this anomaly to the NE was not practical due to topography. Line D-1 attempted to locate a NE boundary by taking advantage of a ravine cutting the cliff line (and the normal profiles) at approximately a 40° angle.

Line D-1

This diagonal line employed one spread of 1,000 ft. dipoles to locate the NE edge of the anomalous zone. Although the 5n and 6n separation data were not read due to high noise, we are certain that adequate information from depth was obtained to detect mineralization under the cliff. The character of the

east edge of the high MCF values indicates that mineralization is rather sharply cut off, but a somewhat persistant fringe of very weak MCF values may indicate slight mineralization of the cliff forming rocks.

The decreasing PFE values indicate that the anomaly is closing off to the west, however the MCF values remain moderate, also a single questionable or doubtful reading helps confuse matters at the west end of the line. In any case, the anomalism on D-1 nicly confirms that on the previous lines, and a contact at 2.0 SW also fits into the picture.

Drilling of this line is accomplished by a test hole on another line.

Line 24 E

The 1,000 ft. dipole spread on this line detected only the southwest side of the anomaly because of the cliff to the northeast. In view of the results of Line D-1, the strong anomalous zone is most likely on the order of 1,000 ft. wide, cutting off rather abruptly near the cliff line.

A resistivity contrast, shown at 1.5 SW, indicates a contact which seemingly has little relation to the I.P. anomaly. No SP anomalism is noted. There is a magnetic low corresponding to the I.P. high on this line, according to a prior Gunnex survey.

Test drilling on this line is not recommended at this time because the same feature is better tested on another line.

Line 30 E

All comments made for Line 24 E hold true for this line except the contact has been interpreted at station 1.0 SW and drilling is proposed on 30 E.

The drilling proposed at 30 N is intended to check the two distinct zones from the same drill site. Both test holes are to be angled 60° down from the horizontal, one leading NE and the other to the SW. The hole leading NE should be continued entirely through the mineralization and check the location of the northeast edge of the anomaly. The other hole is intended to penetrate the magnetic low.included within the I.P. anomaly. It may be necessary to move this hole to the NW in order that it pass through the magnetic low as determined by the prior Gunnex Survey. Please note that this hole must be collared near 30 N, and possibly between lines 24 and 30 E in order that it test both the magnetics and the I.P.

Line 54 E

A single spread of 1,000 ft. dipoles effectively located the NE boundary of the strong I.P. high at about 3.5 NE and seems to indicate what may be either a second anomaly to the SW, or a weak fringe of the strong anomalism continuing off the line.

The contact indicated at 4.5 NE is derived from the resistivity data and very likely represents the NE edge of the mineralized zone.

A rather gradual SP decrease of 100 mv to the SW may be of significance, but no direct inference can be reached without additional data to the SW.

Drilling recommendations for this line are discussed in conjunction with Line 84 E.

Line 84 E

This line, bearing N 27° E, took advantage of following a ravine, causing the line to be slightly skewed to the claim boundaries. The center electrode was located on claim Line 84 E, 3,200 ft. NE of the base line. This spread of 1,000 ft. dipoles did not cross the anomalous zone as anticipated. Two open anomalous zones have now appeared at each end of the line, either of which could be the mineralized zone detected on the other lines to the NW. The more northeasterly anomaly is of moderate strength and we believe represents the offset anomaly. The anomaly beginning at about 0.2 NE may be of considerable importance because it seems to be coming from depth and we have seen only a part of it. Additional I.P. is recommended to delineate this zone as indicated on the plan map.

Test drilling of this line and Line 54 E are discussed as one. There seems to be a fault somewhere between 54 and 84 E that interupts the I.P. anomaly, creating a possible locus for deposition of economic minerals at the intersection of the fault and the anomalous zone. We think the fault trace may be near the small mine indicated on Line 84 E. This should be checked by detailed geology, and combined with added knowledge of the anomalous zone obtained from the proposed additional I.P. line as shown on the plan map. Placement of a drill hole to penetrate this locus is possible and based on present data, we would collar it within 500 ft. of 3.75 NE, 7.00 SE as marked by a circle on the plan map, inclined or vertical as geology dictates.

Line 30 N

This line is oriented N 45° W, with an I. P. spread centered at Line 24 E, and is the only line not utilizing 1,000 ft. dipoles. The single spread of 600 ft. dipoles was anomalous over

its entire length, being of moderate strength over 3,000 ft. and very strong for 600 ft. on each end. The purpose of this line was to obtain depth information for planning test drill holes. At all parts of Line 30 N it is evident that the I.P. effects are of the same magnitude for both the 1,000 ft. and 600 ft. dipole spreads, indicating near surface sulfides. Relative to the zone of highest MCF values, sulfides should be within 200 ft. of surface.

We propose a drill hole be collared at 0.6 SE on this line and drilled vertically to at least 500 ft. or to the practical limit of any sulfides or other favorable indications encountered. This drill site represents the area of greatest I. P. anomalism on three separate lines.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Paul A. Head

Paul A. Head
Research Geophysicist

Approved:

Walter E. Heinrichs, Jr.
President & General Manager

July 7, 1966
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BASIS OF THE INDUCED POLARIZATION METHOD

The induced polarization method is based on the electrical properties exhibited by electronic or metallic conductors imbedded in an ionic or electrolytic conducting matrix. These properties are noticed in that the potential across a block of this dual conduction mode material will increase with time, approaching a constant value, when a constant current is made to flow through the block. This phenomenon occurs because at the boundaries between the two conductor types, electrolytic ions have to give up or take on electrons thereby requiring an additional force (overvoltage) over that which would be needed with only one mode of conduction; showing up as a building of potential across the block with time as more ions are backed up. This potential approaches a constant value when an equilibrium is established between the ions backed up at the boundaries and the flow across the boundaries. Therefore from the preceeding discussion, it is seen that the gross effect is quite similar to the charging of a leaky capacitor and for most applications, it is proper to use this mode as a guide. These capacitive-like properties are normally measured by three different techniques.

In the time domain (pulse) method, a steady direct current is imposed across the block for a few seconds and abruptly terminated so that the capacitive-like decay (discharge) curve can be measured or recorded. Usually, the voltage decay curve is integrated with respect to time to give the area under the decay curve in units of volt-seconds. The more area determined, the more capacitance or polarization the block exhibits.

In the frequency domain method, the percentage difference between the impedance (AC resistance) offered to a lower and a higher frequency is measured. A capacitor offers a lower impedance to a higher frequency than it does to a lower frequency, therefore the percentage difference between the impedances will increase with increased polarization.

A third technique is to measure the phase angle or delay between an introduced current wave-form and the received voltage wave across the block. This phase delay also increases as polarization increases.

Almost all metallic lustered sulfides such as for example; pyrite, chalcopyrite, chalcocite, bornite and molybdenite are electronic conductors and the rocks and ground water, with which they permeate or are permeated, are ionic conductors, therefore if an electric current is made to flow through a sulfide deposit, it will polarize and can be detected by the three methods described above.

This induced polarization property is not entirely unique with sulfides since magnetite, graphite and some clays will exhibit it; however, with sufficient geological and geophysical data, effects due to sulfides can generally be interpreted apart from non-sulfide anomalism. The type of sulfide however, say pyrite, as distinct from chalcopyrite, cannot yet be distinguished with present induced polarization techniques since all types give quite similar types of problems.

The I. P. technique was developed primarily for porphyry type deposits and is perhaps the only reliable means of detecting hidden disseminated sulfides. However, the I. P. method works just as well or perhaps better on semi-massive to massive sulfides, contrary to some of the earlier thinking, for it gives increased response with increased volume percentage of sulfide.

FIELD TECHNIQUES AND INTERPRETATION

For routine exploration, we prefer and use the dual frequency system because of its greater simplicity of instrumentation, operation and greater accuracy as well as simplicity of interpretation. However, all three methods give basically the same results and the choice is either a matter of opinion or highly technical reasons and therefore should be left to the individual application and the geophysicist's discretion.

The two frequencies we most commonly use are 0.05 and 3.0 cycles per second, respectively or so called "D.C." and "A.C." modes. Other frequencies are available with our equipment and are occasionally used when desired. The usual frequency range used is from about 0.01 cps. to 10 cps. The lower frequency limit is due to naturally existing time varying Telluric (earth) currents and

electrode polarization. The upper limit is determined by electro-magnetic coupling effects which increase rapidly with increasing frequency.

In our standard reconnaissance field practice, five equally spaced co-linear current electrodes are placed in the ground by burying aluminum foil in pits wetted with brine. Observations are made in accordance with a symmetrical dipole-dipole configuration where the distance between the receiver or potential electrodes is kept equal to the distance between adjacent electrode pairs. Generally the receiving dipole is separated by one to six dipole units ("n" separation) from the sending dipole. Figures 1 and 2 indicate this configuration and resulting data plotting positions. A precisely controlled square wave current is sent through a sending dipole at 0.05 and 3.0 cycles per second from which, at the receiving dipole, a "D.C." and an "A.C." voltage are measured, respectively. By knowing the geometry involved (the dipole length or spacing and the separation distance between the two receiving-sending dipole pairs), along with the two voltages, an apparent "D.C." and an "A.C." resistivity can be calculated. From these apparent resistivities, their percentage difference is determined, thus giving the Percent Frequency Effect (PFE). A third quantity proportional to PFE and inversely proportional to "D.C." resistivity, called Metallic Conduction Factor (MCF) is computed in order to somewhat normalize PFE for variations in ground conductivity purely as a technical interpretational aid. Formulas for these various quantities are given on Figure 3.

Selection of electrode spacings is determined by the objectives to be reached in a given survey. This spacing will range from very small (50 feet or less) for very detailed and shallow surveys, up to 1,000 feet, or occasionally more, for broad and deep reconnaissance work. Other factors involved in the selection of spacing are concerned with the anticipated physical geometry of any possibly existing mineral occurrence. This includes consideration of such size, shape and position factors as expected depth of burial to the top of the deposit, the dimensions of the deposit itself, its orientation, strike and dip, etc., as well as its expected electrical properties.

In general, the greater the dipole spacing and "n" separation, the greater the depth penetration and the less

the resolution. A rule of thumb used in practice is that, with a good contrast of electrical properties, using the symmetrical - co-linear dipole-dipole system, and having data from 1 through 6 in "n" separations, two times the dipole length is the maximum depth of detectable penetration, and 0.2 times the dipole length is about the minimum depth of detectable penetration for a body having two or three of its dimensions large in relation to the dipole spacing. However, a body having two or three of its dimensions less than the dipole spacing, and buried more than one spacing probably will not be detectable. A zone, regardless of orientation, having a dimension less than 0.1 the dipole spacing will not likely be detectable. Also, zones differing by less than about 30% in electrical conductivity will not be very easily resolved by resistivity measurements, but may still be detected if a polarization contrast exists.

To illustrate the above in more concrete terms, consider a dipole spacing of 1,000 feet for the following: An overburden of more than 2,000 feet would likely not allow enough current penetration into bedrock to detect even a large and highly mineralized zone in the bedrock. Also, a sulfide zone lying completely within 200 feet of the surface generally would not be detected. A spherical or elongated cylindrical body whose top is more than about 1,000 feet below surface and whose diameter is much less than 1,000 feet would be just out of the range of detectability. A Dike-like or sill-like zone whose width is less than 100 feet probably would not be detected regardless of how it lies relative to the spread.

So far, only the maximum and minimum limits of detection and resolution relative to the various geological and geometrical configurations have been discussed, thus omitting optimum conditions. Generally, we attempt to make the dipole spacing one to two times the expected depth to the target in order to obtain a good electrical response. Of course, where it is suspected that the zone has a good depth extent, say two or more dipole spacings, as is typical of most porphyry type copper deposits, a spacing considerably more than two times the expected depth to sub-outcrop can be used to obtain broader and more rapid coverage, as long as we do not exceed the zone's width. Because of these factors, we usually use 500 to 1,000 foot dipole spacings in prospecting for porphyry-type deposits.

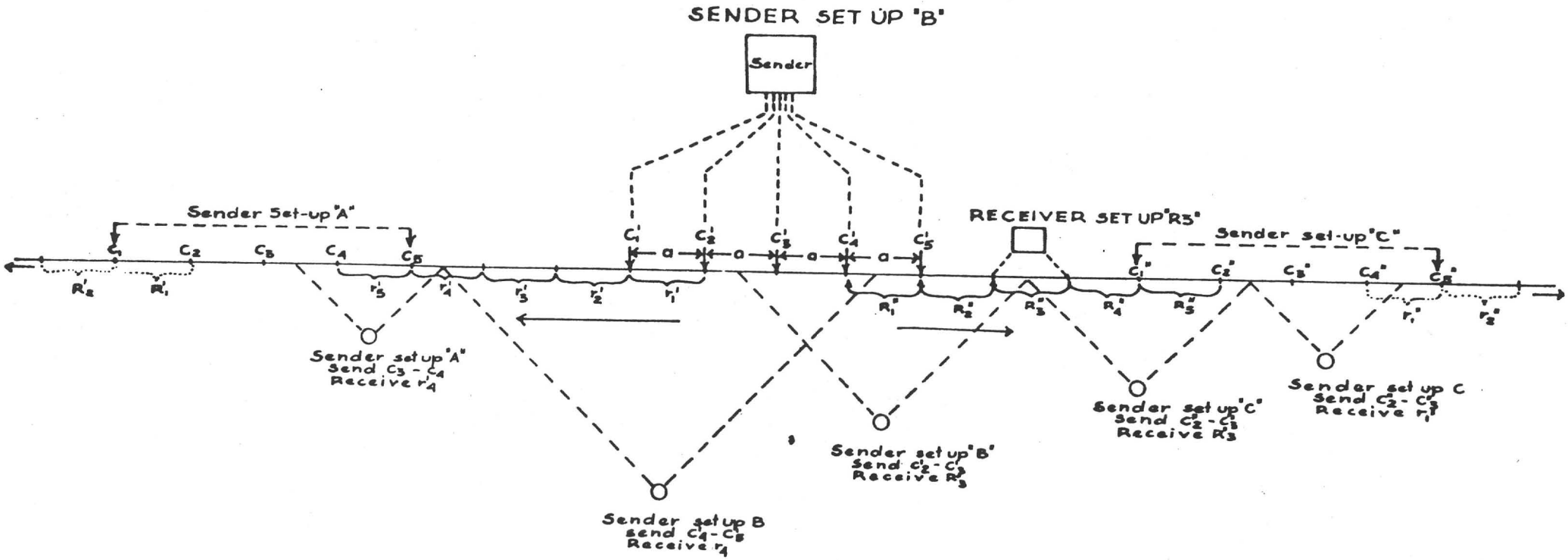
The field data are interpreted after plotting the PFE, MCF and resistivity as in Figures 1 and 2. These values are then contoured, the resistivity and metallic conduction factor logarithmically (because of the usual large variations in magnitude) and the percent frequency effect on a constant interval. This two dimensional method of plotting gives an additional leverage over the standard profile methods in that easily recognizable patterns are associated with various subsurface geometrical configurations and that lateral variations can be separated from vertical effects.

It should be realized that there is no definite relation between the vertical scale on these plots and actual subsurface depth. The data point values are a complexly weighted average of the electrical contrast distribution in the vicinity of the sending-receiving dipole pair and contain depth as well as lateral information. About all that can be said is that by increasing the dipole length and the dipole separation ("n" separation) more volume of ground is being affected and therefore more depth penetration.

There are cases where the depth to a subsurface feature can be determined fairly precisely as in the two horizontal layer situation. The field data is compared with theoretical type curves for various resistivity contrasts between the top and bottom layer and various thickness of the top layer until a close match is found. This enables the depth to the bottom layer in the field to be determined as well as the true resistivity of both layers. A major limitation to this interpretational technique is that only a few simple geometric cases related to a relatively few number of layers have been theoretically developed. However, extremely valuable information can still be derived in alluvial and lake bed applications for depth to bedrock and ground water purposes, etc.

In interpreting PFE's, values of 0 to 4 percent are usually considered background, 4 to 8% marginally anomalous and 8 to 40 plus definitely anomalous, but they must be considered in light of the associated resistivity. Very low resistivities give an increased background frequency effect due to an electromagnetic inductive coupling interference phenomenon that must be corrected for. The MCF tends to correct any high resistivity increased background frequency effects but tends to amplify the electro-magnetic frequency effects making a correction imperative.

Figure 1



Schematic diagram illustrating the method of obtaining and plotting Dipole-Dipole I. P. data. Diagram shows three separate current electrode spreads along a traverse line. In normal procedure, there are three dipole separations between current electrode spreads. The receiver setups are moved outwards from the ends of each current electrode spread usually until three dipole spacings separate the potential electrode setup from the near end of the spread. Current is "sent" to each possible pair of electrodes for each receiver setup. For instance, in Sender setup "B" when the receiver is receiving at R_1 only $C_3' - C_2'$ and $C_2' - C_1'$ can be "sent" so that data at 1 and 2 dipole separations is obtained respectively. When the receiver is at R_5'; $C_5' - C_4'$, $C_4' - C_3'$, $C_3' - C_2'$, and $C_1' - C_2'$ are sent and data is obtained for 3, 4, 5 and 6 dipole separations respectively. Each sender setup provides 33 data points.

Figure 2

(Data obtained from the three setups of Figure 1)

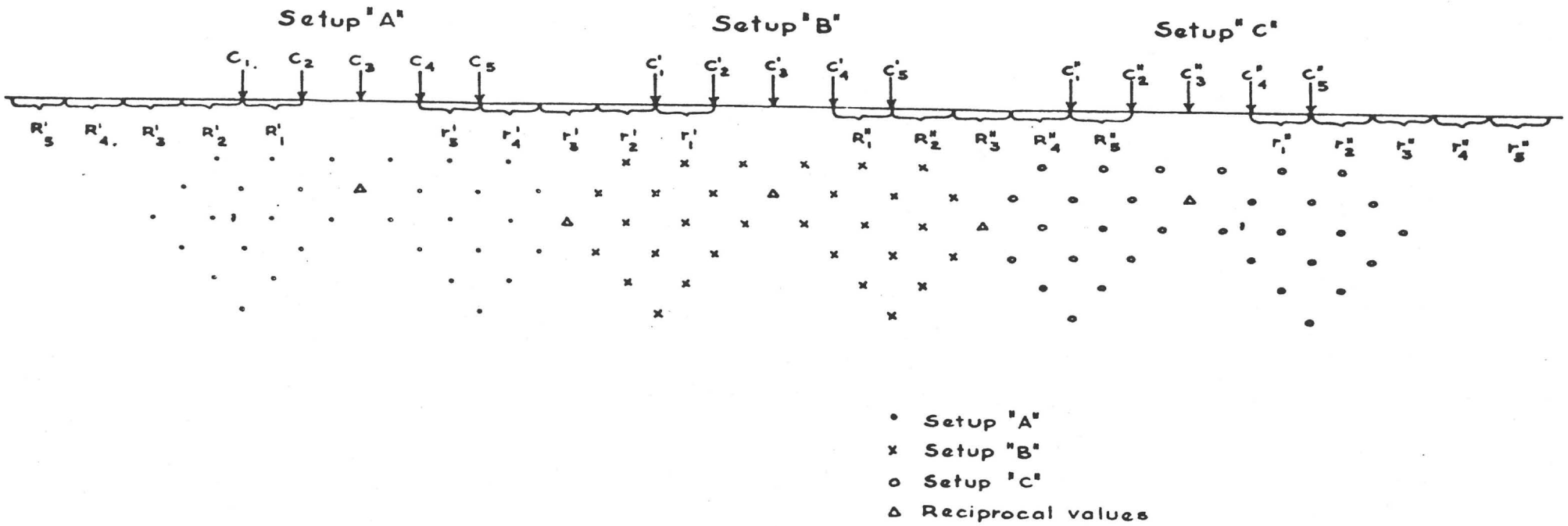


FIGURE 3

$$PFE = \left(\frac{\rho_{dc}}{\rho_{ac}} - 1\right) 100$$

Where PFE is Percent Frequency Effect, ρ_{dc} is the apparent resistivity at the lower frequency and ρ_{ac} is the higher frequency apparent resistivity.

$$\rho = \frac{2\pi V}{I} Kn$$

Where ρ is either ρ_{dc} or ρ_{ac} depending on frequency of the current I which is measured in amperes. The potential V, arising from I, is measured in volts. K_n is the geometric factor given by:

$$Kn = \frac{an(n+1)(n+2)}{2}$$

(Only for dipole-dipole arrays)

Where a is the dipole spacing in feet and n is the number of dipoles separating the sending and receiving dipoles, this gives, for apparent resistivity:

$$\rho = \frac{2\pi V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

from which we see that ρ is in units of ohm-feet. However, the apparent resistivity usually plotted is $\rho/2\pi$ or:

$$\frac{\rho}{2\pi} = \frac{V}{I} Kn = \frac{V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

$$MCF = \frac{PFE}{\rho_{dc}/2\pi} \times 1000$$

Where MCF is the Metallic Conduction Factor and $\rho_{dc}/2\pi$ is apparent "D.C." resistivity.

INDUCTIVE COUPLING INTERFERENCE

If $a(n+1)\sqrt{\frac{f}{\rho/2\pi}}$ is less than 1000 then the inductive coupling false frequency effect will be less than 2.5%. Likewise if less than 1500 the false effect will be less than 5%, and if less than 2000, the false effect will be less than 10%. Frequency f is in cycles per second.

INDUCED POLARIZATION SURVEY
THE S.O.B. CLAIM GROUP, SUPERIOR AREA
PINAL COUNTY, ARIZONA

for

GUNNEX, LIMITED

June 1966

by

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Our general impression is that the anomalous zone has somewhat irregular gradational boundaries on the southwest and

that some sort of cross structure limits the anomaly to the southeast. The zone of major anomalism is in excess of 1,000 ft. wide and persists for at least 7,000 ft. in a NW-SE direction. Continuity has been disrupted between Lines 54E and 84E, possibly offset to the northeast. The anomaly is somewhat weaker to the northwest, but is much wider and completely open ended. Pending the outcome of initial test drilling, the I.P. anomaly should be closed off on all sides not now defined. Based on a rule of thumb estimate, the strong MCF zones may represent 3% total sulfides averaged through large volumes of rock in the vicinity of station 0.6SE on Line 30N.

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A single spread of 1,000 ft. dipole separations was run on this line. A strong anomalism detected hints at a fairly flat structure dipping to the NE. This zone of strong anomalism

is between station 1.5 and 2.5 NE with a weak anomaly continuing NE, apparently disappearing under the cliff.

Another anomalous zone beginning at station 1.0 SW and continuing off the line to the southwest may represent the feature that caused the anomalism on Line 15 W to be very wide. It seems to be deeper than the main anomaly, but additional geophysical work or drilling is needed to properly locate and determine its depth. Very weak SP correlation to the I.P. anomaly is shown, but is not considered an interpretational aid on this line. A good resistivity contrast at station 1.0 NE may indicate the boundary of the mineralized zone detected by I.P.

No drilling is recommended on this line because the same features will be checked by proposed test holes on other lines.

Line 12 E

Results from the single spread of 1,000 ft. dipoles on this line were restricted because of topography on the NE and by excessive SP noise. The data obtained indicates very strong anomalism beginning at station 2 NE and continuing NE beyond the readings obtained.

The southwest side of this anomalous zone has a very weak to moderate fringe and the anomaly decreases with increased "n" spacings, possibly indicating either a nearly flat, thin body or two comparatively isolated bodies having very little depth continuity.

A sharp resistivity contrast has been detected at station 1.0 SW that may also be the edge of a mineralized or altered zone. No SP correlation is noted.

No drill holes are proposed on this line as the important features are considered the same as suggested drill targets on adjacent lines, or at least sufficiently similar, that other drilling will provide adequately representative testing for the time being.

Closing this anomaly to the NE was not practical due to topography. Line D-1 attempted to locate a NE boundary by taking advantage of a ravine cutting the cliff line (and the normal profiles) at approximately a 40° angle.

Line D-1

This diagonal line employed one spread of 1,000 ft. dipoles to locate the NE edge of the anomalous zone. Although the 5n and 6n separation data were not read due to high noise, we are certain that adequate information from depth was obtained to detect mineralization under the cliff. The character of the

east edge of the high MCF values indicates that mineralization is rather sharply cut off, but a somewhat persistant fringe of very weak MCF values may indicate slight mineralization of the cliff forming rocks.

The decreasing PFE values indicate that the anomaly is closing off to the west, however the MCF values remain moderate, also a single questionable or doubtful reading helps confuse matters at the west end of the line. In any case, the anomalism on D-1 nicly confirms that on the previous lines, and a contact at 2.0 SW also fits into the picture.

Drilling of this line is accomplished by a test hole on another line.

Line 24 E

The 1,000 ft. dipole spread on this line detected only the southwest side of the anomaly because of the cliff to the northeast. In view of the results of Line D-1, the strong anomalous zone is most likely on the order of 1,000 ft. wide, cutting off rather abruptly near the cliff line.

A resistivity contrast, shown at 1.5 SW, indicates a contact which seemingly has little relation to the I.P. anomaly. No SP anomalism is noted. There is a magnetic low corresponding to the I.P. high on this line, according to a prior Gunnex survey.

Test drilling on this line is not recommended at this time because the same feature is better tested on another line.

Line 30 E

All comments made for Line 24 E hold true for this line except the contact has been interpreted at station 1.0 SW and drilling is proposed on 30 E.

The drilling proposed at 30 N is intended to check the two distinct zones from the same drill site. Both test holes are to be angled 60° down from the horizontal, one leading NE and the other to the SW. The hole leading NE should be continued entirely through the mineralization and check the location of the northeast edge of the anomaly. The other hole is intended to penetrate the magnetic low.included within the I.P. anomaly. It may be necessary to move this hole to the NW in order that it pass through the magnetic low as determined by the prior Gunnex Survey. Please note that this hole must be collared near 30 N, and possibly between lines 24 and 30 E in order that it test both the magnetics and the I.P.

Line 54 E

A single spread of 1,000 ft. dipoles effectively located the NE boundary of the strong I.P. high at about 3.5 NE and seems to indicate what may be either a second anomaly to the SW, or a weak fringe of the strong anomalism continuing off the line.

The contact indicated at 4.5 NE is derived from the resistivity data and very likely represents the NE edge of the mineralized zone.

A rather gradual SP decrease of 100 mv to the SW may be of significance, but no direct inference can be reached without additional data to the SW.

Drilling recommendations for this line are discussed in conjunction with Line 84 E.

Line 84 E

This line, bearing N 27° E, took advantage of following a ravine, causing the line to be slightly skewed to the claim boundaries. The center electrode was located on claim Line 84 E, 3,200 ft. NE of the base line. This spread of 1,000 ft. dipoles did not cross the anomalous zone as anticipated. Two open anomalous zones have now appeared at each end of the line, either of which could be the mineralized zone detected on the other lines to the NW. The more northeasterly anomaly is of moderate strength and we believe represents the offset anomaly. The anomaly beginning at about 0.2 NE may be of considerable importance because it seems to be coming from depth and we have seen only a part of it. Additional I.P. is recommended to delineate this zone as indicated on the plan map.

Test drilling of this line and Line 54 E are discussed as one. There seems to be a fault somewhere between 54 and 84 E that interupts the I.P. anomaly, creating a possible locus for deposition of economic minerals at the intersection of the fault and the anomalous zone. We think the fault trace may be near the small mine indicated on Line 84 E. This should be checked by detailed geology, and combined with added knowledge of the anomalous zone obtained from the proposed additional I.P. line as shown on the plan map. Placement of a drill hole to penetrate this locus is possible and based on present data, we would collar it within 500 ft. of 3.75 NE, 7.00 SE as marked by a circle on the plan map, inclined or vertical as geology dictates.

Line 30 N

This line is oriented N 45° W, with an I. P. spread centered at Line 24 E, and is the only line not utilizing 1,000 ft. dipoles. The single spread of 600 ft. dipoles was anomalous over

its entire length, being of moderate strength over 3,000 ft. and very strong for 600 ft. on each end. The purpose of this line was to obtain depth information for planning test drill holes. At all parts of Line 30 N it is evident that the I.P. effects are of the same magnitude for both the 1,000 ft. and 600 ft. dipole spreads, indicating near surface sulfides. Relative to the zone of highest MCF values, sulfides should be within 200 ft. of surface.

We propose a drill hole be collared at 0.6 SE on this line and drilled vertically to at least 500 ft. or to the practical limit of any sulfides or other favorable indications encountered. This drill site represents the area of greatest I. P. anomalism on three separate lines.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Paul A. Head

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Research Geophysicist

Approved:

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President & General Manager

July 7, 1966
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BASIS OF THE INDUCED POLARIZATION METHOD

The induced polarization method is based on the electrical properties exhibited by electronic or metallic conductors imbedded in an ionic or electrolytic conducting matrix. These properties are noticed in that the potential across a block of this dual conduction mode material will increase with time, approaching a constant value, when a constant current is made to flow through the block. This phenomenon occurs because at the boundaries between the two conductor types, electrolytic ions have to give up or take on electrons thereby requiring an additional force (overvoltage) over that which would be needed with only one mode of conduction; showing up as a building of potential across the block with time as more ions are backed up. This potential approaches a constant value when an equilibrium is established between the ions backed up at the boundaries and the flow across the boundaries. Therefore from the preceeding discussion, it is seen that the gross effect is quite similar to the charging of a leaky capacitor and for most applications, it is proper to use this mode as a guide. These capacitive-like properties are normally measured by three different techniques.

In the time domain (pulse) method, a steady direct current is imposed across the block for a few seconds and abruptly terminated so that the capacitive-like decay (discharge) curve can be measured or recorded. Usually, the voltage decay curve is integrated with respect to time to give the area under the decay curve in units of volt-seconds. The more area determined, the more capacitance or polarization the block exhibits.

In the frequency domain method, the percentage difference between the impedance (AC resistance) offered to a lower and a higher frequency is measured. A capacitor offers a lower impedance to a higher frequency than it does to a lower frequency, therefore the percentage difference between the impedances will increase with increased polarization.

A third technique is to measure the phase angle or delay between an introduced current wave-form and the received voltage wave across the block. This phase delay also increases as polarization increases.

Almost all metallic lustered sulfides such as for example; pyrite, chalcopyrite, chalcocite, bornite and molybdenite are electronic conductors and the rocks and ground water, with which they permeate or are permeated, are ionic conductors, therefore if an electric current is made to flow through a sulfide deposit, it will polarize and can be detected by the three methods described above.

This induced polarization property is not entirely unique with sulfides since magnetite, graphite and some clays will exhibit it; however, with sufficient geological and geophysical data, effects due to sulfides can generally be interpreted apart from non-sulfide anomalism. The type of sulfide however, say pyrite, as distinct from chalcopyrite, cannot yet be distinguished with present induced polarization techniques since all types give quite similar types of problems.

The I. P. technique was developed primarily for porphyry type deposits and is perhaps the only reliable means of detecting hidden disseminated sulfides. However, the I. P. method works just as well or perhaps better on semi-massive to massive sulfides, contrary to some of the earlier thinking, for it gives increased response with increased volume percentage of sulfide.

FIELD TECHNIQUES AND INTERPRETATION

For routine exploration, we prefer and use the dual frequency system because of its greater simplicity of instrumentation, operation and greater accuracy as well as simplicity of interpretation. However, all three methods give basically the same results and the choice is either a matter of opinion or highly technical reasons and therefore should be left to the individual application and the geophysicist's discretion.

The two frequencies we most commonly use are 0.05 and 3.0 cycles per second, respectively or so called "D.C." and "A.C." modes. Other frequencies are available with our equipment and are occasionally used when desired. The usual frequency range used is from about 0.01 cps. to 10 cps. The lower frequency limit is due to naturally existing time varying Telluric (earth) currents and

electrode polarization. The upper limit is determined by electro-magnetic coupling effects which increase rapidly with increasing frequency.

In our standard reconnaissance field practice, five equally spaced co-linear current electrodes are placed in the ground by burying aluminum foil in pits wetted with brine. Observations are made in accordance with a symmetrical dipole-dipole configuration where the distance between the receiver or potential electrodes is kept equal to the distance between adjacent electrode pairs. Generally the receiving dipole is separated by one to six dipole units ("n" separation) from the sending dipole. Figures 1 and 2 indicate this configuration and resulting data plotting positions. A precisely controlled square wave current is sent through a sending dipole at 0.05 and 3.0 cycles per second from which, at the receiving dipole, a "D.C." and an "A.C." voltage are measured, respectively. By knowing the geometry involved (the dipole length or spacing and the separation distance between the two receiving-sending dipole pairs), along with the two voltages, an apparent "D.C." and an "A.C." resistivity can be calculated. From these apparent resistivities, their percentage difference is determined, thus giving the Percent Frequency Effect (PFE). A third quantity proportional to PFE and inversely proportional to "D.C." resistivity, called Metallic Conduction Factor (MCF) is computed in order to somewhat normalize PFE for variations in ground conductivity purely as a technical interpretational aid. Formulas for these various quantities are given on Figure 3.

Selection of electrode spacings is determined by the objectives to be reached in a given survey. This spacing will range from very small (50 feet or less) for very detailed and shallow surveys, up to 1,000 feet, or occasionally more, for broad and deep reconnaissance work. Other factors involved in the selection of spacing are concerned with the anticipated physical geometry of any possibly existing mineral occurrence. This includes consideration of such size, shape and position factors as expected depth of burial to the top of the deposit, the dimensions of the deposit itself, its orientation, strike and dip, etc., as well as its expected electrical properties.

In general, the greater the dipole spacing and "n" separation, the greater the depth penetration and the less

the resolution. A rule of thumb used in practice is that, with a good contrast of electrical properties, using the symmetrical - co-linear dipole-dipole system, and having data from 1 through 6 in "n" separations, two times the dipole length is the maximum depth of detectable penetration, and 0.2 times the dipole length is about the minimum depth of detectable penetration for a body having two or three of its dimensions large in relation to the dipole spacing. However, a body having two or three of its dimensions less than the dipole spacing, and buried more than one spacing probably will not be detectable. A zone, regardless of orientation, having a dimension less than 0.1 the dipole spacing will not likely be detectable. Also, zones differing by less than about 30% in electrical conductivity will not be very easily resolved by resistivity measurements, but may still be detected if a polarization contrast exists.

To illustrate the above in more concrete terms, consider a dipole spacing of 1,000 feet for the following: An overburden of more than 2,000 feet would likely not allow enough current penetration into bedrock to detect even a large and highly mineralized zone in the bedrock. Also, a sulfide zone lying completely within 200 feet of the surface generally would not be detected. A spherical or elongated cylindrical body whose top is more than about 1,000 feet below surface and whose diameter is much less than 1,000 feet would be just out of the range of detectability. A Dike-like or sill-like zone whose width is less than 100 feet probably would not be detected regardless of how it lies relative to the spread.

So far, only the maximum and minimum limits of detection and resolution relative to the various geological and geometrical configurations have been discussed, thus omitting optimum conditions. Generally, we attempt to make the dipole spacing one to two times the expected depth to the target in order to obtain a good electrical response. Of course, where it is suspected that the zone has a good depth extent, say two or more dipole spacings, as is typical of most porphyry type copper deposits, a spacing considerably more than two times the expected depth to sub-outcrop can be used to obtain broader and more rapid coverage, as long as we do not exceed the zone's width. Because of these factors, we usually use 500 to 1,000 foot dipole spacings in prospecting for porphyry-type deposits.

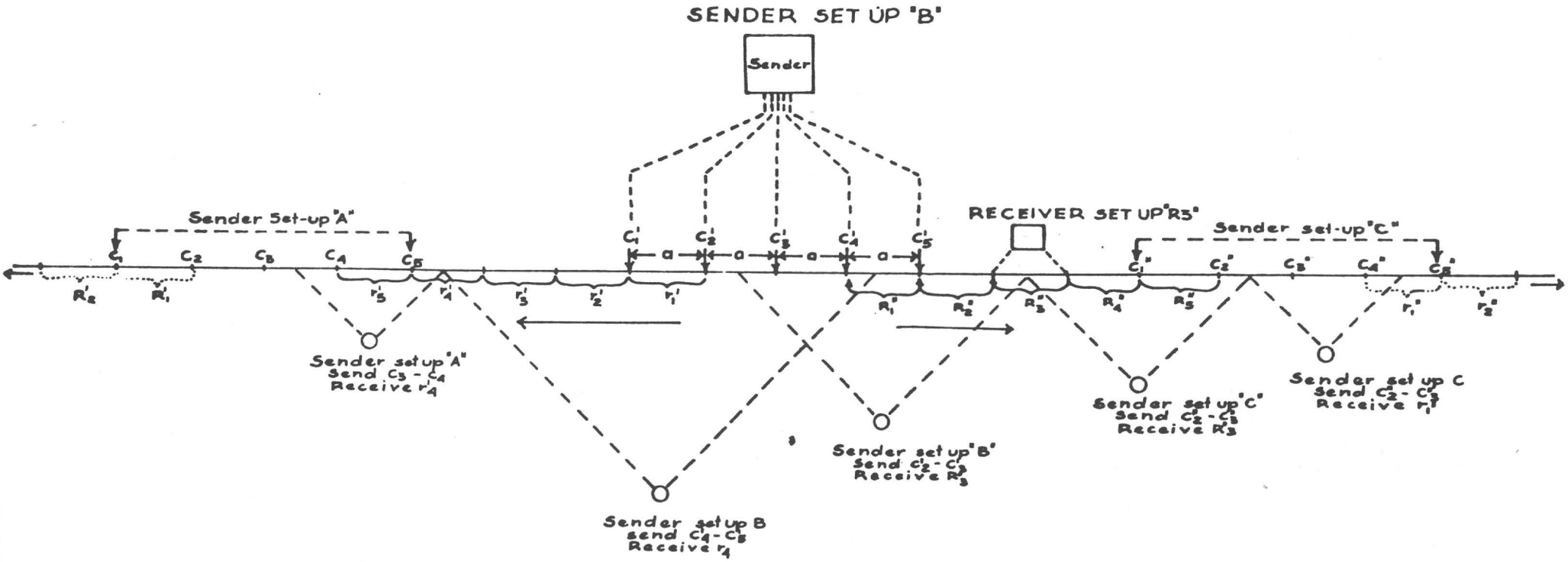
The field data are interpreted after plotting the PFE, MCF and resistivity as in Figures 1 and 2. These values are then contoured, the resistivity and metallic conduction factor logarithmically (because of the usual large variations in magnitude) and the percent frequency effect on a constant interval. This two dimensional method of plotting gives an additional leverage over the standard profile methods in that easily recognizable patterns are associated with various subsurface geometrical configurations and that lateral variations can be separated from vertical effects.

It should be realized that there is no definite relation between the vertical scale on these plots and actual subsurface depth. The data point values are a complexly weighted average of the electrical contrast distribution in the vicinity of the sending-receiving dipole pair and contain depth as well as lateral information. About all that can be said is that by increasing the dipole length and the dipole separation ("n" separation) more volume of ground is being affected and therefore more depth penetration.

There are cases where the depth to a subsurface feature can be determined fairly precisely as in the two horizontal layer situation. The field data is compared with theoretical type curves for various resistivity contrasts between the top and bottom layer and various thickness of the top layer until a close match is found. This enables the depth to the bottom layer in the field to be determined as well as the true resistivity of both layers. A major limitation to this interpretational technique is that only a few simple geometric cases related to a relatively few number of layers have been theoretically developed. However, extremely valuable information can still be derived in alluvial and lake bed applications for depth to bedrock and ground water purposes, etc.

In interpreting PFE's, values of 0 to 4 percent are usually considered background, 4 to 8% marginally anomalous and 8 to 40 plus definitely anomalous, but they must be considered in light of the associated resistivity. Very low resistivities give an increased background frequency effect due to an electromagnetic inductive coupling interference phenomenon that must be corrected for. The MCF tends to correct any high resistivity increased background frequency effects but tends to amplify the electro-magnetic frequency effects making a correction imperative.

Figure 1



Schematic diagram illustrating the method of obtaining and plotting Dipole-Dipole I. P. data. Diagram shows three separate current electrode spreads along a traverse line. In normal procedure, there are three dipole separations between current electrode spreads. The receiver setups are moved outwards from the ends of each current electrode spread usually until three dipole spacings separate the potential electrode setup from the near end of the spread. Current is "sent" to each possible pair of electrodes for each receiver setup. For instance, in Sender setup "B" when the receiver is receiving at R_1 only $C_3' - C_2'$ and $C_2' - C_1'$ can be "sent" so that data at 1 and 2 dipole separations is obtained respectively. When the receiver is at R_5'; $C_5' - C_4'$, $C_4' - C_3'$, $C_3' - C_2'$, and $C_1' - C_2'$ are sent and data is obtained for 3, 4, 5 and 6 dipole separations respectively. Each sender setup provides 33 data points.

Figure 2

(Data obtained from the three setups of Figure 1)

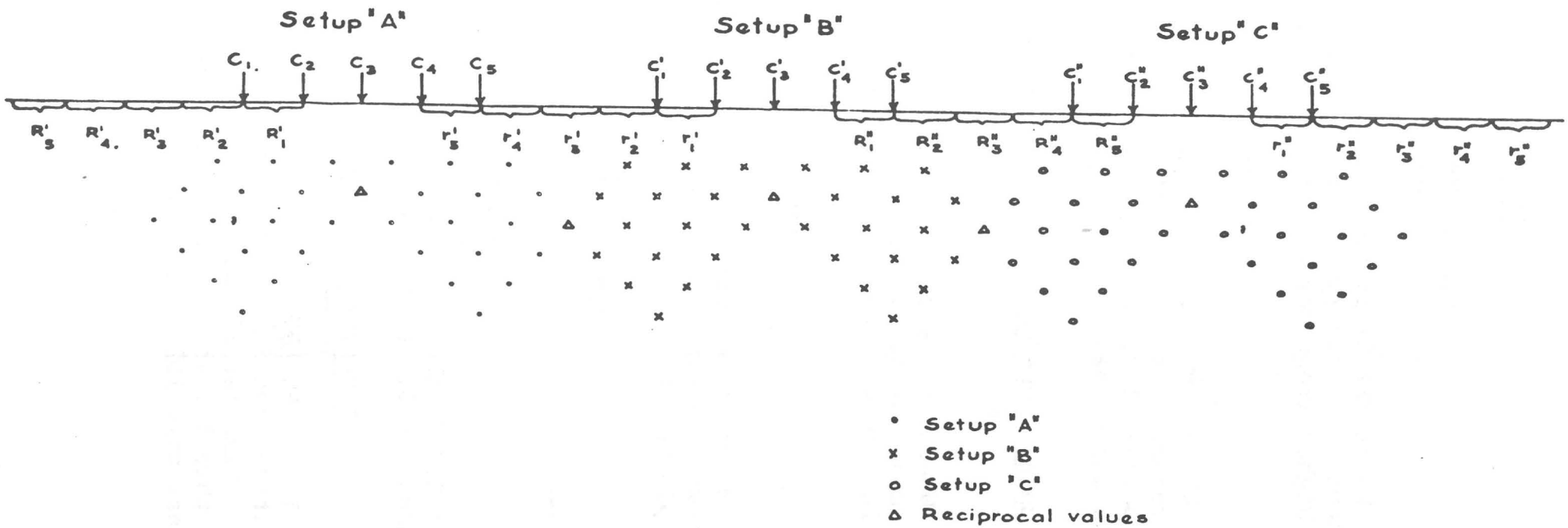


FIGURE 3

$$PFE = \left(\frac{\rho dc}{\rho ac} - 1\right) 100$$

Where PFE is Percent Frequency Effect, ρ dc is the apparent resistivity at the lower frequency and ρ ac is the higher frequency apparent resistivity.

$$\rho = \frac{2\pi V}{I} Kn$$

Where ρ is either ρ dc or ρ ac depending on frequency of the current I which is measured in amperes. The potential V, arising from I, is measured in volts. K_n is the geometric factor given by:

$$Kn = \frac{an(n+1)(n+2)}{2}$$

(Only for dipole-dipole arrays)

Where a is the dipole spacing in feet and n is the number of dipoles separating the sending and receiving dipoles, this gives, for apparent resistivity:

$$\rho = \frac{2\pi V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

from which we see that ρ is in units of ohm-feet. However, the apparent resistivity usually plotted is $\rho/2\pi$ or:

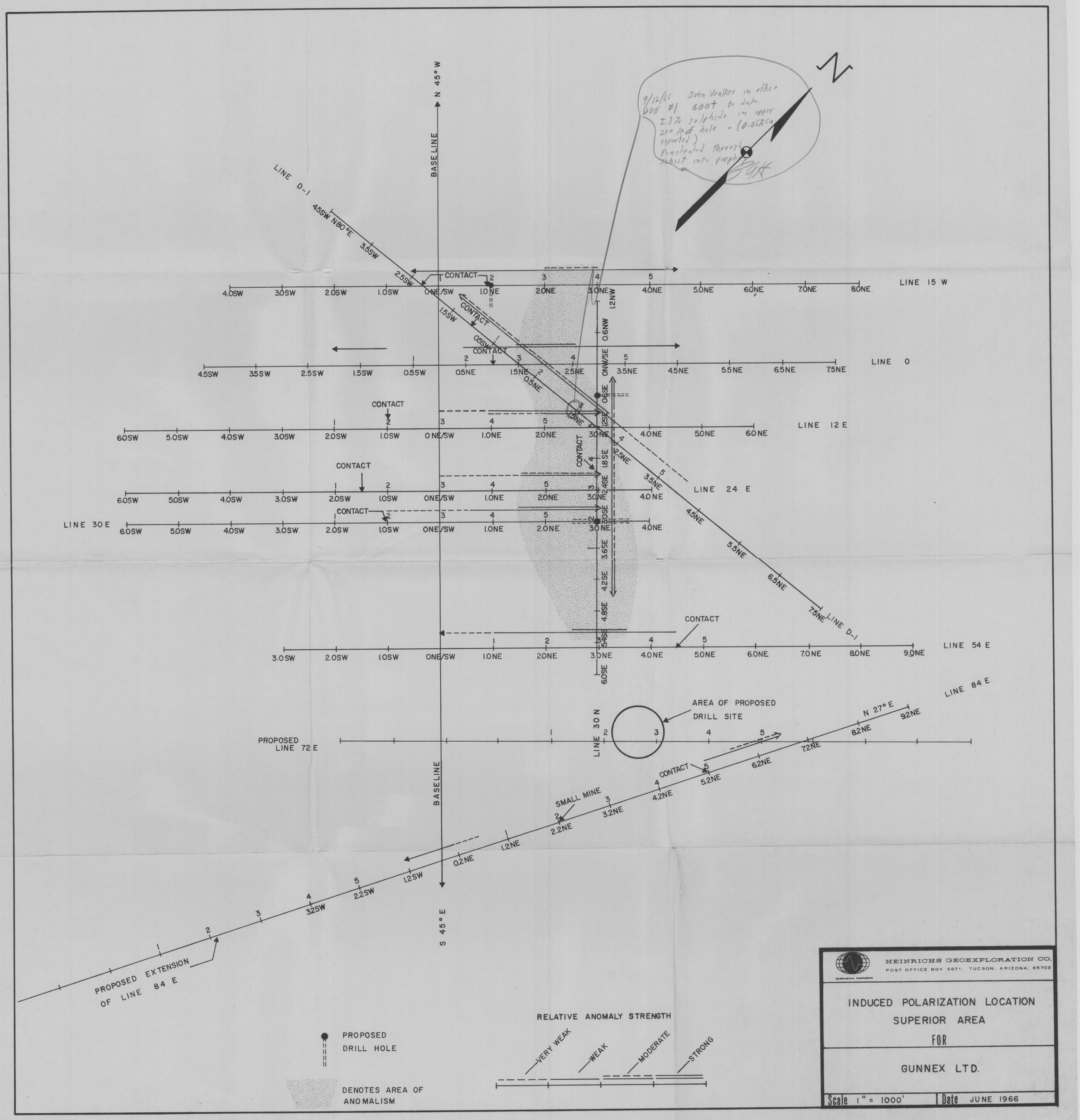
$$\frac{\rho}{2\pi} = \frac{V}{I} Kn = \frac{V}{I} \left(\frac{an(n+1)(n+2)}{2}\right)$$

$$MCF = \frac{PFE}{\rho dc/2\pi} \times 1000$$

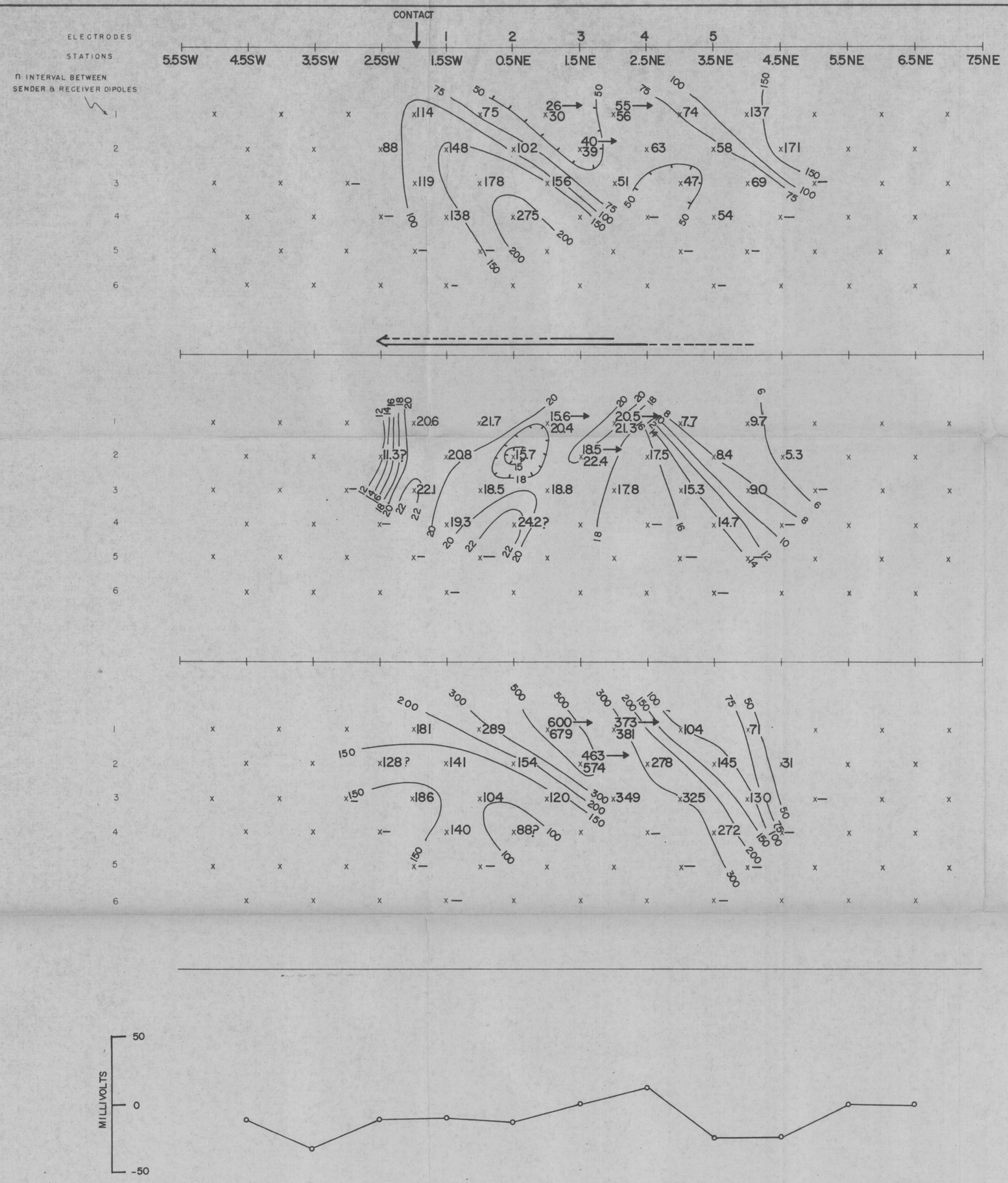
Where MCF is the Metallic Conduction Factor and $\rho dc/2\pi$ is apparent "D.C." resistivity.

INDUCTIVE COUPLING INTERFERENCE

If $a(n+1)\sqrt{\frac{f}{\rho/2\pi}}$ is less than 1000 then the inductive coupling false frequency effect will be less than 2.5%. Likewise if less than 1500 the false effect will be less than 5%, and if less than 2000, the false effect will be less than 10%. Frequency f is in cycles per second.



N
9/12/66 John Walker in office
DDH #1 600t to date
±3% sulphide in upper
200 ft of hole - (0.05% Cu
reported)
Penetrated through
schist into porphy
BGH
N 45° W
BASE LINE
LINE D-1
4.5SW N80°E
3.5SW
2.5SW
1.5SW
0.5SW
CONTACT
LINE 15 W
4.0SW 3.0SW 2.0SW 1.0SW 0NE/SW 1.0NE 2.0NE 3.0NE 4.0NE 5.0NE 6.0NE 7.0NE 8.0NE
1.2NW
0.6NW
LINE 0
4.5SW 3.5SW 2.5SW 1.5SW 0.5SW 0.5NE 1.5NE 2.5NE 3.5NE 4.5NE 5.5NE 6.5NE 7.5NE
0NW/SE
0.6SE
LINE 12 E
6.0SW 5.0SW 4.0SW 3.0SW 2.0SW 1.0SW 0NE/SW 1.0NE 2.0NE 3.0NE 4.0NE 5.0NE 6.0NE
1.2SE
1.8SE
2.4SE
3.0SE
3.6SE
4.2SE
4.8SE
5.4SE
6.0SE
LINE 24 E
6.0SW 5.0SW 4.0SW 3.0SW 2.0SW 1.0SW 0NE/SW 1.0NE 2.0NE 3.0NE 4.0NE
LINE 30 E
6.0SW 5.0SW 4.0SW 3.0SW 2.0SW 1.0SW 0NE/SW 1.0NE 2.0NE 3.0NE 4.0NE
3.5NE
4.5NE
5.5NE
6.5NE
7.5NE
LINE D-1
LINE 54 E
3.0SW 2.0SW 1.0SW 0NE/SW 1.0NE 2.0NE 3.0NE 4.0NE 5.0NE 6.0NE 7.0NE 8.0NE 9.0NE
LINE 84 E
AREA OF PROPOSED
DRILL SITE
LINE 30 N
PROPOSED
LINE 72 E
N 27° E
9.2NE
8.2NE
7.2NE
6.2NE
5.2NE
4.2NE
3.2NE
2.2NE
1.2NE
0.2NE
1.2SW
2.2SW
3.2SW
SMALL MINE
S 45° E
PROPOSED EXTENSION
OF LINE 84 E
PROPOSED
DRILL HOLE
DENOTES AREA OF
ANOMALISM
RELATIVE ANOMALY STRENGTH
VERY WEAK
WEAK
MODERATE
STRONG
HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
INDUCED POLARIZATION LOCATION
SUPERIOR AREA
FOR
GUNNEX LTD.
Scale 1" = 1000'
Date JUNE 1966



EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000 — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING N 10° W

SUPERIOR AREA

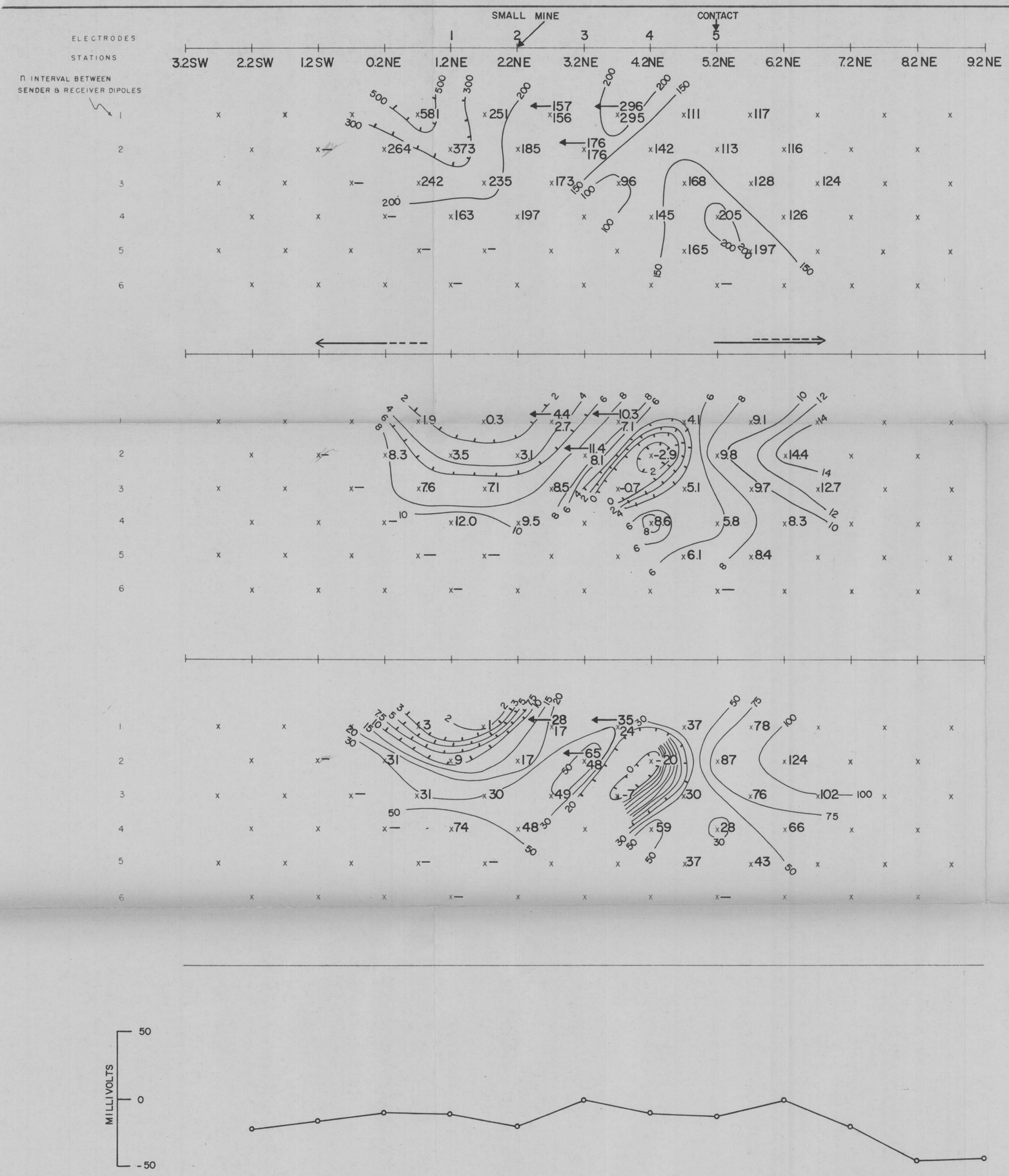
SECTIONAL DATA SHEET
LINE NO. D-1
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY
SCALE: 1" = 1000' DATE: JUNE 1966

FOR

GUNNEX LTD.

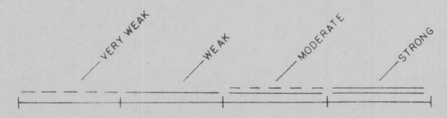
HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA



EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH



LOOKING N 63° W

OFFICE

SUPERIOR AREA

SECTIONAL DATA SHEET
LINE NO. 84 E
INDUCED POLARIZATION TRAVERSE

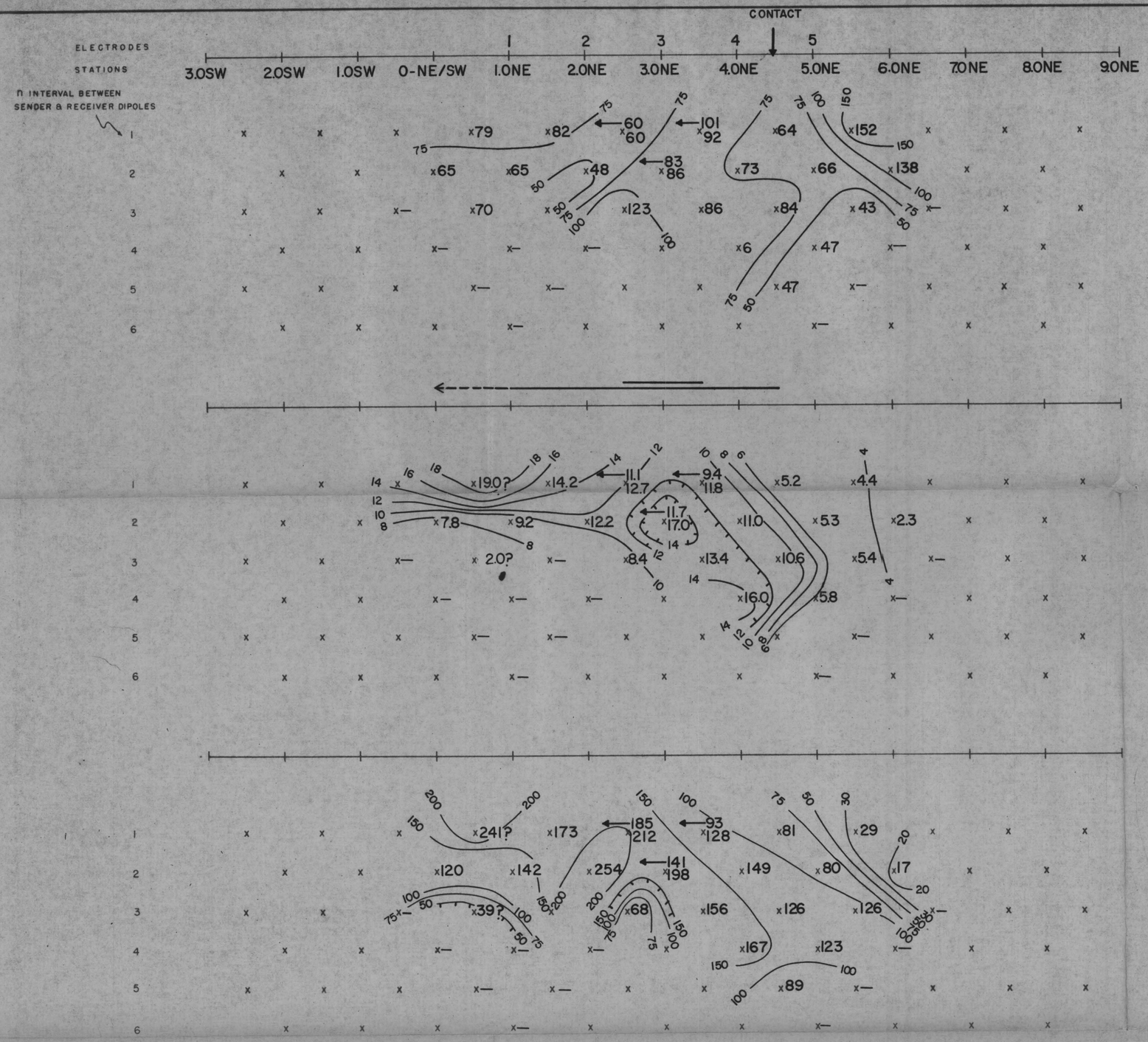
HEINRICHS GEOEXPLORATION COMPANY
SCALE: 1" = 1000' DATE: JUNE 1966

FOR

GUNNEX LTD.

SELF POTENTIAL

HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS TUCSON, ARIZONA



EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING N 45°W

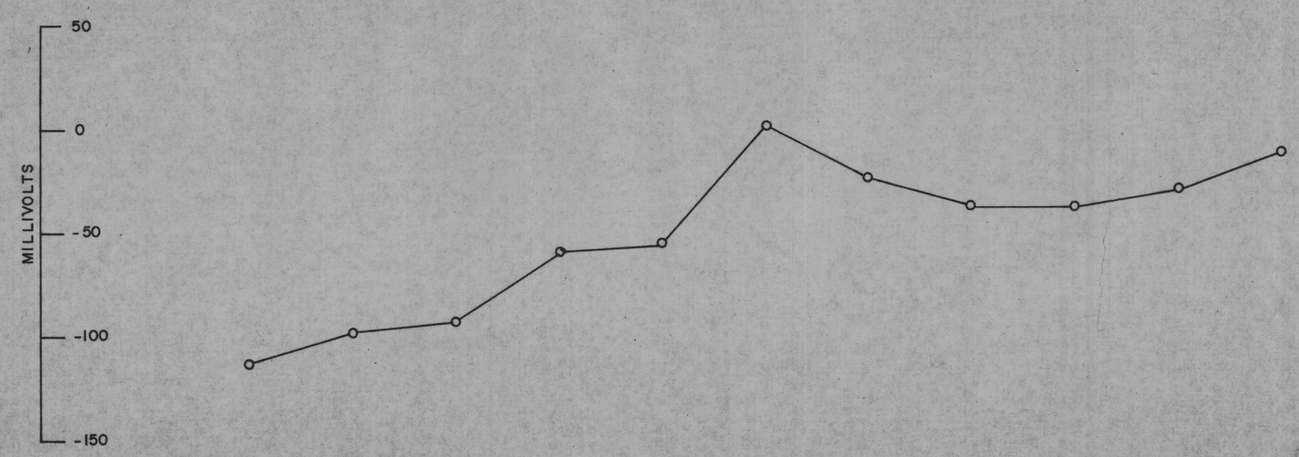
SUPERIOR AREA

SECTIONAL DATA SHEET
LINE NO. 54 E
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY
SCALE: 1" = 1000' DATE: JUNE 1966

FOR

GUNNEX LTD.



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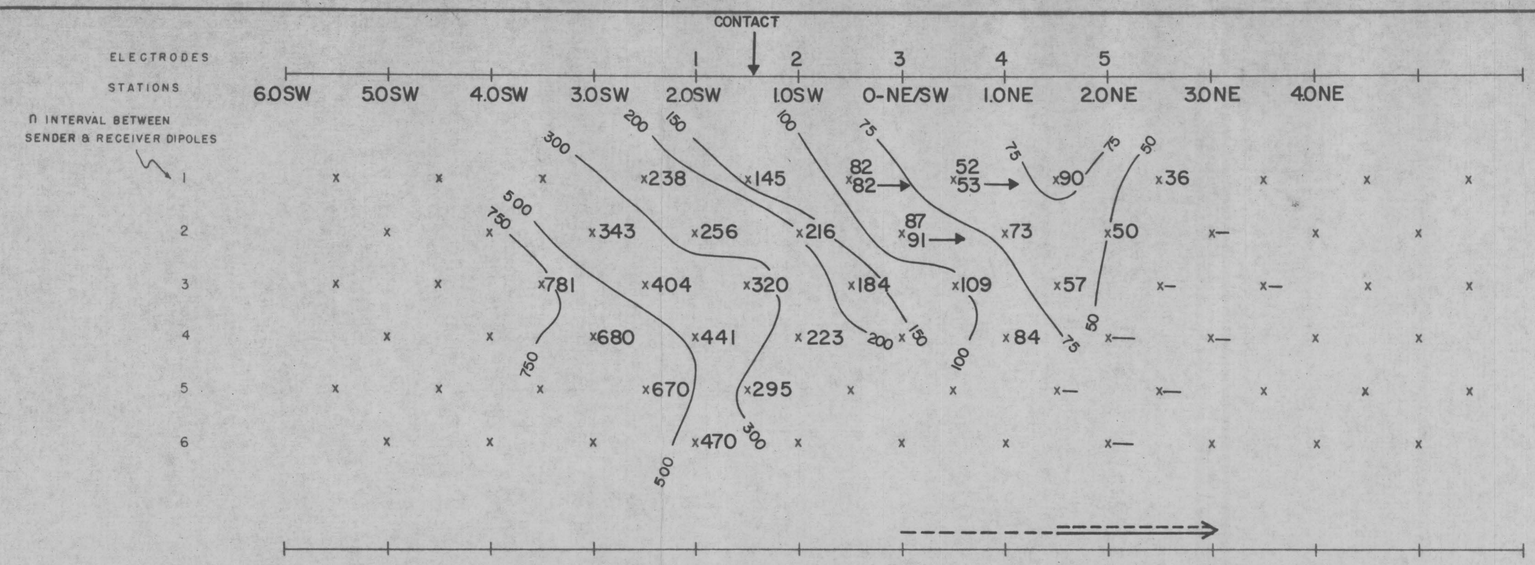
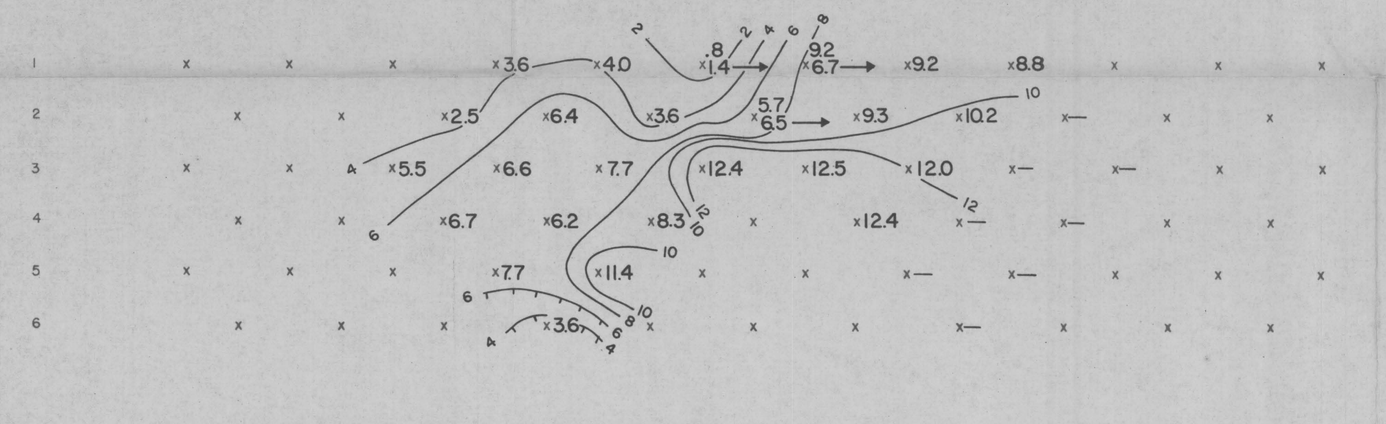
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

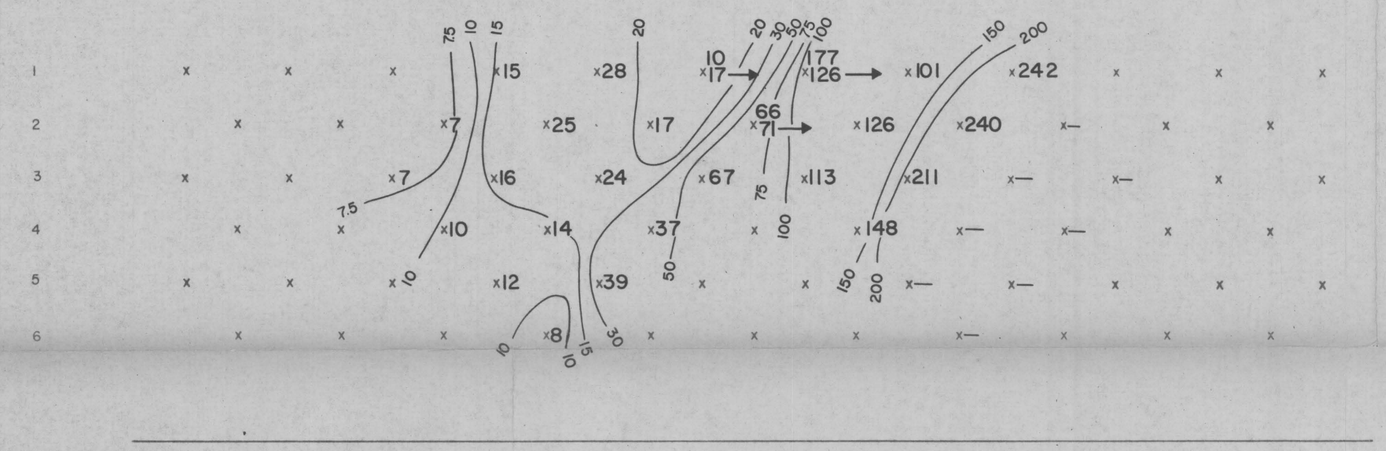


APPARENT RESISTIVITY ($\rho_{DC}/2\pi$) IN UNITS OF OHM FEET

CONTOUR INTERVAL LOGARITHMIC
SENDER FREQUENCY: 0.05 c.p.s.



PERCENT FREQUENCY EFFECT (PFE)
CONTOUR INTERVAL CONSTANT
SENDER FREQUENCIES: 0.05 & 3.0 c.p.s

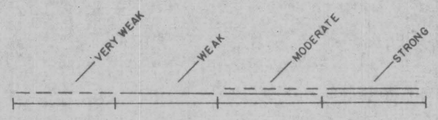


APPARENT "METALLIC CONDUCTION" FACTOR (MCF)
$\left(MCF = \frac{PFE \times 1000}{\rho_{DC}/2\pi}\right)$
CONTOUR INTERVAL LOGARITHMIC

EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH



LOOKING N 45° W

SUPERIOR AREA

SECTIONAL DATA SHEET

LINE NO. 24 E

INDUCED POLARIZATION TRAVERSE

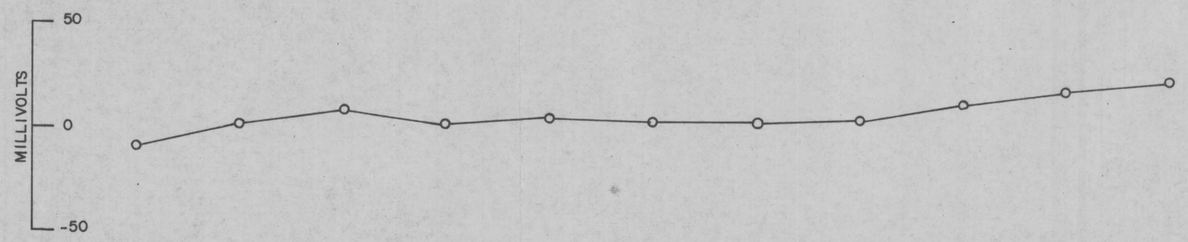
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: MAY 1966

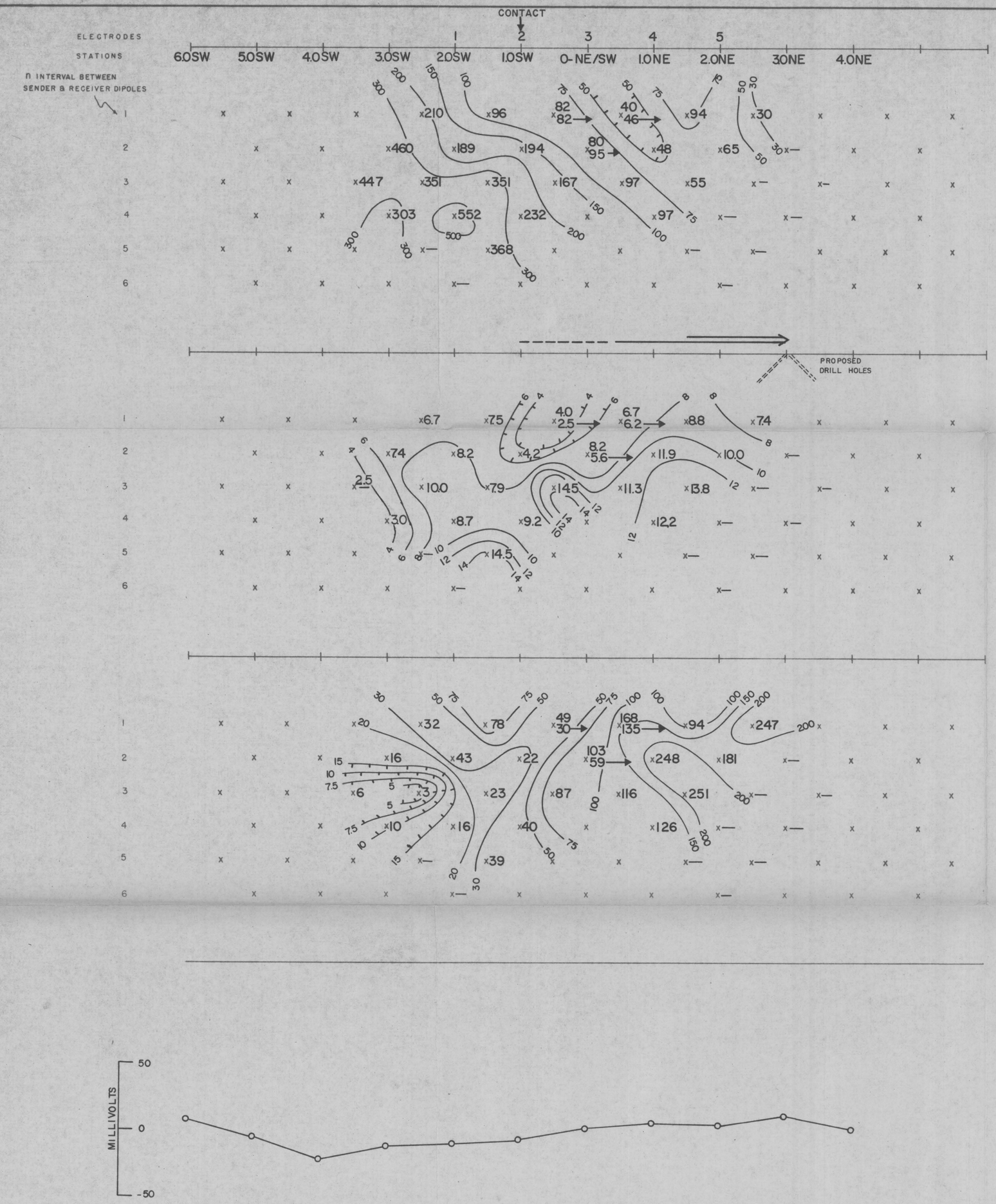
FOR

GUNNEX LTD.

SELF POTENTIAL



HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA



EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING N 45° W

SUPERIOR AREA

SECTIONAL DATA SHEET

LINE NO. 30 E

INDUCED POLARIZATION TRAVERSE

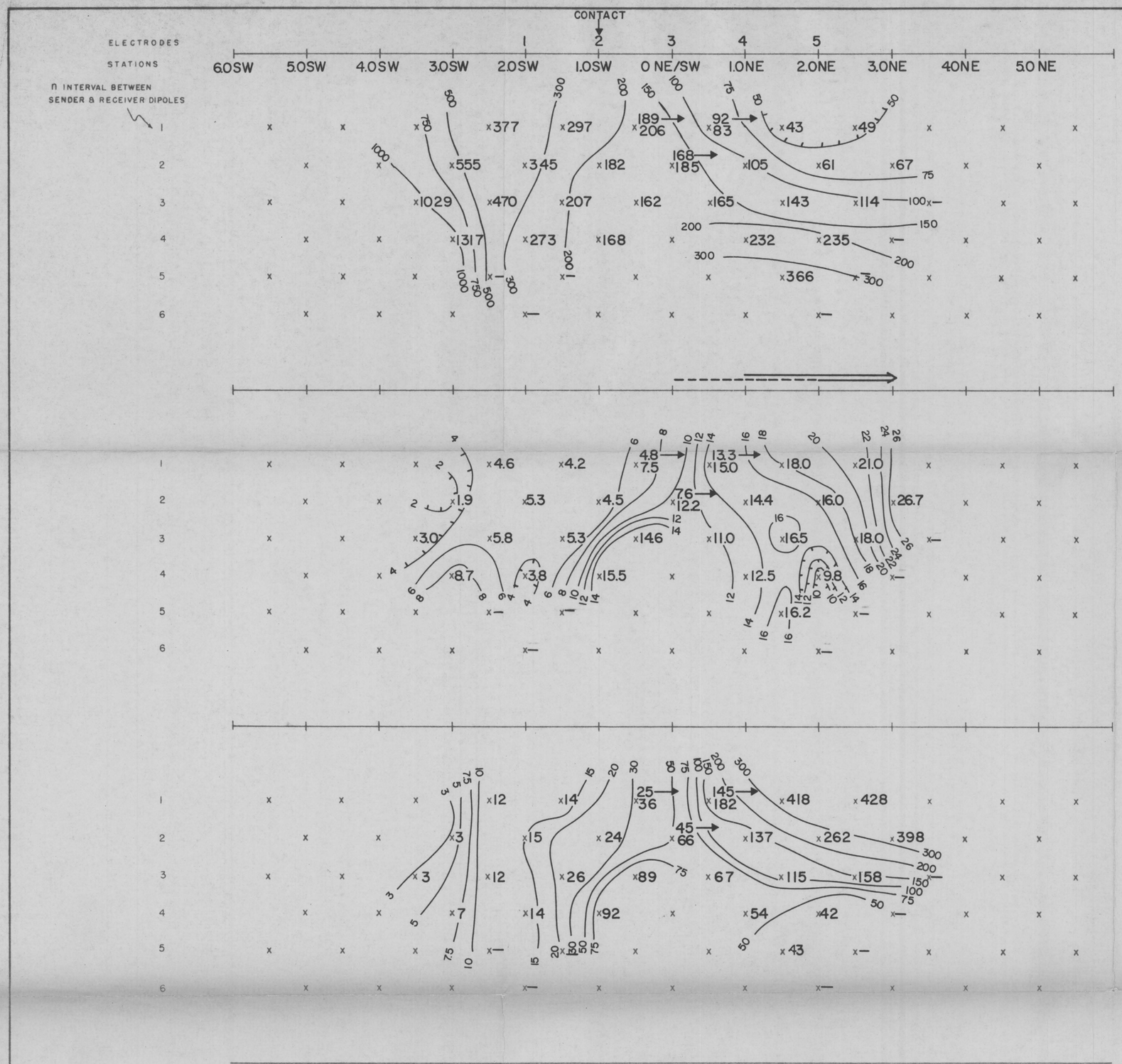
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: MAY 1966

FOR

GUNNEX LTD.

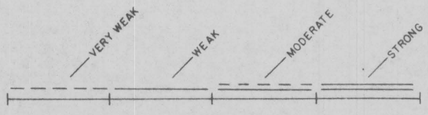
HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA



EXPLANATION

ELECTRODE ARRAY: 1000' SENDER DIPOLE — n x 1000' — 1000' RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH



LOOKING N 45° W

OFFICE

SUPERIOR AREA

SECTIONAL DATA SHEET

LINE NO. 12 E

INDUCED POLARIZATION TRAVERSE

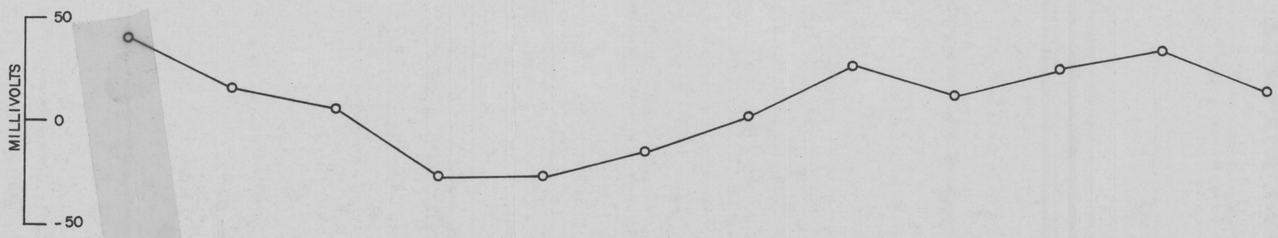
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: MAY 1966

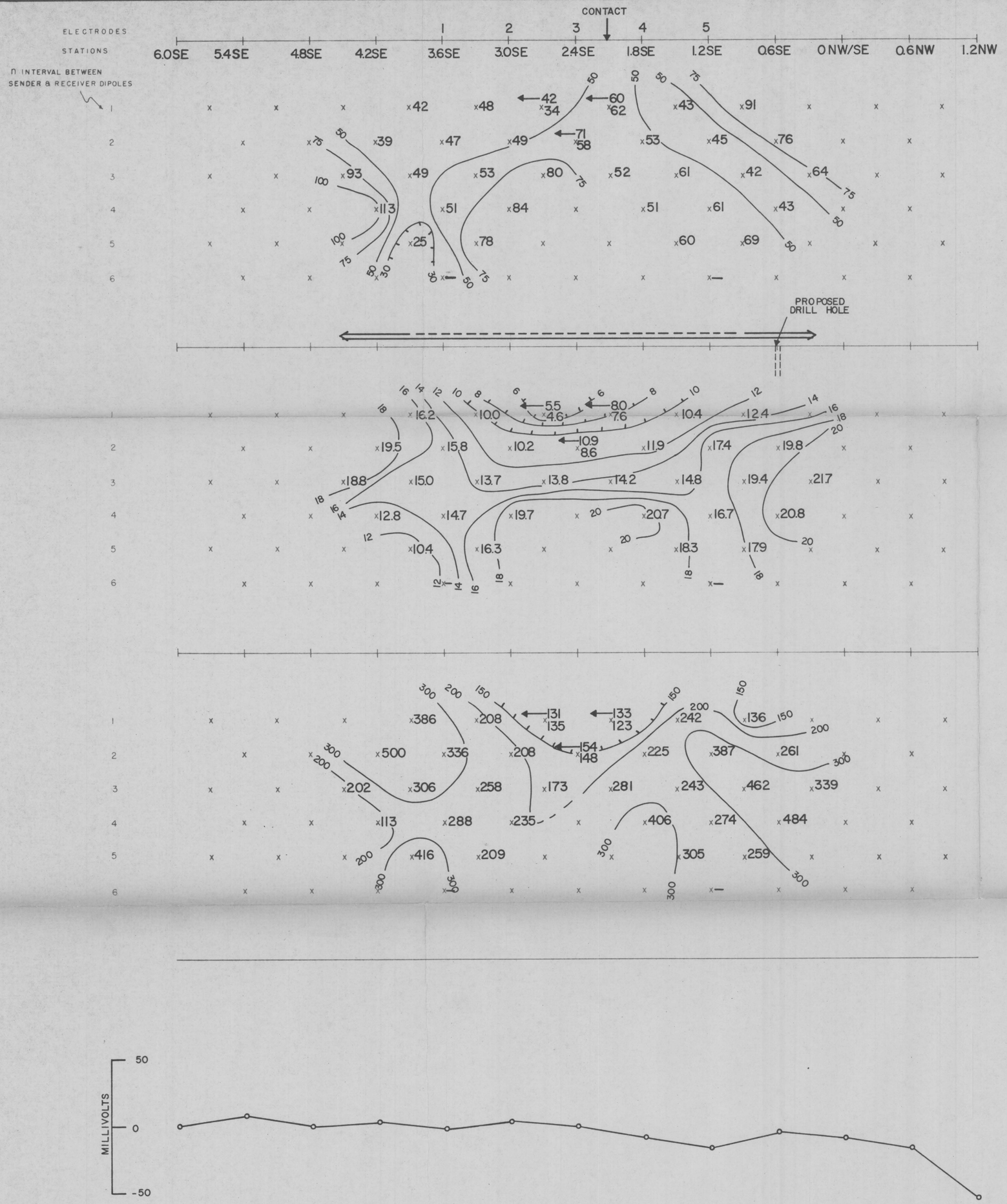
FOR

GUNNEX LTD.

SELF POTENTIAL



HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA



EXPLANATION

ELECTRODE ARRAY: 600' — n x 600' — 600'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING SW

SUPERIOR AREA

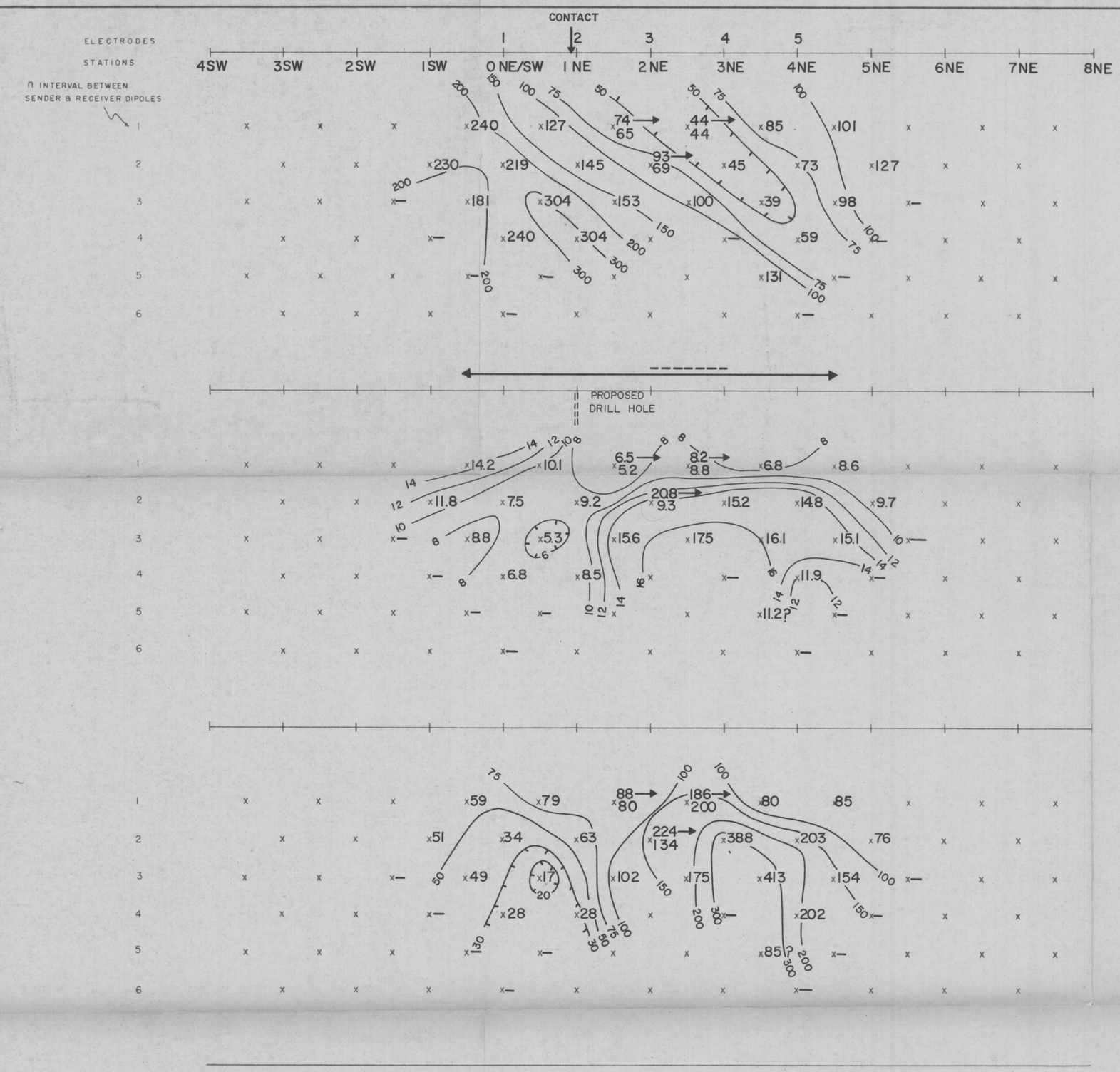
SECTIONAL DATA SHEET
LINE NO. 30 N
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY
SCALE: 1" = 600' DATE: JUNE 1966

FOR

GUNNEX LTD.

HEINRICHS GEOEX



APPARENT RESISTIVITY ($\rho_{DC}/2\pi$) IN UNITS OF OHM FEET
CONTOUR INTERVAL LOGARITHMIC
SENDER FREQUENCY: 0.05 c.p.s.

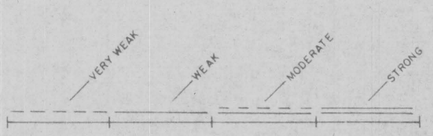
PERCENT FREQUENCY EFFECT (PFE)
CONTOUR INTERVAL CONSTANT
SENDER FREQUENCIES: 0.05 & 3.0 c.p.s

APPARENT "METALLIC CONDUCTION" FACTOR (MCF)
$\left(MCF = \frac{PFE \times 1000}{\rho_{DC}/2\pi}\right)$
CONTOUR INTERVAL LOGARITHMIC

EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH



LOOKING N 45° W

SUPERIOR AREA

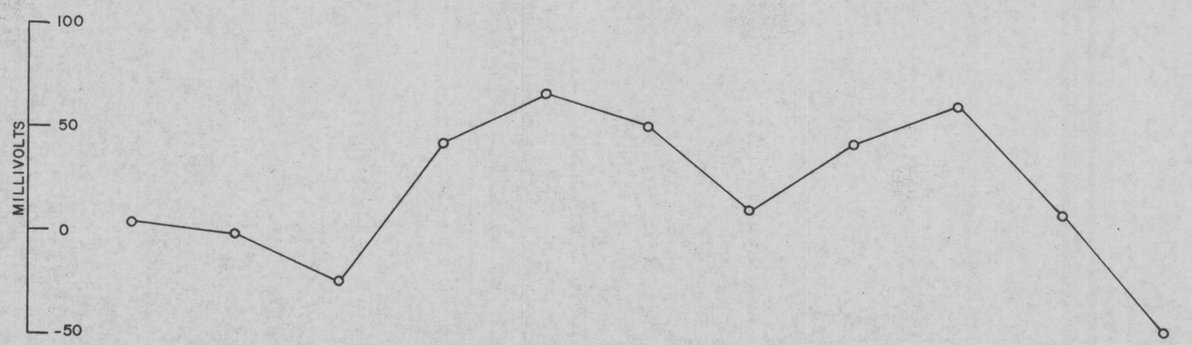
SECTIONAL DATA SHEET
LINE NO. 15 W
INDUCED POLARIZATION TRAVERSE

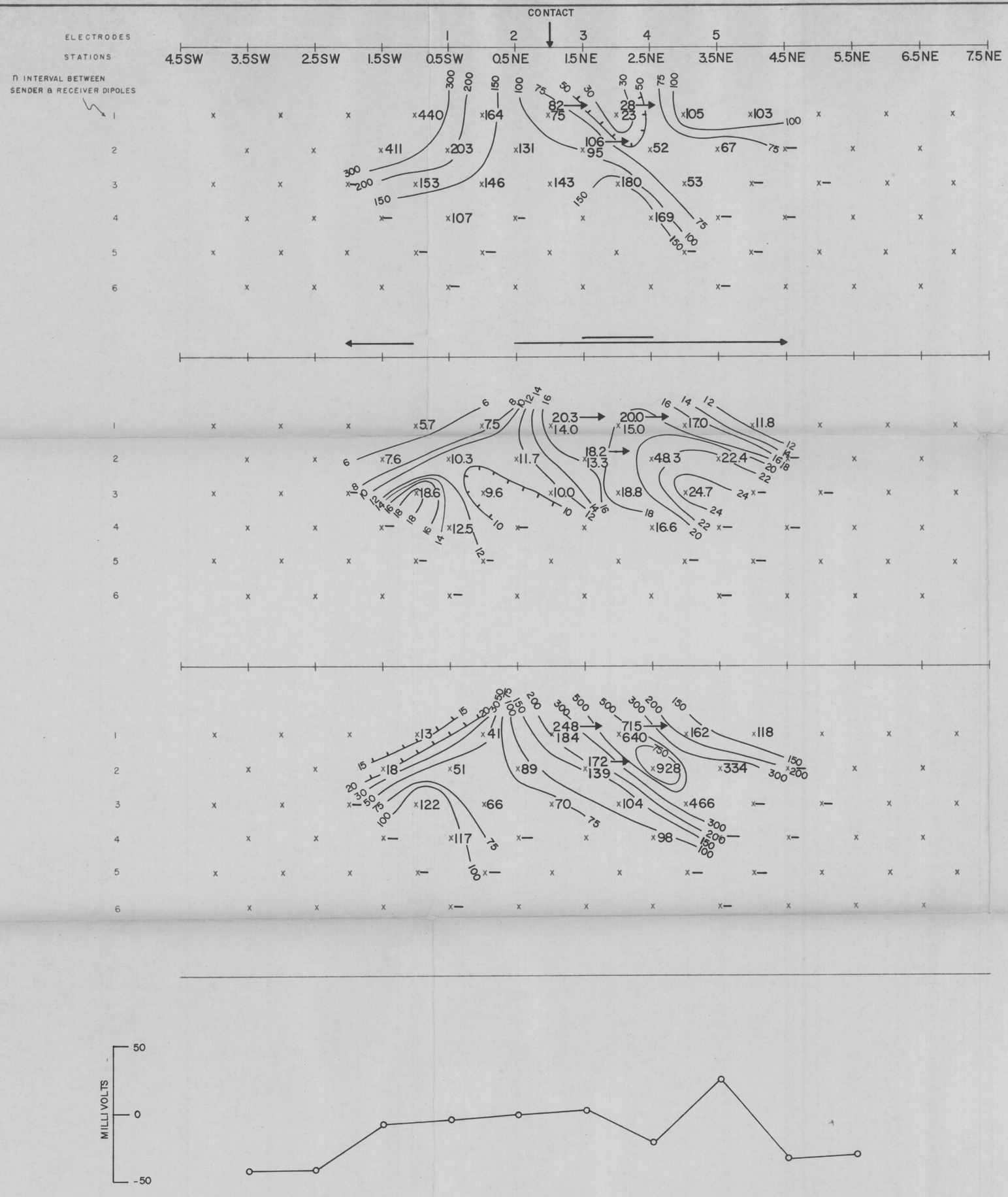
HEINRICHS GEOEXPLORATION COMPANY
SCALE: 1" = 1000' DATE: JUNE 1966

FOR

GUNNEX LTD.

SELF POTENTIAL





EXPLANATION

ELECTRODE ARRAY: 1000' — n x 1000' — 1000'
SENDER DIPOLE — RECEIVER DIPOLE

RELATIVE ANOMALY STRENGTH

VERY WEAK — WEAK — MODERATE — STRONG

LOOKING N 45° W

SUPERIOR AREA

SECTIONAL DATA SHEET
LINE NO. 0
INDUCED POLARIZATION TRAVERSE

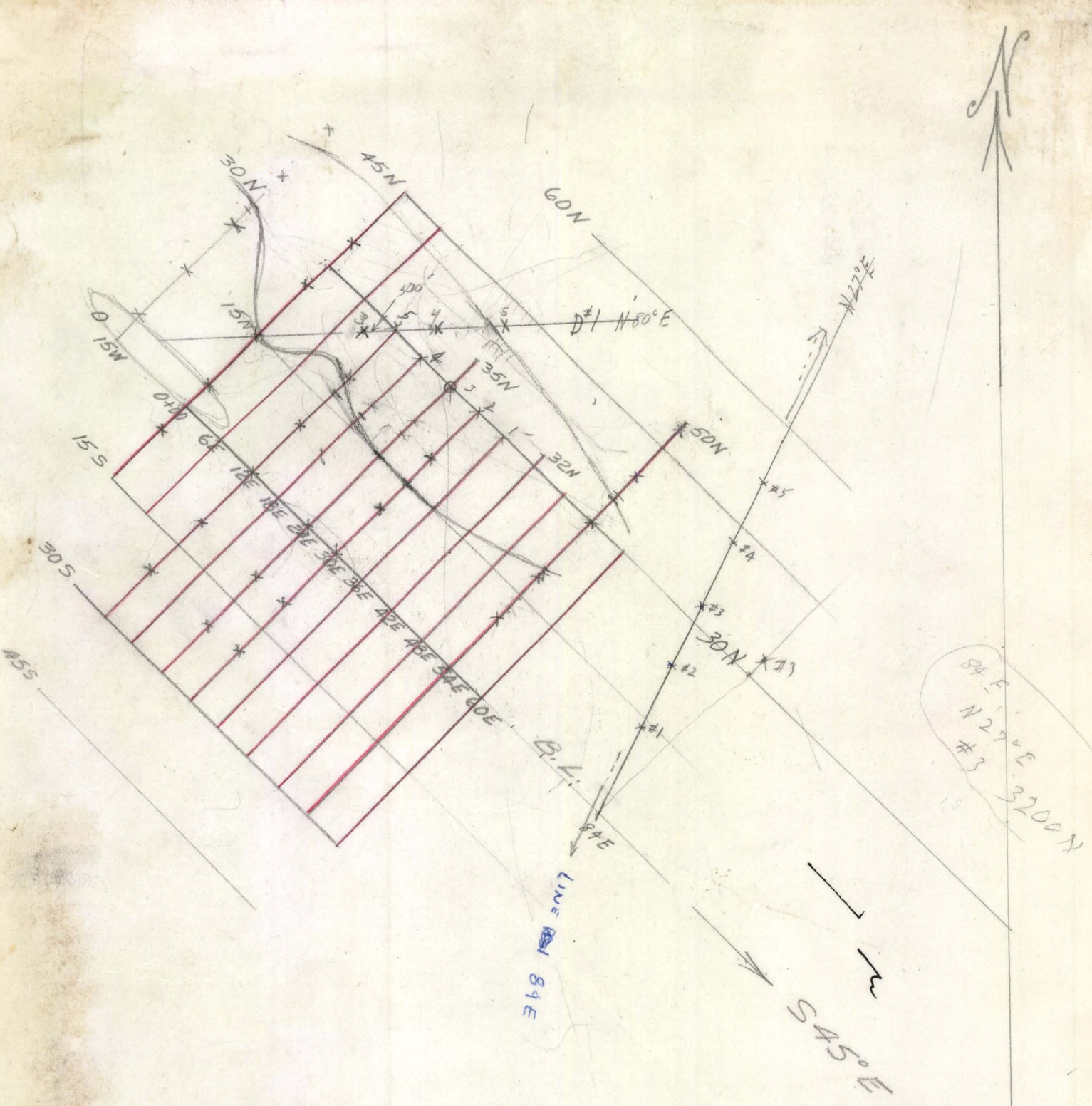
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1000' DATE: JUNE 1966

FOR

GUNNEX LTD.

HEINRICHS GEOEX

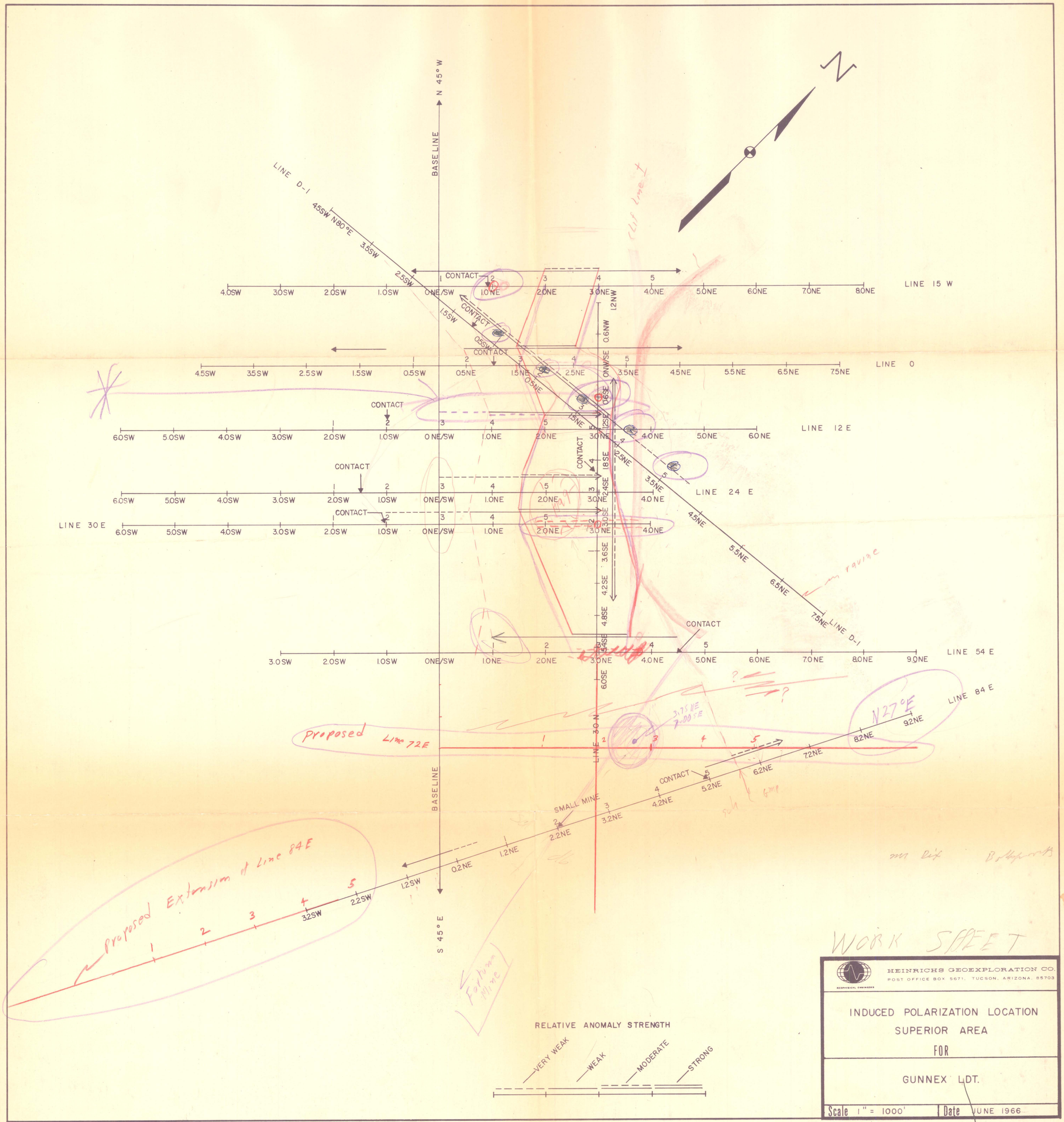


1" = 2000 ±

Gunnex Ltd.

GRID: Lines flagged at 100' intervals

(Line 6E flagged only at 200' int.


N 45° W
BASE LINE
LINE D-1
4.5SW N80°E
3.5SW
2.5SW
1.5SW
0.5SW
CONTACT
LINE 15 W
LINE 0
LINE 12 E
LINE 24 E
LINE 30 E
LINE 54 E
LINE 84 E
LINE 30 N
S 45° E
SMALL MINE
Proposed Line 72E
Proposed Extension of Line 84E
N27°E
Fortuna Mine
RELATIVE ANOMALY STRENGTH
VERY WEAK
WEAK
MODERATE
STRONG
HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
INDUCED POLARIZATION LOCATION
SUPERIOR AREA
FOR
GUNNEX LDT.
Scale 1" = 1000'
Date JUNE 1966
WORK SHEET

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

SUPERIOR QUADRANGLE
ARIZONA–PINAL CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1945. Field check 1948

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone

Unchecked elevations are shown in brown

TRUE NORTH
MAGNETIC NORTH
14°
APPROXIMATE MEAN DECLINATION, 1948

SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO OR WASHINGTON 25, D. C.

ROAD CLASSIFICATION

HARD-SURFACE ALL WEATHER ROADS		DRY WEATHER ROADS
Heavy-duty	4 LANE 16 LANE	Improved dirt
Medium-duty	4 LANE 16 LANE	Unimproved dirt

Loose-surface, graded, or narrow hard-surface

U. S. Route — State Route

SUPERIOR, ARIZ.
N3315—W11100/7.5

EDITION OF 1949

162C

THE TOPOGRAPHIC MAPS OF THE UNITED STATES

The United States Geological Survey is making a series of standard topographic maps to cover the United States. This work has been in progress since 1882, and the published maps cover more than 47 percent of the country, exclusive of outlying possessions.

The maps are published on sheets that measure about 16½ by 20 inches. Under the general plan adopted the country is divided into quadrangles bounded by parallels of latitude and meridians of longitude. These quadrangles are mapped on different scales, the scale selected for each map being that which is best adapted to general use in the development of the country, and consequently, though the standard maps are of nearly uniform size, the areas that they represent are of different sizes. On the lower margin of each map are printed graphic scales showing distances in feet, meters, miles, and kilometers. In addition, the scale of the map is shown by a fraction expressing a fixed ratio between linear measurements on the map and corresponding distances on the ground. For example, the scale $\frac{1}{62,500}$ means that 1 unit on the map (such as 1 inch, 1 foot, or 1 meter) represents 62,500 of the same units on the earth's surface.

Although some areas are surveyed and some maps are compiled and published on special scales for special purposes, the standard topographic surveys and the resulting maps have for many years been of three types, differentiated as follows:

1. Surveys of areas in which there are problems of great public importance—relating, for example, to mineral development, irrigation, or reclamation of swamp areas—are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{31,680}$ (1 inch = one-half mile) or $\frac{1}{24,000}$ (1 inch = 2,000 feet), with a contour interval of 1 to 100 feet, according to the relief of the particular area mapped.

2. Surveys of areas in which there are problems of average public importance, such as most of the basin of the Mississippi and its tributaries, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile), with a contour interval of 10 to 100 feet.

3. Surveys of areas in which the problems are of minor public importance, such as much of the mountain or desert region of Arizona or New Mexico, and the high mountain area of the northwest, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{125,000}$ (1 inch = nearly 2 miles) or $\frac{1}{250,000}$ (1 inch = nearly 4 miles), with a contour interval of 20 to 250 feet.

The aerial camera is now being used in mapping. From the information recorded on the photographs, planimetric maps, which show only drainage and culture, have been made for some areas in the United States. By the use of stereoscopic plotting apparatus, aerial photographs are utilized also in the making of the regular topographic maps, which show relief as well as drainage and culture.

A topographic survey of Alaska has been in progress since 1898, and nearly 44 percent of its area has now been mapped. About 15 percent of the Territory has been covered by maps on a scale of $\frac{1}{500,000}$ (1 inch = nearly 8 miles). For most of the remainder of the area surveyed the maps published are on a scale of $\frac{1}{250,000}$ (1 inch = nearly 4 miles). For some areas of particular economic importance, covering about 4,300 square miles, the maps published are on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile) or larger. In addition to the area covered by topographic maps, about 11,300 square miles of southeastern Alaska has been covered by planimetric maps on scales of $\frac{1}{125,000}$ and $\frac{1}{250,000}$.

The Hawaiian Islands have been surveyed, and the resulting maps are published on a scale of $\frac{1}{62,500}$.

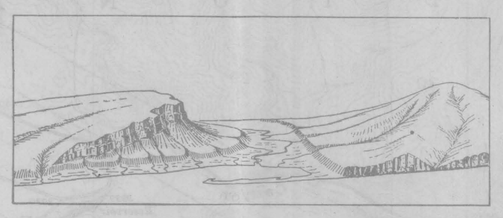
A survey of Puerto Rico is now in progress. The scale of the published maps is $\frac{1}{30,000}$.

The features shown on topographic maps may be arranged in three groups—(1) water, including seas, lakes, rivers, canals, swamps, and other bodies of water; (2) relief, including mountains, hills, valleys, and other features of the land surface; (3) culture (works of man), such as towns, cities, roads, railroads, and boundaries. The symbols used to represent these features are shown and explained below. Variations appear on some earlier maps, and additional features are represented on some special maps.

All the water features are represented in blue, the smaller streams and canals by single blue lines and the larger streams by double lines. The larger streams, lakes, and the sea are accentuated by blue water lining or blue tint. Intermittent streams—those whose beds are dry for a large part of the year—are shown by lines of blue dots and dashes.

Relief is shown by contour lines in brown, which on a few maps are supplemented by shading showing the effect of light thrown from the northwest across the area represented, for the purpose of giving the appearance of relief and thus aiding in the interpretation of the contour lines. A contour line represents an imaginary line on the ground (a contour) every part of which is at the same altitude above sea level. Such a line could be drawn at any altitude, but in practice only the contours at certain regular intervals of altitude are shown. The datum or zero of altitude of the Geological Survey maps is mean sea level. The 20-foot contour would be the shore line if the sea should rise 20 feet above mean sea level. Contour lines show the shape of the hills, mountains, and valleys, as well as their altitude. Successive contour lines that are far apart on the map indicate a gentle slope, lines that are close together indicate a steep slope, and lines that run together indicate a cliff.

The manner in which contour lines express altitude, form, and grade is shown in the figure below.



The sketch represents a river valley that lies between two hills. In the foreground is the sea, with a bay that is partly enclosed by a hooked sand bar. On each side of the valley is a terrace into which small streams have cut narrow gullies. The hill on the right has a rounded summit and gently sloping spurs separated by ravines. The spurs are truncated at their lower ends by a sea cliff. The hill at the left terminates abruptly at the valley in a steep scarp, from which it slopes gradually away and forms an inclined tableland that is traversed by a few shallow gullies. On the map each of these features is represented, directly beneath its position in the sketch, by contour lines.

The contour interval, or the vertical distance in feet between one contour and the next, is stated at the bottom of each map. This interval differs according to the topography of the area mapped: in a flat country it may be as small as 1 foot; in a mountainous region it may be as great as 250 feet. In order that the contours may be read more easily certain contour lines, every fourth or fifth, are made heavier than the others and are accompanied by figures showing altitude. The heights of many points—such as road intersections, summits, surfaces of lakes, and benchmarks—are also given on the map in figures, which show altitudes to the nearest foot only. More precise figures for the altitudes of benchmarks are given in the Geological Survey's bulletins on spirit leveling. The geodetic coordinates of triangulation and transit-traverse stations are also published in bulletins.

Lettering and the works of man are shown in black. Boundaries, such as those of a State, county, city, land grant, township, or reservation, are shown by continuous or broken lines of different kinds and weights. Public roads suitable for motor travel the greater part of the year are shown by solid double lines; poor public roads and private roads by dashed double lines; trails by dashed single lines. Additional public road classification if available is shown by red overprint.

Each quadrangle is designated by the name of a city, town, or prominent natural feature within it, and on the margins of the map are printed the names of adjoining quadrangles of which maps have been published. More than 4,100 quadrangles in the United States have been surveyed, and maps of them similar to the one on the other side of this sheet have been published.

Geologic maps of some of the areas shown on the topographic maps have been published in the form of folios. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped, and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. Two hundred twenty-five folios have been published.

Index maps of each State and of Alaska and Hawaii showing the areas covered by topographic maps and geologic folios published by the United States Geological Survey may be obtained free. Copies of the standard topographic maps may be obtained for 10 cents each; some special maps are sold at different prices. A discount of 40 percent is allowed on an order amounting to $5 or more at the retail price. The discount is allowed on an order for maps alone, either of one kind or in any assortment, or for maps together with geologic folios. The geologic folios are sold for 25 cents or more each, the price depending on the size of the folio. A circular describing the folios will be sent on request.

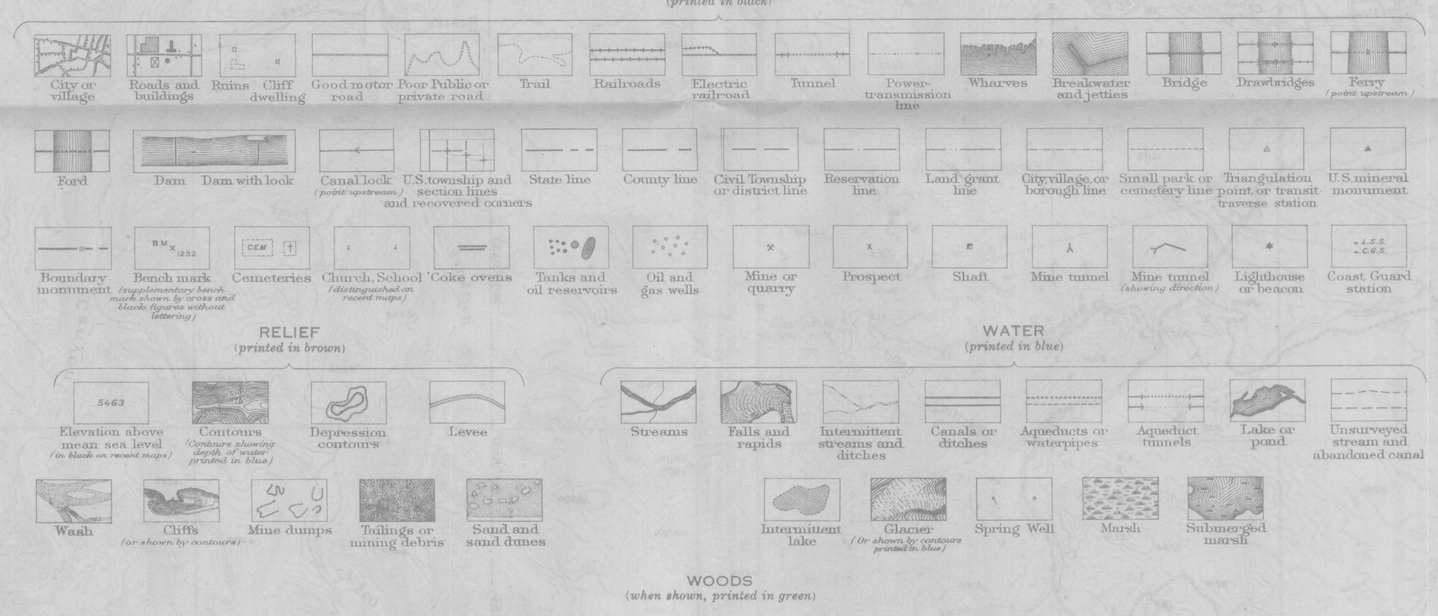
Applications for maps or folios should be accompanied by cash, draft, or money order (not postage stamps) and should be addressed to

THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

November 1937.

NOTE:—Effective on and after October 1, 1946, the price of standard topographic quadrangle maps will be 20 cents each, with a discount of 20 percent on orders amounting to $10 or more at the retail rate.

STANDARD SYMBOLS



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

HAUNTED CANYON QUADRANGLE
ARIZONA
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1945. Field check 1948

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central and east zones.

Dashed land lines indicate approximate location

Unchecked elevations are shown in brown

TRUE NORTH
MAGNETIC NORTH
14°
APPROXIMATE MEAN DECLINATION, 1948

SCALE 1:24000

1 ½ 0 1 MILE

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1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
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FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO OR WASHINGTON 25, D. C.

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U. S. Route — State Route

HAUNTED CANYON, ARIZ.
N3322.5—W11100/7.5

EDITION OF 1949

162B

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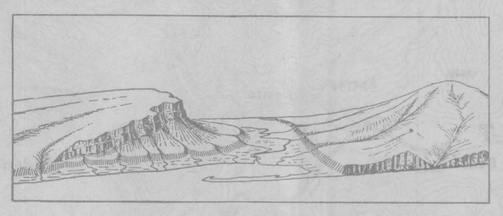

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Lettering and the works of man are shown in black. Boundaries, such as those of a State, county, city, land grant, township, or reservation, are shown by continuous or broken lines of different kinds and weights. Public roads suitable for motor travel the greater part of the year are shown by solid double lines; poor public roads and private roads by dashed double lines; trails by dashed single lines. Additional public road classification if available is shown by red overprint.

Each quadrangle is designated by the name of a city, town, or prominent natural feature within it, and on the margins of the map are printed the names of adjoining quadrangles of which maps have been published. More than 4,100 quadrangles in the United States have been surveyed, and maps of them similar to the one on the other side of this sheet have been published.

Geologic maps of some of the areas shown on the topographic maps have been published in the form of folios. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped, and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. Two hundred twenty-five folios have been published.

Index maps of each State and of Alaska and Hawaii showing the areas covered by topographic maps and geologic folios published by the United States Geological Survey may be obtained free. Copies of the standard topographic maps may be obtained for 10 cents each; some special maps are sold at different prices. A discount of 40 percent is allowed on an order amounting to $5 or more at the retail price. The discount is allowed on an order for maps alone, either of one kind or in any assortment, or for maps together with geologic folios. The geologic folios are sold for 25 cents or more each, the price depending on the size of the folio. A circular describing the folios will be sent on request.

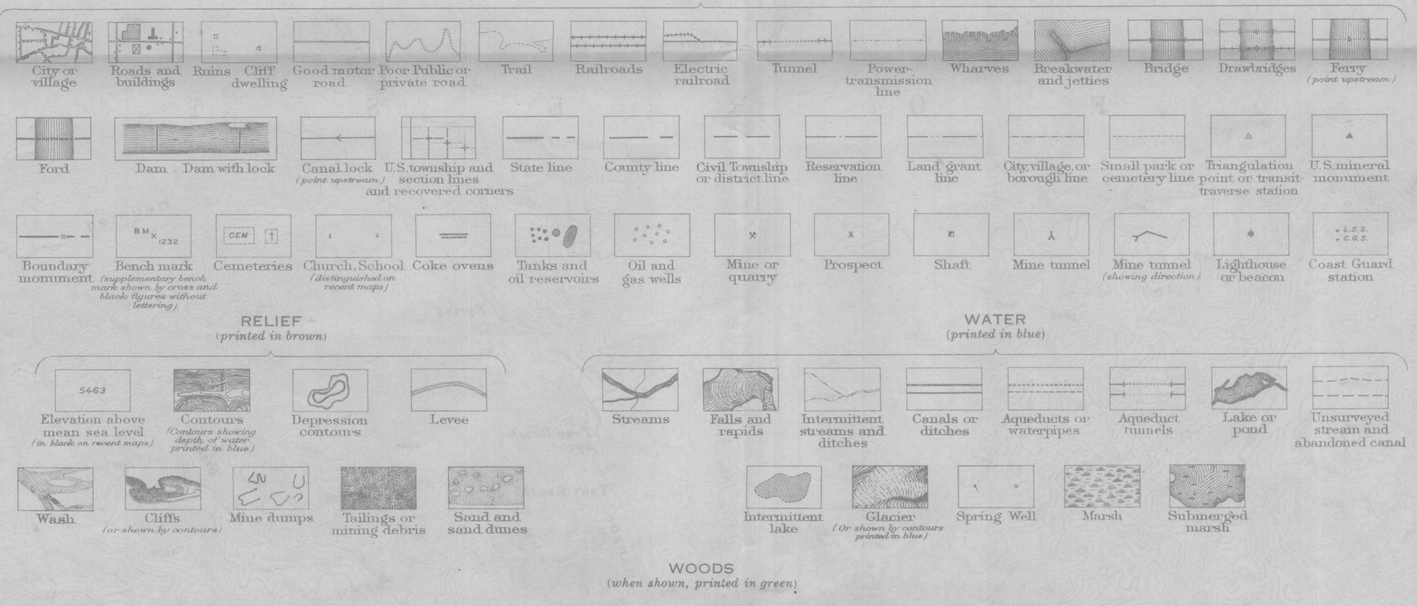
Applications for maps or folios should be accompanied by cash, draft, or money order (not postage stamps) and should be addressed to

THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

November 1937.

NOTE:—Effective on and after October 1, 1946, the price of standard topographic quadrangle maps will be 20 cents each, with a discount of 20 percent on orders amounting to $10 or more at the retail rate.

STANDARD SYMBOLS



INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNEX-SUPERIOR Line: 12E-NE Int.Cal .88 Date: 5/26/65

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL.
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.3	.1	.1	.03	.03	.03	.1	.03	.03	.01		
DC-1	97 114	51.7 51.6	24.7 22.0	20.5 22.0	13.5 15.8	9.0 9.4	21.5 26.5	7.2 6.6 6.4 8.4	7.7 8.1 7.9 8.5	6.7 6.5 6.5 7.0	6.3 5.3 7.1 6.8	95 95
DC-2	112 100	50.5 53.3	22.8 24.7	20.5 22.0	13.9 15.1	9.5 9.2 9.2 9.0	24.8 23.2	6.3 7.4 8.6 7.0	6.5 7.9 8.8 8.8	6.2 6.2 7.1 7.9	5.5 6.2 7.0 7.4	95 95
Σ	105/106	51.7/51.9	23.4/23.7	21.2/21.3	14.7/14.5	9.2 9.1 9.4	24.0 24.0	6.7 7.5 7.5 7.2	7.8 8.3 7.7 8.3	6.6 6.7 6.8 7.0	6.7 6.1 6.3 6.8	
DC-3	109 102	50.3 53.5	23.5 23.7	20.5 21.5	15.4 16.0	10.2 9.0 8.3 10.0	24.3 24.0	5.5 6.5 10.2 9.5	7.1 5.9 9.1 8.9	5.5 6.6 7.0 6.3		
Dc-4	97 115	51.5 51.7	23.8 23.5	21.0 21.8	13.8 16.5	9.2 9.6 9.5 8.4	23.8 24.0	5.6 6.7 9.4 8.2	8.4 9.0 7.7 8.0	5.9 5.6 7.2 7.6		
Σ	106/107	51.9/51.8	23.4/23.7	21.0/21.4	15.7/15.2	9.3 9.5 9.4 9.0	24.1 23.9	7.8 8.0 7.5 7.5	8.1 7.4 7.8 8.5	6.3 6.5 6.5 6.6		
DC-AV	106	51.8	23.6	21.1	14.8	9.3	24.0	7.5	8.0	6.5		
AC-1	101	45.3	21.7	17.8	12.8	8.3	19.5	6.4	6.8	5.72		96
AC-2	100	45.2	21.7	17.6	12.8	8.3	19.7	6.4	6.8	5.72		96
Σ	100	45.3	21.7	17.7	12.8		19.6					
S. P.	+20.4	-9.4		+12.7			+10.1					
AC-N	.04	.04		.06			.04					
.Res.												

5.5 7.4
9.4

7.4
7.1

6.6 7.1
7.5

48
7.53

14.8 14.8 21.2 20.8 25.2
14.8 20.4 22.0

14.7 14.9 21.6 21.1 25.0
14.5 20.5 21.7

14.6 14.1 21.6 21.0
15.2 20.3

14.3 14.9
15.7

8 6
8 9
64
508

14.8
1185
8
38
32
65
64

3 4
14.8
14.7
14.6
14.3
14.7
14.5
15.7
15.2
1185

20.8
21.1
21.0
21.2
21.3
21.0
21.4
147.8
21.1

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: GUNNEX-SUPERIOR Line: 12E -NE Int.Cal _____ Date: 5/26/65

Send	4-5	3-4	2-3	1-2	21-5	3-4	2-3	1-2				
Rec.	40-50	→	→	→	50-60	→	→	→				
Time	.03	.01	.03	.01								
DC-1	8.5 7.4 8.5 9.5	5.4 4.5 6.5 5.7	6.7 6.4 6.6 7.1	5.2 5.6 6.4 5.6								
DC-2	8.6 8.8 8.0 7.6	5.1 5.1 5.7 6.8	7.2 6.1 6.5 7.2	5.8 5.9 5.7 7.5								
Σ	8.5 8.0 8.3 8.2	6.0 5.1 5.4 5.9	6.7 6.8 6.8 6.6	5.8 5.6 5.7 6.7								
DC-3	7.8 7.5 5.8 8.2	5.0 6.7 6.0 5.2	6.1 7.0 6.6 6.3	4.0 4.9 7.3 7.2								
Dc-4	8.0 8.8 8.8 7.6	6.6 5.3 3.9 6.1	6.4 6.8 6.4 5.5	5.2 4.9 6.6 6.0								
Σ	8.3 7.9 8.4 8.2	5.5 5.3 5.3 5.7	6.4 6.6 6.4 6.2	5.7 6.0 5.9 5.5	46							
DC-AV	8.2	5.6	6.6	5.86								
AC-1	6.4	4.70	6.0	5.0								
AC-2	6.4	4.70	5.9	5.0								
Σ												
S. P.	-20.9											
AC-N	.04											
Res.												

6.2 6.0 6.8 5.8 6.6 8.8
6.5 7.1 5.1 4.9 9.7 7.6
7.2 6.1 6.0 5.8 9.4 8.0
7.2 7.7 4.7 5.9 7.4 8.2
7.2 6.5 4.9 6.0 8.2 8.2
6.1 5.2 6.8 4.9 8.4 8.1

8.2
5.0

6.0 5.4
5.3 5.8
5.9 5.9

6.4 6.6
7.2 6.9
6.6 5.8
6.6

12 | 27

6
15 | 88
70

43
45
88

6
14 | 85
84

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 12 E - NE Date: MAY 26/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-1	1-2	1-2	2-3	2-3	2-3	3-4	3-4	3-4	3-4		
Time												
Range												
Current	1.6	1.6	1.6	1.4	1.6	1.6	1.4	1.4	1.6	1.6		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Receive	4-5	4-5	4-5	4-5	5-6	5-6	5-6	5-6				
Time												
Range												
Current	1.4	1.4	1.6	1.6								

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 1

Project: SUPERIOR Line: 12E-SW Int.Cal .89 Date: 5/25/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.3	.1	.3	.1	.03	.1	.1	.03	.01		
DC-1	42.2 44.5	11.5 96	19.0 32.5	149 161	23.7 20.3	10.0 10.0 6.5 6.4	217 224	47.2 48.7	8.5 10.6 11.6 9.6	3.80 4.30	4.25 3.80	96.5 96.5
DC-2	38.5 47.0	104 110	25.8 25.2	151 163	20.7 23.5	7.4 8.9 7.8 7.6	217 225	46.7 48.5	8.3 8.9 11.4 11.5	4.75 3.20	4.00 3.85	96.5 96.5
Σ	43.4 42.7	105 107	25.7 25.5		22.0 22.1	8.2 8.2 7.6 8.3	221 221	48.0 47.6	10.1 10.1 9.8 10.2	4.10 4.00	4.02 3.93	
DC-3	45.0 42.5	106 107	24.5 25.7	152 165	20.0 24.0	8.9 9.5 7.5 6.7	223 217	46.7 49.0	8.7 9.0 10.4 11.1	3.48 4.85	4.25 3.87	
Dc-4	42.0 43.5	104 110	26.2 25.2	152 166	20.0 23.8	8.2 8.0 8.2 8.7	221	46.5 48.7	9.4 9.4 10.5 9.9	4.30 3.75	3.95 4.17	
Σ	42.8 42.7	106 107	25.6 25.7		22.0 21.9	8.2 8.1 8.2 8.4		47.8 47.6	10.1 10.0 10.0 9.7	4.17 4.12	4.06 4.01	
DC-AV	42.9	106.6	25.5	164	22.0	8.4	221	47.6	10.0	4.05		
AC-1	36.7	98	22.5	146	20.7	7.2	208	44.5	9.4	3.45		95
AC-2	36.8	97	22.3	155 OK	20.7	7.2	208	44.5	9.3	3.45		95
Σ	36.8	97.5		155	20.7	7.2	208					
S. P.	-15.7	-11.8		-0.3			32.7					
AC-N	.08	.06		.04			.04					
Res.												

49.7
46.2

49.3
46.0

167
153

168
154

154
171

154
172

164 155
173

164 160
168

165 160
170

21.9
29.0

25.0
25.5

24.5
25.8

111
101

114
99

112
98

111
95

101
108

43.0
43.0

43.2
43.0

42.3
42.7

43.4
42.7
42.8
42.7

7 | 20.2 | 2.9
14
62
63

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: SUPERIOR Line: 12E-SW Int.Cal _____ Date: 5/25/66

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Rec.	40-50	→			50-60	→						
Time	.3	.1	.03	.01	.1	.1						
DC-1	71 84	23.2 28.5	6.1 6.5 6.3 7.1		53.5 60.0	27.8 22.6						
DC-2	67 85	28.0 25.3	5.6 7.6 7.8 5.7	Interference	61.0 52.7	24.0 21.7						
Σ												
DC-3	72 81	25.5 26.5	6.4 7.6 6.8 5.4		57.2 57.5	25.8 20.2						
Dc-4	72 81	25.0 27.0	6.9 6.5		54.5 58.7	24.0 21.5						
Σ												
DC-AV												
AC-1	74	24.2	6.2	2.55	54.3	20.6						
AC-2	74	24.2	6.3		54.5	20.6						
Σ												
S. P.	+ 10.4				+21.8							
AC-N	.06				.04							
.Res.												

4.10
4.00
4.02
3.93
4.17
4.12
4.06
4.01

8 | 4.1
.05

25.5
26.0

25.5
26.0

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 12E - SW Date: 5/25/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
Receive	0-1000	1000-2000	→	2000-3000	→	→	3000-4000	→	→	→	4000-5000	→
Current ~~Time~~	2 X 700	2X700 + 50	2X800	2X800	2X700	2X700 + 50	2X800 + 50	2X800	2X700	2X700	2X800	2X800
Range												
TOTAL Current	1400	1500	1600	1600	1400	1500	1700	1600	1400	1400	1600	1600
Send	3-4	4-5	1-2	2-3	3-4	4-5		CAL. 1 AMP				
Receive	→	→	5000-6000	→	→	→						
Current ~~Time~~	2X700	2X700	2X800	2X800	2X700	2X700						
Range												
TOTAL Current	1400	1400	1600	1600	1400	1400				71.55		

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX SUPERIOR Line 12E-NE Field date 5/26/66 Data page 1 Comp. date 5/26/66. Comp by JMc

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.6	1.6	1.6	1.4	1.6	1.6	1.4	1.4	1.6	1.6		
(E) Vdc (avg)	106	51.8	23.6	21.1	14.8	9.3	24.0	7.5	8.0	6.5		
(F) DCcal	.950	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	189	92	168	43	105	165	49	61	143	232		
(I) Vac Σ	100	45.3	21.7	17.7	12.8	8.3	19.6	6.4	6.8	5.72		
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.990	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.048	1.133	1.076	1.180	1.144	1.110	1.210	1.160	1.165	1.125		
(N) PFE=(M-1)(10^2)	4.8	13.3	7.6	18.0	14.4	11.0	21.0	16.0	16.5	12.5		
(O) MCF=(M-1)(10^5)/H	254	145	45	418	137	67	428	262	115	54		
	+20.4	-9.4		+12.7			+10.1					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	3-4	2-3	1-2								
(B) Receive	40-50	→	→	→								
(C) n separation	2	3	4	5								
(D) I	1.4	1.4	1.6	1.6								
(E) Vdc (avg)	8.2	5.6	6.6	5.86								
(F) DCcal	.950	→	→	→								
(G) Kn x 10^{-3}	12	30	60	105								
(H) ρ dc=ExFxGx10^3/D	67	114	235	366								
(I) Vac Σ	6.4	4.7	5.95	5.0								
(J) AC noise x 2	—											
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.990	→	→	→								
(M) ρdc/ρac =ExL/K	1.267	1.180	1.098	1.162								
(N) PFE=(M-1)(10^2)	26.7	18.0	9.8	16.2								
(O) MCF=(M-1)(10^5)/H	398	158	42	43								
	-20.9											

10.000 50 19000 43 400

21000 50 400

Draft 12500 200 Checked

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project SUPERIOR-GONNEX Line 12E-SW Field date 5/25/66 Data page 1 Comp. date 5/26/66 . Comp by JMC

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.4	1.5	1.6	1.6	1.4	1.3	1.7	1.6	1.4	1.4		
(E) Vdc (avg)	42.9	106.6	25.5	164	22.0	8.4	221	47.6	10.0	4.05		
(F) DCcal	.965	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	83	206	185	297	182	162	377	345	207	168		
(I) Vac Σ	36.75	97.5	22.4	155	20.7	7.2	208	44.5	9.35	3.45		
(J) AC noise x 2	—											
(K) Vac(corr) $=\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.984	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.150	1.075	1.122	1.042	1.045	1.146	1.045	1.053	1.053	1.155		
(N) PFE=(M-1)(10^2)	15.0	7.5	12.2	4.2	4.6	14.6	4.5	5.3	5.3	15.5		
(O) MCF=(M-1)(10^5)/H	182	36	66	114	24	89	12	15	26	92		
	-15.7	-11.8		-0.3			+32.7					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3						
(B) Receive	40-50	→	→	→	50-60	→						
(C) n separation	2	3	4	5	3	4						
(D) I	1.6	1.6	1.4	1.4	1.6	1.6						
(E) Vdc (avg)	76.63	26.0	6.59	[illegible]	56.89	22.75						
(F) DCcal	.965	→	→	→	→	→						
(G) Kn x 10^{-3}	12	30	60		30	60						
(H) ρ dc=ExFxGx10^3/D	555	470	273		1029	1317						
(I) Vac Σ	74	24.2	6.25		54.4	20.6						
(J) AC noise x 2	—											
(K) Vac (corr) $=\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.984	→	→	→	→	→						
(M) ρdc/ρac =ExL/K	1.019	1.058	1.038		1.030	1.087						
(N) PFE=(M-1)(10^2)	1.9	5.8	3.8		3.0	8.7						
(O) MCF=(M-1)(10^5)/H	3	12	14		3	7						
	+10.4				+29.8							

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: SUPERIOR Line: 24E - SW Int.Cal _____ Date: _____

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Rec.	40-50	→	→	→	50-60	→	→	→				
Time	.1	.1	.03	.01	.1	.03	.03	.01				
DC-1	5.42 5.85	20.0 20.7	13.0 15.3	4.9 5.4	39.5 46.4	16.0 19.6	14.1 10.9	4.0 3.7 4.6 5.4				
DC-2	5.50 5.45	24.5 18.5	18.0 11.0	4.6 4.6 5.4 6.2	42.7 42.5	15.2 19.7	12.5 12.5	4.2 4.5 4.5 4.5				
Σ	5.64/5.63	20.4/21.5	14.3/14.5	5.2 5.3 5.0	43.0 42.6	17.8 17.3	12.5 12.5	4.4 4.4				
DC-3	5.85 5.60	22.3 19.5	12.2 18.2	3.0 5.8 3.2 4.1	43.5 42.5	17.9 17.0	12.7 12.4	4.6 5.0 4.3 4.2				
Dc-4	5.80 5.35	16.5 25.0	15.0 19.7	5.2 4.6 5.0 4.6	40.7 45.2	18.1 17.3	12.3 12.6	3.8 4.3 4.2 4.5				
Σ	5.19/5.57	20.9/20.7	16.3/17.9	6.4 3.4	43.0 43.0	17.5 17.7	12.6 12.5	4.0 4.2				
DC-AV	56.6	20.8	14.4	5.1 5.0 6.1 4.6	42.9	17.5	12.5	4.3				
AC-1	55.2	19.5	13.6	4.45	40.5	16.4	11.7	4.1				
AC-2	55.2	19.5	13.5	4.50	41.0	16.4	11.5	4.2				
Σ												
S. P.	-6.7			5.00	-11.5							
AC-N	.06											
Res.												

17.1	44.7	14.3	13.6	19.5	56.0	57.0
18.4	40.7		15.0	21.5	58.0	
		14.2	9.5	21.8	54.5	56.6
16.8			19.0	19.8	58.7	
18.6		14.3	13.0	23.0	55.0	56.6
			15.5	18.8	58.2	
16.4					56.5	58.0
19.1		14.7	13.5		57.5	
			16.0			
		14.2	12.2			
			16.2			

58
4
15
7

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: SUPERIOR Line: 24E-SW Int.Cal .89 Date: 5/23/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.3	.1	.03	.3	.1	.03	.03		
DC-1	26.5 32.0	49.0 56.7	15.0 9.2	74 75	34.2 32.7	10.2 11.5	102 123	28.8 37.5	20.0 22.1	8.2 4.8		97 97
DC-2	32.0 28.8	51.8 54.5	14.4 11.4	71 78	34.0 32.7	10.2 11.6	116 104	33.3 32.7	20.7 21.0	7.2 5.6		97 97
Σ	29.7/30.4	52.8/53.1	12.1/12.9	74.5/74.5	33.5/33.4	10.8/10.9	113/110	33.2/33.0	21.1/20.9	6.4/6.4		
DC-3	28.5 32.5	52.7 54.5	13.2 12.5	77 73	33.8 32.7	10.0 11.6	122 102	33.0 32.5	21.7 20.2	7.5 5.6		
Dc-4	32.8 28.0	57.2 55.0	11.7 14.5	75 75	32.5 34.0	10.0 11.5	104 122	33.5 32.3	19.7 22.2	7.6 5.5		
Σ	30.5/30.4	53.6/53.6	12.1/13.1	75/75	33.3/33.2	10.8/10.8	112/113	33.3/32.9	20.7/20.7	6.6/6.5		
DC-AV	30.0	53.3	12.7	74.8	33.4	10.8	112	33.0	20.9	6.5		
AC-1	27.5	52.7	12.0	72	31.8	9.7	108	31.0	19.3	6.0		97
AC-2	27.5	53.0	12.0	72	32.0	9.7	108	31.0	19.5	6.0		97
Σ												
S. P.	~~0~~	+2.7		-2.5			+7.5					
AC-N	.04	.04		.04			.06					
.Res.												

11.6	12.7	52.5	28.2	29.4
12.1	10.5	54.8	30.5	
15.6	12.5		26.5	29.6
12.8	14.8		32.7	
12.7	11.6		30.2	30.8
12.9	13.8		31.5	
12.8	14.5		28.0	28.9
13.1	11.2		29.8	

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 24E-5W Date: MAY 23/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-1	1-2	1-2	2-3	2-3	2-3	3-4	3-4	3-4	3-4		
Time												
Range												
Current	1.7	1.4	1.7	1.5	1.8	1.7	1.6	1.5	1.9	1.7		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Receive	4-5	4-5	4-5	4-5	5-6	5-6	5-6	5-6				
Time			JUMP									
Range												
Current	1.6	1.5	1.9	1.7	1.6	1.5	1.9	1.7				

INDUCED POLARIZATION - RECEIVER NOTES 9.5 PAGE 1

Project: GUNNEX-SUPERIOR Line: 24E-NE Int.Cal .89 Date: 5/24/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.1	.03	.01	.03	.03	.01	.01		
DC-1	46.8 44.7	26.8 28.7	11.8 13.7	53.7 52.7	9.5 9.2 9.6 9.5	6.25 6.62	21.5 20.6	7.8 7.8 6.9 6.8	3.15 2.85	2.22 2.47	2.50 1.90	96 96
DC-2	47.0 44.5	26.7 28.5	13.0 12.5	54.2 52.0	10.4 10.1 8.6 8.9	5.85 6.02	21.4 20.5	7.7 7.7 7.1 7.0	2.88 3.03	2.35 2.45	2.02 2.75	96 96
Σ	45.8/45.7	27.8/27.6	12.8/12.7	53.2/53.1	9.6 9.3 9.5 9.5	6.44/5.94	21.1/21.0	7.4 7.3 7.4 7.3	3.00/2.96	2.35/2.40	2.20/2.38	
DC-3	46.2 45.8	28.2 27.0	11.8 13.6	54.5 51.5 53.0	9.7 9.4 9.0 9.7	6.6 5.4 5.8 6.6	21.4 20.6	7.3 7.3 7.3 7.4	2.98 2.90	2.25 2.50	2.82 1.90	
Dc-4	45.5 46.0	~~27.6~~		55.5 50.5 53.0	9.4 9.4 10.5 9.2	6.7 6.10 5.3 5.82	19.6 22.2	7.3 7.4	2.82 2.98	2.47 2.15	1.95 2.75	
Σ	46.0/46.8	27.6	12.7	53.5 53.0	9.4 9.5 9.8 9.3	6.2 6.0 6.0 5.96	21.0/20.9		2.94/2.90	2.37/2.31	2.36/2.35	
DC-AV	45.8	27.6	12.7	52.7	9.5	6.06	21.0	7.35	2.94	2.34		97
AC-1	44.7	25.7	11.8	48.2	8.6	5.35	19.0	6.6	2.60	2.07		97
AC-2	44.7	25.5	11.8	48.2	8.6	5.33	19.1	6.6	2.60	2.05		
Σ												
S. P.	+14.2	+6.7		+15.1			+4.9					
AC-N	.08	.06		.04			.04					
Res.				(53.1)								

5.05
2.85

2.85
2.95

22.2 4.8 7.4
19.6 7.0 6.0

21.1 5.5 7.3
21.1 6.5 4.9

20.7 7.1 5.7
21.3 4.8 6.3

20.1
21.0

INDUCED POLARIZATION SENDER NOTES

project: SUPERIOR Line: LINE #24 N.E. Date:

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2	4-5	3-4
Receive	0-1000	1000-2000	→	2000-3000	→	→	3000-4000	→	→	→	4000-5000	→
Current ~~Time~~	2 X 800	2X700 + 50	2 X 800	2X800 + 50	2X700 X 50	2X8						
Range												
Total Current	1600	1500	1600	1700	1500	1600	1.7	1.7	1.5	1.6		
Send	2-3	1-2	4-5	3-4	2-3	1-2				CALIBRAMP		
Receive	→	→	5000-6000	→	→	→						
Current ~~Time~~												
Range												
Total Current												

3

2.35
2.40
2.37
2.31
2.20
15 2.38
2.36
2.35

18.72
2.37

8 | 18.72
16
27
24
32
32

295

2 | 5.91
4
19
18
11
10

1

6.44
5.94
6.20
6.00
6.00
5.96

6 | 36.34 | 6.06
36.0

6.

4

2.95
2.90
3.00
2.96
2.94
2.90

6 | 17.65 | 2.94
12
56
54
25
24

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project SUPERIOR Line 24E-NE Field date 5/24/66 Data page 1 Comp. date 5/24/66. Comp by VMc

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.6	1.5	1.6	1.7	1.5	1.6	1.7	1.7	1.5	1.6		100
(E) Vdc (avg)	45.8	27.6	12.7	53.1	9.5	6.06	21.0	7.35	2.94	2.34		96
(F) DCcal	.960	→	→	→	→	→	→	→	→	→		9
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	82	53	91	90	73	109	36	50	57	84		
(I) Vac Σ	44.7	25.6	11.8	48.2	8.6	5.34	19.1	6.6	2.60	2.06		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.990	→	→	→	→	→	→	→	→	→		97
(M) ρ dc/ρac=ExL/K	1.014	1.067	1.065	1.092	1.093	1.125	1.088	1.102	1.120	1.124		
(N) PFE=(M-1)(10^2)	1.4	6.7	6.5	9.2	9.3	12.5	8.8	10.2	12.0	12.4		
(O) MCF=(M-1)(10^5)/H	17	126	71	101	126	113	242	240	211	148		
	+14.2	+6.7		+15.1			+4.9					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send												
(B) Receive												
(C) n separation												
(D) I												
(E) Vdc (avg)												
(F) DCcal												
(G) Kn x 10^{-3}												
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

Draft my checked

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX-SUPERIOR Line 24E-SW Field date 5/23/66 Data page_____ Comp. date 5/23/66. Comp by JMC

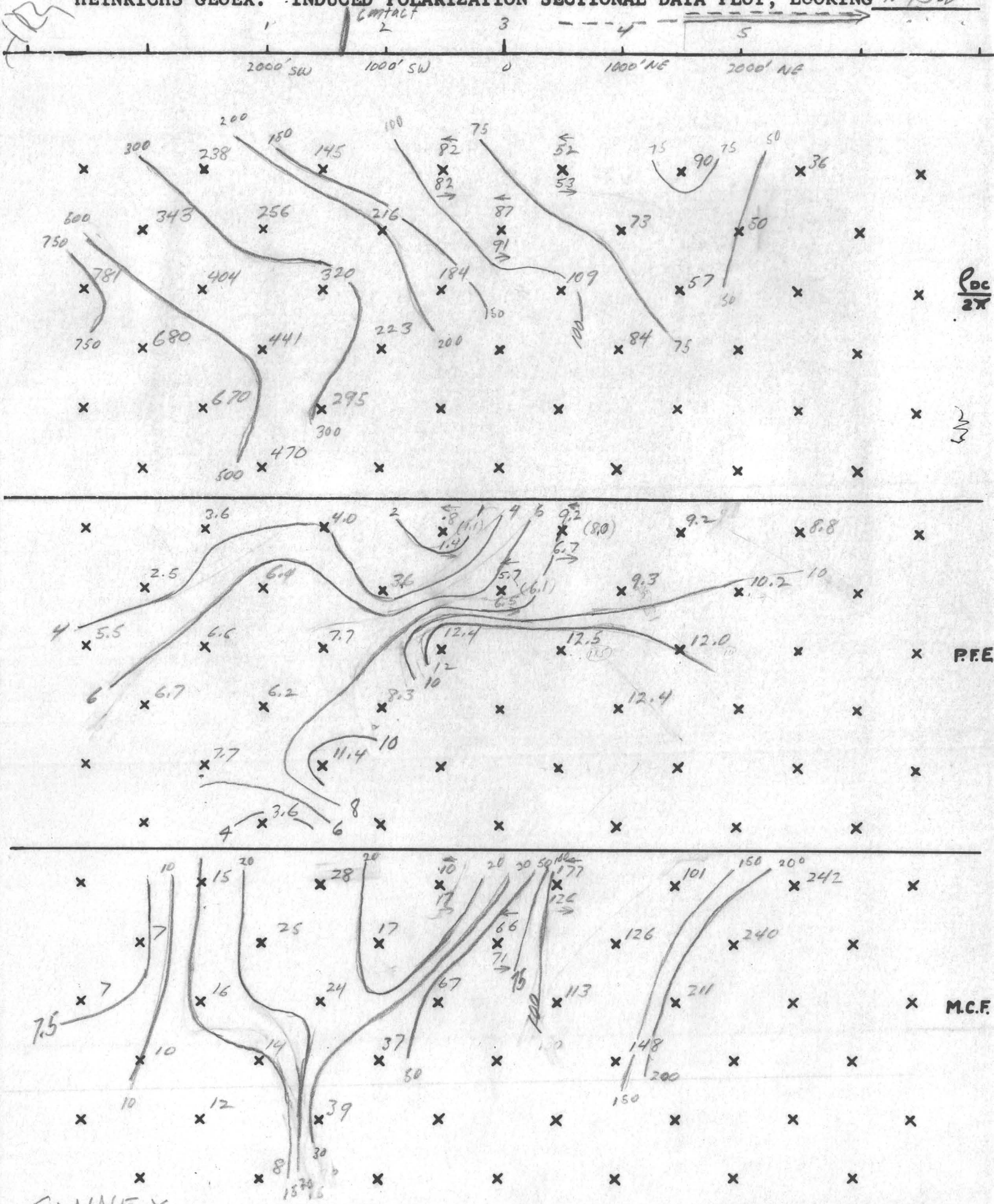
(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.7	1.9	1.7	1.5	1.8	1.7	1.6	1.5	1.9	1.7		
(E) Vdc (avg)	30.0	53.3	12.7	74.8	33.4	16.8	11.2	33.0	20.9	6.5		
(F) DCcal	.970	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	52	82	87	145	216	184	238	256	320	223		
(I) Vac Σ	27.5	52.9	12.0	72	31.9	9.7	108	31.0	19.4	6.0		
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.000	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.092	1.008	1.057	1.040	1.036	1.124	1.036	1.064	1.077	1.083		
(N) PFE=(M-1)(10^2)	9.2	.8	5.7	4.0	3.6	12.4	3.6	6.4	7.7	8.3		
(O) MCF=(M-1)(10^5)/H	177	10	66	28	17	67	15	25	24	37		
	0	+2.7		+2.5			+7.5					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
(B) Receive	40-50	→	→	→	50-60	→	→	→				
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1.6	1.5	1.9	1.7	1.6	1.5	1.9	1.7				
(E) Vdc (avg)	56.6	20.8	14.4	5.00	42.9	17.5	12.5	4.9				
(F) DCcal	.970	→	→	→	→	→	→	→				
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10^3/D	343	404	441	295	781	680	670	470				
(I) Vac Σ	55.2	19.5	13.55	4.48	40.7	16.4	11.6	4.15				
(J) AC noise x 2	—											
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.000	→	→	→	→	→	→	→				
(M) ρdc/ρac =ExL/K	1.025	1.066	1.062	1.114	1.055	1.067	1.077	1.036				
(N) PFE=(M-1)(10^2)	2.5	6.6	6.2	11.4	5.5	6.7	7.7	3.6				
(O) MCF=(M-1)(10^5)/H	7	16	14	39	7	10	12	8				
	-1.7				-11.5							

1.5
2.0
3.0
5.0
7.5

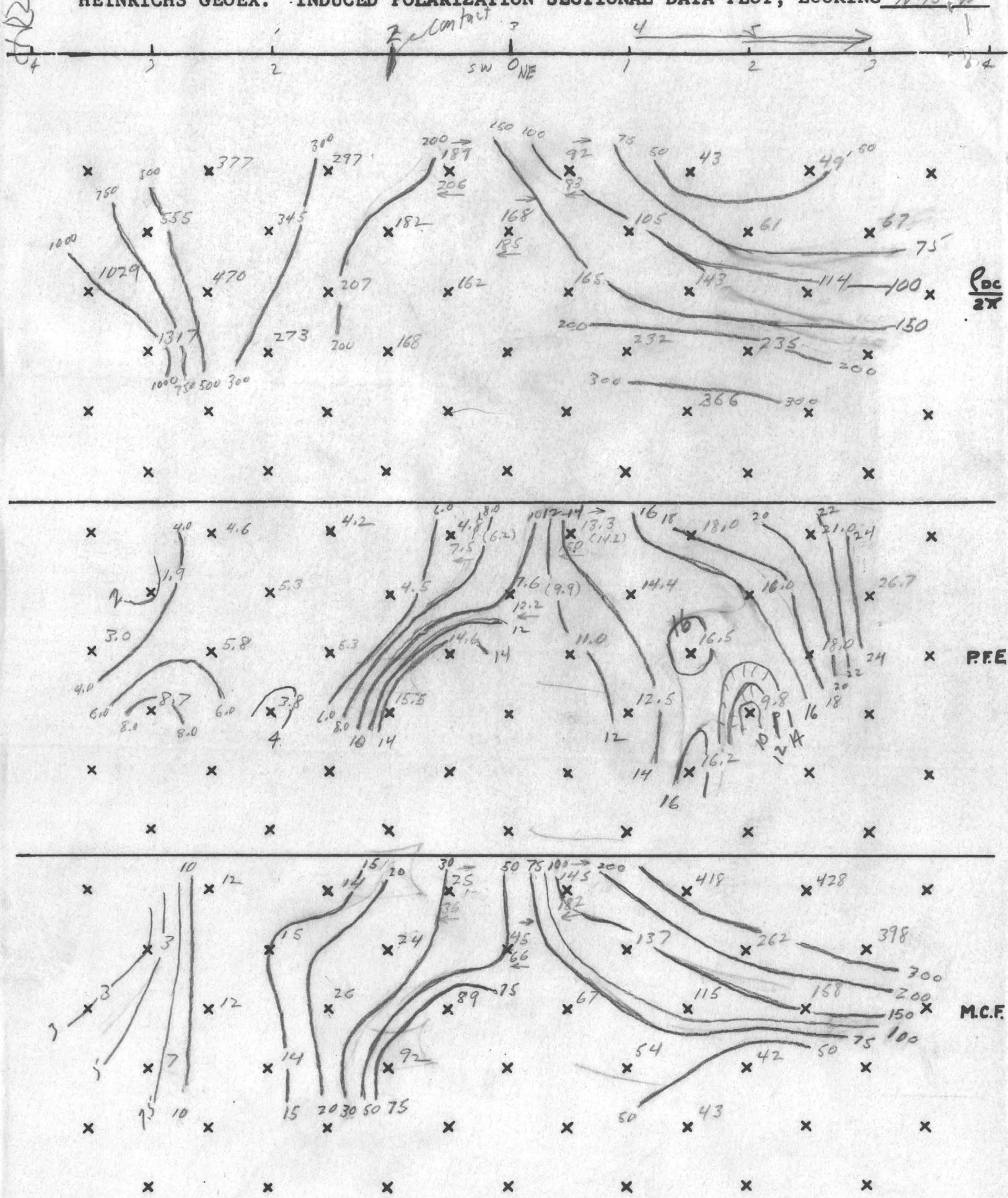
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N45W



GUNNEX

AREA Superior LINE 24E a = 1000' SCALE: 1" = 1000 DATE:

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N45°W



GUNNEX

AREA SUPERIOR LINE 12E a = 1000' SCALE: 1" = 1000' DATE: 5/26/66

John Walker - Geologist
Bill Petersen - Bulldozer operator
Both in Rm 2 Motel
Superior, Ariz

John will indicate line layout wanted.
1000' dipoles

4 wheel drive needed

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 1

Project: SUPERIOR Line: OE — NE Int.Cal .89 Date: 5/31/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-38	→	→	→		
Time	.1	.03	.03	.1	.01	.03	.1	.03	.01	.01		
DC-1	40.0 44.7	15.5 12.8	13.1 13.9	51.3 56.5	6.4 7.0	9.8 8.7	34.7 29.2	9.3 7.8	2.47 3.00	4.25 4.55	4.15 4.50	97 97
DC-2	39.8 44.7	14.8 14.0	12.9 14.6	60.8 57.0	6.50 6.95	9.6 8.9	30.5 32.3	9.5 7.7	2.85 2.55	4.10 4.50	4.65 4.12	97 97
Σ	42.3 42.3	14.2 14.4	13.5 13.7	53.9 53.9	6.9 6.73	9.2 9.3	32.0 31.4	8.6 8.6	2.73 2.70	4.40 4.30	4.33 4.38	
DC-3	39.5 44.7	14.9 13.7	13.2 14.2	51.3 56.7	7.05 6.35	9.5 9.0	31.5 31.8	8.7 8.7	2.65 2.90	4.20 4.50	4.25 4.47	
Dc-4	39.5 44.8	15.5 13.3	13.7 13.5	56.5 51.2	6.80 6.55	9.5 9.0	32.0 31.8	8.5 8.5	2.65 2.65	4.15 4.65	4.17 4.50	
Σ	42.1 42.2	14.3 14.4	13.7/13.6	54.0 53.9	6.70 6.67	9.2/9.3	31.7 31.9	8.7 8.5	2.77 2.65	4.35 4.40	4.36 4.32	
DC-AV	42.1	14.4	13.6	53.9	6.72	9.25	31.75	8.6	2.71	4.36		
AC-1	34.7	11.9	11.3	45.5	4.48	7.7	28.2	7.0	2.15	3.70	2-3	98
AC-2	34.7	11.9	11.3	45.7	4.48	7.7	28.0	6.9	2.15	3.70	2.80 2.90	98
Σ											3.75 3.85	
S. P.	-19.9	+42.4		-57.9			+2.0				2.75	
AC-N	.08	.06		.08			.08				2.70	
.Res.				NOTE - 4th SETUP IS 200' SHORT								

31.7 32.7
30.7

31.8 33.5
30.0

6.66 6.62
6.70

6.73 6.62
6.85

6.75 6.60
6.90

6.80 6.65
6.95

70
73
70
67

9 574 7
58
14

14.3 14.1
14.5

14.5 15.5
13.5

14.8 15.7
14.0

41.7 42.2 42.0

41.6 42.3 41.9

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: GUNNEX SUPERIOR Line: 08-SW Int.Cal _____ Date: 6/2/66

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Rec.	40-50	→	→	→	50-60	→	→	→				
Time	.1	.03	.01									
DC-1	54.3 56.0	8.6 8.1 6.5 6.4	2.5 3.7 3.1 1.7									
DC-2	55.0 52.2	9.1 7.9 7.7 7.2	2.2 2.9 4.0 2.4									
Σ	53.7 53.6											
DC-3	55.0 52.5	8.9 7.8 6.0 7.1	2.3 3.0 2.9 2.4									
Dc-4	57.0 50.0	9.7 10.4 5.4 5.1	2.4 3.2 3.5 2.6									
Σ	53.7 53.5											
DC-AV												
AC-1	49.8	6.6	2.4/2									
AC-2	49.8	6.6	2.4/2									
Σ												
S. P.	0											
AC-N	.08											
Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNER -SUPERIOR Line: OE-SW Int.Cal .89 Date: 6/2/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.03	.1	.03	.3	.03	.01	1.0	.1	.03	.01		
DC-1	7.6 8.6	39.7 40.0	7.7 7.9 6.4 6.1	86 85	20.0 14.2	3.50 5.82	227 230	27.7 24.7	7.0 9.5	2.0 2.9		96 96
DC-2	7.5 8.7	40.0 37.0	8.2 8.0 7.8 5.2	83 87	17.2 13.6	4.70 3.62	228 230	29.5 23.0	5.0 7.2 10.9 8.4			96 96
Σ	8.1 8.1	39.8 38.5	8.1 7.0 8.0 6.6	85.5/85.0	17.1 15.4	4.66/4.16	229 229	26.2 26.3	8.3 8.0 7.8			
DC-3	8.1 8.1	35.8 39.5	11.6 9.6 4.8 5.1	85 86	15.4 20.1	2.9 4.1 6.2 5.7	228 230	27.5 26.0	6.5 7.0 7.0 4.5			
Dc-4	8.1 8.1	36.2 42.0	9.0 10.8 5.1 2.8	84 86	11.4 21.4	5.6 3.1 2.6 6.2	228 230	27.8 26.3	8.3 6.6 7.2 9.1	DRIFT		
Σ		37.6 39.1	8.2 7.3 7.1 6.3	86.5/85.0	17.7 18.4	4.5 4.7 4.1 4.6	229 229	26.7 26.5	6.7 7.8 7.7 7.3			
DC-AV	8.1	39.0	7.4	85.25	17.0	4.47	229	26.44	7.73			
AC-1	6.8	33.5	6.4	77	14.8	3.95	212	23.5	6.9	2.15		98
AC-2	6.9	33.5	6.4	78	15.0	4.00	212	23.5	6.8	2.20		98
Σ	6.9	33.5	6.4	77.5								
S. P.	-4.3	-1.7		-3.0			-33.7					
AC-N	.08	.08					.06					
Res.												

25.2 26.6
26.0

25.2 26.8
28.5

27.0 27.0
27.0

5.1 4.5
3.7

5.8 4.4
3.0

4.2 4.6
4.9

16.7 6.4
17.0 16.8

14.4 18.5
22.6

15.7 18.1
20.5

14.7 15.1
15.5

22.5 17.9
13.4

17.1
15.4
17.7
16.4
63.0

42.5 40.5
38.5

41.5
35.0 38.3

37.9
38.5
37.6
39.1

6 | 53.9 | 8.9
48
59

INDUCED POLARIZATION SENDER NOTES

Project: Superior Line: Line 0 East NE Date: 5/30/86

Send	1-2	1-2	2-3	1-2	2-3	3-4	1-2	2-3	3-4	4-5	1-2	2-3
Receive	0-1000	1000-2000	→	2000-3000	→		3000-4000	→			4000-5100	→
Current ~~Time~~	2X700 + 50	2X700 + 50	2X700 + 50	2X700 + 50	2X700 + 50	2X700 + 50	2X700 + 50	2X700 + 50	2X700 + 50	2X400 + 50		
Range												
Total Current	1500	1500	1500	1500	1500	1500	1500	1500	1500	900		
Send	3-4	4-5	1-2	2-3	3-4	4-5		CAL 1 AMP				
Receive	→		5000-6000	→								
Current ~~Time~~												
Range												
Total Current												

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: LINE D SW Date: 5/31/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-1	1-2	1-2	2-3	2-3	2-3	3-4	3-4	3-4	3-4		
Time												
Range												
Current	.9	1.5	.9	1.5	1.5	.9	1.5	1.5	1.5	.9		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Receive	4-5	4-5	4-5	4-5	5-6	5-6	5-6	5-6				
Time												
Range												
Current	1.5	1.5	1.5									

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project GUNNEX - SUPERIOR Line OE-SW Field date 6/2/66 Data page 1 Comp. date 6/2/66. Comp by JMC

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	.9	1.5	.9	1.5	1.5	.9	1.5	1.5	1.5	.9		1.00
(E) Vdc (avg)	8.1	39.0	7.4	85.25	17.0	4.47	229	26.44	7.73			
(F) DCcal 1.042	.960	→	→	→	→	→	→	→	→	→		.96
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρdc=ExFxGx10^3/D ✓	23	75	95	164	131	143	440	203	146			
(I) Vac Σ	6.9	33.5	6.4	77.5	14.9	3.98	212	23.5	6.9			
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.978	→	→	→	→	→	→	→	→	→		.98
(M) ρdc/ρac=ExL/K	1.150	1.140	1.133	1.075	1.117	1.100	1.057	1.103	1.096			
(N) PFE=(M-1)(10^2) ✓	15.0	14.0	13.3	7.5	11.7	10.0	5.7	10.3	9.6			
(O) MCF=(M-1)(10^5)/H	648	184	139	41	89	70	13	51	66			
	-4.3	-1.7		-3.0			-33.7					

Project Line Field date Data page Comp. date Comp by

(A) Send	1-2	2-3	3-4									
(B) Receive	40-50	→	→									
(C) n separation	2	3	4									
(D) I	1.5	1.5	1.5									
(E) Vdc (avg)	53.6	7.99	2.78									
(F) DCcal	.960	→	→									
(G) Kn x 10^{-3}	12	30	60									
(H) ρdc=ExFxGx10^3/D	411	153	107									
(I) Vac Σ	49.8	6.6	2.42									
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.978	→	→									
(M) ρdc/ρac =ExL/K	1.076	1.186	1.125									
(N) PFE=(M-1)(10^2)	7.6	18.6	12.5									
(O) MCF=(M-1)(10^5)/H	18	122	117									

0

Drafting

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

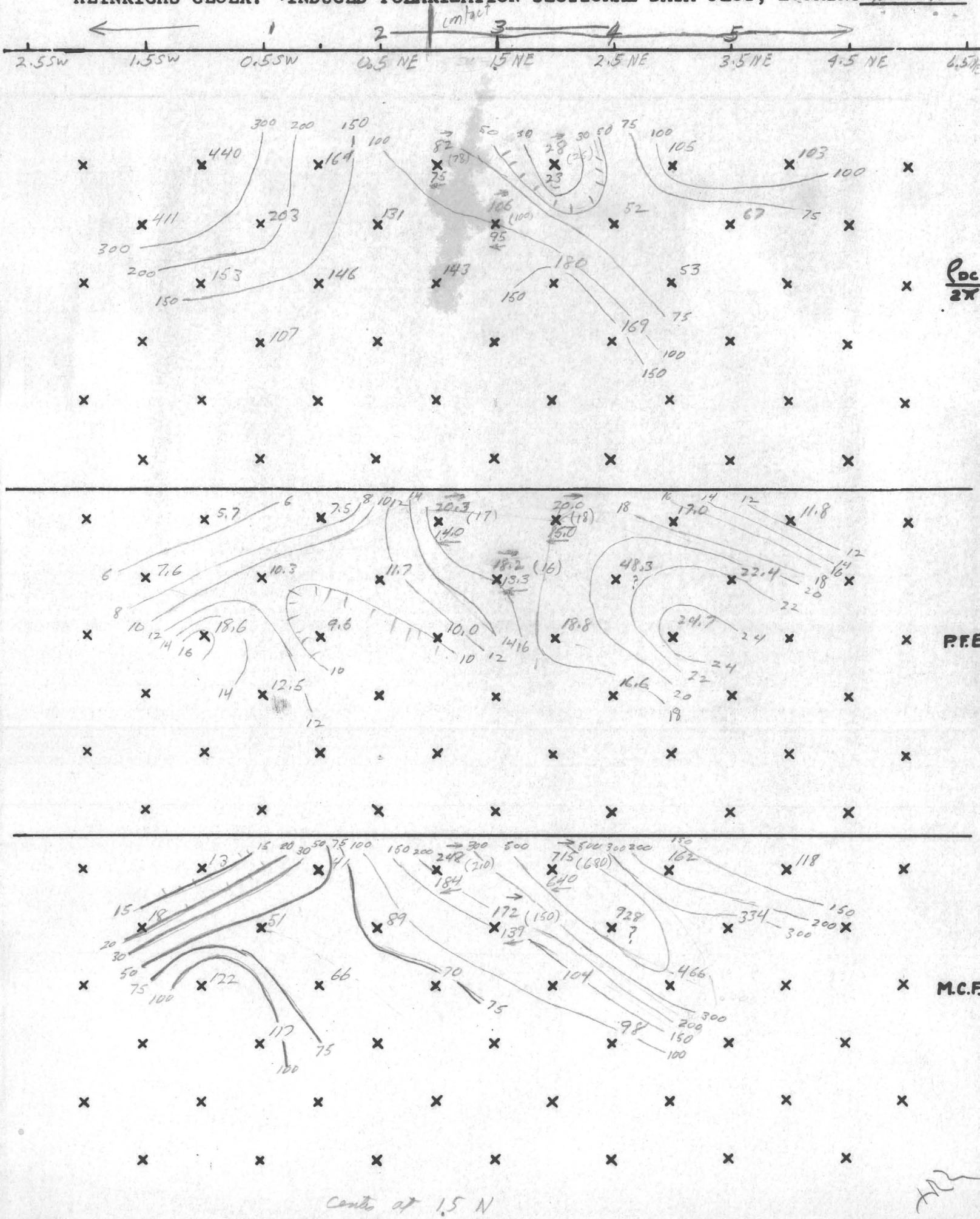
Project GUNNEX - SUPERIOR Line OE-NE Field date 6/1/66 Data page 1 Comp. date 6/1/66 . Comp by JMC

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAC
(B) Receive	0-10	10-20	→	20-30	→	→	30-38	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.5	1.5	1.5	1.5	1.5	1.5	.9	1.5	1.5	1.5		1.00
(E) Vdc (avg)	42.1	14.4	15.6	53.9	6.72	9.25	31.75	8.6	2.71	4.36		.97
(F) DCcal 1.032	.970	—	—	—	—	—	—	—	—	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	82	28	106	105	52	180	103	67	53	169		
(I) Vac Σ	34.7	11.9	11.3	45.6	4.48	7.7	28.1	6.95	2.15	3.70		.98
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.990	—	—	—	—	—	—	—	—	→		
(M) ρ dc/ρac=ExL/K	1.203	1.200	1.182	1.170	1.483	1.188	1.118	1.224	1.247	1.166		
(N) PFE=(M-1)(10^2)	20.3	20.0	18.2	17.0	48.3	18.8	11.8	22.4	24.7	16.6		
(O) MCF=(M-1)(10^5)/H	248	715	172	162	928	104	118	334	466	98		
	-19.9	+42.4		-57.9	? 1.026		+2.0					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send												
(B) Receive												
(C) n separation												
(D) I												
(E) Vdc (avg)												
(F) DCcal												
(G) Kn x 10^{-3}												
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N45°W



Centre at 1.5 N

AREA GUNNEX-SUPERIOR LINE COE a = 1000' SCALE: 1" = 1000' DATE: 6/1/66

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNEX Line: 84E-S Int.Cal 89 Date: 6/23/66

Send.	2-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	CAL1	CAL2
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→	(1+2)	(2-5)
Time	.3	.3	.1	.3	.1	.03	1.0	.1	.03	.01		
DC-1	176 174	92 93	26.5 25.3	149 147	27.8 26.7	9.3 11.2	330 356	55.3 55.0	15.0 14.0	5.2 5.2 6.4 6.6	96 96	96 96
DC-2	176 174	92 94	27.0 25.0	150 148	27.8 26.7	9.5 10.7	353 333	54.3 55.7	13.7 13.8	5.8 5.9 6.0 6.2	96 96	96 96
Σ												
DC-3	175 174	93 93	26.2 25.7	147 149	28.2 26.5	10.2 10.0	345 341	54.3 55.7	14.2 14.4	4.5 5.4 6.6 6.6		
Dc-4		92 93	26.2 25.8		28.8 25.7	10.6 10.0		54.5 55.5	14.6 12.8	6.3 5.4 5.0 6.4		
Σ												
DC-AV	175	92.8	25.96	148	27.3	10.2	343	55.0	13.9	5.81		
AC-1	157	88	23.2	146	26.3	9.3	334	52.7	12.9	5.25	95	97
AC-2	157	88	23.0	146	26.1	9.3	332	52.5	12.8	5.25	95	97
Σ												
S. P.	-19.7	+9.6		0			-6.1			↑?		
AC-N	.10	.08		.08			.10					
Res.												

14.7
12.8

16.7
11.0

13.1
14.2

11.1
16.0

10.5
10.2

9.7
10.7

9.7
10.6

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNEX Line: 84E-S Int.Cal _____ Date: _____

Send	1-2	2-3	3-4	4-5								
Rec.	40-50											
Time	.03	.1	.01									
DC-1	13.2 15.6	43.0 35.0	7.2 5.3 2.4 4.5									
DC-2	15.4 13.3	45.3 34.5	5.0 5.3 4.1 4.1									
Σ												
DC-3	16.5 13.1	43.5 34.3	6.2 3.8 3.7 6.0									
Dc-4	14.5 16.1	40.5 37.5	4.9 4.9 4.9 4.7									
Σ												
DC-AV	14.3	39.0	4.81									
AC-1	13.1	35.8	4.25	1.98								
AC-2	13.2	35.5	4.25									
Σ												
S. P.	-6.2											
AC-N	.08											
Res.												

Drift & Interference

	16.5
52.0	9.0
41.0	
	10.5
	18.2
	15.6
	15.2
	11.0
	17.3

INDUCED POLARIZATION SENDER NOTES

Project: Superior Line: 24 East. - S Date: 5/23/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-1000	1000-2000	→	2000-3000	→		3000-4000	→		→		
Current ~~Time~~	800 ± 50	800 ± 50	800 ± 50	800 ± 50	800 ± 50	800 ± 50	800 ± 50	800 ± 50	800 ± 50	800 ± 50		
Range												
TOTAL Current	1700	1700	1700	1700	1700	1700						
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		23	24	
Receive	4000-5000	→		→	5000-6000	→		→		CAL. 1 AMP	CAL. 1 AMP	
Current ~~Time~~	800 ± 50	800 ± 50	800 ± 50	800 ± 50								
Range												
TOTAL Current	1700	1700	1700	1700								

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNEX Line: 84E-N Int.Cal 89 Date: 6/23/86

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.3	.3	.1	.3	.1	.03	.3	.03	.03	.01		
DC-1	97 98	184 185	23.8 25.2	76 78	21.8 20.5	5.2 5.0 6.1 6.5	92 85	20.3 19.0	13.0 13.1	5.05 6.07	5.80 5.75	96 96
DC-2	97 98	184 185	24.4 24.5	75 78	21.8 20.2	5.6 5.1 6.3 6.2	94 85	20.1 19.2	12.7 13.0	4.60 6.05	5.38 5.80	96 96
Σ												
DC-3	97 98	184 185	24.4 24.5	75 78	20.5 21.5	5.4 5.0 6.4 5.9	90 89	18.4 20.6	13.1 12.1	5.00 6.35		
Dc-4				76 78	21.8 20.2	5.5 5.8 6.1 5.4	90 89	19.4 21.6	13.5 12.5	5.20 6.52		
Σ												
DC-AV												
AC-1	94	171	22.4	73	21.4	~~5.40~~ 5.7	81	17.8	12.1	5.07		97
AC-2	94	170	22.4	73	21.4	5.7	81	17.7	12.1	5.05		97
Σ												
S. P.	-9.9	-3.0		+11.6			-20.4					
AC-N	.08	.04		.04			.04					
Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: GUNNEX Line: 84E-N Int.Cal _____ Date: 6/23

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Rec.	40-50	→	→	→	50-60	→	→	→				
Time	.03	.03	.01	.01	.03	.01	.01					
DC-1	16.3 18.0	7.3 7.8	6.12 5.95	3.05 3.20	7.5 6.9 7.1 7.6	3.75 3.70	2.80 3.70	3.40 3.35				
DC-2	17.8 16.6	7.5 7.5	6.15 5.90	3.00 3.27	6.1 7.1 8.0 7.5	3.89 3.70	3.45 3.30	~~3.40~~ ~~2.60~~				
Σ												
DC-3	16.5 17.8	7.6 7.5	5.95 6.18	3.10 3.06	7.0 7.0 7.5 7.9	3.05 4.35	2.85 3.75					
Dc-4		7.7 7.4	6.20 5.85		6.7 6.8 8.0 8.0	3.90 3.40	2.77 3.90					
Σ												
DC-AV												
AC-1	14.9	6.8	5.65	2.90	6.4	3.40	3.03					
AC-2	14.8	6.8	5.65	2.90	6.4	3.40	3.03					
Σ												
S. P.	-25.4				+2.1							
AC-N	.08				.08							
Res.												

NOTE: LINE 84E CENTERED AT 3200'N, TRENDS N 27°E

4.00
3.15

3.78
3.90

3.95
3.35

3.50
4.05

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 84-E-N Date: 6/23/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-1000	1000 2000	? →	2000 3000	→		3000 4000	→				
Time												
Range												
Current	1.8	1.8	1.6	2.0	1.7	1.7	2.2	2.0	2.2	2.2		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Receive	4000 5000	→		→	5000 6000	→		→				
Time												
Range												
Current	1.7	1.2	1.7	1.7	1.7	1.7						

1.7 ?

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX Line 84E-N Field date 6/23/66 Data page 1 Comp. date 6/26/6. Comp by UMS

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.8	1.8	1.6	2.0	1.7	1.7	2.2	2.0	2.2	2.2		
(E) Vdc (avg)	92.5	184.5	24.47	76.8	21.0	5.72	89.3	19.7	12.85	5.55		
(F) DCcal	.960	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	156	295	176	111	142	96	117	113	168	145		
(I) Vac Σ	94	170.5	22.4	73	21.4	5.7	81	17.75	12.1	5.06		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.9897	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.027	1.071	1.081	1.041	-.029	-.007	1.091	1.098	1.051	1.086		
(N) PFE=(M-1)(10^2)	2.7	7.1	8.1	4.1	-2.9	-.7	9.1	9.8	5.1	8.6		
(O) MCF=(M-1)(10^5)/H	17	24	48	37	-20	-7	78	87	30	59		
	-10	-3		+12	↑?		-20					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2			Cal	
(B) Receive	40-50	→	→	→	50-60	→	→	→				
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1.7	1.7	1.7	1.9	1.7	1.7	1.7				1.000	
(E) Vdc (avg)	12.17	7.54	6.04	3.11	7.29	3.72	3.32				96	
(F) DCcal	.960	→	→	→	→	→	→					
(G) Kn x 10^{-3}	12	30	60	105	30	60	105					
(H) ρ dc=ExFxGx10^3/D	116	128	205	165	124	126	197					
(I) Vac Σ	14.85	6.8	5.65	2.90	6.4	3.40	3.03				97	
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.9897	→	→	→	→	→	→					
(M) ρdc/ρac =ExL/K	1.144	1.097	1.058	1.061	1.127	1.083	1.084					
(N) PFE=(M-1)(10^2)	14.4	9.7	5.8	6.1	12.7	8.3	8.4					
(O) MCF=(M-1)(10^5)/H	124	76	28	37	102	66	43					
	-25				+2							

Dorothy Clarke

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX Line 8#E-S Field date 6/23/66 Data page 1 Comp. date 6/26/66. Comp by JMC

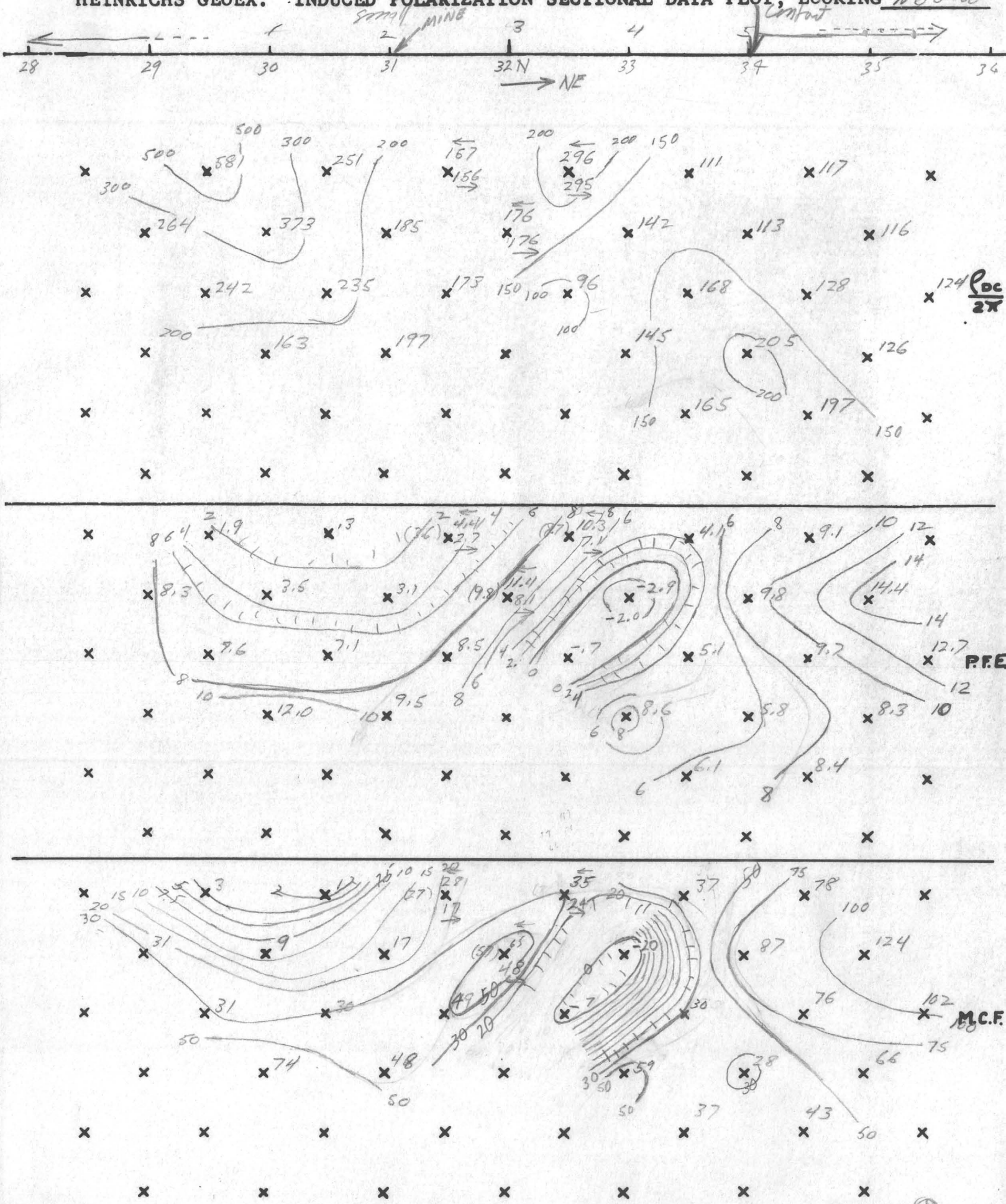
(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.7	→	→	→	→	→	→	→	→	→		
(E) Vdc (avg)	175	92.8	26.0	148	27.3	10.2	343	55.0	13.9	5.81		
(F) DCcal	.960	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	296	157	176	251	185	173	581	373	235	197		
(I) Vac Σ	157	88	23.1	146	26.2	9.3	333	52.6	12.85	5.25		
(J) AC noise x 2												
(K) Vac(corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.9897	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.103	1.044	1.174	1.003	1.031	1.085	1.019	1.035	1.071	1.095		
(N) PFE=(M-1)(10^2)	10.3	4.4	11.4	.3	3.1	8.5	1.9	3.5	7.1	9.5		
(O) MCF=(M-1)(10^5)/H	35	28	65	1	17	49	3	9	30	48		
	-20	+10		0			-6.1					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4					CAL 1	CAL 2			
(B) Receive	40-50	→	→									
(C) n separation	2	3	4									
(D) I	1.7	→	→					96	96			
(E) Vdc (avg)	39.0	14.3	4.81									
(F) DCcal	.960	→	→									
(G) Kn x 10^{-3}	12	30	60									
(H) ρ dc=ExFxGx10^3/D	264	242	163									
(I) Vac Σ	35.65	13.15	4.25					95	97			
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.9897	→	→									
(M) ρdc/ρac =ExL/K	1.083	1.076	1.120									
(N) PFE=(M-1)(10^2)	8.3	7.6	12.0									
(O) MCF=(M-1)(10^5)/H	31	31	74									
	-6											

LINE CENTERED AT 3200' N (ON 8#E), TRENDS N 27° E

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N63°W



AREA SUPERIOR LINE 84E a = 1000' SCALE: 1" = 1000' DATE: 6/26/66

INDUCED POLARIZATION SENDER NOTES

Project: Supplex Line: D1 South Date: 5/16/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
Receive	0-1000	1000-1000	→	2000-3000	→		3000-4000	→		→	4000-5000	→
Current ~~Time~~	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50
Range												
Total Current	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700

Send	3-4	4-5	1-2	2-3	3-4	4-5		CAL 1 AMP				
Receive	→	→	5000-6000	→		→						
Current ~~Time~~	800 + 50	800 + 50										
Range												
Total Current	1700	1700										

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNEX Line: D#1-SW Int.Cal .90 Date: 6/16/86

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30			30-40			→		
Time	.1	.03	.01	.1	.03	.03	.1	.03	.03	.03		
DC-1	33.8 31.2	16.4 18.6	5.72 7.95	46.7 41.5	11.2 13.0	5.4 10.0 14.0 6.5	65.0 64.7	20.5 22.5	11.2 9.6	9.8 7.6 6.7 7.6		98 98
DC-2	32.4 32.3	15.6 17.7	6.52 7.20	44.5 48.5	14.0 15.7	7.4 9.6 10.0 8.3	67.0 64.2	19.7 22.6	10.6 10.9	8.8 8.2 5.1 8.0		98 98
Σ	32.5 32.4	17.5 16.7	6.84 6.86	44.1 46.5	15.1 14.9	9.7 8.2 8.7 8.9	64.9 65.6	21.5 21.2	10.4 10.7	8.3 7.6 7.0 8.1		
DC-3	32.6 32.0	15.6 19.4	6.85 5.92	38.5 43.0	17.5 13.1	8.6 8.7 9.1 9.7	64.2 76.0	21.2 21.5	10.5 10.3 9.0 10.9	6.1 10.2 9.0 5.8		
Dc-4	32.5 32.3	15.7 18.3	7.60 6.50	43.0 44.8	16.1 15.6	8.5 8.6 10.0 10.1	66.7 75.7	23.8 19.6	10.6 13.8 10.7 6.1	10.5 7.2 7.6 8.8		
Σ	32.3 32.4	17.5 17.0	6.38 7.05	40.8 43.9	15.3 15.8	8.9 9.2 9.2 9.4	70.1 66.2	21.3 21.7	9.8 10.6 10.6 9.9	7.5 8.0 9.1 8.0		
DC-AV	32.4	17.1	6.77	43.2	14.8	9.03	66.1	21.4	10.3	7.95		98
AC-1	26.7	14.2	5.53	35.5	12.8	7.6	54.7	17.7	8.7	6.4		98
AC-2	26.7	14.2	5.53	35.5	12.8	7.6	55.0	17.7	8.7	6.4		
Σ												
S. P.	-14.2	+4.2		-1.2			-22.4					
AC-N	.06	.06		.04			.08					
Res.												

21.2	69.5	12.2	48.5	6.00	16.0	42
21.4	61.5	14.0	36.0	6.58	17.5	16.8
22.3	72.2	14.6	39.0	6.15	16.7	17.1
19.2	56.7	14.5	45.8	7.40	17.6	17.5
22.2	61.5	17.0	41.2	6.03		16.7
21.5	70.0	12.1	45.5	7.60		17.5
22.6		19.0	40.0	5.90		17.0
21.0		11.5	44.8	7.70		
				7.27		
				6.90		

$\frac{28}{14}$

$\frac{42}{}$

6 $\boxed{102.6}$ 17.1

6

42

42

6

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNEX Line: D#1-SW Int.Cal _____ Date: _____

Send	1-2	2-3	3-4	4-5								
Rec..	40-50	→	→	→								
Time	.03	.01	.01									
DC-1	10.9 15.2	7.5 7.4 7.3 5.2	3.6 4.2 4.2 4.3		7.0 6.8	4.5						
DC-2	11.2 11.6	7.4 6.8 6.5 7.8	2.8 3.6 6.3 4.1			3.9 8 | 3 | 7 24						
Σ	13.1 11.4	7.4 6.3 7.0 7.3	3.9 4.3 4.5 3.8			17 72						
DC-3	15.6 9.8	7.8 6.1 5.8 9.2	3.5 4.2 4.0 4.1									
Dc-4	13.9 10.6	6.4 6.6 6.6 5.8	4.0 4.6 2.7 3.1									
Σ	12.7 12.3	6.8 7.6 6.5 6.2	3.8 4.1 3.4 3.9									
DC-AV	12.7	6.9	4.0									
AC-1	11.1	5.6	3.3	1.7								
AC-2	11.6	5.7	3.4									
Σ												
S. P.	+20.9											
AC-N	.10											
.Res.												

11.7 12.6
13.4

10.4 12.9
15.4

11.2
15.0 13.1

15.5 14.5
13.6

12.6 11.9
11.2 13.1
12.7
12.3
11.4

9 | 24.5 | 2.7

INDUCED POLARIZATION SENDER NOTES

project: SUPERIOR Line: D-1 Date: JUNE 14/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-10	10-20	→	20-30	→		30-40	→				
Time												
Range												
Current	1.6	1.7	1.6	1.7	1.7	1.6	1.7	1.7	1.7	1.7		
Send	4-5	3-4	2-3	1-2								
Receive	40-50	→										
Time												
Range												
Current	1.7	1.7	1.7	1.7								

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNEX Line: D#1 - NE Int.Cal .89 Date: 6/14/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.03	.1	.01	.1	.03	.01	.3	.03	.01	.003		
DC-1	14.5 13.5	32.5 31.5	6.40 4.72	42.8 42.8	8.6 8.4 9.6 9.5	2.90 2.85	75 83	7.5 9.2	2.50 2.55	.5 2.3		98 98
DC-2	14.7 13.5	30.8 32.8	5.75 4.15	43.8 41.5	8.4 8.2 9.6 10.0	3.40 3.1 2.20 1.7	79 78	8.3 8.4	2.55 2.40	1.9 1.3		98 98
Σ	14.0 14.0	32.0 31.8	5.06 4.96	42.8 42.7	9.1 9.0 9.0 9.1	2.88 2.80 2.80	79 78.5	8.35 8.35	2.53 2.48			
DC-3	14.4 15.6	29.5 33.7	5.90 4.90	42.0 44.3	8.0 8.8 10.0 9.4	2.1 2.7 3.3 2.3	80 78	8.3 8.4	2.15 3.60			108 108
Dc-4		31.5 30.0	5.80 5.47	43.0 40.0	9.0 9.1	3.2 3.4 2.6 2.1	80 78	8.35	1.98 3.60	drift		108 108
Σ	14.0	31.6 30.8	5.40 5.64	43.1 41.5		2.7 2.5 2.9 2.75	79 79		2.87 2.79			
DC-AV	14.0	31.6	5.39	42.5	9.05	2.77	79	8.35	2.71			
AC-1	12.0	26.2	4.55	39.4	7.7	2.35	72	7.7	2.35	.97		98
AC-2	12.2	26.2	4.55	39.4	7.7	2.35	72	7.7	2.35	1.00		98
Σ	12.1	26.2	4.55	39.4	7.7	2.35	72	7.7	2.35			108
S. P.	+12.2	-37.1		-.09			+24.9					108
AC-N	.08	.05	~~.10~~	.10			.04					SEND 1.1
.Res.												

LINE ORIENTATION N 80°E

2 1
1.53
1.55
1.53
1.61
4 | 2.22 | .55
20
20

2.83 3.20
2.45

2.77 3.17
2.38

2.74 3.00
2.48

3.05
2.45

2.15 3.7
1.8

2.65 3.1
2.2

2.95 3.0
2.9
~~2.88~~

39.0
46.5

40.5
45.0

5.35
6.10

4.80
5.47

5.77
5.35

5.92
5.35

4 3
5.73

5.13

5.56

5.64

5.06
4.95
5.40
5.64

8 | 3.11 | .37
24
61
7

1.12

1.27

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: CUNEX Line: D#1-NE Int.Cal _____ Date: 6/14/66

Send	4-5	3-4	2-3	1-2								
Rec.	40-50	→	→	→								
Time	.1	.01	.003	.003								
DC-1	24.2 25.3	3.75 4.25	1.52 1.54									
DC-2	25.0 24.7	4.12 3.90	1.67 1.53									
Σ	24.8 24.8	4.00 4.01	1.53 1.55									
DC-3	24.7 24.7	4.08 3.90	1.75 1.30									
Dc-4	24.5 25.0	3.80 4.15	1.57 1.65									
Σ	24.7 24.7	3.94 3.98	1.53 1.61									
DC-AV	24.75	4.00	1.56									
AC-1	23.5	3.67	1.36	.63								
AC-2	23.5	3.67	1.36									
Σ	23.5	3.67	1.36									
S. P.	0											
AC-N	.04											
Res.												

32.0
31.8
31.5
30.8
4 | 6.2 | 1.55
4
22

42.8
42.7
43.1
41.5
42.7
6 | 2.7 | .5

45.5

2.85
2.86

2.75
2.65
2.95
10 | 7.6.8 | 7
70

1.67
1.40

drift,

2.53
2.48
2.87
2.79
2.83
2.77
2.74
5.01 | .71
47

Line N80°E

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX Line D#1-SW Field date 6/16/66 Data page 1 Comp. date 6/16/66. Comp by JMc

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.7	→	→	→	→	→	→	→	→	→		
(E) Vdc (avg)	32.4	17.1	6.77	43.2	14.8	9.03	66.1	21.4	10.3	7.95		
(F) DCcal	.980	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	56	30	39	75	102	156	114	148	178	275		
(I) Vac Σ	26.7	14.2	5.53	35.5	12.8	7.6	54.9	17.7	8.7	6.4		
(J) AC noise x 2												
(K) Vac(corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.000											
(M) ρ dc/ρac=ExL/K	1.213	1.204	1.224	1.217	1.157	1.188	1.206	1.208	1.185	1.242		
(N) PFE=(M-1)(10^2)	21.3	20.4	22.4	21.7	15.7	18.8	20.6	20.8	18.5	24.2		
(O) MCF=(M-1)(10^5)/H	381	679	574	289	154	120	181	141	164	88		
	-14	+4		-1			-22					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4									
(B) Receive	40-50	→	→									
(C) n separation	2	3	4									
(D) I	1.7	→	→									
(E) Vdc (avg)	12.7	6.9	4.0									
(F) DCcal	.980	→	→									
(G) Kn x 10^{-3}	12	30	60									
(H) ρ dc=ExFxGx10^3/D	88	119	138									
(I) Vac Σ	11.4	5.85	3.35									
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.000											
(M) ρdc/ρac =ExL/K	1.113	1.221	1.193									
(N) PFE=(M-1)(10^2)	11.3	22.1	19.3									
(O) MCF=(M-1)(10^5)/H	128	186	140									
	113	+21										

Posting Checked

N 80° E

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

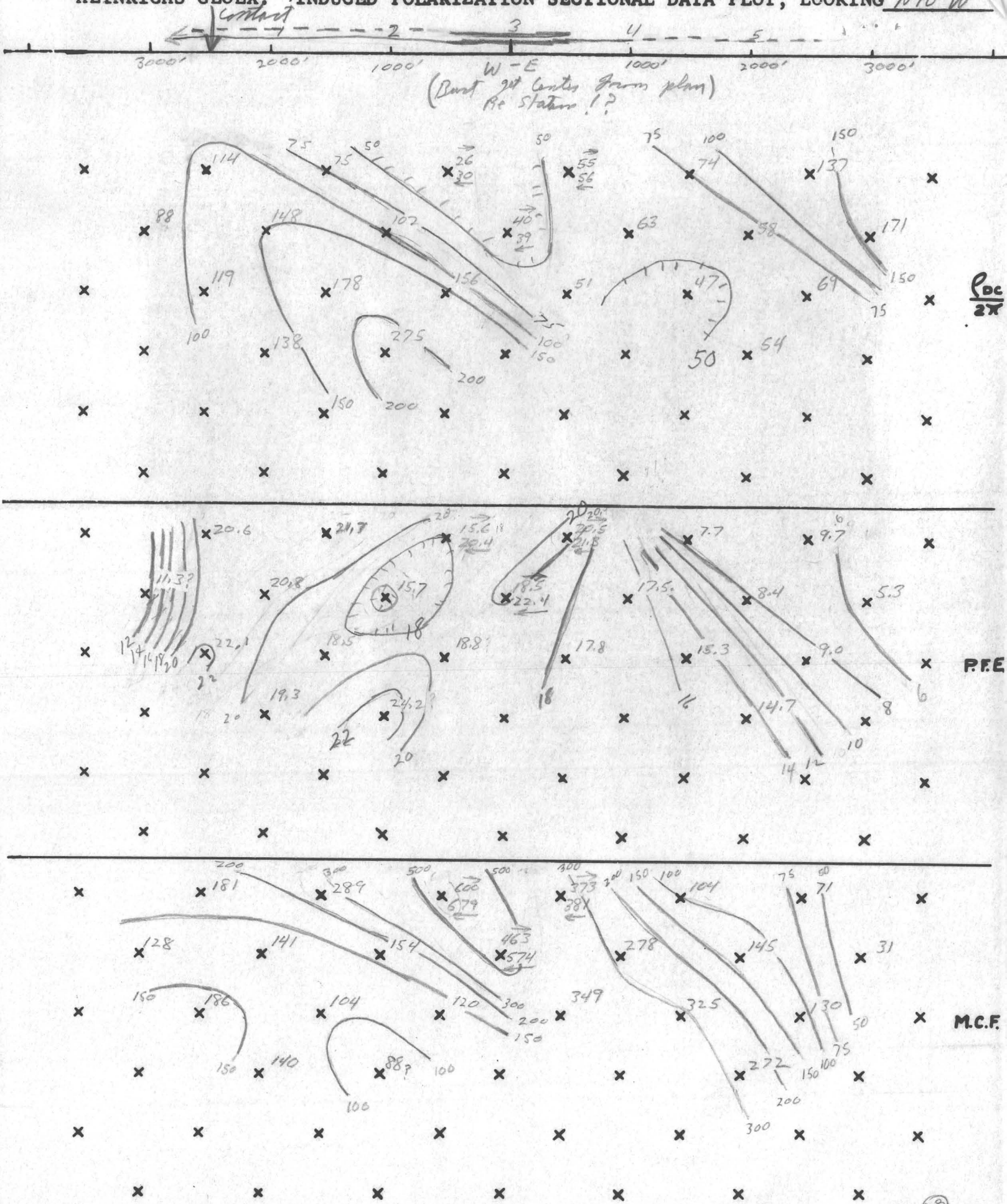
Project GUNNEX Line D#1-NE Field date 6/15/66 Data page 1 Comp. date 6/15/66. Comp by JMC

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.6	1.7	1.6	1.7	1.7	1.6	1.7	1.7	1.7	1.7		
(E) Vdc (avg)	14.0	31.6	5.39	42.5	9.05	2.77	79	8.35	2.71			
(F) DCcal	.980	→	→	→	→	→	→	→	→			
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	26	55	40	74	63	51	137	58	47			
(I) Vac Σ	12.1	26.2	4.55	39.4	7.7	2.35	72	7.7	2.35			
(J) AC noise x 2												
(K) Vac(corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→	→	→	→	→	→	→	→			
(M) ρ dc/ρac=ExL/K	1.156	1.205	1.185	1.077	1.175	1.178	1.097	1.084	1.153			
(N) PFE=(M-1)(10^2)	15.6	20.5	18.5	7.7	17.5	17.8	9.7	8.4	15.3			
(O) MCF=(M-1)(10^5)/H	600	373	463	104	278	349	71	145	325			
	+12	-37		-0			+25					

Project _____ Line _____ Field date _____ Data page _____ Comp. date _____ Comp by _____

(A) Send	4-5	3-4	2-3									
(B) Receive	40-50	→	→									
(C) n separation	2	3	4									
(D) I	1.7	1.7	1.7									
(E) Vdc (avg)	24.75	4.00	1.56									
(F) DCcal	.980	→	→									
(G) Kn x 10^{-3}	12	30	60									
(H) ρ dc=ExFxGx10^3/D	171	69	54									
(I) Vac Σ	28.5	3.67	1.36									
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→	→									
(M) ρdc/ρac =ExL/K	1.053	1.090	1.147									
(N) PFE=(M-1)(10^2)	5.3	9.0	14.7									
(O) MCF=(M-1)(10^5)/H	31	130	272									
	0											

HEINRICHS GEOEX, INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N10°W



AREA SUPERIOR LINE D"1 a = 1000' SCALE: 1" = 1000' DATE: 6/10/66

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: SUPERIOR Line: 54E-5W Int.Cal 90 Date: 6/6/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.1	.03	.01	.1	.03	.01			
DC-1	34.5 34.5	35.0 33.0	6.5 6.8 7.8 6.7	43.6 48.2	7.0 6.0 7.0 7.8	4.90 4.56 4.40 4.50	39.7 45.2	9.9 8.9 7.4 8.8	3.8 4.1 .5 2.2			98 98
DC-2	33.8 34.7	35.5 36.0	6.7 6.0 7.5 8.2	47.5 47.0	6.36 6.0 7.2 7.5	4.82 4.50 4.20 4.45	41.5 45.5	9.4 11.5 7.5 7.2	3.6 2.4			98 98
Σ	34.5 34.3	34.0 35.2	7.2 6.8 7.1 7.1	46.0 47.2	7.0 6.9 6.8 7.1	4.65 4.54 4.51 4.47	42.5 43.5	8.7 8.9 8.4 9.4				
DC-3	35.5 33.5	34.5 35.2	7.5 7.0 6.5 7.2	47.0 47.0	8.0 6.6	4.82 4.5 4.35 4.3	42.1 43.0	10.2 9.5 7.2 9.2				
Dc-4	34.5	34.0 36.5	7.0 7.1	47.5 47.0	7.0 6.7		43.7 41.2		DRIFT			
Σ		34.8 35.3	7.1	47.0 47.3	7.3 6.9	4.59 4.4	42.9 42.4	8.7 9.3				
DC-AV	34.4	34.8	7.1	47.2	7.0	4.53	42.8	8.9				
AC-1	31.0	31.2	6.3	41.2	6.2	4.15	35.8	8.1	2.40			98.5
AC-2	31.4	31.0	6.3	41.2	6.2	4.15	35.8	8.1				99
Σ												
S. P.	-56.0	-5.7		-33.1			-3.3					
AC-N	.06	.08		.06			.06					
.Res.												

40.0		
45.0	47.5	37.5
	45.8	29.8
	45.5	34.5
	48.0	35.0
		34.2
		35.5

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: GUNNEX Line: 54E - SW Int.Cal .90 Date: 6/7/66

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				CAL
Rec.	40-50	→	→	→	50-60	→	→	→				(1-2)
Time	.03	.01	.003									
DC-1	10.4 7.2	2.6 3.0 4.2 4.7										98 98
DC-2	8.2 9.6 9.4 6.6	3.2 3.8 5.1 4.0										98 98
Σ	8.8 8.1 8.8	3.4 3.8 4.2 3.9										
DC-3	6.6 8.6 12.2 8.0	4.8 4.4 3.4 2.8										
Dc-4	9.2 12.2 7.9 7.6	5.7 3.5 2.0 4.2										
Σ	9.4 6.3 8.6 9.9	4.1 3.6 3.9 3.8										
DC-AV	8.8	3.8										
AC-1	8.1	3.7	1.4									98
AC-2	8.1	3.7										98
Σ												
S. P.	-16.9											
AC-N	.10											
Res.												

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 54 N Date: 4/2/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-1	1-2	1-2	2-3	2-3	2-3	3-4	3-4	3-4	3-4		
Time												
Range												
Current	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Receive	4-5	4-5	4-5	4-5	5-6	5-6	5-6	5-6				
Time	?	?	?	?								
Range												
Current	1.6	→										

3 set up

Sent 3-1

2-3 told to stop

heard send 2-3

heard send [illegible]

so sent 3-0 [illegible]

if [illegible] understand [illegible] (2) 2-3

next sent 1-2

5 set sent on time

could not raise you

INDUCED POLARIZATION SENDER NOTES

Project: Suppior Line: 54 South Date: 4/6/86

Send	4-5	3-4	4-5	2-3	3-4	45	1-2	2-3	3-4	4-5	1-2	2-3
Receive	0-1000	100-200	→	2000-3000	→		3000-4000	→			4000-5000	→
Current ~~Time~~	2X500	2X800 +50	2X500 +0	2X800 +50	2X800 +50	2X500 +0	2X800 +0	2X800 +0	2X800 +0	2X500 +0		
Range												
Total Current	1000	1700	1000	1700	1700	1000	1600	1600	1600	1000		
Send	3-4	4-5	1-2	2-3	3-4	4-5		CAL 1 AMP		CAL. 1 AMP		
Receive	→	→	5000-6000	→	→			3-4		1-2		
Current ~~Time~~												
Range												
Total Current												

1-2 — .75 — 1.0-300v

2-3 — 1.00 — 1.4-290v

3-4 — 1.00 — 1.7

4-5 — 1.00 — 1.8

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNEX Line: 54E - NE Int.Cal Date:

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.03	.1	.01	.3	.03	.01	.01		
DC-1	33.0 32.5	50.5 49.5	11.8 11.5	10.6 9.8 11.2 10.6	37.7 31.5	4.4 5.0 5.0 5.6	83 82	9.5 8.4	4.78 4.45	2.1 2.5 3.1 2.7		98 98
DC-2	32.7 32.7	50.0 49.8	11.6 11.7	9.8 8.8 11.2 11.0	34.7 34.5	4.3 3.2 5.4 6.0	83 82	9.0 9.1	5.00 4.10	2.8 2.7 2.3 2.4		98 98
Σ	32.8 32.7	50.0 49.9	11.7 11.6	10.9 10.2 10.5 9.9	34.6 34.6	4.7 5.3 4.8 4.6		9.05	4.61 4.55	2.6 2.6 2.5 2.6		
DC-3	33.2 32.7	50.0 49.7	11.8 11.5	8.4 10.2 10.2 11.3	33.0 34.2	4.2 4.4 4.6 4.6	83 82	8.9 9.1	4.48 4.68	2.8 3.0 2.5 2.2		
Dc-4		50.0 50.0		8.9 8.6 8.1 10.6	34.6	4.2 4.5 4.1 4.7		9.1 9.0		2.5 2.9 2.7 2.2		
Σ	32.7	49.9 50.0	11.7	9.3 10.8 9.5 9.6		4.4 4.5 4.3 4.6		9.05	4.58	2.6 2.6 2.6 2.7		
DC-AV	32.7	49.95	11.7	10.1	34.6	4.65	82.5	9.01	4.58	2.60		98
AC-1	29.0	44.5	10.0	9.1	33.0	4.1	79	8.55	4.15	2.23		98
AC-2	29.0	44.7	10.0	9.1	32.8	4.1	79	8.55	4.15	2.25		
Σ												
S. P.	-25.0	-14.0		~~.0~~			+8.4					
AC-N	.50	.10		.10			.08					
.Res.												

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNES Line: 54E-NE Int.Cal _____ Date: _____

Send	4-5	3-4	2-3	1-2								
Rec.												
Time	.03	.01	.003	.003								
DC-1	18.4 19.2	2.25 2.35	1.5 1.4 1.4 1.1	.5 .75 1.0 .80								
DC-2	18.4 19.0	2.45 2.55	1.4 1.5 1.0 1.1	.80 .67 .60 1.00								
Σ	18.8 18.7	2.30 2.34	1.3 1.25 1.2 1.3	.75 .78 .70 .83								
DC-3	18.5 19.1	2.40 2.50	1.3 1.4 1.2 1.2	.95 .90 .40 .45								
Dc-4	17.0 18.6	2.35 2.37										
Σ	18.8 18.8	2.35 2.36	1.25 1.3	.67 .67								
DC-AV	18.8	2.34	1.27	.73								
AC-1	18.4	2.22	1.2	.72								
AC-2	18.4	2.22	1.2	.68								
Σ												
S. P.	+18.0											
AC-N	.08											
Res.												

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project GUNNEX Line 54E-SW Field date 6/6/66 Data page 1 Comp. date 6/9/66. Comp by JMC

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4			
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→			
(C) n separation	1	1	2	1	2	3	1	2	3			
(D) I	1.0	1.7	1.0	1.7	1.7	1.0	1.6	1.6	1.6			1.00
(E) Vdc (avg)	34.4	34.8	7.1	47.2	7.0	4.53	42.8	8.9				98
(F) DCcal 1.02	.980	→										
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30			
(H) ρ dc=ExFxGx10^3/D	101	60	83	82	48	123	79	65				
(I) Vac Σ	31.2	31.1	6.3	41.2	6.2	4.15	35.8	8.1				98.25
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.993	→										
(M) ρ dc/ρac=ExL/K	1.094	1.111	1.117	1.142	1.122	1.084	1.190	1.092				
(N) PFE=(M-1)(10^2)	9.4	11.1	11.7	14.2	12.2	8.4	19.0	9.2				
(O) MCF=(M-1)(10^5)/H	93	185	141	173	254	68	241	142				
	-56.0	-5.7		-33.1			-3.3					

Project Line Field date Data page Comp. date Comp by

(A) Send	1-2	2-3										
(B) Receive	46-50	→										
(C) n separation	2	3										
(D) I	1.6	1.6										
(E) Vdc (avg)	8.8	3.8										
(F) DCcal	.980	→										
(G) Kn x 10^{-3}	12	30										
(H) ρ dc=ExFxGx10^3/D	65	70										
(I) Vac Σ	8.1	3.7										
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→										
(M) ρdc/ρac =ExL/K	1.078	1.020										
(N) PFE=(M-1)(10^2)	7.8	2.0										
(O) MCF=(M-1)(10^5)/H	120	39										
	-16.9											

Drafting [illegible]

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

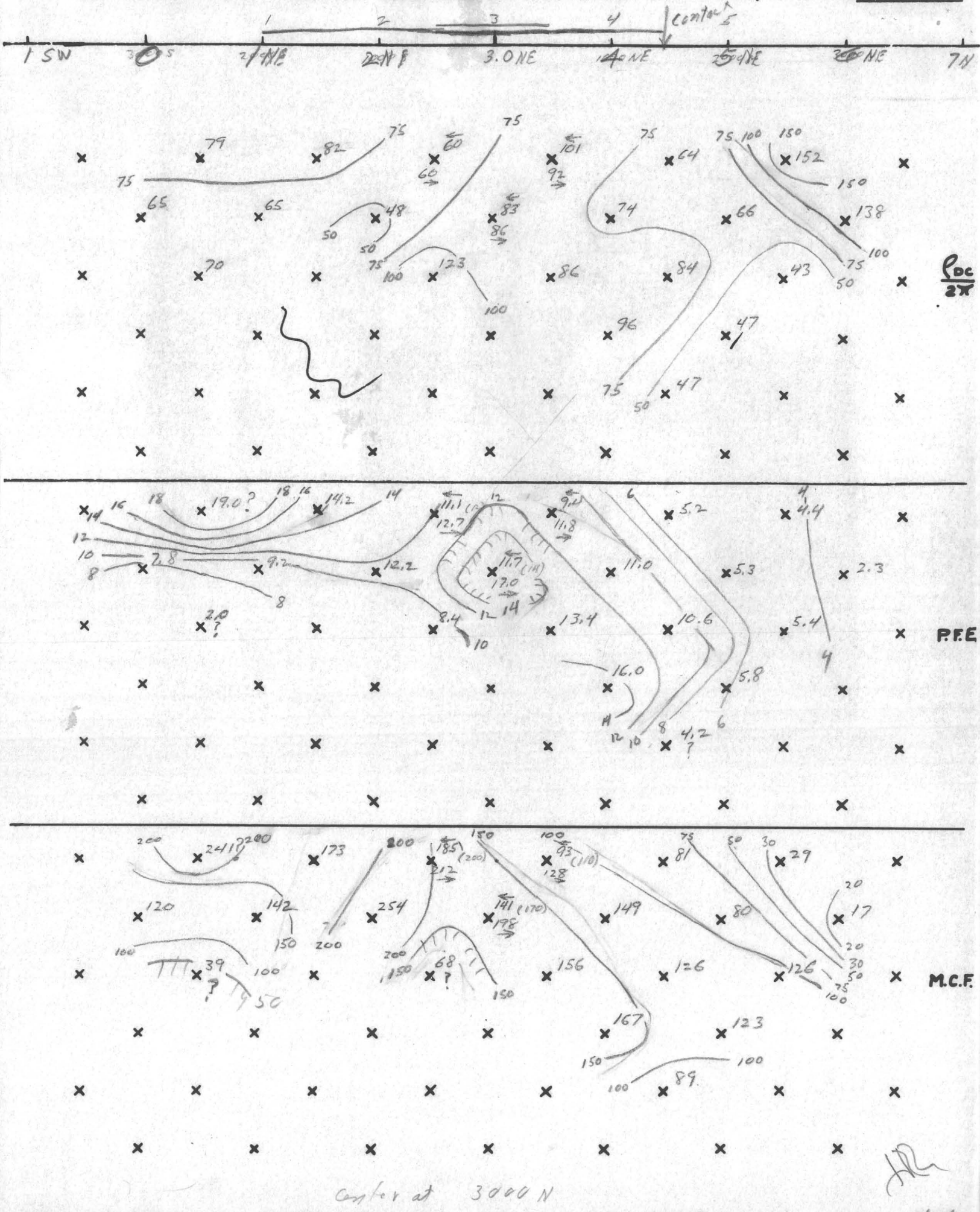
Project GUNNEX Line 54E-NE Field date 6/7/66 Data page_____ Comp. date 6/7/66. Comp by JMS

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.6	→	→	→	→	→	→	→	→	→		1.00
(E) Vdc (avg) 1.02	32.7	49.95	11.2	34.6	10.1	4.65	82.5	9.01	4.58	2.60		98
(F) DCcal	.980	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	60	92	86	64	74	86	152	66	84	96		
(I) Vac Σ	29.0	44.6	10.0	32.9	9.1	4.1	79	8.55	4.15	2.24		98
(J) AC noise x 2												
(K) Vac(corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.127	1.118	1.170	1.052	1.110	1.134	1.044	1.053	1.106	1.160		
(N) PFE=(M-1)(10^2)	12.7	11.8	17.0	5.2	11.0	13.4	4.4	5.3	10.6	16.0		
(O) MCF=(M-1)(10^5)/H	212	128	198	81	149	156	29	80	126	167		
	25.0	-14.0		0			+8.4					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	3-4	2-3	1-2								
(B) Receive	40-50	→	→	→								
(C) n separation	2	3	4	5								
(D) I	1.6	→	→	→								
(E) Vdc (avg)	18.8	2.34	1.27	.73								
(F) DCcal	.980	→	→	→								
(G) Kn x 10^{-3}	12	30	60	105								
(H) ρ dc=ExFxGx10^3/D	138	43	47	47								
(I) Vac Σ	18.4	2.22	1.2	.70								
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→	→	→								
(M) ρdc/ρac =ExL/K	1.023	1.054	1.058	1.042								
(N) PFE=(M-1)(10^2)	2.3	5.4	5.8	4.2								
(O) MCF=(M-1)(10^5)/H	17	126	123	89								
				+18.0								

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N45°W



Center at 3000 N

AREA SUPERIOR LINE 54E a = 1000' SCALE: 1" = 1000' DATE: 6/9/66

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 30N-SE Date: 6/17/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-600	600-1200	→	1200-1800	→	→	1800-2400	→	→	→		
Current ~~Time~~	900 + 0	800 + 50	700 + 0	900 + 0	800 + 50	700 + 0	500 + 0	900 + 0	900 + 0	900 + 0		
Range												
TOTAL Current	1400	1700	1400	1800	1700	1400	1000	1800	1800	1400		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	CAL 1AMP			
Receive	2400-3000	→	→	→	3000-3600	→	→	→				
Current ~~Time~~												
Range												
TOTAL Current	1.0	1.8	1.8	1.4	1.0	1.8	1.8	1.4				

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNEX 36 Line: 30N - SE Int.Cal .89 Date: 6/17/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-6	6-12	→	12-18	→	→	18-24	→	→	→		
Time	.1	.1	.03	.1	.03	.01	.1	.03	.01	.01		
DC-1	48.5 47.7	38.2 43.2	14.6 13.9	50.3 48.2	12.2 11.6	6.60 6.22	24.5 23.2	11.8 12.1	5.47 5.42	3.37 3.35	3.35 3.20	97 97
DC-2	48.6 47.8	43.3 38.2	14.3 13.7	48.5 50.0	12.5 11.3	6.08 7.10	24.5 23.2	12.0 12.1	5.40 5.42	3.42 3.25	3.25 3.25	97 97
Σ	48.1 48.2	40.3 40.3	14.3 14.0	49.3 49.2	11.9 11.9	6.41 6.59	23.8 23.9	12.0 12.0	5.44 5.41	3.36 3.24	3.27 3.25	
DC-3	48.2 48.2	38.5 42.7	14.7 13.7	50.2 48.2	12.4 11.5	6.68 6.20	24.5 23.4	11.9 12.2	5.45 5.45	3.20 3.25	3.30 3.25	
Dc-4	48.2 48.2	38.5 42.7	14.7 13.6	49.4 49.0	12.1 11.7	6.35 6.25	24.5 23.3	12.5 11.6	5.40 5.47	3.25 3.40	3.27 3.22	
Σ	48.2 48.2	40.5 40.6	14.2 14.1	49.2 49.2	11.9 11.9	6.44 6.30	23.9 23.9	12.0 12.1	5.45 5.44	3.22 3.33	3.28 3.24	
DC-AV	48.2	40.6	14.2	49.2	11.9	6.42	23.9	12.0	5.42	3.35		
AC-1	44.6	38.5	12.8	44.8	10.8	5.65	20.6	10.7	4.75	2.80		97
AC-2	44.6	38.5	12.8	44.6	10.8	5.63	20.6	10.6	4.77	2.80		97
Σ												
S. P.	+2.8	-0.7	+6.4				-2.6					
AC-N	.06	.06	.04			↓	.05					
t.Res.												

3

5.55 5.39
5.22

5.55 5.39
5.25

5.44
5.41
5.45
5.44

12

3 3

5.80 6.45
7.10

6.80 6.44
6.07

6.75 6.37
6.00

7.00 6.35
5.70 6.41
6.57
6.44
6.30

8 | 3.53 | .41
32
13
8

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUANEX Line: 30N-SE Int.Cal _____ Date: _____

Send	1-2	2-3	3-4	4-5	1-2	2-3	→	3-4	4-5			
Rec.	24-30	→	→	→	30-36	→	→	→	→			
Time	.01	.01	.01	.003	.01	.01	.01	.003				
DC-1	5.45 5.80	5.32 4.50	2.50 2.65	1.30 2.27	5.4 5.0 4.6 5.6	5.4 5.0 6.4 6.7	5.9 5.9 5.8 5.9	.76 .76 .72 .74				
DC-2	5.40 5.95	5.17 4.75	2.65 2.57	1.51 2.00	4.2 2.5 7.2 8.2	6.3 5.6 5.6 6.1	5.7 5.1 6.3 6.5	.74 .70 .77 .79				
Σ	5.63 5.67	4.91 4.96	2.57 2.61	1.73 1.70	5.0 5.3 5.7 5.4	5.9 5.8 5.7 5.9	5.9 6.0	.74 .75 .75 .75				
DC-3	5.85 5.42	5.25 4.82	2.70 2.70	1.95 1.74	4.8 5.4 6.2 5.2	6.3 5.6 6.5 5.8	5.6 5.9 5.8 5.6	.70 .67 .81 .83				
Dc-4	5.05 5.75	5.25 4.72	2.63 2.65	1.82 1.82	4.9 4.2 5.7 6.4	5.2 5.2 6.4 6.5	5.8 5.7 5.9 6.0	.61 .56 .87 .90				
Σ	5.64 5.90	5.03 4.99	2.70 2.64	1.85 1.82	5.5 5.3 5.3 5.3	5.9 5.7 5.8 5.8		.76 .73 .74 .73				
DC-AV	5.56	5.00	2.64	4.79	5.35	5.81		.75				
AC-1	4.67	4.37	2.30	1.55	4.5	5.15	5.15	.68				
AC-2	4.65	4.33	2.30	1.53	4.5	5.15	~~5.10~~	.68				
Σ												
S. P.	+6.9				-6.1							
AC-N	.06				.08		16	11				
.Res.	20	12	12	20	17							

2.63
2.77
2.60
2.62
2.57
2.6
2.7
2.

1.82
1.76
1.85
1.77
1.73
1.70
1.85
1.82

1.76
1.87
1.54
1.97
1.74
1.96
1.63
1.91

2.55
2.70
2.65
2.90
2.35
2.85
2.50
2.75

4.90
5.15
4.97
5.32
5.80
4.05

5.67
5.35
5.70
5.35
5.85
5.20

5.51
5.53
5.52
5.63
5.67
5.64
5.40

8 | 5
48 | 6.30 | 79
56
70

5.03
5.14
4.92
4.91
4.96
5.03
4.99

7 | 34.98 | 4.99
28
69
63
58

7 | 3.90 | 56
35
40

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 30 - NW Date: 6/17/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	5-4	2-3	1-2		
Receive	0-600	600-1200	→	1200-1800	→		1800-2400	→		→		
Time												
Range												
Current	1.0	1.8	1.0	1.8	1.8	1.0	1.4	1.8	1.8	1.0		
Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Receive	2400-3000	→		→	3000-3600	→				CAL. 1 AMP		
Time												
Range												
Current	1.4	1.9	2.0	1.2	1.4	1.8	1.9					

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: GUNNEX Line: 30N-NW Int.Cal _____ Date: 6/20/66

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2				
Rec.	34-30	→	→	→	35-36	→	→	→				
Time	.03	.01	.01	.003	.01	.01	.003					
DC-1	14.5	4.00 5.05	2.95 4.65	1.13	5.12 5.10	2.00 2.45	2.30 1.95			1.20 1.13		
DC-2	14.0 15.8	5.20 3.85	3.55 3.47	1.21 1.16	5.00 5.25	1.85 2.65	2.25 1.95			1.30 1.16		
Σ	15.1	4.63 4.52	3.50 3.51	1.18	5.11 5.12	2.23 2.28	2.13 2.10			1.17 1.22		
DC-3	14.3 15.8	5.15 3.85	3.60 3.40	1.18 1.12	5.37 4.80	2.20 2.20	2.15 2.00			1.20 1.06		
Dc-4	14.2 15.9	4.60 4.40	3.75 3.25	1.24 1.04	5.12 5.12	2.30 2.07	2.00 2.15			1.08 1.18		
Σ	15.1 16.0	4.50 4.50	3.60 3.50	1.15 1.14	5.09 5.12	2.20 2.18	2.07 2.08			1.13 1.23		
DC-AV	15.1	4.51	3.50	1.17	5.11	2.20	2.14					
AC-1	12.6	~~3.66~~	3.00	1.00	4.20	1.82	1.80					
AC-2	12.6	3.80	3.00	.98	4.20	1.82	1.80					
Σ		3.75										
S. P.	-8.2	3.78			-39.2							
AC-N	.03				.05							
Res.												

1.95 2.17
2.40

1.90 2.25
2.60

2.65 2.18
1.70 38

7) .98 | .14
.7
28

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNEX Line: 30N-NW Int.Cal 89 Date: 6/20/8

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-6	6-12	→	12-18	→	→	18-24	→	→	→		
Time	.03	.3	.03	.1	.03	.01	.3	.03	.01	.003		
DC-1	18.4 19.9	65 62	8.3 8.3	44.3 44.7	14.0 13.4	3.25 3.00	74 71	10.9 12.1	5.85 6.65	1.20 1.60	1.7 1.8 1.2 1.3	97.5 97.5
DC-2	19.7 18.0	65 62	8.3 8.3	44.5 44.5	14.0 13.4	3.15 2.80	75 70	10.9 12.0	6.80 6.07	1.4 1.2 1.7 1.8	1.45 T	97.5 97.5
Σ	19.1 18.9	63 64	8.25 8.3	44.5 44.5	13.7 13.7	2.98 3.	72.5 72.5	11.5 11.4	6.28 6.18	1.4 1.55 1.5	1.45 1.55	
DC-3	18.0 20.2	63 64	8.2 8.3	44.5 44.5	13.5 13.8	3.20 2.80	75 70	11.1 11.9	6.00 6.45	1.6 1.4 1.3 1.3		
Dc-4	19.1 19.0	63 64	8.2 8.4		13.4 13.8	3.25 2.75		11.0 12.0	6.15 6.30	1.3 1.3 1.6 1.5		
Σ	19.1 19.0	63 64	8.25 8.3		13.6 13.6			11.5 11.5	6.22 6.23	1.45 1.35 1.45 1.40		
DC-AV	19.0	63.5	8.28	44.5	13.65	2.99	72.5	11.5	6.22	1.46		
AC-1	18.3	59	7.6	40.4	12.2	2.62	64	9.8	5.42	1.20		
AC-2	18.2	59	7.6	40.2	12.1	2.60	64	9.8	5.40	1.22		97.5
Σ												97.5
S. P.	-8.0	-9.1		+12.8			-4.2					
AC-N	.06	.05		.04			.06					
Res.							-80'					

6.30 6.20
6.10

6.30 6.29
6.08 6.22
6.23
6.20
6.18
6 1.32 / 22
1.2

19.1 19.2
19.3
18.7 19.1
19.5

Centered 24E, 30N

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX Line 30N-NW Field date 6/20/66 Data page_____ Comp. date_____. Comp by JMc

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-6	6-12	→	12-18	→	→	18-24	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.0	1.8	1.0	1.8	1.8	1.0	1.4	1.8	1.8	1.0		
(E) Vdc (avg)	19.1	63.5	8.28	44.5	13.65	2.99	72.5	11.5	6.22	1.46		
(F) DCcal	.975	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	1.8	1.8	7.2	1.8	7.2	18.0	1.8	7.2	18.0	36.0		
(H) ρ dc=ExFxGx10^3/D	34	62	58	43	53	52	91	45	61	51		
(I) Vac Σ	18.25	59	7.6	40.3	12.2	2.61	64	9.8	5.41	1.21		
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.00	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.046	1.076	1.086	1.104	1.119	1.146	1.124	1.174	1.148	1.207		
(N) PFE=(M-1)(10^2)	4.6	7.6	8.6	10.4	11.9	14.6	12.4	17.4	14.8	20.7		
(O) MCF=(M-1)(10^5)/H	135	123	148	242	225	281	136	387	243	406		
	-8	-9		+13		↑?	-4					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3					
(B) Receive	2	3	4	5	3	4	5					
(C) n separation												
(D) I	1.4	1.9	2.6	1.2	1.4	1.8	1.9					
(E) Vdc (avg)	15.1	4.51	3.50	1.17	5.11	2.20	2.14					
(F) DCcal	.975	→	→	→	→	→	→					
(G) Kn x 10^{-3}	7.2	18.0	36.0	63.0	18.0	36.0	63.0					
(H) ρ dc=ExFxGx10^3/D	76	42	61	60	64	43	69					
(I) Vac Σ	12.6	3.78	3.00	.99	4.20	1.82	1.80					
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→	→	→	→	→	→					
(M) ρdc/ρac =ExL/K	1.198	1.194	1.167	1.183	1.217	1.208	1.179					
(N) PFE=(M-1)(10^2)	19.8	19.4	16.7	18.3	21.7	20.8	17.9					
(O) MCF=(M-1)(10^5)/H	261	462	274	305	339	484	259					
	-8				-39							

Drafting Checked

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

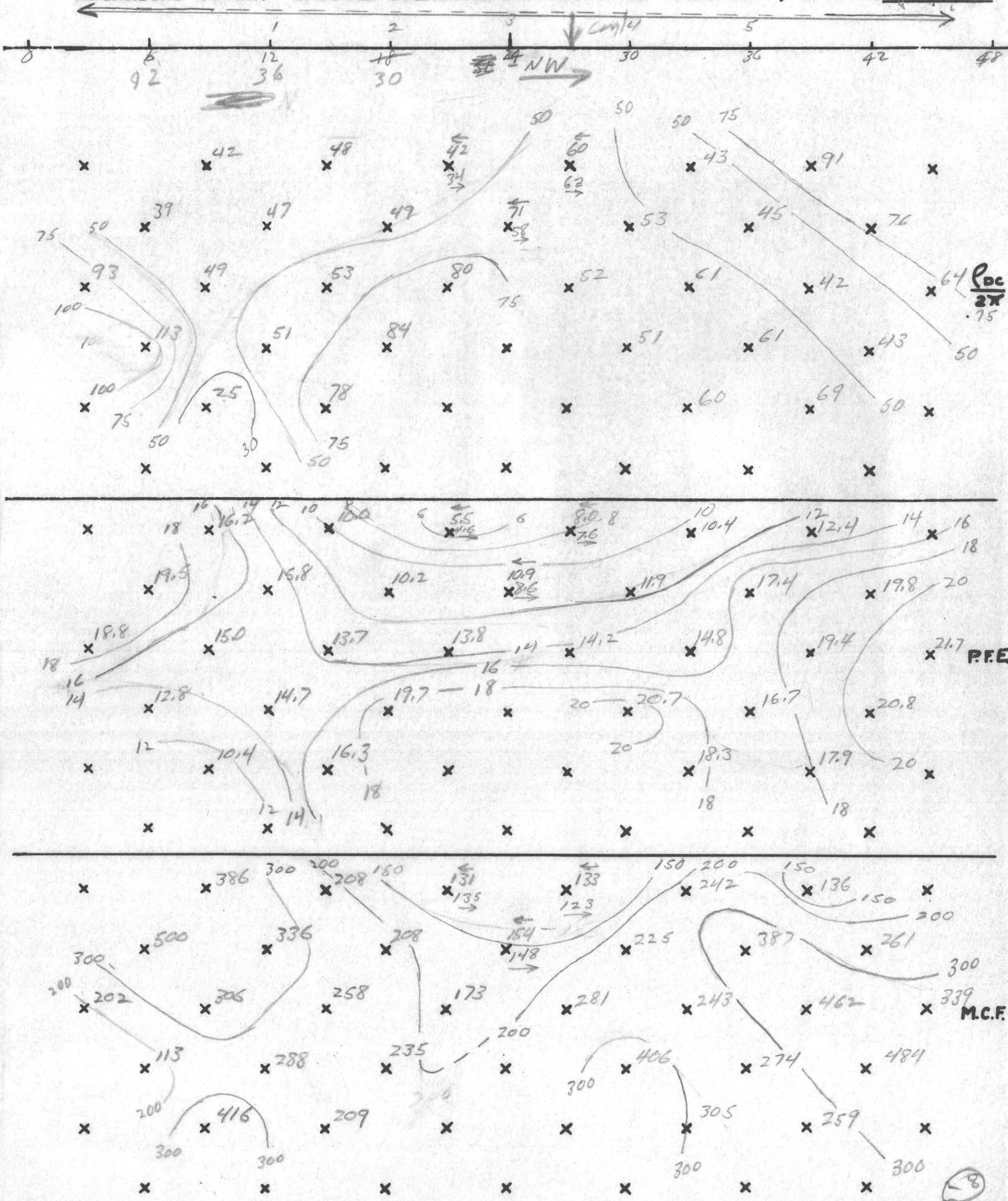
Project GUNNEX Line 30N-SE Field date 6/17/66 Data page 1 Comp. date 6/18/66. Comp by JMC

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-6	6-12	→	12-18	→	→	18-24	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.4	1.7	1.4	1.8	1.7	1.4	1.0	1.8	1.8	1.4		
(E) Vdc (avg)	48.2	40.6	14.2	49.2	11.9	6.42	23.9	12.0	5.42	3.35		
(F) DCcal	.970	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	1.8	1.8	7.2	1.8	7.2	18.0	1.8	7.2	18.0	36.0		
(H) ρ dc=ExFxGx10^3/D	60	42	71	48	49	80	42	47	53	84		
(I) Vac Σ	44.6	38.5	12.8	44.7	10.8	5.64	20.6	10.7	4.76	2.80		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00											
(M) ρ dc/ρac=ExL/K	1.080	1.055	1.109	1.100	1.102	1.138	1.162	1.158	1.137	1.197		
(N) PFE=(M-1)(10^2)	8.0	5.5	10.9	10.0	10.2	13.8	16.2	15.8	13.7	19.7		
(O) MCF=(M-1)(10^5)/H	133	131	154	208	208	173	386	336	258	235		
	+3	-1		+6			-3					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4					
(B) Receive	24-30	→	→	→	30-36	→	→					
(C) n separation	2	3	4	5	3	4	5					
(D) I	1.0	1.8	1.8	1.4	1.0	1.8	1.8					
(E) Vdc (avg)	5.56	5.00	2.64	1.79	5.35	5.81	.75					
(F) DCcal	.970	→	→	→	→	→	→					
(G) Kn x 10^{-3}	7.2	18.0	36.0	63.0	18.0	36.0	63.0					
(H) ρ dc=ExFxGx10^3/D	39	49	51	78	93	113	25					
(I) Vac Σ	4.66	4.35	2.30	1.54	4.5	5.15	.68					
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00											
(M) ρdc/ρac =ExL/K	1.195	1.150	1.147	1.163	1.188	1.128	1.104					
(N) PFE=(M-1)(10^2)	19.5	15.0	14.7	16.3	18.8	12.8	10.4					
(O) MCF=(M-1)(10^5)/H	500	306	288	209	202	113	416					
	+7				-6							

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING SW



AREA GUNNER SUPERIOR LINE 30N a = 600' SCALE: 1" = 600' DATE: 6/17/66

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 2

Project: SUPERIOR Line: 30E - SW Int.Cal. Date: 5/19/66

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Rec.	40-50	→		→	50-60	→	→	→				
Time	.3	.03	.03	.01	.1	.03						
DC-1	64 65	19.3 20.0	14.2 16.2	5.2 6.8	28.7 19.5	7.2 9.9						
DC-2	64 65	20.1 19.5	17.6 13.3	4.6 7.5	23.5 24.7	11.0 5.9						
Σ		19.6/19.8	15.2/15.4	6.0/6.1	24.1/24.1	8.6/8.4						
DC-3	63 66	20.2 19.4	16.2 14.6	6.8 4.6	23.8 26.5	9.6 7.4						
Dc-4		20.0 19.2	16.5 14.5	6.3 5.7	22.2 26.4	9.7 7.0						
Σ		19.8/19.6	15.8/15.5	5.7/6.0	25.4/24.3	8.5/8.3	DRIFT					
DC-AV	64.5	19.7	15.5	5.9		8.5						
AC-1	60	17.9	14.3	5.15	24.5	8.2						
AC-2	60	17.9	14.2	5.15	24.5	8.3						
Σ						8.25						
S. P.	+16.3				13.3							
AC-N	.04				.04							
.Res.												

10.0	8.6	5.6	5.9	17.5	20.3
7.3		6.2		13.3	19.1
		5.5	6.0		20.5
		6.4			19.0
		5.4	6.7		20.3
		6.0			19.2

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: Superior Line: 30E - SW Int.Cal .89 Date: 5/19/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30	→		30-40	→				
Time	.1	.1	.03	.1	.1	.03	.3	.1	.03	.03		
DC-1	25.5 19.5	46.0 45.8	11.0 13.2	53.2 54.2	27.8 26.5	9.4 8.5	116 120	28.0 25.5	20.0 27.5	6.8 6.2		95 95
DC-2	22.7 22.3	46.2 45.5	10.6 12.4	52.0 56.2	31.0 24.8	9.4 12.0	115 121	25.7 27.2	15.6 23.4	7.2 5.6		95 95
Σ	22.5/22.5	45.9/45.9	12.6/11.5	53.7/54.1	27.1/27.9	9.0/10.7	118/	26.7/26.5	21.2/19.5	6.5/6.3		
DC-3	20.5 24.0	46.0 46.5	11.2 12.1	54.2 51.8	25.0 28.0	13.6 4.8	114 122	27.5 26.2	20.7 19.0	7.2 6.0		
Dc-4	[illegible]	45.5 47.0	11.0 12.5	51.5 55.0	27.0 28.7	8.6 10.3	119 117	26.5 26.0	19.8 20.2	7.0 6.2		
Σ	22.3	46.3/46.2	11.6/11.7	53.0/53.3	26.5/27.8	9.2/9.5		26.8/26.2	19.8/20.0	6.6/6.6		
DC-AV	22.4	46.1	11.9	54.0	28.1	9.4	118	26.5	19.7	6.5		
AC-1	21.0	44.5	11.0	50.2	26.2	8.2	111	24.5	18.3	5.90		95
AC-2	21.0	44.2	11.0	50.2	26.0	8.2	110	24.5	18.2	6.00		95
Σ	21.0											
S. P.	-7.4	-3.2	-5.-	-1.8			-9.7					
AC-N	.06	.10	.4	.08			.06					100
.Res.												

7.4	6.5	20.6	19.8	26.7	26.6	9.0	5.0	26.7	28.1
5.6		19.0		26.5			13.0	29.5	
7.0	6.8	20.5	19.4	27.0	26.8	9.1	10.7	27.0	28.8
6.7		18.2		26.5			7.6	30.5	
6.7	6.7	19.4	19.7	27.0	26.2			26.8	28.1
6.7		20.0		25.5				29.5	
6.8	6.6	19.2	19.9					25.5	27.3
6.3		20.6						29.2	
								29.5	28.8
								28.2	
								29.0	28.8
								28.5	
								29.2	28.7
								28.2	
								29.8	29.4
								29.0	

51.5	53.7	9.7	12.1
56.0		14.5	
50.8	54.4	12.2	11.8
58.0		10.6	
52.5	53.5	13.4	11.8
54.5		10.2	
50.5	54.7	10.5	11.7
59.0		12.9	
56.7	54.6		
52.5			
55.0	54.0		
53.0			
53.7	54.8		
56.0			
52.2	54.5		
56.7			

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5	1-2	2-3
Current	800	800	800	800	800	800	800	800	800	800	800	800
Total Current	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Send	3-4	4-5	1-2	2-3	3-4	4-5						
Current	800	800	800	800	800	800						
Total Current	1600	1600	1600	1600	1600	1600						

CAL
1AMP

INDUCED POLARIZATION - RECEIVER NOTES

PAGE 1

Project: SUPERIOR Line: 30E - NE Int.Cal .88 Date: 5/20/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.1	.01	.01	.03	.03	.01	.01		
DC-1	45.3 44.0	23.8 26.6	12.6 13.2	53.0 50.5	6.30 6.62	5.25 5.35	16.1 16.2	7.6 7.3	3.80 2.28	3.10 1.90		97.5 97.5
DC-2	44.5 45.0	25.2 25.2	14.4 11.4	53.3 49.8	6.35 6.70	4.95 5.58	15.8 16.7	8.0 7.1	3.05 3.05	2.35 3.10		97.5 97.6
Σ	44.6/44.7	25.2/25.2	12.9/12.9									
DC-3	44.7 44.7	24.5 26.0	13.5 12.8	55.2 47.5	6.55 6.45	5.05 5.62	16.5 16.1	8.2 6.6	3.18 2.50	2.42 3.05		
Dc-4			12.4 13.7	50.5 51.0	6.62 6.38	5.25 5.25	16.3 16.7	7.5 7.6	3.15 3.30	2.00 3.42		
Σ	44.7	25.2										
DC-AV												
AC-1	43.4	23.5	12.3	47.0	5.75	4.73	15.1	6.8	2.65	2.33		98
AC-2	43.4	23.7	12.2	47.0	5.82	4.70	15.1	6.8	2.65	2.35		98
Σ												
S. P.	+3.8	-1.1		+8.7			-10.4					SEND 100
AC-N	.05	.06		.04			.04					
Res.												

VALLEY AT 3900' STEEP RISE TO 4000'

2.38	2.95	7.0	16.4	5.12	51.3	6.28	14.6
2.65	3.28	7.9	16.6	5.50	51.8	6.70	12.0
2.62	3.25		15.7	4.85	51.7		12.1
2.40	2.90	7.3	16.8	5.60	51.5		14.0
2.48		7.7	16.0				12.4
2.25		7.4	16.5				13.4
3.10		7.7					13.4
2.00		7.1					12.0
		8.1					

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project SUPERIOR Line 30E - SW Field date 5/19/66 Data page 1 Comp. date 5/19/66. Comp by JMC

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		
(E) Vdc (avg)	22.4	46.1	11.9	54.0	~~28.1~~ 21.2	9.4	118	26.5	19.7	6.5		
(F) DCcal	.950	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	40	82	80	96	~~200~~ 194	167	210	189	351	232		
(I) Vac Σ	21.0	44.35	11.0	50.2	26.1	8.2	110.5	24.5	18.25	5.95		
(J) AC noise x 2												
(K) Vac(corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K	1.067	1.040	1.082	1.075	1.076	1.145	1.067	1.082	1.079	1.092		
(N) PFE=(M-1)(10^2)	6.7	4.0	8.2	7.5	~~26~~ 4.2	14.5	6.7	8.2	7.9	9.2		
(O) MCF=(M-1)(10^5)/H	160	49	103	78	~~33~~ 22	87	32	43	23	40		
	-7.4	-3.2		-1.8			-9.7					

Project Line Field date Data page Comp. date Comp by

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3				CAL		
(B) Receive	40-50	→	→	→	30-60	→						
(C) n separation	2	3	4	5	3	4						
(D) I	1.6	1.6	1.6	1.6	1.6	1.6				100		
(E) Vdc (avg)	64.5	19.7	15.5	5.9	25.1	8.5				95		
(F) DCcal	.950	→	→	→	→	→						
(G) Kn x 10^{-3}	12	30	60	105	30	60						
(H) ρ dc=ExFxGx10^3/D	460	351	552	368	447	303						
(I) Vac Σ	60	17.9	14.25	5.15	24.5	8.25				95		
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.00											
(M) ρdc/ρac =ExL/K	1.074	1.100	1.087	1.145	1.025	1.030						
(N) PFE=(M-1)(10^2)	7.4	10.0	8.7	14.5	2.5	3.0						
(O) MCF=(M-1)(10^5)/H	16	3	16	40	6	10						
	+16.3			?	? +13.3							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

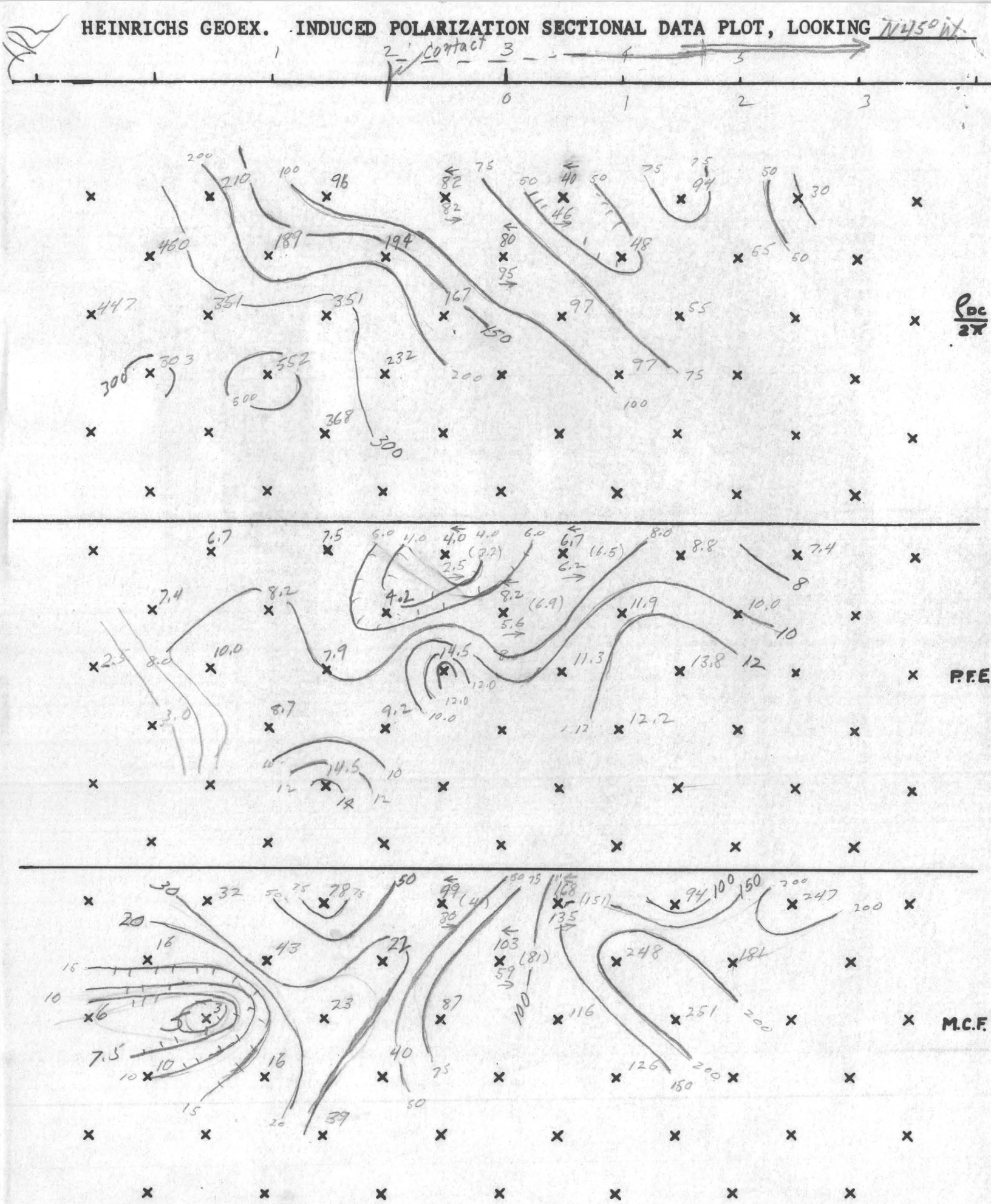
Project GUNNEX-SUPERIOR Line 30E-NE Field date 5/19/66 Data page 1 Comp. date 5/20/66. Comp by JMc

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.6									→		
(E) Vdc (avg)	44.7	25.2	13.0	51.4	6.50	5.28	16.3	7.51	3.03	2.64		
(F) DCcal	3	3	12	3	12	30	3	12	30	60		
(G) Kn x 10^{-3}	.975									→		
(H) ρ dc=ExFxGx10^3/D	82	46	95	94	48	97	30	55	55	97		
(I) Vac Σ	43.4	23.6	12.25	47.0	5.78	4.72	15.1	6.8	2.65	2.34		
(J) AC noise x 2	—											
(K) Vac(corr) $=\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	.9948									→		
(M) ρ dc/ρac=ExL/K	1.025	1.062	1.056	1.088	1.119	1.113	1.074	1.100	1.138	1.122		
(N) PFE=(M-1)(10^2)	2.5	6.2	5.6	8.8	11.9	11.3	7.4	10.0	13.8	12.2		
(O) MCF=(M-1)(10^5)/H	30	135	59	94	248	116	247	181	251	126		
	+3.8	-1.1		+8.7			-10.4					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send												
(B) Receive												
(C) n separation												
(D) I												
(E) Vdc (avg)												
(F) DCcal												
(G) Kn x 10^{-3}												
(H) ρ dc=ExFxGx10^3/D												
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H												

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N45°W.



GUNNEX

AREA SUPERIOR LINE 30E a = 1000' SCALE: 1" = 1000' DATE: 5/19/66

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 30 E - NE Date: MAY 20/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Receive	0-1	1-2	1-2	2-3	2-3	2-3	3-4	3-4	3-4	3-4		
Time												
Range												
Current	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		
Send												
Receive												
Time												
Range												
Current												

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: GUNNEX Line: 15W-5W Int.Cal .90 Date: 6/9/66

Send	1-2	2-3	3-4	4-5								
Rec.	40-50	→	→									
Time	.03	.03	.03									
DC-1	19.1 20.1	9.5 9.0	7.5 4.4									
DC-2	19.5 20.0	9.6 7.8	7.8 6.3									
Σ												
DC-3	20.8 18.9	9.9 7.9	5.5 8.0									
Dc-4	21.4 18.2	8.0 9.4	4.8 9.4									
Σ												
DC-AV												
AC-1	17.5	7.9	6.5									
AC-2	17.5	7.9	6.5									
Σ												
S. P.	6.0											
AC-N	.06											
t.Res.												

DUPLICATE

9.6	7.3	20.2
5.1	11.6	18.2
7.0	6.8	
8.6	9.5	

INDUCED POLARIZATION SENDER NOTES

Project: SUPERIOR Line: 15W - 5 Date: JUNE 10/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-1	1-2	1-2	2-3	2-3	2-3	3-4	3-4	3-4	3-4		
Time												
Range												
Current	1.8	1.7	1.8	1.4	1.7	1.8	1.0	1.4	1.7	1.7		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5				
Receive	4-5	4-5	4-5	4-5	5-6	5-6	5-6	5-6				
Time												
Range												
Current	1.0	1.4	1.7	1.7								

REC. .90

INDUCED POLARIZATION ~~SENDER~~ NOTES

project: GUNNEX Line: 15W-SW Date: 6/9/66

Send	4-5 0-10	3-4 10-20	4-5 →	2-3 20-30	3-4	4-5 →	1-2 30-40	2-3	3-4	4-5 →		CAL
RANGE Receive	.1 27.8 26.7	.1	.03	.1 60.2 60.6	.1 22.5 21.5	.03	.3	.1	.03	.03		
Time	29.7 26.5	36.2 39.5 38.5 36.0	9.9 9.4 12.5 12.0	63.5 58.0	20.3 22.0	8.9 8.1 10.6 12.3	85 85 80 79	21.4 35.0	16.5 18.6	7.6 10.0 9.1 8.0		97 97
Range	27.8 23.5	38.3 40.3 36.3 34.6	9.5 9.8 11.8 11.5	61.7 60.8	23.5 20.0	5.4 7.9 12.2 10.1	85 80 80 86	23.5 29.8	19.7 16.4	9.6 11.5 8.4 5.7		97 97
Current	26.5 28.3	37.8 43.5	10.8 10.1 10.8 10.2	61.0 62.7	22.5 19.8	10.6 10.4 8.0 8.8		22.5 30.5	20.5 12.6	10.0 9.9 8.6 8.2		
Send	28.0 27.5	31.5 43.0	10.8 10.7	66.0 57.5	23.2 18.5	8.4 11.5 10.6 7.5		24.2 24.5	17.4 19.3 19.4 16.2	10.4 11.4 6.9 6.6		
Receive	27.2 27.5	36.5 38.7		60.5 62.0	21.2 20.7			28.5 24.8	16.9 19.7			
~~Time~~ AC	24.7 25.0	~~34.7~~ 36.7	9.7 9.7	55.0 55.2	19.2 19.2	8.1 8.1	71 72	24.3 24.3	16.7 16.7	8.1 8.1		98 98
~~Range~~ SP	-14.8	-24.0		-66.9			-23.5					
~~Current~~ AC NO	.06	.08		.08			.20					

ORIGONAL

26.2
21.5
25.5
22.7

1-2	2-3	3-4	4-5
40-50			
.03	.03	.03	.01
19.1	7.5	7.3	
20.1	9.0	4.4	
19.5	9.6	7.8	
21.0	7.8	6.3	
20.8	9.9	5.5	
18.9	7.9	8.0	
21.4	8.0	4.8	
18.2	9.4	9.4	
20.2	7.3	9.6	
18.2	11.6	5.4	
	6.8	7.0	
	9.5	8.6	
17.5	7.9	6.5	3.65
17.5	7.9	6.5	3.90
+6.0			
.06			

No difference

30.0
22.7
24.5
29.2

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUNNEX Line: 15W-NE Int.Cal .90 Date: 6/10/66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.1	.01	.01	.1	.03	.003	.003		
DC-1	25.0 25.5	21.2 20.8	6.6 7.7 9.5 8.1	50.5 48.7	5.3.7 5.5.5	3.05 3.85	59.8 58.3	9.1 10.3 12.3 11.5	1.7 1.7 2.2 2.1			97 97
DC-2	25.3 26.0	21.2 21.0	6.4 8.0 9.0 8.1	48.7 50.3	5.3.2 5.6.0	3.57 3.20	60.0 57.5	11.4 11.2 9.7 9.9	1.7 1.4 2.0 2.1			97 97
Σ												
DC-3	25.3 25.3	21.5 20.5	8.2 7.6 8.0 8.4	49.5 49.5	5.45 5.55	3.70 3.15	60.5 57.3	11.2 11.1 9.9 10.0	2.05 1.78			
Dc-4	25.3 25.5	21.0 21.0	7.6 6.7 8.1 9.5	49.5 49.7	5.27 5.60	3.00 4.00	59.3 59.0	11.1 11.6 9.9 10.7	1.62 2.18			
Σ												
DC-AV	25.4	21.0	7.97	49.55	5.46	3.43	58.96	10.68				
AC-1	23.7	19.4	6.6	46.3	4.73	2.92	54.3	9.3	1.62	1.15		97.
AC-2	24.0	19.4	6.6	46.5	4.75	2.92	54.3	9.3	1.60			97
Σ												
S. P.	-40.9	+31.3		+18.7			-52.5					
AC-N	.06	.01		.04			.04					
Res.												

2.17	58.5	4.00	5.50
1.44	59.5	2.59	5.35
2.62	58.3	3.47	
1.10	59.5	3.45	
		3.55	
		3.40	

INDUCED POLARIZATION - RECEIVER NOTES PAGE 2

Project: CUNEX Line: 15W-NE Int.Cal _____ Date: 6/10/66

Send	4-5	3-4	2-3	1-2								
Rec.	40-50	→	→	→								
Time	.08	.01	.003	.003								
DC-1	19.5 17.0	5.70 5.42	1.70 1.06	1.67 .158								
DC-2	18.5 18.6	6.00 5.45	1.40 1.96	1.15 1.63								
Σ												
DC-3	20.3 15.0	5.85 5.50	16.1 10.9	1.27 1.30								
Dc-4	17.6 21.2	5.22 6.40	14.8 12.7	2.02 .57								
Σ												
DC-AV	18.49											
AC-1	16.9	4.98	1.26	1.16								
AC-2	16.8	4.98	1.26	1.16								
Σ												
S. P.	+56.7											
AC-N	.06											
.Res.												

1.54	1.31	5.75	18.4
1.12	2.00	5.55	18.8
	2.00		
1.12	0.50	6.08	
1.53		5.20	
	1.60		
	1.17	5.80	
		5.90	
	.96		
	2.03	5.35	
		6.30	
	2.05		
	.62		
	1.93		
	.82		

INDUCED POLARIZATION - RECEIVER NOTES PAGE 1

Project: GUANEX Line: 15W-SW Int.Cal .90 Date: 6/8/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	.1	.1	.03	.1	.1	.03	.3	.1	.03	.03		
DC-1	27.8 26.7	36.2 38.5	9.7 9.4 12.5 12.0	60.2 60.5	20.3 22.0	8.9 8.1 10.6 12.3	85 85 80 79	21.4 35.0	16.5 18.6	7.6 10.0 9.1 8.0	DUPLICATE	97 97
DC-2	29.7 26.5	39.5 36.0	9.5 9.8 11.8 11.5	63.5 58.0	23.5 20.0	5.4 7.9 12.2 10.1	85 80 80 86	23.5 29.8	19.7 16.4	9.6 11.5 8.4 5.7		97 97
Σ												
DC-3	27.8 23.5	38.3 36.3	10.8 10.1 10.8 10.2	61.7 60.8	22.5 19.8	10.6 10.4 8.0 8.8		22.5 30.5	20.5 12.6	10.0 9.9 8.6 8.2		
Dc-4	26.5 28.3	40.3 34.5	10.8 10.7	61.0 62.7	23.2 18.5	8.4 11.5 10.6 7.5		29.2 24.5	17.4 19.4	10.4 11.4 6.9 6.6		
Σ												
DC-AV	27.25											
AC-1	24.7	~~34.7~~	9.7	55.0	19.2	8.1	71	24.3	16.7	8.1		98
AC-2	25.0	36.7	9.7	55.2	19.2	8.1	72	24.3	16.7	8.1		98
Σ	24.85											
S. P.	+14.8											
AC-N	.06											
C.Res.												

19.3	28.5
16.2	24.8
16.9	26.2
19.7	21.5
	28.5
	22.7
	30.0
	22.7
	24.5
	29.2

21.2	66.0	37.8	28.0
20.7	57.5	43.5	27.5
	60.5	31.5	27.2
	62.0	43.0	27.5
		36.5	
		38.7	

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project GUNNEX Line 15W-NE Field date 6/10/66 Data page _____ Comp. date 6/11/66. Comp by JMc

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.0	1.4	1.0	1.7	1.4	1.0	1.7	1.7	1.4	1.0		
(E) Vdc (avg)	25.4	21.0	7.97	49.55	5.46	3.43	58.96	10.68	1.87			
(F) DCcal	.970	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30			
(H) ρ dc=ExFxGx10^3/D	74	44	93	85	45	100	101	73	39			
(I) Vac Σ	23.85	19.4	6.6	46.4	4.74	2.92	54.3	9.3	1.61			
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.000	→	→	→	→	→	→	→	→			
(M) ρ dc/ρac=ExL/K	1.065	1.082	1.208	1.068	1.152	1.175	1.086	1.148	1.161			
(N) PFE=(M-1)(10^2)	6.5	8.2	20.8	6.8	15.2	17.5	8.6	14.8	16.1			
(O) MCF=(M-1)(10^5)/H	88	186	224	80	338	175	85	203	413			
	-40.9	+31.3		18.7		-52.5						

Project _____ Line _____ Field date _____ Data page _____ Comp. date _____ Comp by _____

(A) Send	4-5	3-4	2-3	1-2								Cal
(B) Receive	40-50	→	→	→								
(C) n separation	2	3	4	5								
(D) I	1.7	1.7	1.4	1.0								1.00
(E) Vdc (avg)	18.49	5.73	1.41	1.29								97
(F) DCcal	.970	→	→	→								
(G) Kn x 10^{-3}	12	30	60	105								
(H) ρ dc=ExFxGx10^3/D	127	98	59	131								
(I) Vac Σ	16.85	4.98	1.26	1.16								
(J) AC noise x 2	—											97
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal.	1.000	→	→	→								
(M) ρdc/ρac =ExL/K	1.097	1.151	1.119	1.112								
(N) PFE=(M-1)(10^2)	9.7	15.1	11.9	11.2								
(O) MCF=(M-1)(10^5)/H	76	154	202	85								
	-56.7											

Problems checked

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

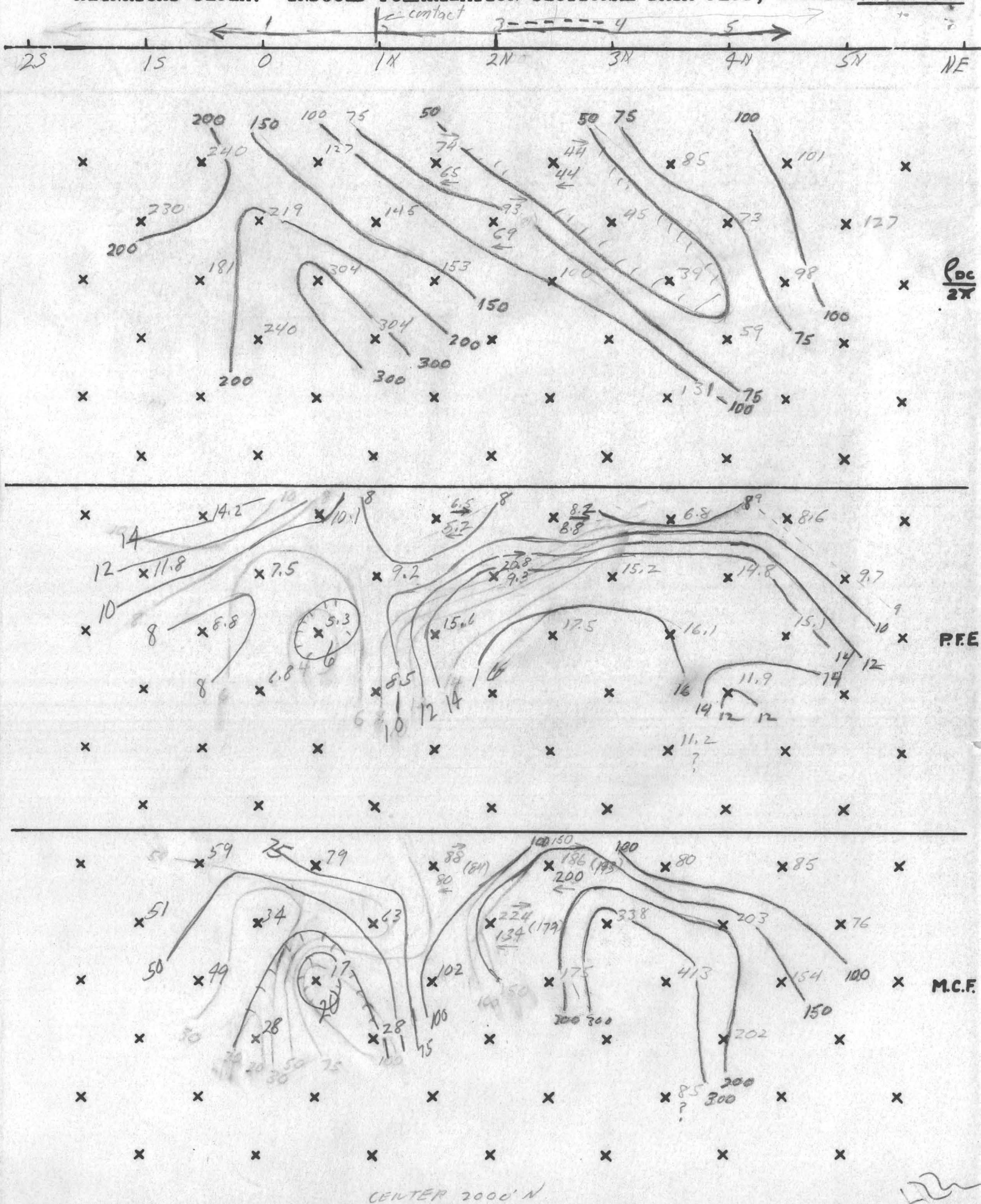
Project GUNNEX Line 15W-5W Field date 6/9/66 Data page 1 Comp. date 6/11/66. Comp by JMc

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.8	1.7	1.8	1.4	1.7	1.8	1.0	1.4	1.7	1.7		
(E) Vdc (avg)	27.25	37.95	10.7	61.2	21.17	9.46	82.5	26.39	17.77	8.87		
(F) DCcal 1.03	.970	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	44	65	69	127	145	153	240	219	304	301		
(I) Vac Σ	24.85	35.7	9.7	55.1	19.2	8.1	21.5	24.3	16.7	8.1		
(J) AC noise x 2	—											
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	—											
(L) AC-DC cal. 1.010	.990	→	→	→	→	→	→	7.5	1.053	→		
(M) ρ dc/ρac=ExL/K	1.064	1.052	1.070	1.077	1.070	1.133	1.119	1.053	1.032	1.062		
(N) PFE=(M-1)(10^2)	886.4	5.2	~~7.0~~ 9.3	~~7.7~~ 10.1	7.0 9.2	13.1 5.6	11.1 8.2	5.3 7.5	3.2 5.3	6.2 8.5		
(O) MCF=(M-1)(10^5)/H	~~145~~ 200	80	101 134	61 79	48 63	87 102	50 59	24 34	107 17	103 28		
	+14.8	−24		−66.9			+23.5					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4										Cal
(B) Receive	40-50	→	→										
(C) n separation	2	3	4										
(D) I	1.0	1.4	1.7										1000
(E) Vdc (avg)	19.74	8.69	7.01										97
(F) DCcal	.970	→	→										
(G) Kn x 10^{-3}	12	30	60										
(H) ρ dc=ExFxGx10^3/D	230	181	240										
(I) Vac Σ	17.5	7.9	6.5										
(J) AC noise x 2	—												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	—												98
(L) AC-DC cal.	.990	→	→										
(M) ρdc/ρac =ExL/K	1.094	1.067	1.046										
(N) PFE=(M-1)(10^2)	9.4 11.8	6.7 8.8	4.6 6.8										
(O) MCF=(M-1)(10^5)/H	41 51	37 49	19 28										
	+6.0												

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N45°W



CENTER 2000' N

AREA SUPERIOR LINE 15W a = 1000' SCALE: 1" = 1000' DATE: 6/11/66

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: FLORENCE GUNNEX Line: R#1 - SW Int.Cal .90 Date: 6/25/66

Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL
Rec.	0-10	10-20	20-30	20-30	→	→	30-40	→	→	→		
Time	.3	.3	.1	.3	.1	.03	.3	.1	.1	.03		
DC-1	128 135	194 200	32.8 32.0	138 138	50.0 56.8	14.4 16.8	198 212	59.7 57.2	31.8 34.5	11.4 10.8	12.2 10.0	97 97
DC-2	131 132	196 196	34.4 34.7	139 138	51.8 56.5	16.8 16.2	200 210	57.2 63.2	35.2 32.5	12.5 10.6	11.5 11.7	97 97
Σ												
DC-3	132 132	198 198	32.5 36.0	139 138	53.0 55.5	12.4 21.0	209 202	55.0 65.8	34.5 31.5	11.7 11.5	10.5 11.8	
Dc-4	131 133	198 199	31.8 35.3	146 135	52.0 54.5	16.8 13.6	205 206	59.5 57.0	34.5 31.5	9.5 14.6	12.5 11.0	
Σ												
DC-AV												
AC-1	126	192	33.3	134	51.7	15.4	196	55.8	31.4	10.8		95
AC-2	125	194	33.5	138	51.7	15.4	196	55.8	31.4	10.8		95
Σ												
S. P.	-5.9	-13.6		+28.1			-6.1					
AC-N	.08	.08		.10			.10					
Res.												

34.0	60.0			138 AC	
31.8	52.5	14.1	57.0	141	34.7
53.8	61.5	16.6	53.0	142	34.7
31.5	56.2	15.1	57.0	143	36.2
	56.2	18.4	51.8	141	35.2
	58.5	15.6	55.8	145	35.5
	56.5	17.4	50.0	140	33.5
	60.7	17.7	56.5	145	35.8
		17.4	50.3	141	36.5
				145	
				142	
				140 AC	

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: GUNNEX Line: B#1-SW Int.Cal _____ Date: _____

Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		4-5		
Rec.	40-50	→	→	→	50-60	→	→	→		40-50		
Time	.1	.1	.03	.01	.03	.03	.03	.01				
DC-1	44.2 44.0	21.7 19.8	16.5 13.5	6.80 5.18	17.6 19.7	11.5 12.5 7.5 7.6	7.5 7.1 8.5 7.0	3.5 4.6 4.3 4.3		6.2 5.3		
DC-2	44.5 43.5	21.2 20.0	14.5 15.6	5.6 6.9 5.8 6.0	19.4 19.0	10.0 10.0 9.6 10.6	6.9 8.8 9.5 7.2	3.6 2.2 4.8 4.0				
Σ												
DC-3	44.5 43.8	21.5 19.5	14.5 16.1	6.4 6.2 6.5 6.8	18.8 19.0	10.5 10.4 9.4 10.1	6.0 8.4 11.0 7.4	5.0 3.1 1.7 2.2				
Dc-4	44.0 44.2	21.5 19.5	15.0 14.4	5.5 5.6 7.0 7.5	19.2 17.6	11.4 10.2 12.6 10.9	5.8 6.0 10.6 9.7	2.5 2.5 4.2 3.9				
Σ												
DC-AV												
AC-1	42.3	19.5	14.4	5.75	18.1	9.6	7.3	3.07				
AC-2	42.5	19.5	14.1	5.77	18.5	10.0	7.3	3.05				
Σ												
S. P.	+12.9				-20.0							
AC-N	.08											
Res.												

ORIENTATION: N60°E

18.5	16.3
19.0	14.4
16.9	15.4
20.1	14.2
18.9	16.6
19.1	12.8
20.7	15.2
19.6	15.4

INDUCED POLARIZATION SENDER NOTES

project: Gunnex Line: R-1 S.W. Date: [illegible]

Send	4-5	34	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
Receive	0-1000	1000-2000	→	2000-3000	→		3000-4000	→				
Current Time	900 + 0	900 + 0	800 + 50	900 + 0	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50	800 + 50		
Range												
TOTAL Current	1.800	1.800	1.700	1.800	1.700	1.700	1.700	1.700	1.700	1.700		
Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		CAL 1 AMP		
Receive	4000-5000	→		→	5000-6000	→		→				
Current ~~Time~~	800 + 50	800 + 50	800 + 50	800 + 50								
Range												
TOTAL Current	1.700	1.700	1.700	1.700	→			→				

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Gunex - Florence Line: R1 NE 1/2 Int.Cal _____ Date: 6-27-66

Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
Rec.	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
Time	300	300	100	300	100	30	1000	300	100	30		
DC-1	199 199	127 126	35.2 39.0	226 225	38.0 38.6	19.1 18.7	295 295	95 90	24.6 28.0	16.5 15.3		
DC-2	199 199	126 127	35.2 38.8	226 225	38.0 38.0	18.4 17.6	282 275	94 92	26.6 27.4	15.9 16.3		
Σ												
DC-3	199 199	127 125	34.8 39.2	225 224	37.6 38.6	19.0 17.4	280 275	94 92	27.2 26.4	15.2 15.9		
Dc-4		127 125	34.6 39.4	225 224	38.0 38.4	19.0 18.4	280 276	96 90	28.6 26.2	14.8 16.2		
Σ						18.6 17.8						
DC-AV	398	252.6	73.97	450	76.29	36.79	555.0	185.9	54.17	31.36		
AC-1	190	119	35.2	212	36.2	17.4	230	88	25.9	14.9		
AC-2	191	120	35.4	212	36.2	17.4	23.2	88	25.9	15.0		
Σ	381	239.0	70.6	424	72.4	34.8	462	176	51.8	29.9		
S. P.	+3.3	-11.6	[illegible]	-21.5			+19.6					
AC-N	.2	.13	.15	.15		.22						
Pot. Res												

INDUCED POLARIZATION - RECEIVER NOTES PAGE _____

Project: Gunex-Florence Line: R1NE 1/2 Int.Cal _____ Date: 6-27-66

Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		coil		
Rec.	40-50	→	→	→	50-60	→	→	→		2-3		
Time	100	100	30	30	100	30	30	10		300		
DC-1	41.4 47.6	34.0 28.0	12.5 13.1	9.2 8.8	35.2 28.6	15.0 13.8	10.2 8.2	5.6 6.2		95.0 95.0		
DC-2	42.4 49.4	34.0 26.6	12.4 14.1	8.8 8.4	35.6 28.4	15.2 13.2	10.2 8.0	5.8 6.0		95.0 95.0		
Σ	42.8 47.6	33.0 28.2	12.0 12.8	9.1 8.6								
DC-3	41.8 47.8	33.6 26.6	12.8 13.6	8.8 10.0	36.0 28.2	15.4 12.8	10.6 8.0	5.6 6.4				
Dc-4	41.8 48.4	32.8 27.6	12.6 12.9	7.1 10.6	36.2 27.8	15.6 13.4	10.7 8.1	5.4 6.6				
Σ												
DC-AV	90.24	60.8	25.8	17.57	64.14	28.63	18.53	10.97		190.0		
AC-1	43.5	28.6	12.2	8.3	29.5	13.3	8.8	4.8		93.5		
AC-2	43.8	28.6	12.3	8.3	29.5	13.3	8.8	4.8		93.5		
Σ	87.3	57.2	24.5	16.6	59.0	26.6	17.6	9.6		187.0		
S. P.	-5.8				+6.2							
AC-N	.22				.16							
Pot. Res												

Line N60°E

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project GUNNEX -FLORENCE Line SP#1-SW Field date 6/25/66 Data page 1 Comp. date 6/26/66 Comp by JMC

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive	0-10	10-20	→	20-30	—	→	30-40	—	—	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1.8	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7		
(E) Vdc (avg)	132	197	34	138.5	53.8	16.0	205.3	59.3	33.3	11.49		
(F) DCcal	.970	—	—	—	—	—	—	—	—	→		
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	218	325	237	228	376	279	359	414	582	401		
(I) Vac Σ	125.5	193	33.45	136	51.7	15.4	196	55.8	31.4	10.8		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.021	—	—	—	—	—	—	—	—	→		
(M) ρ dc/ρac=ExL/K	1.074	1.042	1.038	1.040	1.063	1.061	1.070	1.085	1.083	1.086		
(N) PFE=(M-1)(10^2)	7.4	4.2	3.8	4.0	6.3	6.1	7.0	8.5	8.3	8.6		
(O) MCF=(M-1)(10^5)/H	34	13	16	18	17	22	19	21	14	21		
	-6	-14		+28			-6					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5			Cal	
(B) Receive	40-50	5	—	→	50-60	—	—	→				
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1.7	—	—	—	—	—	—	→				
(E) Vdc (avg)	44.1	20.6	15.0	6.34	18.9	10.43	7.93	3.34			97	
(F) DCcal	.970	—	—	—	—	—	—	→				
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10^3/D	308	360	524	388	330	364	485	327				
(I) Vac Σ	42.4	19.5	14.25	5.76	18.3	9.8	7.3	3.06			95	
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	1.021	—	—	—	—	—	—	→				
(M) ρdc/ρac =ExL/K	1.062	1.079	1.075	1.124	1.055	1.087	1.109	1.115				
(N) PFE=(M-1)(10^2)	6.2	7.9	7.5	12.4	5.5	8.7	10.9	11.5				
(O) MCF=(M-1)(10^5)/H	20	22	14	32	17	24	23	68				
	+13				-20							

Drilling checked

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

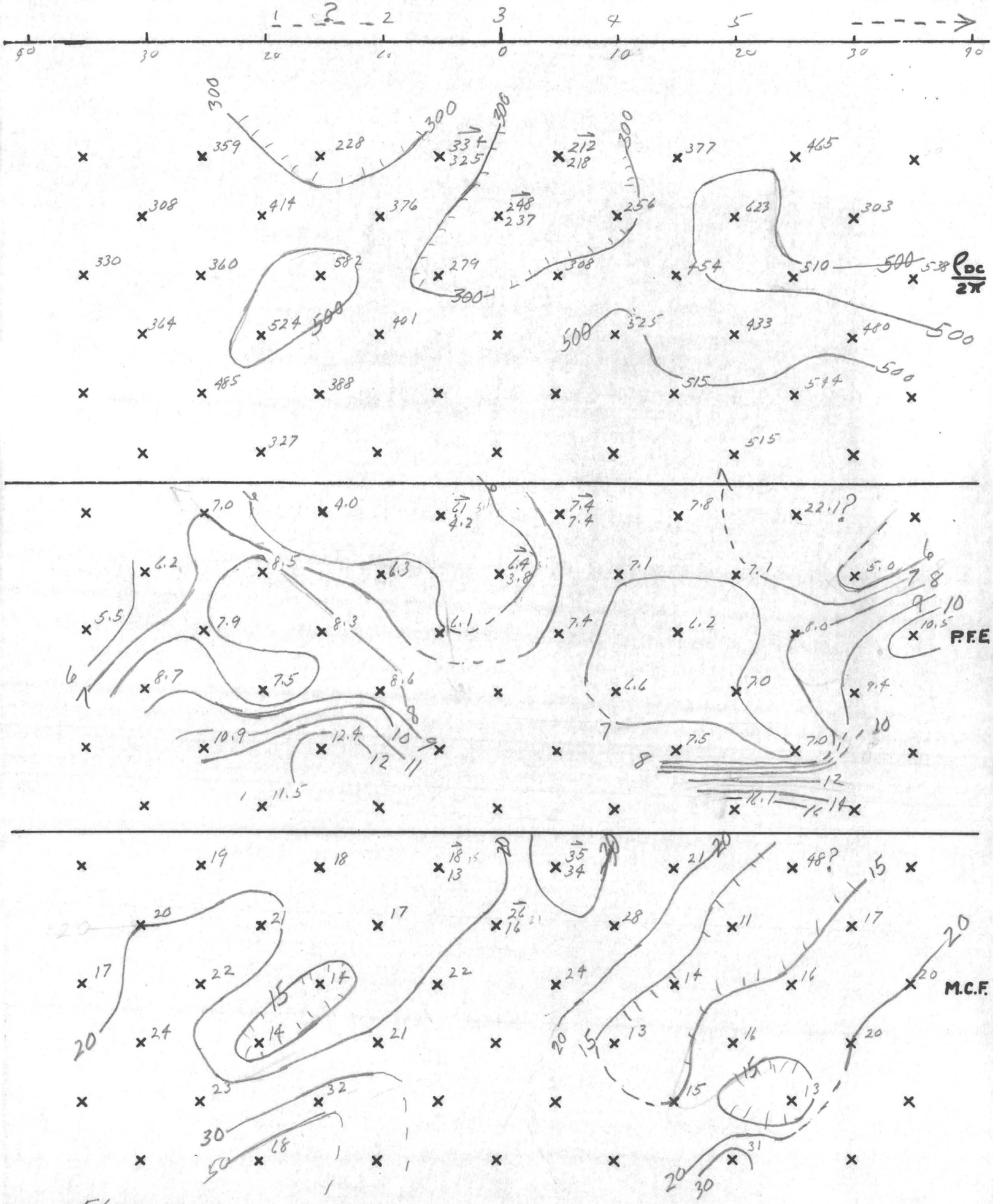
Project Florence Gunex Line R #1 NE Field date 6-27-66 Data page_____ Comp. date 6-28-66. Comp by R.P.

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	0-10	10-20	→	20-30	→	→	30-40	→	→	→		
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	1700	→	→	→	→	→	→	→	→	→		
(E) Vdc (avg)	398	252.6	73.97	450.0	76.29	36.79	555.0	185.9	54.17	31.36		
(F) DCcal	.475											
(G) Kn x 10^{-3}	3	3	12	3	12	30	3	12	30	60		
(H) ρ dc=ExFxGx10^3/D	334	212	248	377	256	308	465	623	454	525		
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac(corr) $=\sqrt{I^2 - J^2}$	381	239.0	70.6	424	72.4	34.8	462	176	51.8	29.9		
(L) AC-DC cal.	1.016											
(M) ρ dc/ρac=ExL/K	1.061	1.074	1.064	1.078	1.071	1.074	1.221	1.071	1.062	1.066		
(N) PFE=(M-1)(10^2)	6.1	7.4	6.4	7.8	7.1	7.4	22.1 ?	7.1	6.2	6.6		
(O) MCF=(M-1)(10^5)/H	18	35	26	21	28	24	48 ?	11	14	13		
	+3	-12		-22		-	+20					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal.		
(B) Receive	40-50	→	→	→	50-60	→	→	→		0-10		
(C) n separation	2	3	4	5	3	4	5	6				
(D) I	1700	→	→	→	→	→	→	→		1000		
(E) Vdc (avg)	90.24	60.8	25.8	17.57	64.14	28.63	18.53	10.97		1.90		
(F) DCcal												
(G) Kn x 10^{-3}	12	30	60	105	30	60	105	168				
(H) ρ dc=ExFxGx10^3/D	303	510	433	515	538	480	544	515				
(I) Vac Σ												
(J) AC noise x 2												
(K) Vac (corr) $=\sqrt{I^2 - J^2}$	87.3	57.2	24.5	16.6	59.0	26.6	17.6	9.6		187		
(L) AC-DC cal.	1.016											
(M) ρdc/ρac =ExL/K	1.050	1.080	1.070	1.075	1.105	1.094	1.070	1.161				
(N) PFE=(M-1)(10^2)	5.0	8.0	7.0	7.5	10.5	9.4	7.0	16.1				
(O) MCF=(M-1)(10^5)/H	17	16	16	15	20	20	13	31				
	-6				+6							

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING NW



AREA Florence Gunnex LINE R #1 a = 1000' SCALE: 1" = 1000' DATE: 6/25/11