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INDUCED POLARIZATION SURVEY

TWIN PEAKS AREA

PIMA COUNTY, ARIZONA

For

Arizona Portland Cement Company

July - August, 1967

By

Heinrichs Geoexploration Company
P. O. Box 5671 Tucson, Arizona 85703
Phone: 623-0578 Area Code: 602

TABLE OF CONTENTS

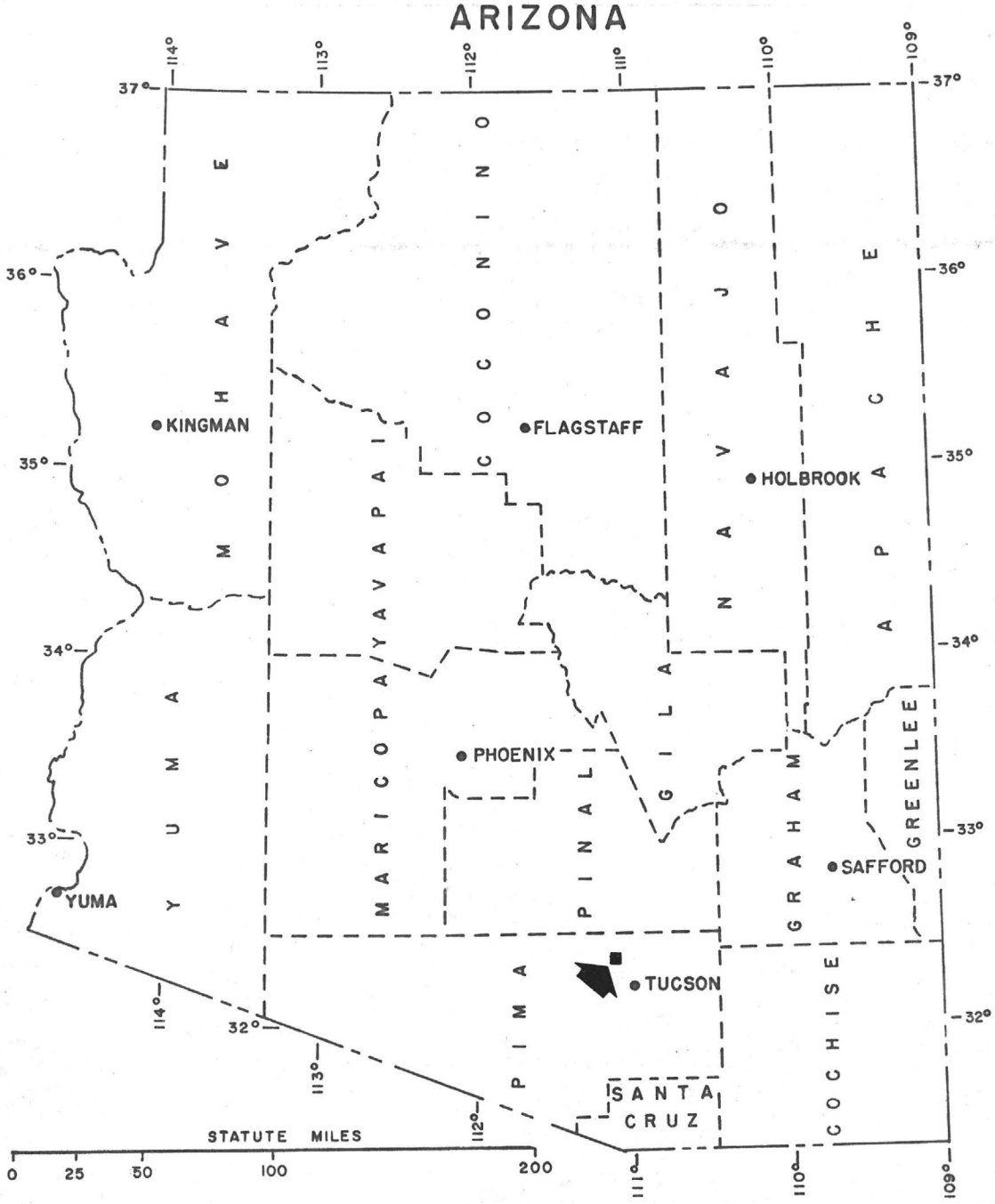
	PAGE
GENERAL LOCATION	
INTRODUCTION	1
CONCLUSIONS AND RECOMMENDATIONS	2
INTERPRETATION	4
BASIS OF THE INDUCED POLARIZATION METHOD	1A

IN MAP POCKET: (Total 9 pieces)

Induced Polarization Location and Interpretation Plan
Sectional Data Sheets:
- Line 1 (1,500'=a)
- Line 2 1,500'=a
- Line 3 1,500'=a
- Line 4 500'=a
- Line 5 1,500'=a
- Line 5A 500'=a

West Expander
East Expander

GENERAL LOCATION OF
TWIN PEAKS AREA (RILLITO QUARRY)
FOR
ARIZONA PORTLAND CEMENT COMPANY
ARIZONA



INTRODUCTION

At the request of Mr. R. G. Patterson of the California Portland Cement Company, Heinrichs Geoexploration Company conducted and completed an induced polarization survey over parts of the Twin Peaks Area (Rillito Quarry), Pima County, Arizona for the Arizona Portland Cement Company. This work was done during the interim July 19 to August 16, 1967.

A total of six lines were run plus two expanders. The lines give a total surface coverage of 95,000 feet of which 61,500 feet are "subsurface" plotted data. Each of the two expanders extended out to 12,000 feet end to end.

Lines 1, 2, 3, and 5 are all run on a 1,500 foot dipole spacing, whereas Lines 4, and 5A are on a 500 foot spacing. The expanders ranged from a spacing of 125 feet to 3,000 feet and centered over a fixed point on an "n"=2 separation.

Lines 1, 2, and 3 were oriented N80°E-S80°W and Lines 4, 5 and 5A, N10°W-S10°E except that the north spread on 5A bends somewhat to the northeast along the west flank of the east hill. See the plan for a more detailed location of these lines and expanders.

The dual frequency induced polarization system was employed with sending frequencies of 0.05 and 1.0 hertz (cps). A standard collinear dipole-dipole electrode configuration was utilized on both the lines and expanders.

The purpose of this survey was to attempt to locate any sulfide mineralization of possible economic interest in the area below and surrounding the quarry. The 1,500 foot dipole lines which typically give resolvable penetration down to 1,800 or 2,000 feet below surface were used to locate any deep extensively mineralized zones in the vicinity of the lines. The 500 foot dipole lines were utilized to prospect for shallow replacement sulfide zones down to 600 or 700 feet below surface. The expanders were run to gain additional and deeper information on two questionable anomalous zones seen on Line 2.

Heinrichs personnel involved in the field work were H. K. Henson, geophysical crew chief, S. Cruze, A. Frost, F. Heinrichs, and G. Leavitt, technical assistants. The office work and report were under the supervision of Chris S. Ludwig, Senior Geophysicist. The assistance of Mr. D. Chiaro and Mr. R. Burton of the Arizona Portland Cement Company was most gratefully appreciated.

CONCLUSIONS AND RECOMMENDATIONS

Except for one very deep possibility, the induced polarization survey shows no evidence of sulfide mineralization in the vicinity of the lines down to the depths probed and within the resolution limits of the dipole spacings used.

The 1,500 foot dipole lines typically give resolvable penetration within the range from 450 feet to at least 1,800 feet and often to 2,000 feet below surface. Lateral penetration is somewhat more than half the depth penetration. Therefore, in the vicinity of the Twin Peaks Area, any existing large disseminated (porphyry-type) sulfide zone should have been detected if suboutcropping within 2,000 feet of the surface.

The 500 foot dipole lines were run to test for possible shallow sulfide zones as for example, replacement lodes in the limestones. The resolvable penetration limits for the 500 foot lines would be one-third that of the 1,500 foot lines.

No anomalous response was seen on the 500 foot lines. The entire area was not surveyed with these detailed lines so it could be possible for a replacement sulfide body to go undetected; however, we feel this to be unlikely in that not even any slight "fringe" effects were noted.

On Line 2, two very weak and deep zones of possible sulfide anomalism were noted, one from about 37.5W to 67.5W and the other from about 37.5E to 60E. Expanding arrays centered on these two zones showed the eastern anomaly to be just an area of higher background response, whereas the western zone was found to be

somewhat stronger than typical background and could represent a sulfide zone at a depth of 1,500 feet or deeper.

This possible sulfide anomaly is quite weak and considering its depth of burial, is not recommended as a drill target. Also, there is a definite possibility of a non-sulfide cause for this anomaly because of its proximity to the NE-SW interface (probable fault) just west of the anomaly. The expander was surveyed parallel to this interface to reduce its effect on the data but the interference cannot be eliminated entirely and corrections are difficult to make.

In any case, if the anomalous data is considered as being entirely due to sulfides, only about 0.5% to 1.5% total sulfide by volume is indicated. However, if the sulfides are in a narrow zone relative to the 1,500 foot dipole spacing, a higher concentration would be possible although making it a more difficult drill target.

The resistivity data shows the Twin Peaks to be bounded by a NE-SW electrical interface on the NW and by a NNW-SSE interface on the east. These interfaces are likely steeply dipping bedrock, alluvium contacts, possibly block faults. The alluvium to the NW is much more conductive than to the east, perhaps explaining why polarization effects were seen associated only with the NE-SW contact.

The expected granite-sediment contact south of the Twin Peaks was seen in the vicinity of station 27.5N, Line 5.

No evidence of the Twin Peaks having a shallow "root" was seen. Electrically, the Twin Peaks formation appears to extend to the limits of penetration. However, geologically there could be a formational bottom near surface with no electrical contrast with the lower material and therefore, not being detectable geophysically.

Self potentials show only random background variations suggesting a lack of sizeable quantities of oxidizing sulfides within several hundred feet of the surface.

In summary, except for one remote possibility, the Twin Peaks Area has been found to be devoid of sulfide mineralization responsive to the I.P. techniques used. We feel that the Twin Peaks Area has been adequately prospected geophysically and no further electrical work is recommended. The one possible sulfide anomaly found is not recommended for drilling because of its great depth and lack of strength.

INTERPRETATION

Line 1

This line was one spread long and centered on the crest of the eastern Twin Peak with 1,500 foot dipoles. The induced polarization response is somewhat anomalous but points directly to grounded metallic pipes near station 12E. Neglecting these artificial effects, the data show only the normal non-sulfide increase with depth (inductive coupling interference).

The resistivity shows the two bounding electrical interfaces of the peaks, one near 37.5W and the other near 15E. Self potential is normal background variation.

Line 2

Line 2 is parallel to Line 1 and runs just south of the Twin Peaks, again with 1,500 foot dipoles. The line consists of three spreads because of extending east and west to obtain additional coverage over anomalism seen on the ends of Spread 1.

Very weak anomalism was seen from station 37.5W to 67.5W and 37.5E to 60E, noticed as increased PFE values below these zones. Both zones indicate a source in excess of 1,500 feet below surface (at the limit of detectibility) and therefore, expanders were centered over these zones to probe deeper.

Most of the increased PFE with depth can be accounted for by inductive coupling effects except in the two anomalous zones where minor, possibly interesting PFE values remain after corrections have been made.

Resistivity shows the bounding interfaces near 67.5W and 15E showing what is probably deep alluvium west and east of these points respectively. Self potentials again are background.

Line 3

This line was surveyed just north of the Peaks and parallel to Line 1 and 2 on a 1,500 foot dipole spacing. The PFE shows the normal inductive coupling increase with depth. No effects related to sulfide were seen.

The symmetric pattern in resistivity comes as a result of the Twin Peak block being narrow enough to be geometrically similar to a steeply dipping tabular, relatively non-conductive, dike-like body. These boundaries are near stations 15W and 15E. The self potentials are background except for a one station low at 30E, probably caused by the receiver being too near an artificial metallic object like a pipe or the aluminum foil electrodes.

Line 4

Line 4 is a 500 foot dipole line run N10W-S10E along the east flank of the west peak to prospect for shallow replacement bodies of sulfides in the sediments. No anomalous polarization effects were seen.

The resisitivity shows an interface near 10N, north of which for about 1,500 feet there is a probable alluvial basin. Self potentials are background.

Lines 5 and 5A

To prospect the area south of the Twin Peaks to the Busterville Mine, Line 5 was surveyed. A dipole spacing of 1,500 feet was used. An extremely weak anomaly giving a pattern which could be due to a narrow near surface sulfide zone was located between 0 N-S, and 15 N. Line 5A (Spread 1) was run to obtain more detailed information on this possible feature. No anomalism was seen with the detailed information and therefore, we believe the slightly anomalous response seen on Line 5 was due to the conductive alluvium in that area near an interface.

Line 5 shows a probable alluvial basin between about 22.5N and 37.5S, north and south of which the alluvium is likely less than 500 feet thick.

Line 5A (Spread 2) bends northeast to run along the west flank of the east peak shows no anomalous response in the sediments. At station 27.5N there is a sharp electrical interface probably representing the granite-sediment contact. The granite, however, is buried under several hundred feet of alluvium. No self potential anomalism was seen.

East Expander

This expander was centered at 45E, Line 2 and oriented N10W-S10E to test the very weak anomaly seen in this area on Line 2. The PFE values after the inductive coupling corrections have been made only go slightly above 3%; in other words, somewhat higher than typical background, but not high enough to be of sulfide interest.

The resistivity increases slightly with depth suggesting a less conductive material at a depth of around 2,000 feet. This could be the bedrock-alluvium interface or a more conductive-less conductive bedrock interface.

West Expander

The west expander was centered at 52.5W on Line 2 to test at depth a very weak anomaly. The expander was oriented approximately N44E-S44W to parallel the sharp electrical interface just northwest. The PFE values go to 6.2% after correction and are therefore of some interest. The indicated depth is in excess of 1,500 feet to the source although these high effects may result from the conductive alluvium just laterally to the northwest, causing an unknown, non-correctable amount of inductive coupling interference. The metallic conduction factors associated with this anomaly don't quite reach 100 and therefore, empirically, the sulfide content would be near 1% by volume if entirely caused by sulfide.

The resistivity suggests an approximate alluvial depth of 200 feet complicated by strong lateral variations in electrical properties in this vicinity.

Respectively submitted,

HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

APPROVED: _____

E. Grover Heinrichs
Vice President

September 8, 1967
Tucson, Arizona

a (IN FEET)

125 250 500 750 1000 1500 2000 2500 3000

$\rho_{dc}/2\pi$ ——— (IN OHM FEET)

MCF

PFE (COUPLING CORRECTED)

1000 900 800 700 600 500 400 300 200 100 90 80 70 60 50 40 30 20 10

10 9 8 7 6 5 4 3 2 1 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1

TO 7

EAST EXPANDER

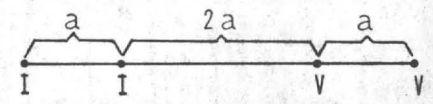
TWIN PEAKS AREA

PIMA COUNTY, ARIZONA

FOR

ARIZONA PORTLAND CEMENT COMPANY

GEOMETRY



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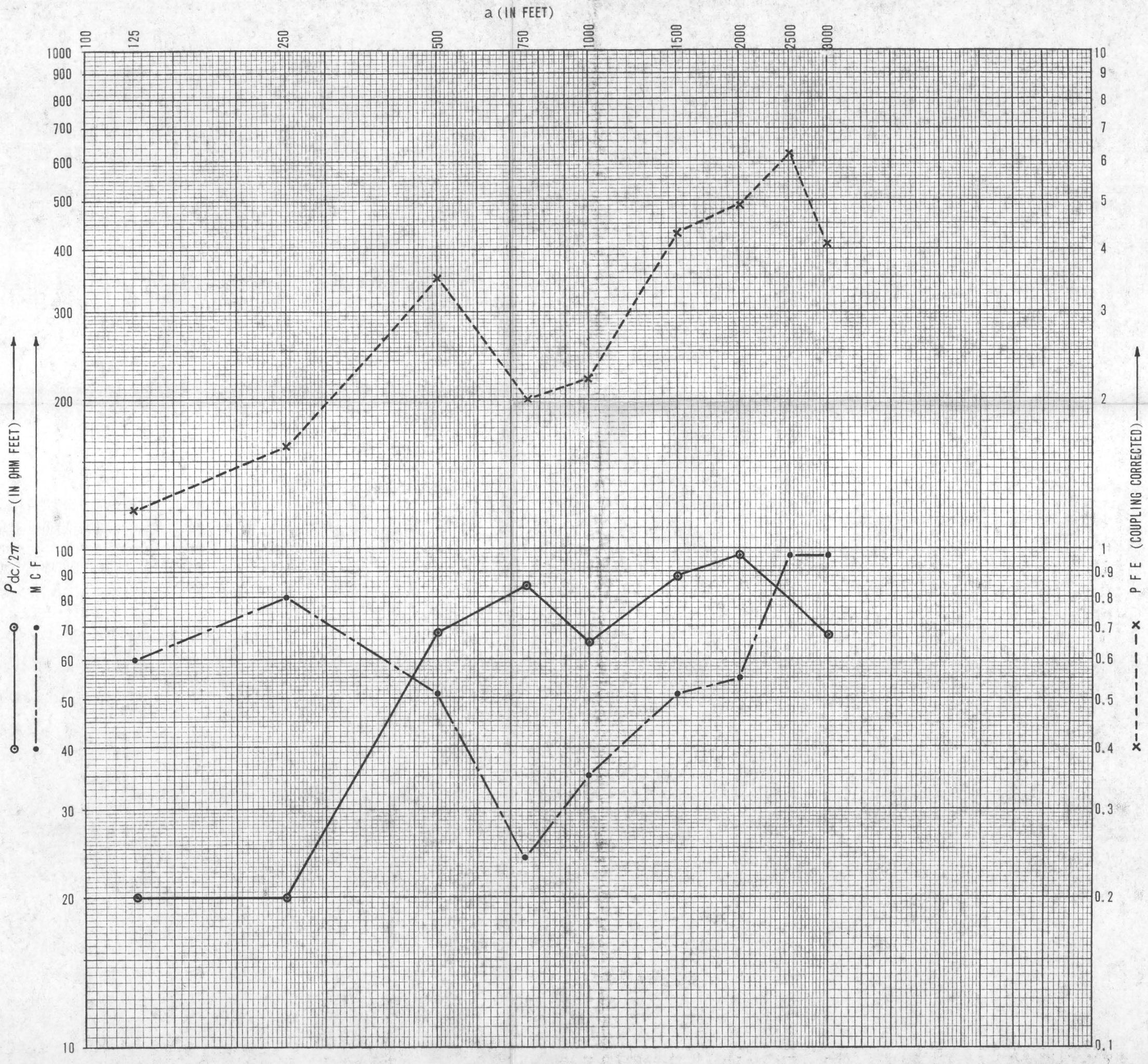
AUGUST 1967



WEST EXPANDER

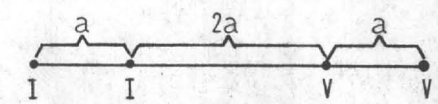
TWIN PEAKS AREA

PIMA COUNTY, ARIZONA

FOR

ARIZONA PORTLAND CEMENT COMPANY

GEOMETRY



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AUGUST 1967

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

CORTARO QUADRANGLE
ARIZONA—PIMA CO.
15 MINUTE SERIES (TOPOGRAPHIC)

(RED ROCK) (TWINKLEMAN) 1:250,000

111°15' 477000m E R.11E. 10' R.12E. 5' 780 000 FEET 111°00'
32°30' 32°30'
3995000m N

TORTOLITA MOUNTAINS

Marana
High School
Cortaro Farms
Santa Cruz River
Rillito
Tortolita Canyon
Wild Burro Canyon
T Ranch-Bar Ranch
Solomonville Ranch
Shields Ranch
El Rancho Rojo
Canada del Oro
Palo Ferro Rancho
Oasis Ranch
Jurko Ranch
Bonnie Brae Ranch
Estrella Ranch
Rattlesnake Pass
M-Z Bar Ranch
Clarey Ranch
Saffold Peak
Sahuaro Ranch
Iron Bell Ranch
Cortaro
Wild Horse Ranch
Contzen Ranch
Kino
Sunset Dairy
Jaynes
Laguna School
Shamrock Dairy
Homer Davis School
Stockham
Sweetwater Ranch
Little Horse Ranch
Wasson Peak
Arnole Pk
Signal Hill Picnic Area
Valley View Picnic Area
Apache Pk
Ez-Kid-In-Zak Recreational Area
Sun Picnic Area
Cam Bob Picnic Area
Nam-A-Cha Picnic Area
Homestead School
Rancho de Esperanza
Twin Peaks
Red Hills
Sewage Disposal
Water Tank
Radio Towers KTKT

STATE GAME REFUGE

TUCSON MOUNTAIN PARK

TUCSON MOUNTAINS

AVRA VALLEY

Map Data

T.11S. T.12S. T.13S.

540 000 FEET
3200
3300
3400
460 000 FEET

25' 20'

111°15' 710 000 FEET R.11E. (SAN XAVIER MISSION) R.12E. 5' 499000m E 111°00'
32°15' 32°15'

(COCORAQUE BUTTE) (TUCSON)

Mapped, edited, and published by the Geological Survey

Control by USGS, and USC&GS

Topography by planetable surveys 1946
Culture revised from aerial photographs taken 1954
Field check 1957

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

SCALE 1:62500

4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1957
TRUE NORTH
MAGNETIC NORTH

ROAD CLASSIFICATION
Heavy-duty
Medium-duty
Light-duty
Unimproved dirt
State Route

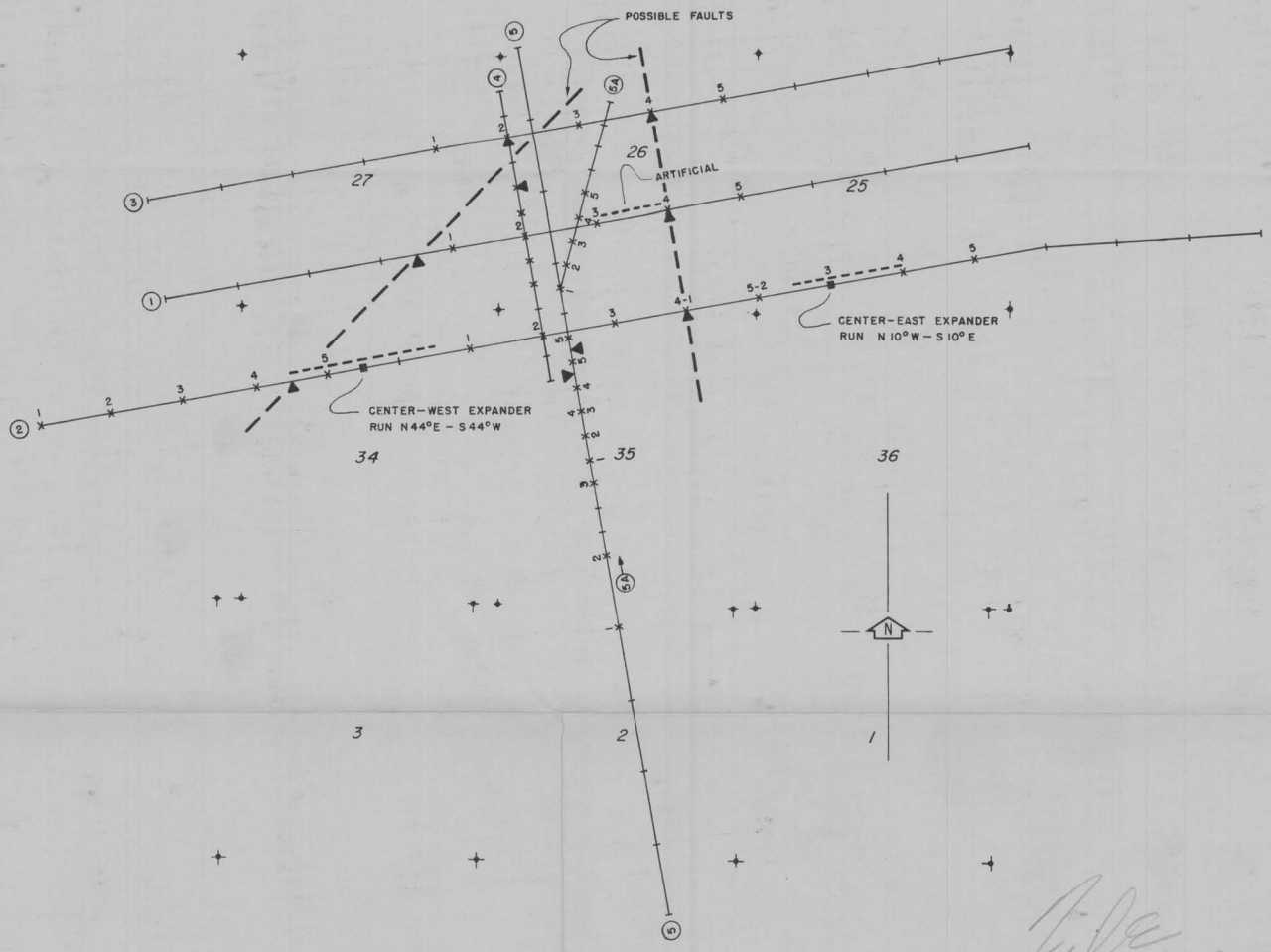
ARIZONA
QUADRANGLE LOCATION

CORTARO, ARIZ.
N3215—W11100/15

1957

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 2, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

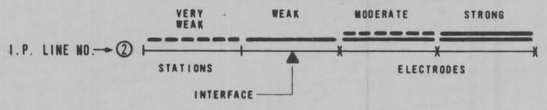
R 11 E



T 12 S

T 13 S

RELATIVE ANOMALY STRENGTH



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geophysical engineers
vancouver
sydney

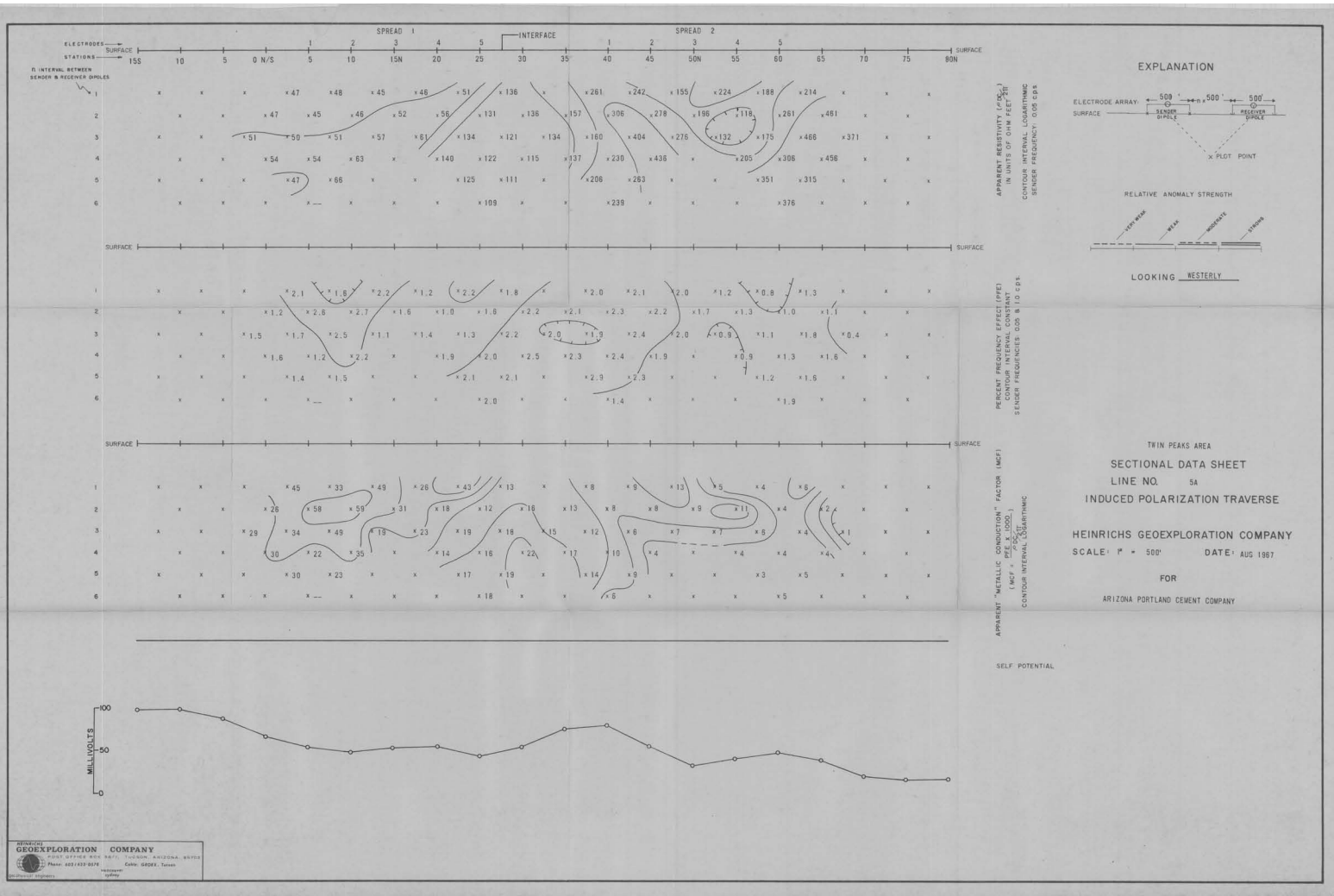
INDUCED POLARIZATION LOCATION AND INTERPRETATION PLAN

TWIN PEAKS AREA
PIMA COUNTY, ARIZONA

FOR

ARIZONA PORTLAND CEMENT CO.

SCALE: 1" = 2000' | DRAWN BY: J. DOWNS | DATE: AUG. 1967



EXPLANATION

RELATIVE ANOMALY STRENGTH

LOOKING WESTERLY

TWIN PEAKS AREA

SECTIONAL DATA SHEET

LINE NO. 5A

INDUCED POLARIZATION TRAVERSE

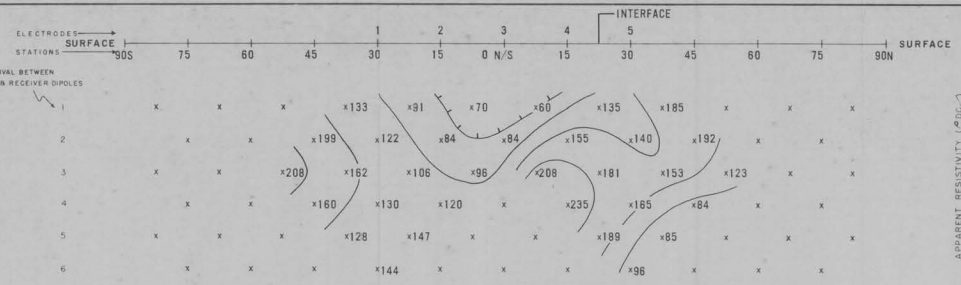
HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 500' DATE: AUG 1967

FOR

ARIZONA PORTLAND CEMENT COMPANY

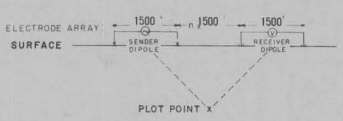
GEOEXPLORATION COMPANY
POST OFFICE BOX 867, TUCSON, ARIZONA, 85705
Phone: 602/622-0479 Cable: GEOEX, Tucson
Vancouver sydney
Geophysical Engineers



APPARENT RESISTIVITY ($\rho_{a_{2n}}$) IN UNITS OF OHM FEET

CONTOUR INTERVAL LOGARITHMIC
SENDER FREQUENCY .005 CPS

EXPLANATION



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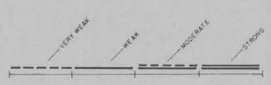
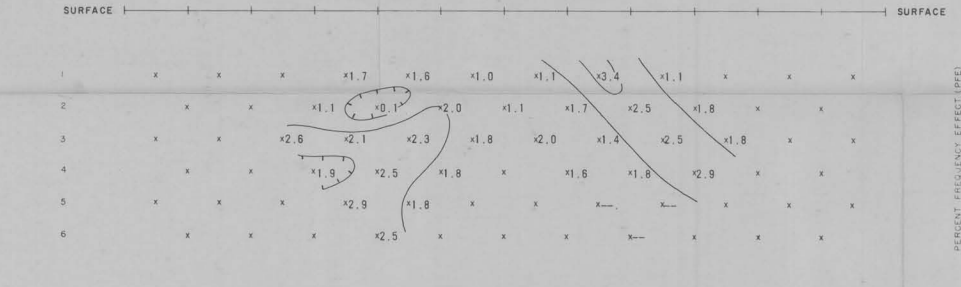
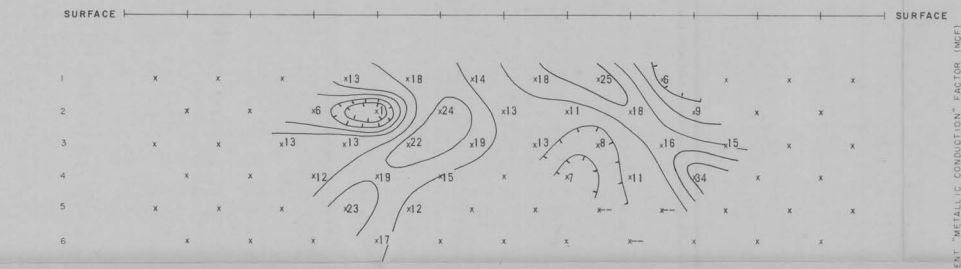


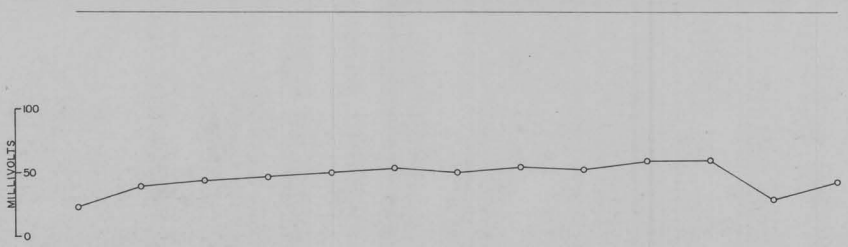
LOOKING S 80° W



PERCENT FREQUENCY EFFECT (PFE)
CONTOUR INTERVAL CONSTANT
SENDER FREQUENCIES: 005 & 1.0 CPS



APPARENT "METALLIC CONDUCTION" FACTOR (MCF)
$(MCF = \frac{PFE \times 1000}{\rho_{a_{2n}}})$
CONTOUR INTERVAL LOGARITHMIC



TWIN PEAKS AREA

SECTIONAL DATA SHEET
LINE NO. 5
INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY
SCALE: 1" = 1500' DATE: AUG 1967

FOR

ARIZONA PORTLAND CEMENT COMPANY

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GEOEXPLORATION COMPANY
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Phone: 602/623-0578 Cable: GEOEX, Tucson
vancouver sydney
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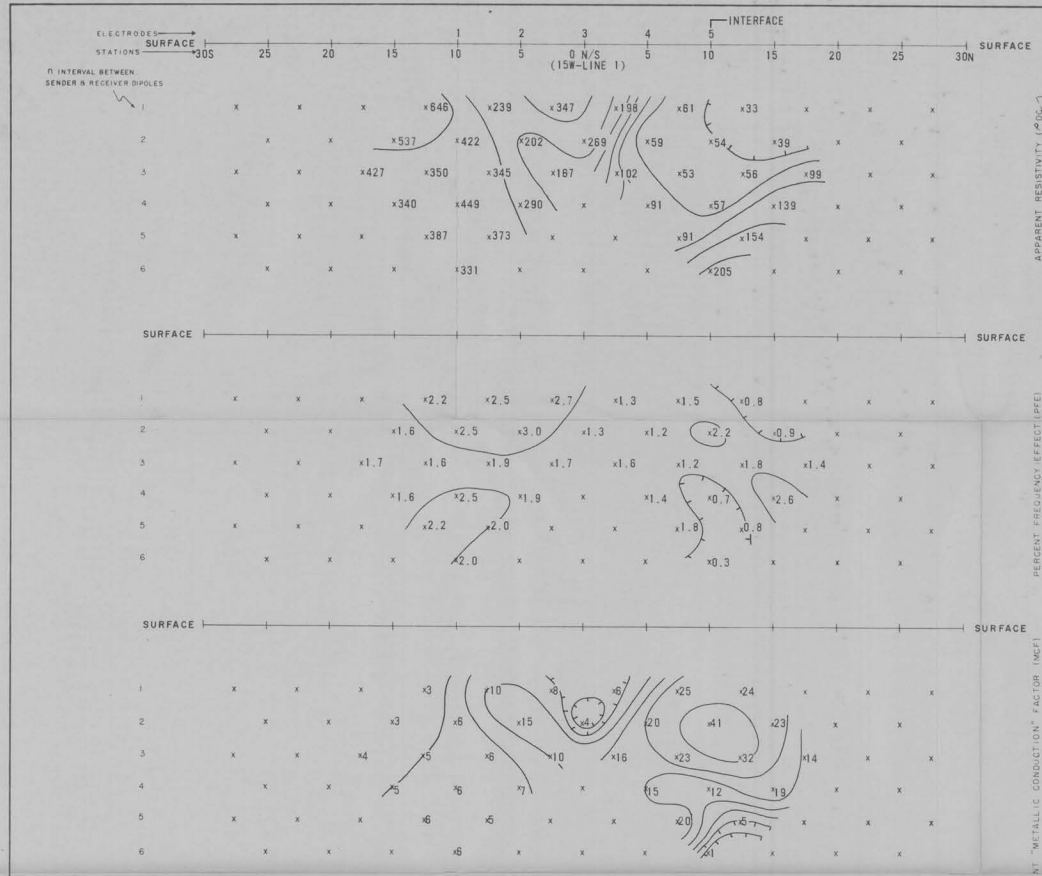
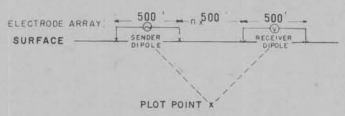
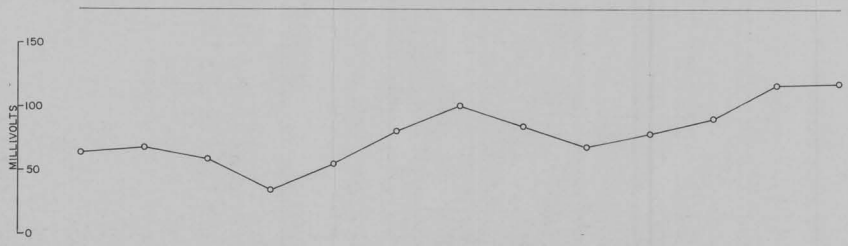


EXPLANATION



RELATIVE ANOMALY STRENGTH

LOOKING S 80° W



TWIN PEAKS AREA

SECTIONAL DATA SHEET

LINE NO. 4

INDUCED POLARIZATION TRAVERSE

HEINRIGHS GEOEXPLORATION COMPANY

SCALE: 1" = 500' DATE: AUG 1967

FOR

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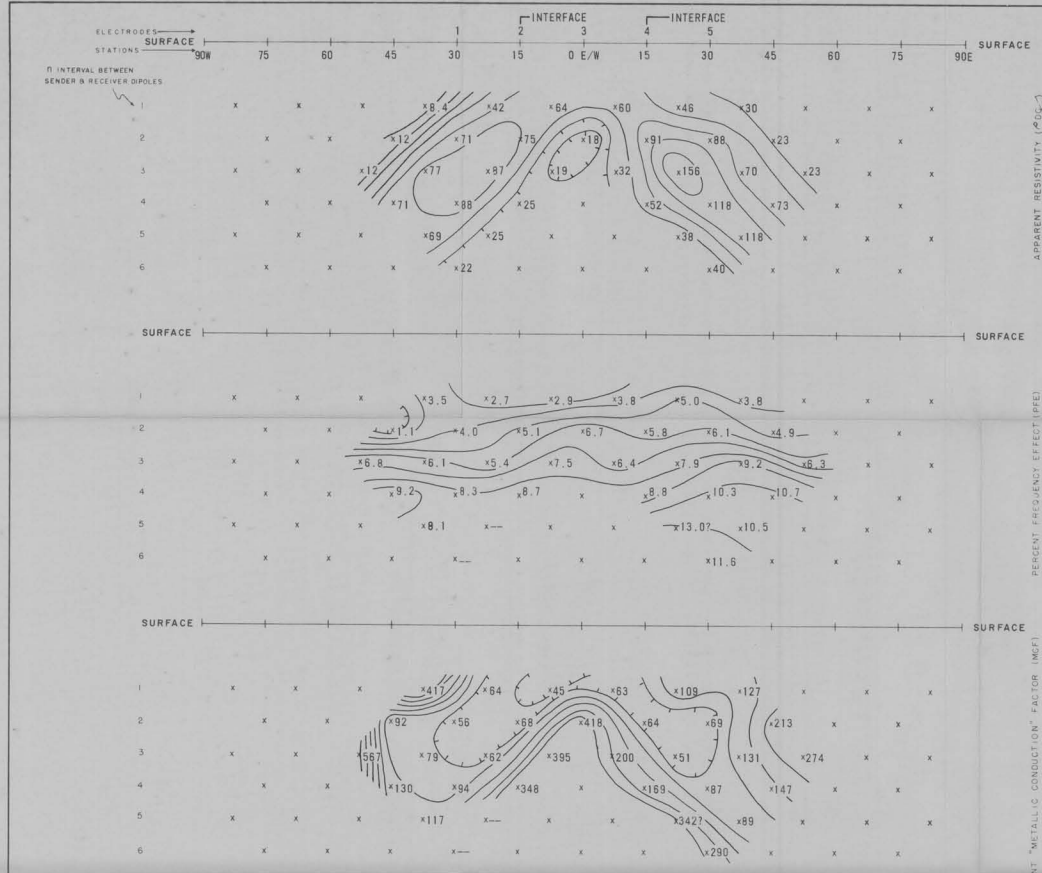
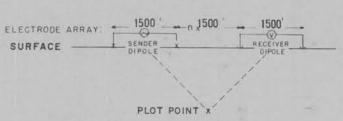
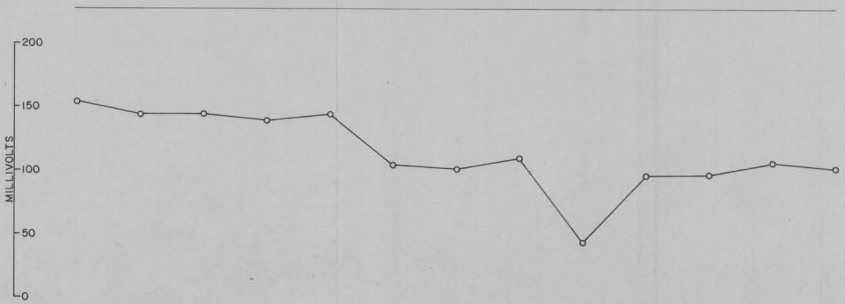


EXPLANATION



RELATIVE ANOMALY STRENGTH

LOOKING N 10° W



TWIN PEAKS AREA

SECTIONAL DATA SHEET

LINE NO. 3

INDUCED POLARIZATION TRAVERSE

HEINRICHS GEOEXPLORATION COMPANY

SCALE: 1" = 1500' DATE: JULY 1967

FOR

ARIZONA PORTLAND CEMENT COMPANY

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GEOEXPLORATION COMPANY
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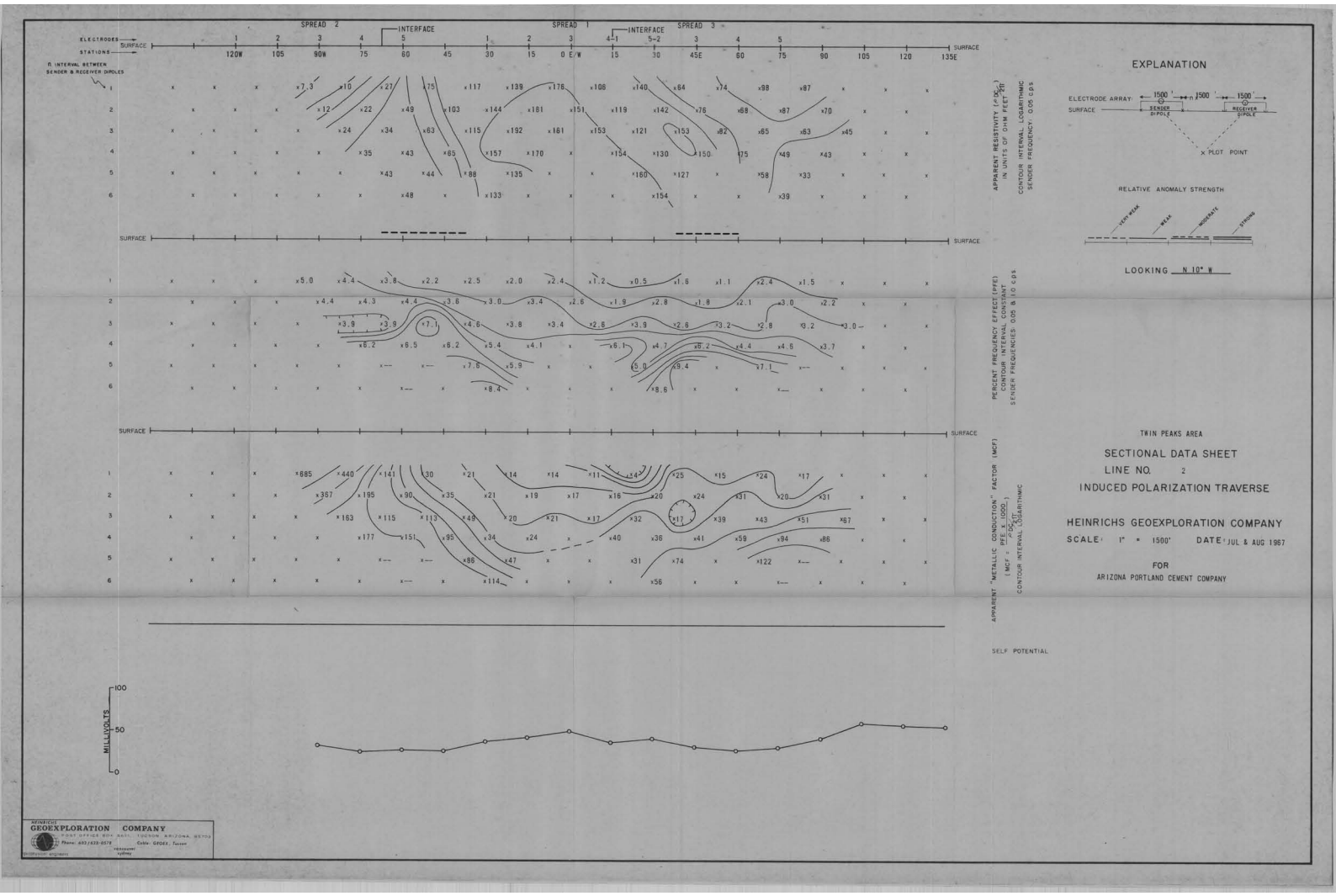
geophysical engineers



EXPLANATION

RELATIVE ANOMALY STRENGTH

LOOKING N 10° W

TWIN PEAKS AREA

SECTIONAL DATA SHEET

LINE NO. 2

INDUCED POLARIZATION TRAVERSE

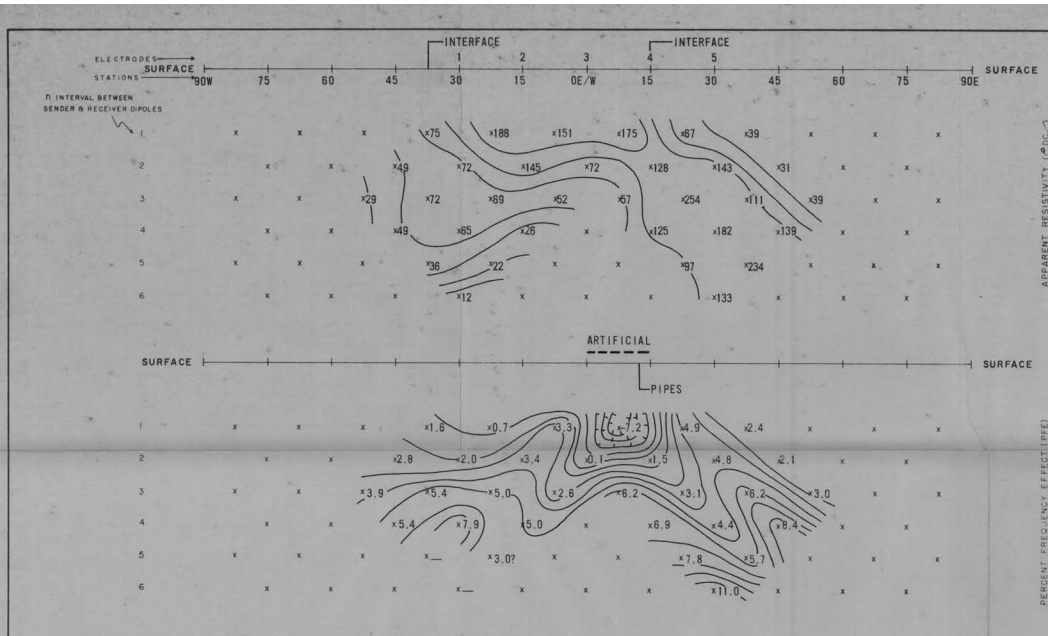
HEINRICHS GEOEXPLORATION COMPANY

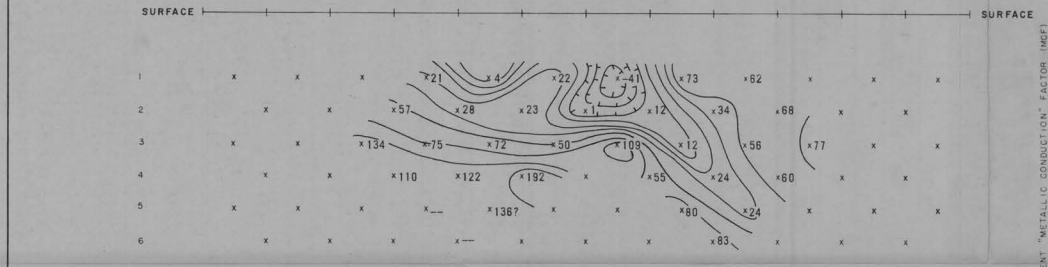
SCALE: 1" = 1500' DATE: JUL & AUG 1967

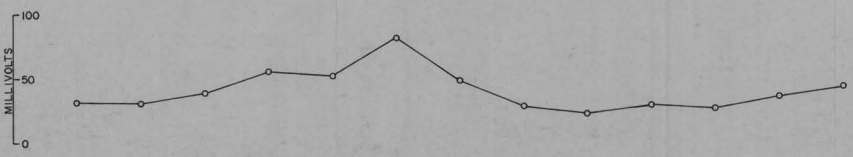
FOR

ARIZONA PORTLAND CEMENT COMPANY

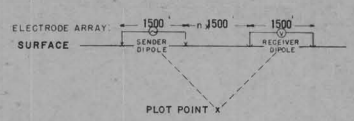
HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5011, TUCSON, ARIZONA, 85703
Phone: 602/623-5578 Cable: GEOEX, Tucson



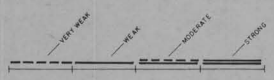




EXPLANATION



RELATIVE ANOMALY STRENGTH



LOOKING N 10° W

TWIN PEAKS AREA

SECTIONAL DATA SHEET

LINE NO. 1

INDUCED POLARIZATION TRAVERSE

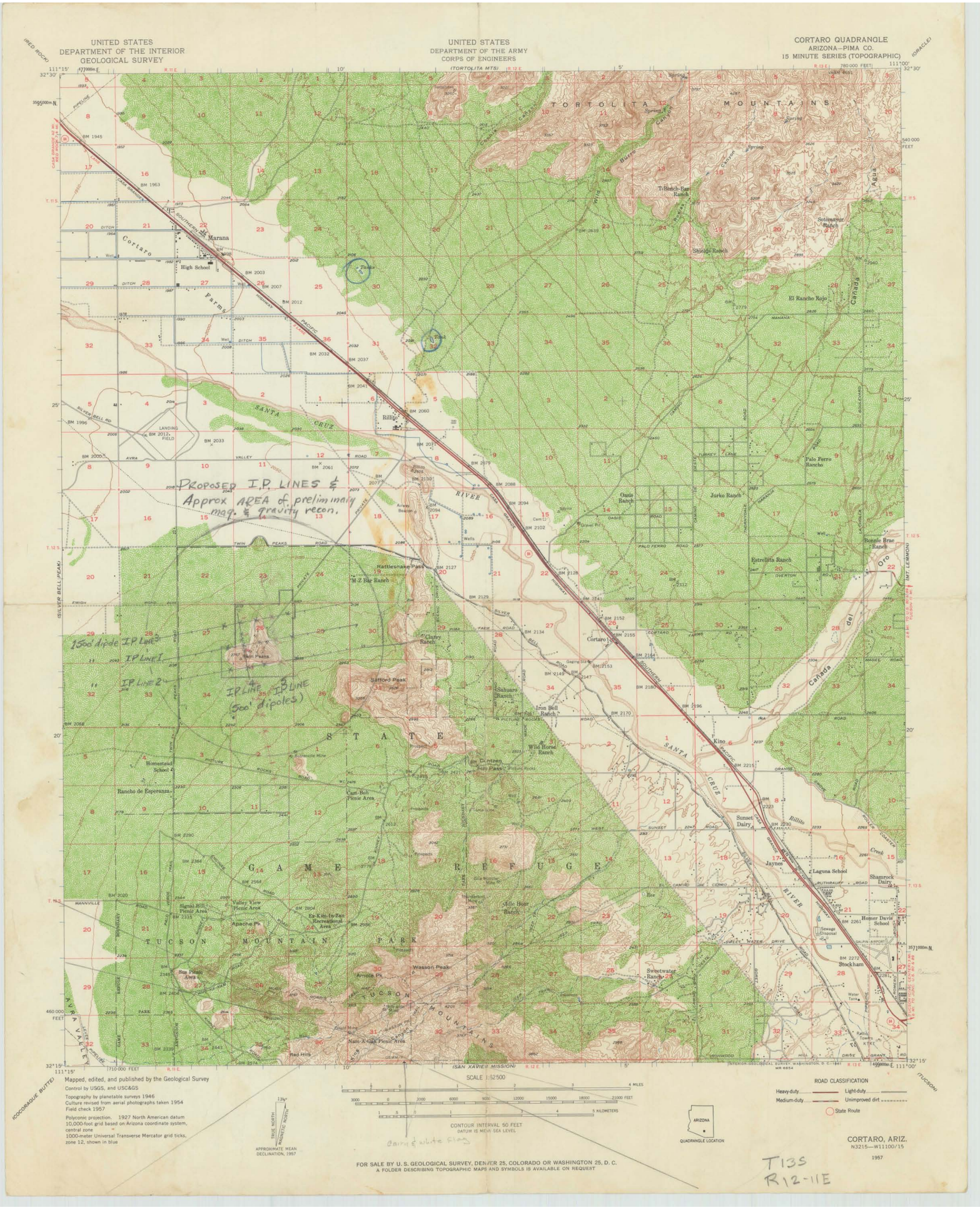
HEINRICHS GEOEXPLORATION COMPANY

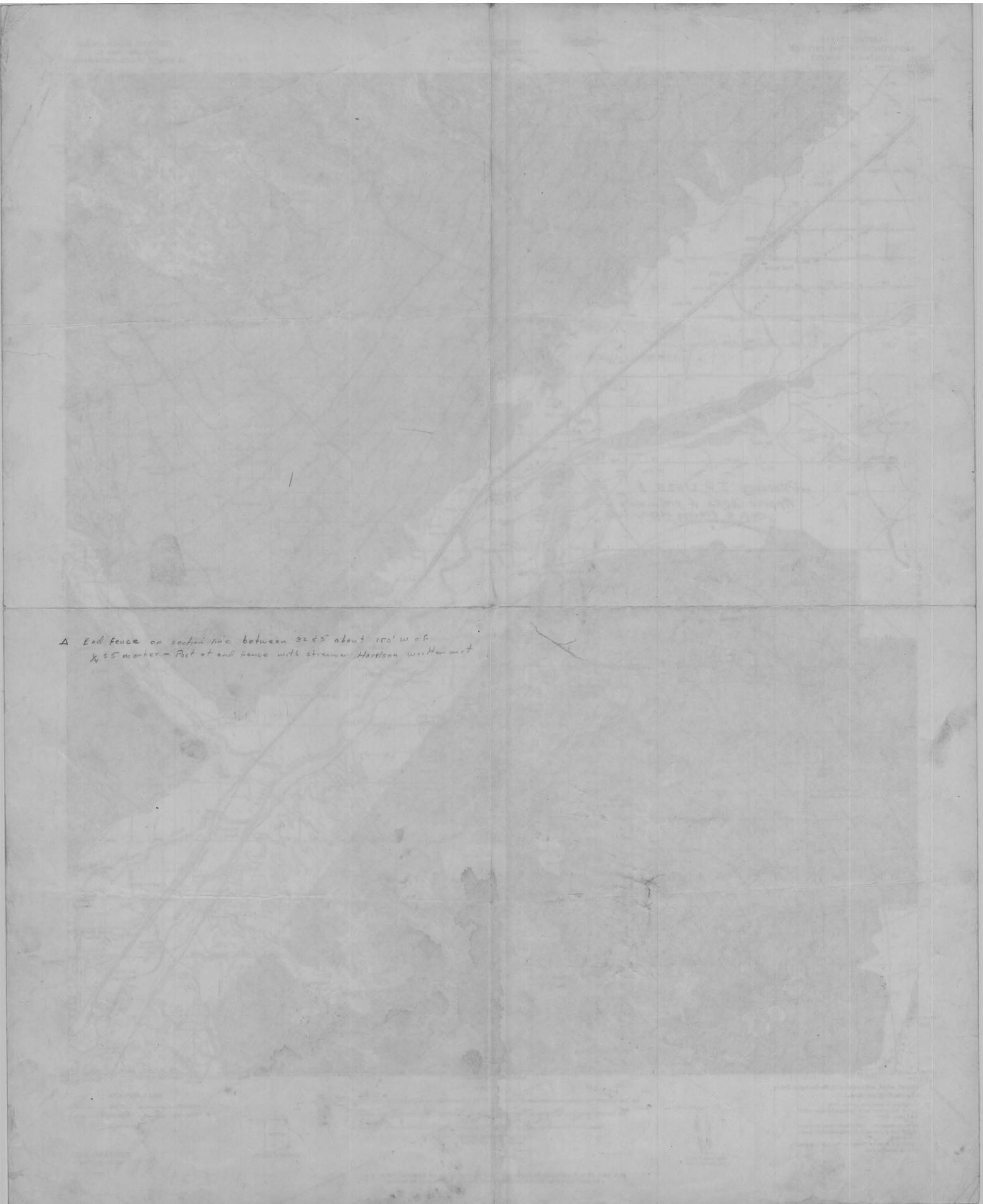
SCALE: 1" = 1500' DATE: JULY 1967

FOR

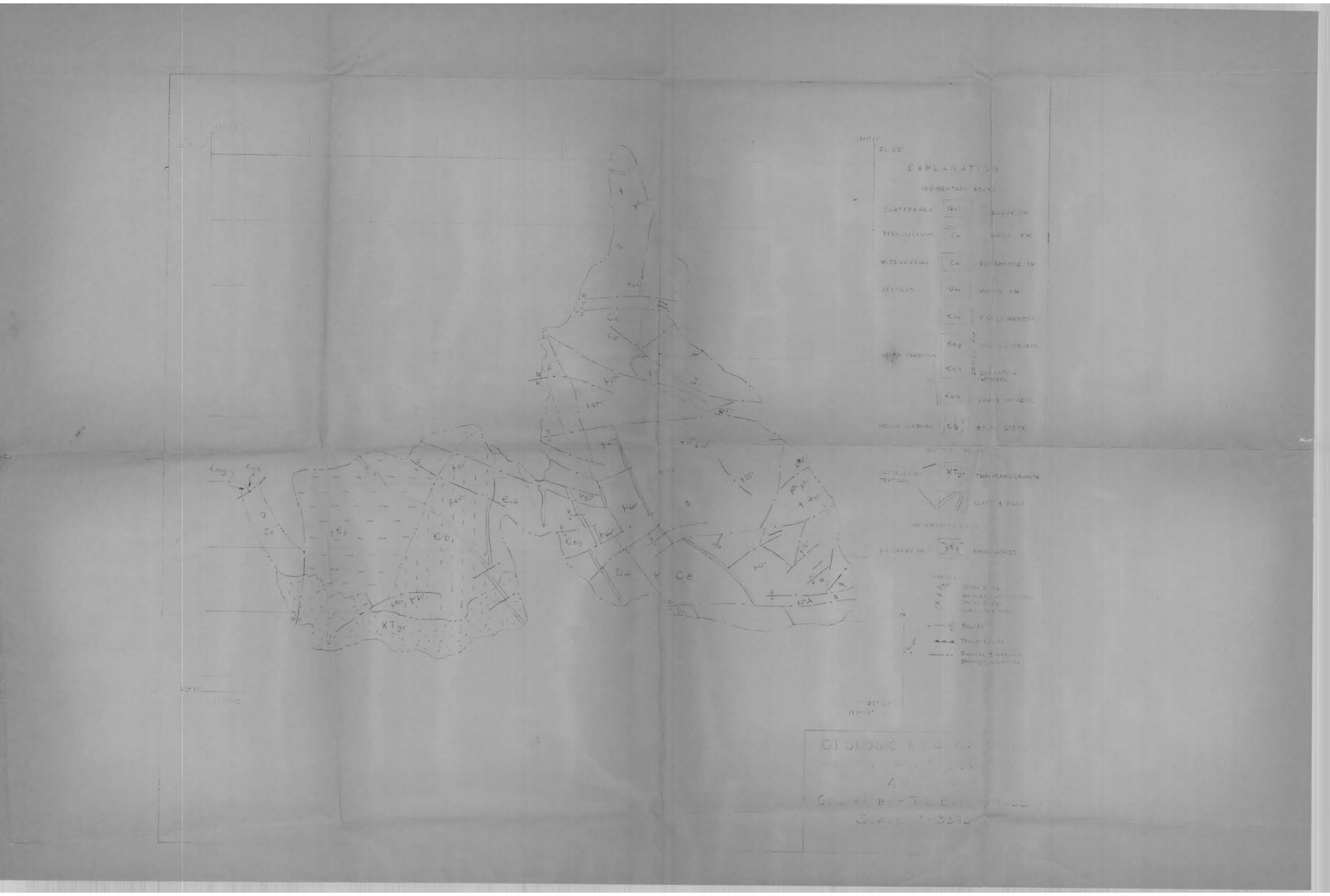
ARIZONA PORTLAND CEMENT COMPANY

HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578 Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
CORTARO QUADRANGLE
ARIZONA—PIMA CO.
15 MINUTE SERIES (TOPOGRAPHIC)
TORTOLITA MOUNTAINS
Marana
High School
Cortaro
Farms
Rillito
SANTA CRUZ RIVER
Oasis Ranch
Jurko Ranch
Palo Ferro Rancho
Bonnie Brae Ranch
Estrellita Ranch
Rattlesnake Pass
M-Z Bar Ranch
Clarey Ranch
Safford Peak
Sahuaro Ranch
Iron Bell Ranch
Wild Horse Ranch
Kino
Sunset Dairy
Jaynes
Laguna School
Shamrock Dairy
Homer Davis School
Stockham
Sweetwater Ranch
Mile Hour Ranch
Wasson Peak
Armory Pk.
Nam-A-Gah Picnic Area
Red Hills
Homestead School
Rancho de Esperanza
Can-Bob Picnic Area
Signal Hill Picnic Area
Valley View Picnic Area
Apache Pk.
Ee-Em-Ity-Zam Recreational Area
Sun Pitaya Area
Clintzen Pass
Picture Rocks
Rillito Creek
Canada del Oro
Tortolita Mts.
T-Bench-Bar Ranch
Sotomayor Ranch
Shields Ranch
El Rancho Rojo
Twin Peaks
Silver Bell Peak
Ina Peak
Tucson
San Xavier Mission
Cocoraque Butte
Ironwood
Gravel Pit
Wells
Tanks
Cemetery
Airway Beacon
Landing Field
Sewage Disposal
Water Tanks
KTKT
Gaining & sinking flow
PROPOSED I.P. LINES &
Approx AREA of preliminary
mag. & gravity recon.
150' dipole I.P. LINE 3
I.P. LINE 1
I.P. LINE 2
I.P. LINE 4
I.P. LINE 5
(500' dipoles)
T 13 S
R 12-11 E
SCALE 1:62500
CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL
ROAD CLASSIFICATION
Heavy-duty
Medium-duty
Light-duty
Unimproved dirt
State Route
ARIZONA
QUADRANGLE LOCATION
APPROXIMATE MEAN DECLINATION, 1957
TRUE NORTH
MAGNETIC NORTH
Mapped, edited, and published by the Geological Survey
Control by USGS, and USC&GS
Topography by planetable surveys 1946
Culture revised from aerial photographs taken 1954
Field check 1957
Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
CORTARO, ARIZ.
N3215—W11100/15
1957



Δ End fence on section line between 32 & 5 about 150' W of
1/4 S5 marker – Post at end fence with streamer Harelson written on it


EXPLANATION
SEDIMENTARY ROCKS
QUATERNARY
ALLUVIUM
PENNSYLVANIAN
MISSISSIPPIAN
DEVONIAN
MARTIN FM
PINTO MEMBER
SHALE MEMBER
EAST STATE
THIN PEAKS GRANITE
PINAL SCHIST
Fluvial
Thrust
GEOLOGIC MAP OF
SCALE 1:3375

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING Westerly

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING Westerly

AREA APC Twin Peaks LINE 5A a = 500 ' SCALE: 1"=500' DATE:

LINE a = ' SCALE: DATE:

K+E LOGARITHMIC 359-110L
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 2 CYCLES

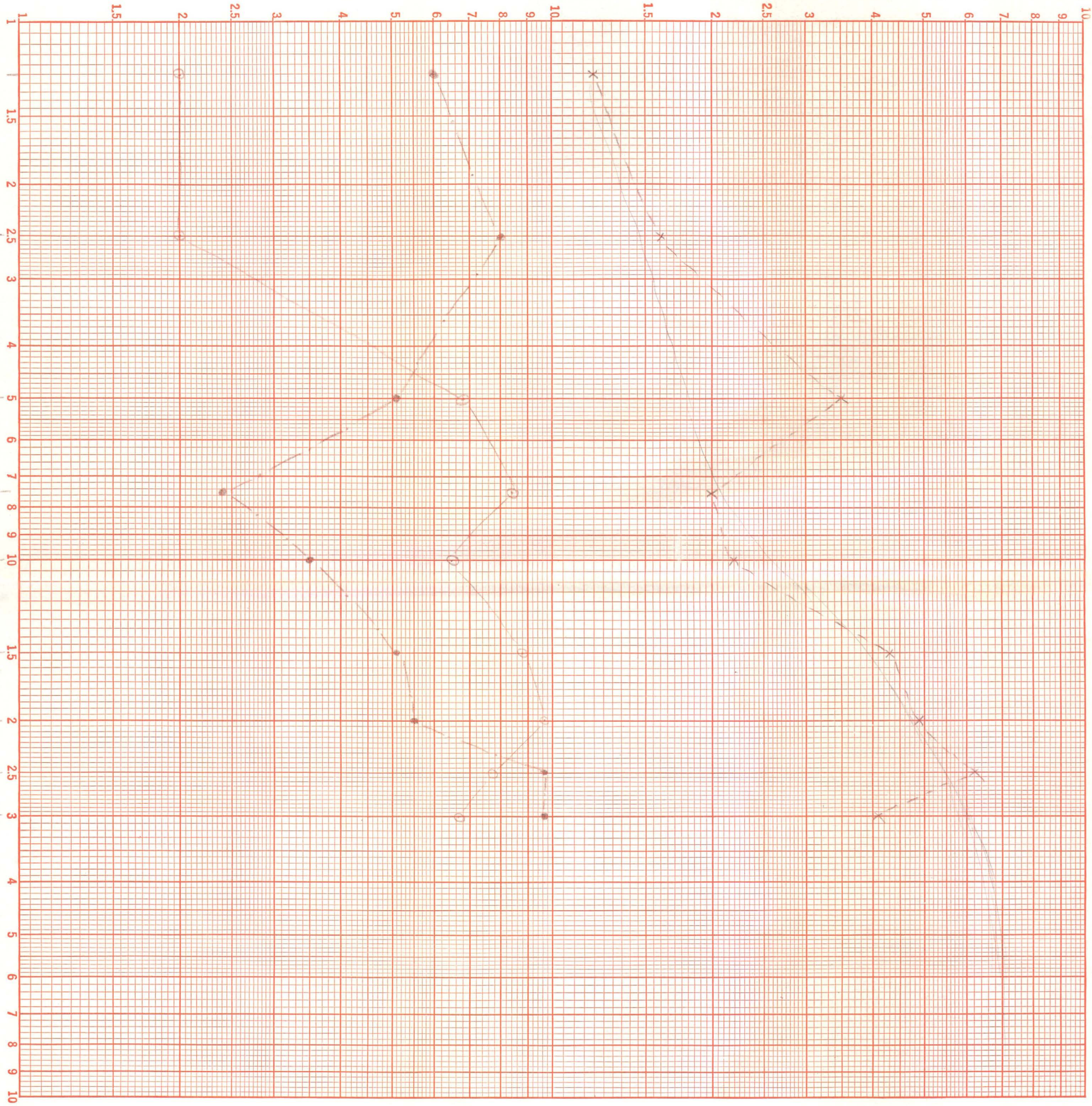
⊙——⊙ Qc/27 ⟶ in ohm feet
•—·—• MCF ⟶

x- - - - -x PFE (coupling corrected)

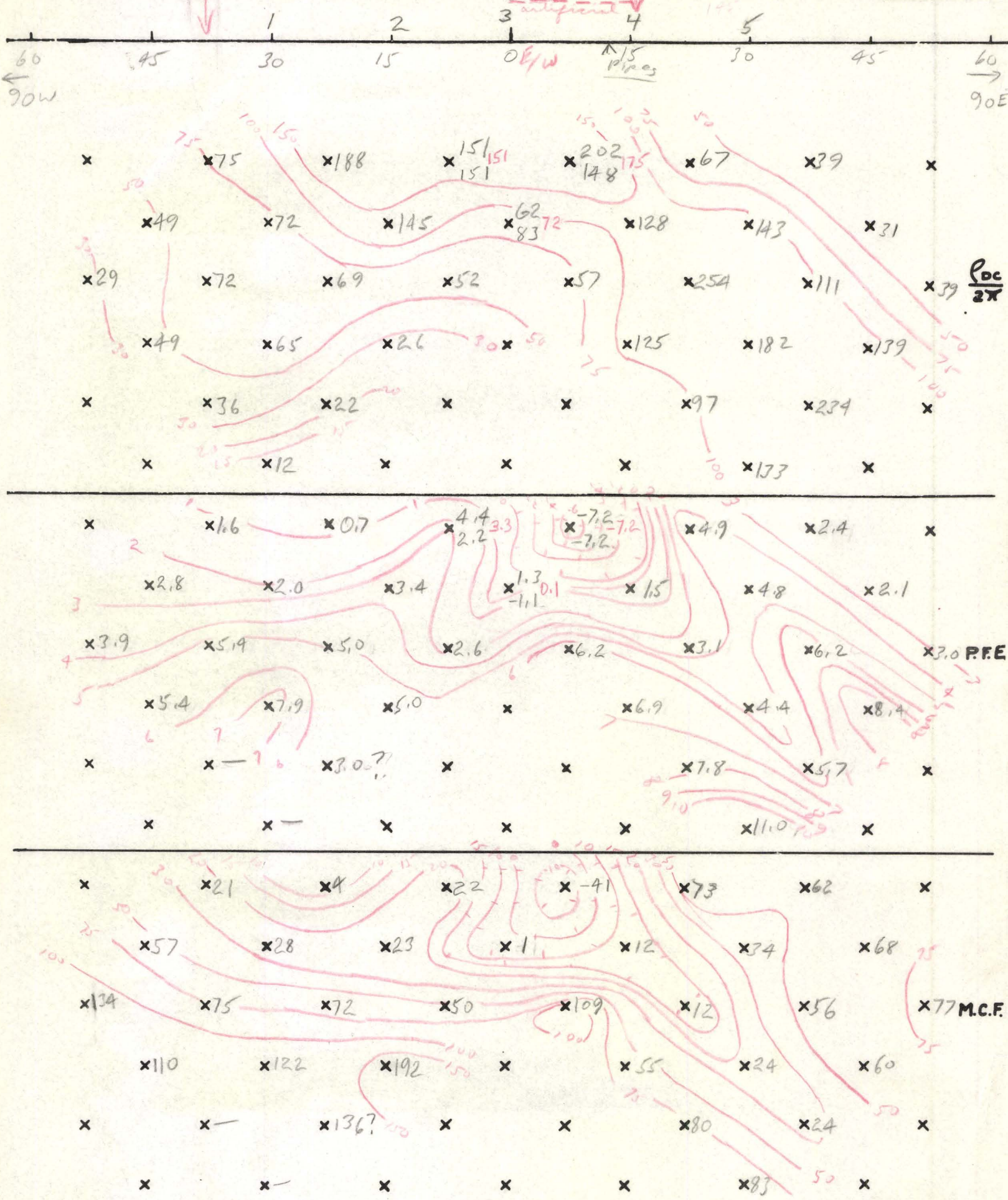
Exit Expander
Tube Test Area

Scanner:

K+E LOGARITHMIC 359-110L
KEUFFEL & ESSER CO. MADE IN U. S. A.
2 X 2 CYCLES



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

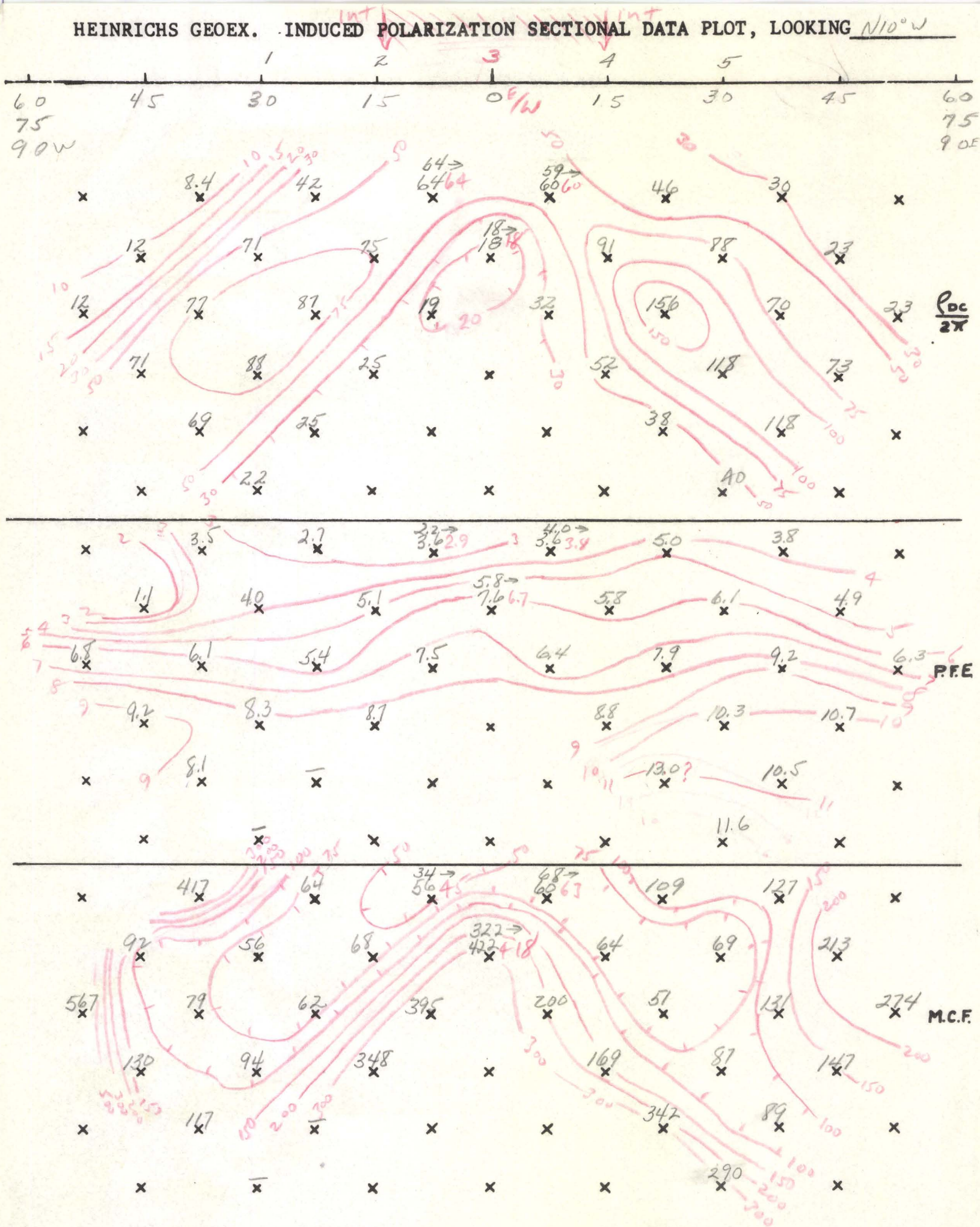


P.F.E

M.C.F.

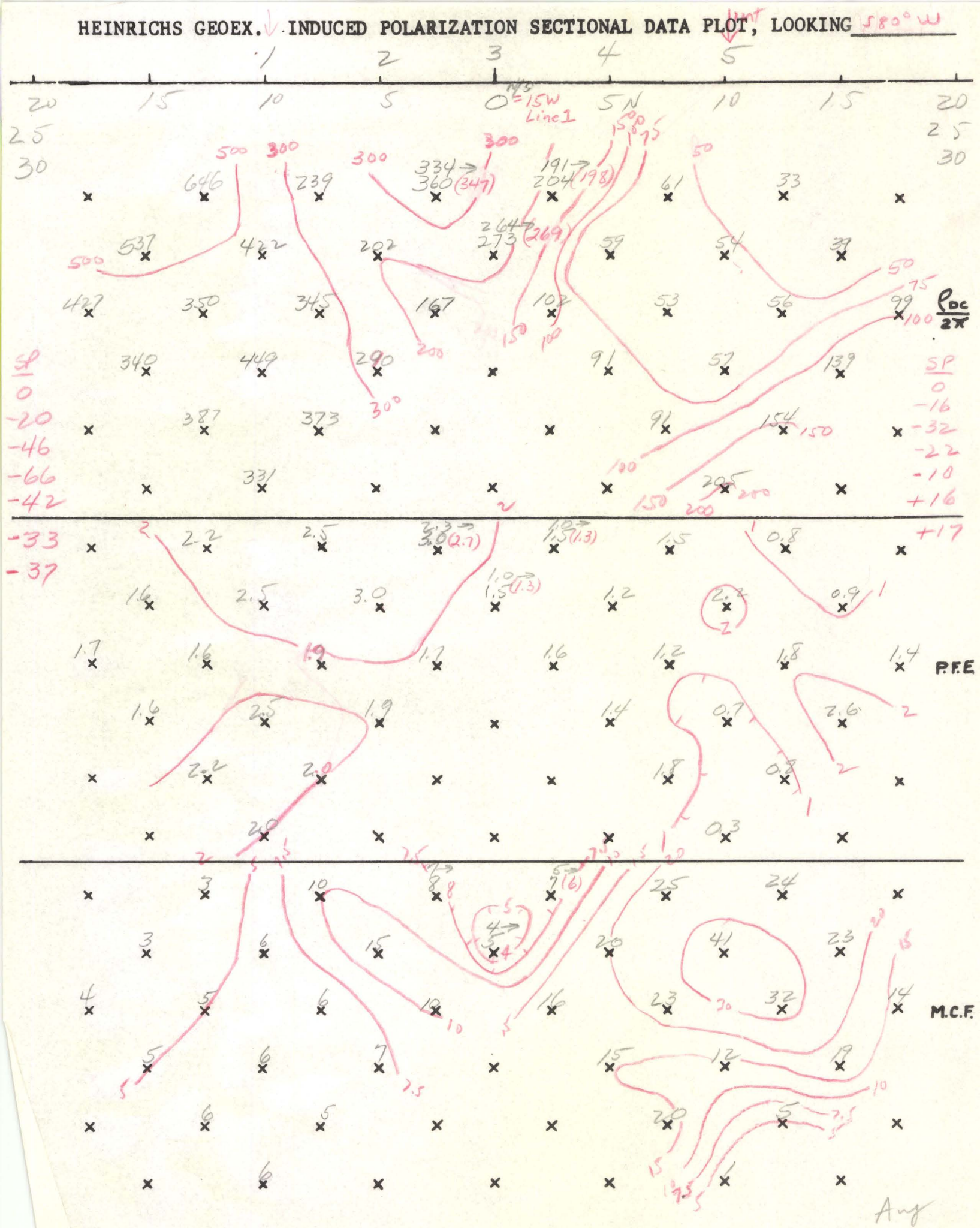
AREA APC LINE 1 a = 1500' SCALE: DATE:

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

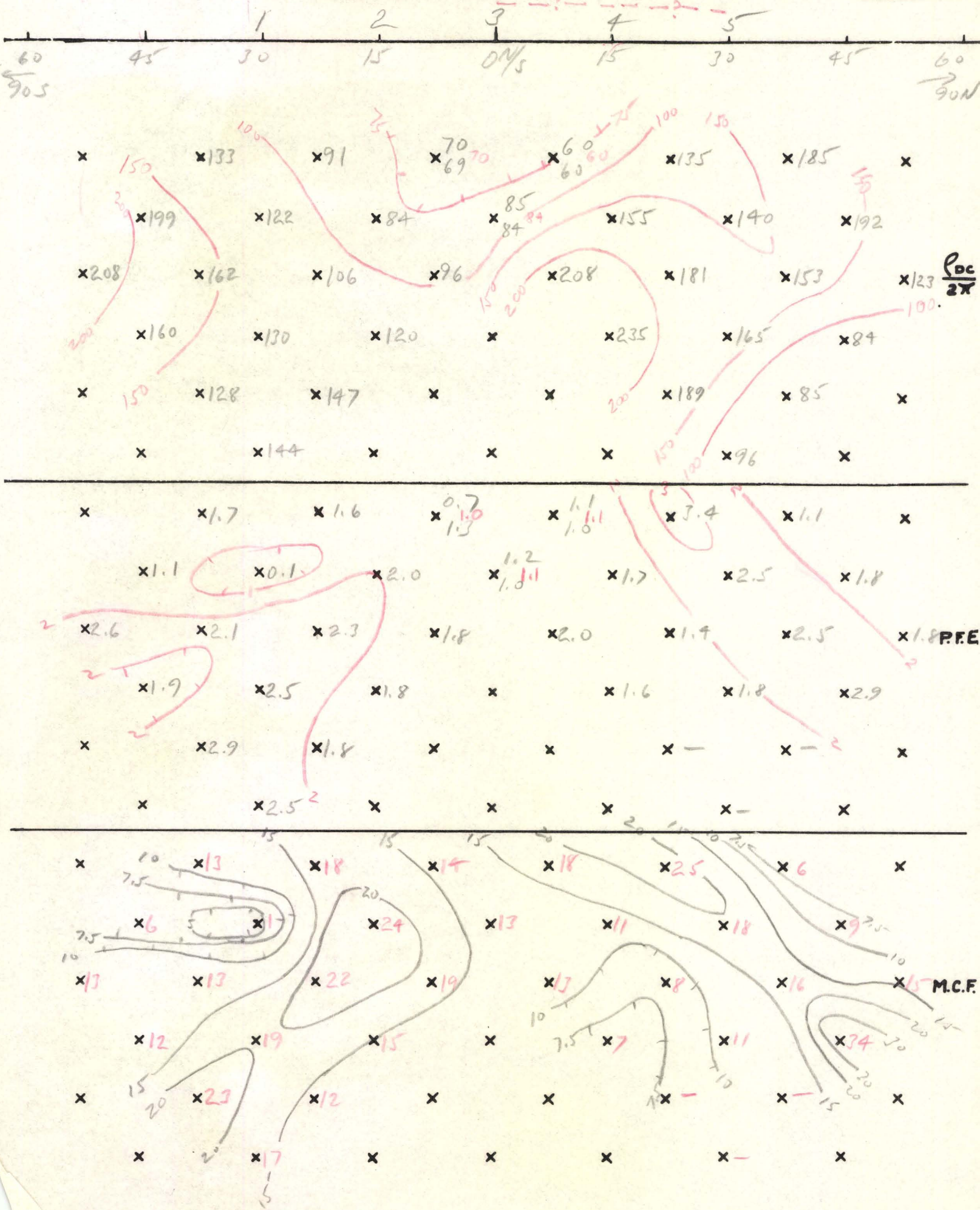


AREA APC LINE 3 a = 1500' SCALE: 1" = 1500' DATE: 7-29-67

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING S80° W



HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING S 80° W



LINE 5 a = 1500' SCALE: 1" = 1500' DATE: Aug 1967

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 1 HALF WEST SP. 1 DATE 7/30/69

PAGE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	800	800	800	800	800	800	800	800	800	800
VOLTAGE	516	584	532	600+	588	572	588	600+	584	572
CURRENT	9A	7A	9A	6A	7A	10.4*	7A	6A	7A	10.4*
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	CAL	3-4
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→	(2-3)?	
RANGE	800	800	800	800	800	800	800	800	200	200
VOLTAGE	548	600	580	572	532	576			172	
CURRENT	7A	6A	7A	10.5A*	7A	6A	7A	10.6	1A	1A

FREQUENCIES 1.0 .05

SENDER NO. MK 3

OPERATOR HEINRICHS

RECEIVER NO. BURR-BROWN

OPERATOR K. HENSON

COMMENTS:

1-2 - 7

2-3 6

3-4 - 7

4-5 - 9+

* TAKEN ON 0-15 AMMETER

2-3
500
172
1A

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 1 HALF East SP. 1 DATE 7/24

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	800	800	800	800	800	800	800	800	800	800
VOLTAGE	536	588	544	548	588	534	520	542	580	540
CURRENT	7A	6A	7A	7A	6A	7A	9A	7A	6A	7A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Cal	
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→		
RANGE	800	800	800	800	800	800	800	800	200	
VOLTAGE	548	548	584	536	544	552	584	532	120	
CURRENT	10.4*	7A	6A	7A	10.4*	7A	6A	7A	1A	

FREQUENCIES 1.0 .05

SENDER NO. Mk3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR K. Hensan

COMMENTS:

* indicates 0-15 ammeter reading

4-5-9

3-4-7

2-3-6

1-2-7

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 1 HALF E SP. 1 DATE 7-21-69

PAGE 1-1

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-1.5E	1.5-3.0	———	3.0-4.5	———	———	4.5-6.0	———	———	———
RANGE	1000	-13	100	1000	100	10	100	100	100	10
DC 1	+15	-31	+.4	+5	1.3	.65	2.4	3.6	2.1	.94
DC 2	14	-12	-.2	+8	1.1	.60	3.6	3.2	.7	.58
DC 3	14	-30	+.2	+1	1.2	.65	2.5	3.2	2.3	1.00
DC 4	15	-12	-.2	+8	1.1	.94	4.1	3.2	.6	.64
DC 5	14	-30	+.2	+4	1.4	.38	2.2	3.9	2.2	.88
DC 6	15	-13	-.1	+7	1.3	.80	3.9	3.0	.7	.79
DC 7			+.3	+5	1.0	.50	2.3	3.8	2.3	.88
DC 8			-.1 @	+6	1.1	.86	4.0	3.2	.7	.72
DC AVG.	260.5 ✓	298.9 ✓	26.8 ✓	115.5 ✓	47.4 ✓	9.79 ✓	86.5 ✓	61.6 ✓	37.7 ✓	10.8 ✓
AC 1	246	319	26.2	110	46.2	9.12	83.4	58.2	36.2	10.0
AC 2	248	319	26.2	108	46.3	9.14	83.8	58.2	36.2	10.0
AC AVG.	247 ✓	319 ✓	26.2 ✓	109 ✓	46.25 ✓	9.13 ✓	83.6 ✓	58.2 ✓	36.2 ✓	10.0 ✓
S.P.	-20	-5	———	+7	———	———	-3	———	———	———
AC NOISE	.02	.03	———	.04	———	———	.08	———	———	———
POT RES.	15-00	1000	———	600	———	———	900	———	———	———

(a)	(b)	(c)	d	e	(f)
+.4	.9	.78	.6	.30	.28
-.2	2.2	-.06	1.3	.86	.62
+.5	.4	.76	1.0	.68	.30
-.3	2.0	-.10	1.2	.42	.41
	.8	.92	.3	.90	.48
	1.8	0	1.2	.46	.44
		.42	.7	.66	.30
		.22	1.2	.68	.51
		.58			
		.46			
		.30			

.60
.24
.68
.16
.72
.16
.60
.16
.66
.16
.32
.58
.24
.64
.16
.64
.24
.56
.26
.46
.40
.40
.48

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE 1 HALF E SP. 1 DATE 2-26-79

PAGE 1-2

SEND	145	37	23	15	45	34	23	12	cal	
RECEIVE	6.0-7.5				7.5-9				1 amp	
RANGE	100	100	100	10	10	100	10	10		
DC 1	.4	1.0	.4	.40	.44	1.1	.60	.44	10	
DC 2	.9	1.8	.7	.36	.12	.6	.54	.24	11.5	
DC 3	.4	.9	.8	.53	.73	1.2	1.00	.66	10	
DC 4	.8	1.6	.8	.22	.22	1.1	.34	.38	11.5	
DC 5	.5	1.0	.6	.80	.56	.9	.46	.42	10	
DC 6	.5	1.8	.8	.08	.36	.8	.76	.26	11.5	
DC 7	.8	1.0	.6	.38	.32	.9	.50	.82		
DC 8	.5	1.5 (a)	.7	.12 (a)	.58	1.3 d	.94 (e)	.24 (f)		
DC AVG.	19.9 ✓	19.2 ✓	13.5 ✓	4.77 ✓	10.04 ✓	11.99 ✓	9.89 ✓	4.12 ✓	110.75	
AC 1	19.3	17.9	12.8	4.39	9.63	11.0	9.26	3.68	109.5	
AC 2	19.3	17.9	12.8	4.37	9.67	10.9	9.26	3.67	109.5	
AC AVG.	19.3 ✓	17.9 ✓	12.8 ✓	4.38 ✓	9.65 ✓	10.95 ✓	9.26 ✓	3.675 ✓		
S.P.	+10				+8					
AC NOISE	.1-.2				~1					
POT RES.	800				800					

100 ~

@ .15
.34
18
20
22
26
-20
78
-16
30
0
46
0
20
-10
42
-6
84
-60
+20

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 1 HALF W SP. 1 DATE 2266

PAGE 1-3

SEND	4/5	3 4	4 5	2 3	3 4	4 5	1 2	2 3	3 4	4/5
RECEIVE	0-1.5W	1.5-3.0	———	3.0-4.5	———	———	4.5	———	———	
RANGE	1000	1000	1000	1000	100	100	1000	100	100	100
DC 1	-16	+2 | +7	+.2	+10	5.4	0	8	1.3	.8	3.6 (W)
DC 2	-12	+16 | +14	1.0	+4	.9	1.4	-2	1.8	.4	-2
DC 3	-15	+2 | +6	2.0	+8	5.1	-.4	11	1.4	.8	
DC 4	-8	+17 | +15	-1.2	+3	1.8	1.2	0	.7	.8	
DC 5	-12	0 | +4	-.8	+11	4.8	0	8	1.4	.7	
DC 6	-4	19 | +11	+.8	+6	1.3	1.0	4	.6	.9	
DC 7	-8	4 | +1	+.2	+11	5.2	-.2	5	1.4		
DC 8		12	+.8		2.2	1.4	4	.7		
DC AVG.	327.3	269.5 | 252	45.6 ✓	279.6 ✓	62.7 ✓	13.4 ✓	128.6 ✓	26.7 ✓	12.0 ✓	3.00
AC 1	338	262 | 244	45.2	272	54.4	12.8	124	25.7	11.2	2.80
AC 2	358	261 | 240	45.2	272	54.4	12.8	124	25.6	11.2	2.80
AC AVG.	348	261.5 | 243	45.2 ✓	272 ✓	59.4 ✓	12.8 ✓	124 ✓	25.65 ✓	11.2 ✓	2.80
S.P.	+33	-30	———	+4	———	———	-18	———	———	———
AC NOISE	~.2	~.1	———	.1~.2	———	———	.1 to .2	———	———	———
POT RES.	?	215	———	1.2K	———	———	1.2K	———	———	———

ⓑ
-.2
1.5
0
2.0
-.2
1.6
-.2
1.7

ⓒ
1.2
.1
1.0
.4
.9
.4

d
.44
.68
.82
.54
.26
.48
.48
.62

ⓔ
-12
+44
-6
-2
-12
+54
-2
+8
-8
+52
-38
+44
-30
+50
+8
+4
+4
-4
+90
-38

⑮

d
0 1
66 66
44 24
88 44
0 6
88 18
22 22
4 5
2 3
6 7
2 1
4 6
36 38
8 70
0
20
22

WEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT ARC
LINE 1 HALF W SP. 1 DATE 2-22-87

SEND	12	23	34	45	12	23	34	45		cal
RECEIVE	6.0-7.5				7.5-9.0					
RANGE	100	10 100%	10	10 (15)	10 (15)	41				1000
DC 1	1.2	.78	.50	12	48	30			11	44
DC 2	1.0	.8	.64	10	0	14			12	0
DC 3	1.0	1.0	.40	14	40	-6			11	4
DC 4	.9	.41	.28	0	44	52			12	-2
DC 5	.3	.7	.40	4	30	50			11	6
DC 6	1.1	.6	.64	32	10	-50				-2
DC 7	0	.8	.66	4	10	+68				6
DC 8	1.8 (b)	4 c	.30 d	20 e	46 f	+28				
DC AVG.	19.2	9.64 ✓	5.06	1.44	4.55 ✓	3.29 ✓	—	—		117
AC 1	18.3	8.92	4.58	1.32 ✓	4.28	3.06	1.80	.52	109	113
AC 2	18.3	8.96	4.61	1.41 ✓	4.30	3.06	1.80	.52	109	113
AC AVG.	18.3 ✓	8.96 ✓	4.595	1.37 ✓	4.29 ✓	3.06 ✓	1.80	.52	109	113
S.P.	-8				0					
AC NOISE	.2-.4				.1					
POT RES.	2.2K				1.5K					

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 1 W 1/2 Field date 7-27-67 Data page_____ Comp. date 7-27-67. Comp by KH

(A) Send	45	34	45	23	34	45	12	23	34	45		
(B) Receive	0-1.5	1.5-3.0		3.0-4.5			4.5-6.0					
(C) n separation	1	1	2	1	2	3	1	2	3	4		
(D) I	9A	7	9	6	7	10.4	7	6	7	10.4		
(E) Vdc (avg)	327.3	262.7	45.6	279.6	62.7	13.4	128.6	26.7	12.0	3.00		
(F) DCcal .900 →						1.0				1.0		
(G) Kn x 10^{-3} →	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρ dc=ExFxGx10^3/D →	148 ✓	151 ✓	83 ✓	184 ✓	145 ✓	52 ✓	75 ✓	72 ✓	69 ✓	26 ✓		
(I) Vac Σ →	348	252	45.2	272	59.4	12.8	124	25.65	11.2	2.80		
(J) AC noise x 2	~0.2	~0.1		0.1-0.2			0.1-0.2					
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .980												
(M) ρ dc/ρac=ExL/K	.922 ✓	1.022 ✓	.989 ✓	1.007 ✓	1.034 ✓	1.026 ✓	1.016 ✓	1.020 ✓	1.050 ✓	1.050 ✓		
(N) PFE=(M-1)(10^2) →	-7.8		-1.1									
(O) MCF=(M-1)(10^5)/H	-53	15	-13	4	23	50	21	28	72	192		
	+33	-30		+4			-18					

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	12	23	34	45	12	23	34	45				
(B) Receive	1.0-2.5				7.5-8.0							
(C) n separation	1	2	3	4	1	2	3	4				
(D) I	7	6	7	10.5	7	6	7	10.6		1A		
(E) Vdc (avg)	19.2	9.64	5.06	1.44	4.55	3.25	—	—		111.5		
(F) DCcal				1.0				1.0				
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	49 ✓	72 ✓	65 ✓	22 ✓	29	49	36	12				
(I) Vac Σ	18.3	8.96	4.595	1.37	4.25	3.06	1.80	.52		109		
(J) AC noise x 2	0.2-0.4				0.1							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .980												
(M) ρdc/ρac =ExL/K	1.028 ✓	1.054 ✓	1.079 ✓	1.030 ✓	1.034 ✓	1.054 ✓	—	—				
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H	57	75	122	136	134	110						
	-8				0							

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page ____

Project APC Line 1E+ Field date 7-26-67 Data page ____ Comp. date 7-27-67 Comp by IHT

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive	0-1.5E	1.5-3.0	—	3.0-4.5	—	—	4.5-6.0	—	—	—		
(C) n separation												
(D) I	7	6	7	7	6	7	9	7	6	7		
(E) Vdc (avg)	260.5	298.9	26.8	115.5	47.4	9.79	86.5	61.6	37.7	10.8		
(F) DCcal .900												
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρ dc=ExFxGx10^3/D	151	202	62	67	128	57	39	143	254	125		
(I) Vac Σ	247	319	26.2	109	46.25	9.13	83.6	58.2	36.2	10.0		
(J) AC noise x 2	.02	.03		.04			.08					
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .990												
(M) ρ dc/ρac=ExL/K	1.044✓	.928	1.013✓	1.049✓	1.015✓	1.062✓	1.024✓	1.048✓	1.031✓	1.069✓		
(N) PFE=(M-1)(10^2)		-7.2✓										
(O) MCF=(M-1)(10^5)/H	29	-36	21	73	12	109	62	34	12	55		
	-20	-5		+7			-3					

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

(A) Send	45	3c1	23	12	45	3c1	23	12		cal		
(B) Receive	6.0-7.5	—	—	—	2.5-4.0	—	—	—				
(C) n separation												
(D) I	10.4	7	6	7	10.4	7	4	7		1		
(E) Vdc (avg)	19.9	19.2	13.5	4.77	10.04	11.99	9.89	4.12		110.75		
(F) DCcal												
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	31	111	182	97	39	139	234	133				
(I) Vac Σ	19.3	17.5	12.8	4.38	9.65	10.55	8.26	3.675		109.5		
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.021✓	1.062✓	1.044✓	1.078✓	1.030✓	1.084✓	1.057✓	1.110✓				
(N) PFE=(M-1)(10^2)					3.0		5.7					
(O) MCF=(M-1)(10^5)/H	68	56	24	80	77	60	24	83				

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE 2 HALF E SP. 1 DATE 7-21-67

PAGE 3

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	01.5E	1.5-3.0	—	3.0-4.5	—	—	4.5-6.0	—	—	—
RANGE	1000	1000	100	1000	100	100	1000	100	100	100
DC 1	+5	+3	+4.3	+12	+1.5	+2.6	+4	+1.8	+.6	+1.5
DC 2	+31	-2	+3.0	-7	+0.8	+0.8	+2	+3.2	+1.0	+1.0
DC 3	+2	+12	+4.3	+15	+1.4	+2.0	+4	+1.8	+.6	+1.6
DC 4	+35	-7	+3.2	-5	+1.1	+1.0	+5	+3.2	+1.1	+1.1
DC 5	+2	+14	+4.2	+16	+1.3	+1.8	+8	+1.4	+.9	+1.3
DC 6	+32	-6	+3.2	-4	+1.2	+1.0	+1	+3.6	+1.0	+1.3
DC 7	+3	+13	+4.0		+1.8	+1.6	+2	+1.4	+.8	+1.1
DC 8	+30	-4	+3.3		+1.2	+1.4	+6	+3.6	+1.1	+1.4
DC AVG.	410	149	89.1	229	41.7	35.8	135	58.3	12.0	15.0
AC 1	393	145	85.4	224	40.4	34.3	131	55.8	16.1	16.7
AC 2	394	145	85.4	224	40.1	34.3	131	55.8	16.1	16.7
AC AVG.	393.5	145	85.4	224	40.25	34.3	131	55.8	16.1	16.7
S.P.	-14	+5	—	-10	—	—	-3	—	—	—
AC NOISE	.2	<15	—	.1 to .2	—	—	.10-.20	—	—	—
POT RES.										

F +2.4
0
2.4
0
2.4
0

G -.1
+2.1
+.1
+2.1
~~-.3~~

H +1.2
0
1.0

I +0
+1.2
+.2
+1.1

J +0.2
+1.2
+.2
+1.2
+.2
+1.1

K .2
1.4
.3
1.3

L .2
.8
.4

M +.7
+.8
-.2
+1.2

11
400

44

2.4
2.3

2.8
3.2
6.4
3.2

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Ape
LINE 2 HALF E SP. ____ DATE ____

PAGE 4

SEND	45	34	23	12	45	34	23	12	cal	
RECEIVE	1.0-7.5				7.5-10		100%	100%	4A	1A
RANGE	100	100	10	10	100	100	10	10	1000	1000
DC 1	+1.8	+.8	+.7	+.4	+.8	+.1	+.4	+.1	+.6	+2.6
DC 2	+0.9	+1.4	+.6	+1.0	+1.0	+1.3	+.8	+.6	+.5	+3.4
DC 3	+1.5	+.5	+.7	+.4	+.7	+.5	+.4	+.4	+.8	+2.8
DC 4	+0.6	+1.2	+.2	+1.0	+.8	+1.3	+1.0	+1.0	+.5	+3.6
DC 5	+2.2	+.6	+1.2	+.2	+.8	+.2	+.4	+.4	+.9	+2.8
DC 6	+0.6	+1.5	+.2	+1.3	+1.0	+1.5	+.8	+.8		+3.6
DC 7	+2.1	+.3	+1.0	+.2	+4	0	+.2	+.7		+2.8
DC 8	+0.4 (F)	+1.8 (G)	+.4 (H)	+1.3 (I)	+1.0 (J)	+1.6 (K)	+.8 (L)	+.9 (M)		+3.6
DC AVG.	35.3	25.1	10.70	10.68	17.6	12.3	5.93	6.44	4.5	103.2
AC 1	34.0	24.1	10.05	9.95	16.9	11.4	5.33	5.83	4.04	101.6
AC 2	34.3	24.0	10.05	10.00	16.9	11.4	5.35	5.83	4.06	101.8
AC AVG.	34.15	24.05	10.05	9.98	16.9	11.4	5.34	5.83		101.7
S.P.	+2				+6					
AC NOISE	.1 — .3				.1 — .3					
POT RES.										

Shelby

#24

22672

#32

19595

PAGE

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 2 HALF EAST SP. 1 DATE 7/21/6

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	800	700	800	800	700	800	700	800	700	800
VOLTAGE	488	460	480	504	464	484	488	504	456	468
CURRENT	10A	6A	10A	7A	6A	10A	9A	7A	6A	10A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Cal	
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→		
RANGE	700	800	700	800	700	800	700	800	500	
VOLTAGE	452	496	492	450	484	504	488	464	344	
CURRENT	8A	7A	7A	10A	9A	7A	7A	10A	3A	

FREQUENCIES 1.0 .05

SENDER NO. Mk III

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR K. Henson

COMMENTS:

1-2 - 8-800
2-3 6-700
3-4 - 7-800

4-5 6-700

120
108
228

2/228

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 2 spd 1 E½ Field date 7-21-67 Data page_____ Comp. date_____. Comp by_____

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive	0-1.5E	1.5-3.0	———	3.0-4.5	———	———	4.5-6.0	———	———	———		
(C) n separation												
(D) I	10	6	10	7	6	10	9	7	6	10		
(E) Vdc (avg)	410	149	89.1	229	41.7	35.8	135	58.3	17.0	18.0		
(F) DCcal .950	———	———	———	———	———	———	———	———	———	———		
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρdc=ExFxGx10^3/D	175 ✓	106 ✓	152 ✓	140 ✓	119 ✓	153 ✓	64 ✓	142 ✓	121 ✓	154 ✓		
(I) Vac Σ	353.5	145	85.4	224	40.25	34.3	131	55.8	16.1	16.7		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K	1.042 ✓	1.028 ✓	1.043 ✓	1.022 ✓	1.036 ✓	1.043 ✓	1.031 ✓	1.045 ✓	1.056 ✓	1.078 ✓		
(N) PFE=(M-1)(10^2)	2.5	1.1	2.6	0.5	1.9	2.6	1.4	2.8	3.9	6.1		
(O) MCF=(M-1)(10^5)/H	~~24~~ ✓	~~27~~ ✓	~~27~~ ✓	~~16~~ ✓	~~30~~ ✓	~~28~~ ✓	~~42~~ ✓	~~32~~ ✓	~~46~~ ✓	~~51~~ ✓		
	14	10	17	4	16	17	22	20	32	40		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	45	34	23	12	45	34	23	12				
(B) Receive	1.0-2.5	———	———	———	2.5-4.0	———	———	———				
(C) n separation												
(D) I	8	7	7	10	9	7	7	10				
(E) Vdc (avg)	35.3	25.1	10.70	10.65	12.6	12.3	5.93	6.43				
(F) DCcal	———	———	———	———	———	———	———	———				
(G) Kn x 10^{-3}	18	45	90	~~157.5~~ 135	45	~~90~~ 72	~~157.5~~ 135	~~315~~ 207				
(H) ρ dc=ExFxGx10^3/D	75 ✓	153 ✓	130 ✓	160 ✓	84 ✓	150 ✓	127 ✓	154				
(I) Vac Σ	34.15	24.05	10.05	5.58	16.9	11.4	5.34	5.83				
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.034 ✓	1.043 ✓	1.064 ✓	1.062 ✓	1.041 ✓	1.079 ✓	1.111 ✓	1.103 ✓				
(N) PFE=(M-1)(10^2)	1.7	2.6	4.7	5.0	2.5	6.2	9.4	8.6				
(O) MCF=(M-1)(10^5)/H	~~45~~ ✓	~~29~~ ✓	~~46~~ ✓	~~44~~ ✓	~~49~~ ✓	~~53~~ ✓	~~87~~ ✓	~~67~~ ✓				
	23	17	36	31	30	41	74	56				

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 2 HALF W SP. 1 DATE 7-21-67

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	0-1.5W	1.5-3.0W	———	3.0-4.5W	———	———	4.5-6.0W	———	———	———
RANGE	100	1000	100	1000	100	100	1000	100	100	100
DC 1	+2.4	+8	+1.6	+7	+4.2	+.6	+8	+2.1	2.1	+0.3
DC 2	+1.6	+19	+2.4	+8	+5.8	+1.8	+10	+2.2	3.1	+1.0
DC 3	+3.0	+10	+2.0	+6	+4.6	+.4	+7	+2.3	2.1	+0.2
DC 4	+1.2	+22	+3.4	+8	+5.6	+2.0	+9	+2.0	3.1	+0.8
DC 5	+3.8	+9	+1.6	+4	+3.4	+.2	+5	+2.4	2.3	+0.4
DC 6	+1.2	+20	+2.2	+10	+4.2	+2.0	+12	+2.0	3.0	+1.0
DC 7	+2.2	+12	+2.6	0	+3.2	+.1	+7	+2.2	2.0	+0.2
DC 8	+2.2	+18	+2.0	+12	+4.6 (A)	+2.0	+13	+2.1	3.0	+0.9
DC AVG.	75.1	346	52.8	155	58.7	22.6	219	50.5	45.1	11.9
AC 1	73.0	331	50.6	188	93.7	21.5	210	48.3	42.5	11.3
AC 2	73.0	332	50.6	188	94.1	21.5	210	48.3	42.5	11.2
AC AVG.	73.0	331.5	50.6	188	93.5	21.5	210	48.3	42.5	11.25
S.P.	-1.5	-2.0	———	-5	———	———	+3			
AC NOISE	.03 (A)	~.2		~.15	———	———	.15-120			
POT RES.			shaky AC							

A
+3.4
+5.8
+4.8
+6.6
+5.5
+5.8
+5.0
+6.4

B
+.42
,22
,44
,30
,54
,24
,50
,26

C
+,44
+.20
+,50

D
+.44
+,66
+,42
+,68

E
+.60
+.38

F +.02
+.28
+.08
+.26
+.08

Road + fence excavation between 7.5+9.0

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE 2 HALF W SP. 1 DATE 7-21-67

SEND	12	23	34	45	12	23	34	34	cal	45
RECEIVE	6.0 - 7.5W				7.5 - 9.0W					
RANGE	100	100	100	10	100	10	10	10		+.10
DC 1	+2.7	+.9	+1.6	.26	+0.8	+.30	+.30	+.48		+.25
DC 2	+2.6	+1.1	+1.2	.36	+0.7	+.38	+.80	+.66		+.08
DC 3	+2.6	+.9	+1.7	.26	+1.0	+.32	+.34	+.48		+.24
DC 4	+2.7	+1.1	+1.2	.34	+0.5	+.34	+.74	+.54		+.08
DC 5	+2.7	+.9	+1.6	.36	+1.1	+.33	+.40	+.48		+.22
DC 6	+2.7	+1.1	+1.2	.34	+0.5	+.30	+.70	+.56		+.14
DC 7	+2.6		+1.6	+.40	+1.2	+.36	+.42	+.48		+.20
DC 8	+2.6		+1.2	+.32 B	+0.4	+.24 (C)	+.66 (D)	+.56 (E)		+.18 (F)
DC AVG.	48.85	16.4	18.9	5.36	11.68	4.60	6.21	5.33		185 188
AC 1	46.2	15.4	17.5	5.01	10.9	4.26	5.66	4.81		1.68
AC 2	46.2	15.4	17.4	5.01	10.4	4.26	5.66	4.81		1.68
AC AVG.	46.2	15.4	17.45	5.01	10.65	4.26	5.66	4.81		1.68
S.P.	0				+2.5					
AC NOISE	.06				.1 ~					
POT RES.				PC						

wizsk

(n) +2.0
+2.2
1.6
1.2
1.8
1.6
3.2
0.4

(p) 0.4
1.4
0.7

g

9 1.3
0.3
1.4
-.1

51
49
61
46
107
2.4

24
22
19
25
90

11
8) 90

+54
+2
+26
+8
+62
+6
+42
+36
+24

(x)

23
21
24
20
18
116
12

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 2 HALF West SP. 1 DATE 7/21

PAGE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-1.5	1.5	3.0 →	3.0-4.5		→	4.5-6			→
RANGE	400	800	700	700	800	700	800	700	800	700
VOLTAGE	248	512	492	488	508	488	416	484	508	484
CURRENT	3A	7A	6A	6A	7A	6A	8A	6A	7A	6A
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	Cal	
RECEIVE	6.7.5			→	7.5-9			→		
RANGE	800	700	800	700	800	700	800	700	600	
VOLTAGE	412	484	508	368	408	481	500	484	480	
CURRENT	8A	6A	7A	6A	8A	6A	7A	6A	4A	

FREQUENCIES 1.0 .05

SENDER NO. MK3

OPERATOR Cruz C

RECEIVER NO. Burr-Brown

OPERATOR K. Henson

COMMENTS:

1-2 - 8-800

2-3 - 6-700

3-4 - 7-800

4-5 - 6-700

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page ____

Project APC Line 2 Spd 1 W Field date 7-21-61 Data page ____ Comp. date ____. Comp by ____

(A) Send	45	34	45	23	34	45	12	23	34	45		
(B) Receive	0-1.5W	1.5-3.0	—	3.0-4.5	—	—	4.5-6.0	—	—	—		
(C) n separation												
(D) I	3	7	6	6	7	6	8	6	7	6		
(E) Vdc (avg)	25.1	34.6	52.8	19.5	98.7	22.6	21.9	50.5	46.1	11.9		
(F) DCcal .950												
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	~~72~~		
(H) ρ dc=ExFxGx10^3/D	107 ✓	~~211~~ ✓	151 ✓	139 ✓	~~241~~	161 ✓	117 ✓	144 ✓	~~225~~ ✓	170 ✓		
(I) Vac Σ	73.0	331.5	50.6	18.8	93.9	21.5	21.0	48.3	42.5	11.25		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K	1.029 ✓	1.044 ✓	1.043 ✓	1.037 ✓	1.051 ✓	1.051 ✓	1.042 ✓	1.047 ✓	1.061 ✓	1.058 ✓		
(N) PFE=(M-1)(10^2)	1.2	2.7	2.6	2.0	~~3.1~~	3.4	2.5	3.0	~~4.1~~	4.1		
(O) MCF=(M-1)(10^5)/H	~~27~~ ✓	—	~~29~~ ✓	~~27~~ ✓	—	~~32~~ ✓	~~36~~ ✓	~~33~~ ✓	—	~~34~~ ✓		
	11		17	14		21	21	21		24		

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

(A) Send	12	23	34	45	12	23	34	45	34			
(B) Receive	6.0-7.5	—	—	—	2.5-3.0	—	—	—				
(C) n separation												
(D) I	8	6	7	6	8	6	7	6	6			
(E) Vdc (avg)	48.8	16.4	18.5	5.36	11.7	4.58	6.21	18.5	5.33			
(F) DCcal												
(G) Kn x 10^{-3}	18	45	~~32~~	~~[illegible]~~	45	~~32~~	~~[illegible]~~	~~[illegible]~~				
(H) ρ dc=ExFxGx10^3/D	104 ✓	117 ✓	~~231~~ ✓	133 ✓	63 ✓	65 ✓	~~133~~	74	~~133~~			
(I) Vac Σ	46.2	15.4	12.45	5.01	10.65	4.26	5.66	16.8	4.81			
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.056 ✓	1.065 ✓	1.083 ✓	1.039 ✓	1.096 ✓	1.080 ✓	1.098 ✓	1.101 ✓	1.108 ✓			
(N) PFE=(M-1)(10^2)	3.9	4.8	~~6.6~~	5.3	7.8	6.3	~~8.1~~	8.4	9.1			
(O) MCF=(M-1)(10^5)/H	~~54~~	56 ✓	—	~~52~~ ✓	159 ✓	115 ✓	—	136	—			
	38	41		40	124	97		114				

Same

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT _____

LINE _____ HALF _____ SP. _____ DATE _____

PAGE

SEND	3-4	3-4	3-4	1-2	2-3	3-4	4-5	3-4		Cal
RECEIVE	1.5-3	3-4.5	4.5-6	6-7.5				7.5-9		
RANGE	800	800	800	800	700	800	700	800		200
VOLTAGE	548	544	544	412	484	548	392	536		88
CURRENT	7A	7A	7A	8A	6A	7A	6A	7A		1A
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES _____ _____

SENDER NO.

OPERATOR

RECEIVER NO.

OPERATOR

COMMENTS:

HEINRICHS GEOEXPLORATION CO. PROJECT APC
I.P. RECEIVER NOTES Repeat data LINE 2 HALF W SP. + DATE

SEND			34	34	34	12	23	24	45	34
RECEIVE			1.5-3.0	3.6-4.5	4.5-6.0	6-7.5				7.5-9
RANGE			1000	100	100	100	100	100	10	10
DC 1	.74	.40	+17	+2.8	+1.9	+1.1	0.9	1.2	.80	.62
DC 2	.54	.86	+7	+3.8	+2.5	+4.0	1.4	0.6	.34	+32
DC 3	.78		+14	+2.4	+0.9	+0.4	0.6	1.2	.62	+32
DC 4	.62		+8	+5.0	+1.3	+4.5	1.5	0.7	-.06	+34
DC 5	.66		+11	+2.7	+2.1	+0.2	0.5	1.0	+.26	+16
DC 6	.52		+8	+4.0	+2.7	+5.5	1.5	0.6	+.58	+52
DC 7	.62		+15	+3.2	+1.2	-0.2	0.1	1.2	+.10	+52
DC 8	.74		+10	+5.2	+1.6 (R)	+4.8	1.9 R	0.4 R	+.72	+14 (R)
DC AVG.	.176		283	72.6	30.9	48.4	16.4	12.6	5.39	4.04
AC 1	558		272	69.0	29.2	46.2	15.4	11.8	4.98	3.61
AC 2	565		272	69.0	29.4	46.4	15.4	11.7	4.97	3.70
AC AVG.			272	69.0	29.3	46.3	15.4	11.75	4.975	3.69
S.P.	—		—	+5	+8	0				
AC NOISE	—		—	.01	.1	.1				
POT RES.										

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 2 W½ Field date 7-24-87 Data page_____ Comp. date_____. Comp by KH

Repeat data

(A) Send	34	34	34	12	23	34	45	34		Lc1		
(B) Receive	1.5-3	3-4.5	4.5-6	6-7.5				7.5-9		1A		
(C) n separation	4.5	18	45	14	45	72	126	126				
(D) I	7	7	7	8	6	7	6	7				
(E) Vdc (avg)	283	72.6	30.9	48.8	16.4	12.6	5.39	4.04		103.2		
(F) DCcal .968												
(G) Kn x 10^{-3}	4.5	18	45	48	45	90	157.5	157.5				
(H) ρdc=ExFxGx10^3/D	176	181	192	106	120	157	137	88				
(I) Vac Σ	272	69.0	29.3	46.3	15.4	11.75	4.975	3.69		101.7		
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .983												
(M) ρdc/ρac=ExL/K	1.024	1.034	1.038	1.037	1.047	1.054	1.065	1.076				
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H	14	19	20	35	39	34	47	~~152~~ 86				

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send												
(B) Receive							3					
(C) n separation							42					
(D) I												
(E) Vdc (avg)												
(F) DCcal												
(G) Kn x 10^{-3}												
(H) ρdc=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 GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page _____

Project APC Line 2 E 1/2 spl 2 Field date 8-2-67 Data page _____ Comp. date 8-3-67 Comp by JPB

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2			
(B) Receive	6-5W	← 5	4W →	←	4-3	→	←	3	2	→			
(C) n separation	100	100	10	100	100	10	1000	100	10	—			
(D) I	9.6A	10A	9A	10A	10A	10A	10A	9A	9A	10A			
(E) Vdc (avg)	15.9	25.25	6.92	66.48	13.57	5.89	187	27.8	~~4.55~~ 7.45	4.32			
(F) DCcal	.98	.89											
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90			
(H) ρdc=ExFxGx10^3/D	7.3	10	12	27	22	24	75	49	34	35			
(I) Vac Σ	14.9	23.8	6.52	63.0	128	5.58	180	26.2	7.07	4.00			
(J) AC noise x 2	—	0.6		0.1			0.1						
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	685	440	367	141	195	163	30	90	115	177			
(L) AC-DC cal.	0.984												
(M) ρdc/ρac=ExL/K	5.0	4.4	4.4	3.8	4.3	3.9	2.2	4.4	3.9	6.2			
(N) PFE=(M-1)(10^2)	~~4.7~~	~~4.1~~	~~4.1~~	~~3.5~~	~~4.0~~	~~3.6~~	~~1.9~~	~~4.1~~	3.6	~~5.7~~			
(O) MCF=(M-1)(10^5)/H	~~783~~	~~440~~	341	130	182	150	25	84	97	169			
	−13	+4		+2			+12		*	*			

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	←		2-1 W	→	←	1-0	→						
(C) n separation	100	100	10	10	100								
(D) I	10A	9A	10A	10A	10A	10A	10A	10A					
(E) Vdc (avg)	61.79	13.64	5.39	—	27.6	8.01	—	—		~~11.33~~ 1.10			
(F) DCcal	62.0												
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252					
(H) ρdc=ExFxGx10^3/D	99	61	43	43	111	57	44	48					
(I) Vac Σ	59.05	12.6	4.98	3.08	26.0	7.43	3.14	2.13		109.25			
(J) AC noise x 2	32	107	151		40	105							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$													
(L) AC-DC cal.													
(M) ρdc/ρac =ExL/K	3.2	6.5	6.5		4.4	6.0							
(N) PFE=(M-1)(10^2)	~~2.9~~	~~6.2~~	~~6.2~~	—	~~4.1~~	~~6.2~~	—	—					
(O) MCF=(M-1)(10^5)/H	~~29~~	~~102~~	144	—	37	~~118~~	—	—					
	+10		*		+45	*							

1 1 1 1 * , 15

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE 2 HALF E SP. 2 DATE 8-2-6

PAGE 6-1

SEND	12	23	12	34	23	12	45	34	23	12	
RECEIVE	6-5W	5-4W		3-4			3-2W				
RANGE	100	100	10	100	100	10	1000	100	10		
DC 1	1.2	1.3	.4	3.8	.5	.12	10	1.0	.0		
DC 2	.8	1.7	.5	3.2	.8	.60	6	2.2	.8		
DC 3	1.2	1.4	.12	4.0	.8	0	11	1.0	.2		
DC 4	.8	1.5	.5	3.6	.8	.52	2	2.4	.9		
DC 5	1.2	1.4	.06	3.8	.9	.06	11	1.3			
DC 6	.8	1.4	.66	3.5	.7	.60	3	1.6			
DC 7		1.6	.10	3.9	1.1	.04	15	1.4			
DC 8		1.3	.92	3.6	.6	.60	0	1.5	1.55		(C)
DC AVG.	15.9	25.25	6.92	66.48	13.657	5.89	187	27.8	7.41	4.32	
AC 1	14.9	23.8	6.52	62.8	12.8	5.58	180	26.2	7.07	4.00	
AC 2	14.9	23.8	6.52	63.2	12.8	5.54	180	26.2	7.07	4.00	
AC AVG.	14.9	23.8		63.0	12.8	5.58	180	26.2	7.07	4.00	
S.P.	-13	4		+2			+17				
AC NOISE		.06		~.1			.1				
POT RES.	2K	415		315			2K				

(a)

-4
-9
10
6
-7
-9
10
-10
13
-9
11

(b)

-9
-13
-17
-21
-25
-29
-33
-37
-41
-45
-49

(c)

-13
-2.3
-1.6
2.4
-2.2
-1.9
2.2

(d)

3.0
3.2
3.2
3.0
3.2
3.0
3.2

(e)

-10
-11
-8
-15
-9
-11
-10

(f)

-2
+0
-2

(g)

22
24
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42

(h)

-15

(i)

-15

(j)

$$\frac{14.9 \times 45}{9} = 75$$

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE

PROJECT APC

LINE 2 HALF E SP. 2 DATE 8-24-67

SEND	45	34	23	12	45	34	23	12		cal
RECEIVE	2-1W	—	—	—	1.0W	—	—	—		
RANGE	100	100	10	10	100					112
DC 1	2.3	1.2			1.4					110
DC 2	3.0	.6			2.0					112
DC 3	2.8	0			1.2					
DC 4	2.2	2.0			2.0					
DC 5	4.2	+.4			1.3					
DC 6	2.4	2.1			2.2					
DC 7	3.8	-.3			1.3					
DC 8	2.4 d	2.3 e			2.0 g	h				
DC AVG.	~~62.0~~ 61.79	13.564	5.39		27.6	8.08				111.33
AC 1	58.9	12.6 c	4.98 f	3.08	25.9	7.43	3.14	2.13		109.5
AC 2	59.2	12.6	4.98	3.08	26.1	7.43	3.14	2.13		109.0
AC AVG.	59.1 05	12.6	4.98	3.08	26.0	7.43	3.14	2.13		109.25
S.P.	+10	—	—	—	+45	—	—	—		
AC NOISE	.1-.2	—	—	—	.2-.3+	—	—	—		
POT RES.	2K	—	—	—	4K	—	—	—		

SP DATE

8 1.4
1.9
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(t)

76
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1500' = a

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 2 HALF E SP. 2 DATE 12-6-67

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	800	700	700	700	700	700	800	800	700	700
VOLTAGE	492	488	496	492	492	508	528	520	512	508
CURRENT	9.6 *A	10A	9A	10A	10A	10A	10A	9A	9A	10A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		cal
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→		
RANGE	800	800	800	700	800	800	700	700		
VOLTAGE	524	520	548	508	520	492	524	496		
CURRENT	10A	9A	10A	10A	10A	10A	10A	10A		1A

FREQUENCIES 1.0 .05 & .15

SENDER NO. MK 3

OPERATOR HEINRICHS

RECEIVER NO. BURR BROWN

OPERATOR K. HENSON

COMMENTS:

1-2 - 800 - 10A

2-3 - 700 - 10A

3-4 700 - 10 - 9

4-5 800 - 10

3-4	2-3
100	100
100	80
1A	1A

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 2 E½ Spd 3 Field date_____ Data page_____ Comp. date_____. Comp by KH

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive	45-6.0	6.0-7.5	—	7.5-9.0	—	—	9.0-	10.5	—	—		
(C) n separation												
(D) I	8	10	9	10	10	9	10	10	10	9		
(E) Vdc (avg)	124	181.5	425	241	41.8	17.8	213.7	535	16.0	8.28		
(F) DCcal .90	—	—	—	—	—	—	—	—	—	—		
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρ dc=ExFxGx10^3/D	63	74	77	98	68	80	87	87	65	75		
(I) Vac Σ	120	177	41.1	232	40.35	16.5	207.5	51.2	15.35	7.82		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.986	—	—	—	—	—	—	—	—	—		
(M) ρ dc/ρac=ExL/K	1.019	1.011	1.020	1.024	1.021	1.039	1.015	1.030	1.028	1.044		
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H	30	15	26	24	31	49	17	20	43	59		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	45	34	23	12	45	34	23	12		cal		
(B) Receive	10.5-	12.0	—	—	12.0-13.5	—	—	—				
(C) n separation												
(D) I	10	10	10	9	10	10	10	9		1		
(E) Vdc (avg)	43.1	15.6	6.07	3.66	11.6	5.26	—	—		111.25		
(F) DCcal	—	—	—	—	—	—	—	—				
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	70	63	49	58	45	43	33	39				
(I) Vac Σ	41.6	14.9	5.72	3.37	11.1	5.00	2.34	1.56		105.7		
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	—	—	—	—	—	—	—	—		984		
(M) ρdc/ρac =ExL/K	1.022	1.032	1.046	1.071	1.030	1.037						
(N) PFE=(M-1)(10^2)												
(O) MCF=(M-1)(10^5)/H	31	51	94	122	67	86						

* * *

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE ____ HALF ____ SP. ____ DATE ____

PAGE 7-2

SEND	45	34	22	12	45	34	23	12		6nl
RECEIVE	14.5	12.0								
RANGE		100	10		10					
DC 1	1.6	1.2 | 1.2	24	.10	1.0 | .7	-6				
DC 2	1.4	.1 | .3	.51		-.1 | .4					
DC 3	1.5	1.2 | 1.0	.10		1.0 | .8					
DC 4	1.7	0 | .6	.90		0 | .4					
DC 5	1.4	1.0 | .8	1.60		1.1					
DC 6	1.7	.6 | .4	1.46		-.2					
DC 7	1.2	.8 | 1.1			1.2					
DC 8	2.0	.5 | .1	(3)	(4)	0	(5)				
DC AVG.	43.1	15.6	6.07	3.66	11.6	5.26				111.25
AC 1	41.5	14.9	5.72	3.377	11.1	5.00	2.34	1.56		109.7
AC 2	41.7	14.9	5.72	3.37?	11.1	5.00	2.34	1.56		109.7
AC AVG.	41.6	14.9	5.72	3.37	11.1	5.00	2.34	1.56		109.7
S.P.	-2				-2					
AC NOISE	~.1				~.1					98
POT RES.	1K				1K					

©

$-4-$

$+40-$

$+8-$

$+40-$

$10-$

52

22

8

56

42

20

26

22

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34

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62

-30

64

14

40

12

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30

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 2 HALF E SP. 3 DATE 8-[illegible]

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	4.5-6.0	6.0-7.5		7.5-9.0			2.0-10.5			
RANGE	1000	1000	100	1000	100	100	1000	100	100	10
DC 1	3 9	3 1	.4 .6	4 6	1.8	.8 0	6 10	1.9	.6 -.6	.46, .30
DC 2	2 2	6 10	2.4 3.2	14 14	1.2	.8 1.4	7 6	2.8	.8 1.6	.32, .42
DC 3	6 9	4 5	.6 -.2	4 7	1.8	.6 .4	3 8	1.8	.1 -.2	.50, .20
DC 4	-1 0	6 6	2.0 2.9	16 10	1.1	1.0 1.6	7 8	2.7	1.2 1.3	.48, .76
DC 5	6	7 2	.6	6 10	2.0	.6 -.4	8 6	2.0	-.3 -.2	.44, .34
DC 6	5	7 8	2.2	12 8	.9	.6 +2.4	2 8	2.4	1.5 1.5	.44, .44
DC 7	5	4	.3	7	2.0	.6 -.2	5 3	2.3	-.6 -.2	.20, .68
DC 8	1	8	27	13	1.1	1.0 1.4	8 12	2.2	1.5 1.4	.52, .32
DC AVG.	124	181.5	42.5	241	41.8	17.8	213.7	53.6	16.0	8.28
AC 1	120	176	41.1	232	40.3	17.0	207	51.2	15.4	7.82
AC 2	120	178	41.1	232	40.4	16.8	208	51.2	15.3	7.82
AC AVG.	120	177	41.1	232	40.35	16.9	207.5	51.2	15.35	7.82
S.P.	-67	+4		+14			+15			
AC NOISE	.1			~.1			~.1-.2			
POT RES.	1K	1K		600			600			

(b)

~~62~~
32
0
36
2
78
-20
84
4
50
28
18
40
22
38
72
34
06
78
-18
72
-20
66
-10
62

(a)

22 > 84
62
-04 > ~~96~~
100
40 > ~~60~~
20
44 > ~~70~~ ok
26
46 > 84
38
34 > ~~70~~ ok
36
38 > 78
40
52 > 72
20
70 > ~~168~~
38
32 > 86
54
46 > ~~66~~
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40 > ~~64~~
24
36 > ~~64~~
52
30

2
84
84
78
72
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494

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570

7
80

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 2 ext HALF E SP. 1 DATE 8/8/67

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	4.5-6	6-7.5	→	7.5-9	→	→	9-10.5	→	→	→
RANGE	800	600	800	700	600	800	700	700	600	800
VOLTAGE	508	452	592	492	452	552	512	484	440	528
CURRENT	8A	10A	9A	10A	10A	9A	10A	10A	10A	9A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	C-1	
RECEIVE	10.5-12	→	→	→	12-13.5	→	→	→		
RANGE	700	600	600	800	800	600	600	800	200	
VOLTAGE	508	464	468	520	504	456	464	520	104	
CURRENT	10A	10A	10A	9A	10A	10A	10A	9A	1A	

FREQUENCIES 1.0 10S

SENDER NO. MK 3

OPERATOR Cryze

RECEIVER NO. Burr-Brown

OPERATOR Henson

COMMENTS:

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 3 E½ Field date 7-24-67 Data page 3-1, 3-2 Comp. date 7-24-67 Comp by KA

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive	0-1.5E	1.5-3.0	———	3.0-4.5	———	———	4.5-6.0	———	———			
(C) n separation												
(D) I	10											
(E) Vdc (avg)	158	146.5	10.9	113	56.4	7.87	73.6	54.2	38.6	6.43		
(F) DCcal .900												
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	~~72~~ 90		
(H) ρ dc=ExFxGx10^3/D	64	59	18	46	91	32	30	88	156	52		
(I) Vac Σ	153	135.5	10.2	106.5	52.8	7.32	70.2	50.55	35.4	5.85		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.990											
(M) ρ dc/ρac=ExL/K	1.022	1.040	1.054	1.050	1.054	1.064	1.038	1.061	1.079	1.084		
(N) PFE=(M-1)(10^2)	2.2	4.0	5.8	5.0	5.8	6.4	3.8	6.1	7.9	8.8		
(O) MCF=(M-1)(10^5)/H	34	68	322	109	64	200	127	69	51	169		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	45	34	23	12	45	34	23	12		cal		
(B) Receive	6.0-1.5				2.5-0							
(C) n separation												
(D) I								11.6		2		
(E) Vdc (avg)	14.3	12.2	14.6	2.74	5.56	8.97	8.35	~~1.77~~ 1.85		88.5		
(F) DCcal								1.000				
(G) Kn x 10^{-3}	18	45	~~72~~ 90	~~15~~ 7.5	45	~~72~~ 90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	23	70	118	39	23	73	118	40				
(I) Vac Σ	13.5	15.6	13.1	2.40	5.18	8.02	7.48	1.57		87.7		
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.										.990		
(M) ρdc/ρac =ExL/K	1.049	1.092	1.103	1.130	1.063	1.107	1.105	~~11.6~~				
(N) PFE=(M-1)(10^2)	4.9	9.2	10.3	13.0	6.3	10.7	10.5	11.6				
(O) MCF=(M-1)(10^5)/H	213	131	87	342	274	147	89	290				

PAGE

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC
LINE 3 HALF East SP. 1 DATE 7/25/67

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	700	700	800	800	800	700	600	800	800	700
VOLTAGE	492	500	492	508	500	492	392	504	496	492
CURRENT	10A	10A	10A	10A	10A	10A	10A	10A	10A	10A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Cal	Cal #2
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→		
RANGE	600	800	800	700	600	800	800	700	200	300
VOLTAGE	388	500	496	488	384	496	492	496	72	232
CURRENT	10A	10A	10A	10A	10A	10A	10A	11.6*	1A	4A

FREQUENCIES .05 1.0
SENDER NO. MK3
OPERATOR Cruze
RECEIVER NO. Burr-Brown
OPERATOR Keith Henson

COMMENTS:
* 0-15 amp meter reading

Cal 200
" 136
2A

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 3 HALF E SP. 1 DATE 7-24-87

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-1.5E	1.5-3.0		3.0-4.5			4.5-6.0			
RANGE	1000	1000	100	1000	100	10	100	100	100	100 + 1000
DC 1	0	-3	+.3	+4	+1.8	+.74	+3.4	+3.2	+2.3	.7
DC 2	+9	+18	+7	+5	+4.5	+.24	+2.9	+4.6	3.8	.3
DC 3	0	-3	+1.1	+4	+3.0	+.84	3.9	3.0	2.8	1.5
DC 4	+12	+18	+.6	+7	4.7	-.40	2.5	4.4	4.0	.2
DC 5	-4	-4	+1.1	+5	3.0	.42	4.4	3.4	2.6	.9
DC 6	+15	+20	+.2	+4	4.8	.84	2.8	4.4	3.6	-.13
DC 7	-4	-6	+0.7	+3	2.3	.30	4.0	2.7	3.8	+1.0
DC 8	+13	+20	+0.5 (a)		4.3 (b)	.40 (c)	3.0 (d)	4.7	3.1	+.1 (e)
DC AVG.	158	146.5	10.9	113	5.64	2.87	73.64	54.2	38.6	6.43
AC 1	153	139	10.2	108	5.28	7.32	70.0	50.4	35.4	5.85
AC 2	153	140	10.2	105	5.28	7.32	76.4	50.7	35.4	5.85
AC AVG.	153	139.5	10.2	106.5	52.8	7.32	70.2	50.55	35.4	5.85
S.P.	+9	-67		+53			+1			
AC NOISE	~.2	~.2		.1 to .2			.1 to .2			
POT RES.	700	200		3000			1200			

Sta 3.0 E in dump
Reason for SP

(a) +0.7
+0.7
+1.2
0.4
0.8
0.8
1.0
0.4

(b) 3.0
4.0
3.7
4.1

(c) .44
.50
.70
.36

(d) 4.2
3.0
4.6
3.2
4.4
3.4
4.4
3.3

(e) +1.8
-.6
+1.5
-.2
+1.6
-.3
+1.8
-.9

(f) 1.3
1.3
1.2
.4

K -.3
+1.3
-.6
+.7
-.4
+1.5
-.3

(g) 0.6
2.4
1.0
2.3

(h) 1.2
1.6
1.6
1.3
1.6
1.4
1.8
1.2

(m) 2.0
.2
2.2
0
2.2
.2

n
-.36
+.60
-.16
+.64
+.08
+.96
-.10

J +.2
.3
-.3
+1.0
+.4
.9
-.3
+.8

(l) 0.5
1.2
1.0
1.0
1.2
1.0
1.2
.6

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 3 HALF E SP. DATE

SEND	45	34	23	12	45	34	23	12		cal
RECEIVE	6.5-7.5				7.5-9					2A
RANGE	100	100	100	10	10 +100?	10				100
DC 1	+1.0	1.6	1.0	+2.8	+.3	+.8	.3	.10		+.7
DC 2	0.0	1.8	1.4	-.5	+1.0	+.9	1.6	.60		+1.9
DC 3	1.5	1.7	2.0	+.6	-.5	+.9	.9	.20		+.7
DC 4	0.5	1.4	1.8	+.2	+.5	+1.1	.5	.20		+1.9
DC 5	0.6	1.2	1.2	+.6	-.3	.6	1.7	.04		+.7
DC 6	0.3	2.6	1.7	+.7	+1.0	1.6	.6	.50		+1.9
DC 7	1.6	1.4	1.7	+.6	-.3	1.2	1.4	.08		
DC 8	0.3 (F)	1.4 (G)	.9 (H)	0 (I)	+.9 (J)	.5 (K)	.2 (M)	.72 (N)		
DC AVG.	14.3	17.2	14.6	2.74	5.50	8.97	8.35	1.77 1.85 ←		48.6
AC 1	13.5	15.6	13.1	2.40	5.18	8.02	7.48	1.64 >	157	87.7
AC 2	13.5	15.6	13.1	2.40	5.18	8.02	7.48	1.58 >		87.8
AC AVG.	13.5	15.6	13.1	2.40	5.18	8.02	7.48	1.57		87.75
S.P.	+9				-4					
AC NOISE	.1-.2				7.05					
POT RES.	1200				1600					

(A)
-4
+24
-3
+24
-6
+20

(B)
+.8
-.1
+.5
+.3
+.5
+.4
+.4
+.4

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 3 W½ Field date 7-24-67 Data page 3-3-34 Comp. date 7-24-67. Comp by IH

(A) Send	45	34	45	23	34	45	12	23	34	45		
(B) Receive	0.1.5W	1.5-3.0	—	3.0.45	—	—	4.5-6.0	—	—	—		
(C) n separation	—	—	—	—	—	—	—	—	—	—		
(D) I	10	—	—	—	—	12.2	10	11.6	10	—		
(E) Vdc (avg)	~~147~~ 146	159	11.2	104.9	46.4	5.84	20.7	45.6	21.4	~~3.24~~ 3.13		
(F) DCcal .900	—	—	—	—	—	—	—	1.000	.900	—		
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρdc=ExFxGx10^3/D	60	64	18	42	75	19	8.4	71	87	25		
(I) Vac Σ	139.5	152	10.3	101.1	43.7	5.38	19.8	43.4	20.1	2.55		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .990	~~1.036~~	—	—	—	—	—	—	—	—	—		
(M) ρ dc/ρac=ExL/K	~~1.043~~	1.036	1.076	1.027	1.051	1.075	1.035	1.040	1.054	1.087		
(N) PFE=(M-1)(10^2)	3.6	3.6	7.6	2.7	5.1	7.5	3.5	4.0	5.4	8.7		
(O) MCF=(M-1)(10^5)/H	60	56	422	64	68	395	417	56	62	348		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	12	23	34	45	12	23	34	45				
(B) Receive	6.0-7.5	—	—	—	7.5 9.0	—	—	—				
(C) n separation	—	—	—	—	—	—	—	—				
(D) I	10	11.4	10	—	—	11.6	10	—				
(E) Vdc (avg)	7.11	19.5	10.86	~~1.18~~	3.02	9.21	4.85	~~.472~~				
(F) DCcal .900	—	1.000	.902	—	—	1.010	.901	—				
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	12	77	88	25	12	71	69	22				
(I) Vac Σ	6.96	18.2	9.93	1.64	2.80	8.35	4.44	.90				
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	—	—	—	—	—	—	—	—				
(M) ρdc/ρac =ExL/K	1.011	1.061	1.083	X	1.068	1.092	1.041					
(N) PFE=(M-1)(10^2)	1.1	6.1	8.3		6.8	9.2	8.1					
(O) MCF=(M-1)(10^5)/H	92	79	94	X	567	130	117					

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 3 HALF West SP. 1 DATE 7/25/4

PAGE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	600	800	600	800	800	600	700	700	700	500
VOLTAGE	400	500	400	492	500	472	488	500	500	392
CURRENT	10A	10A	10A	10A	10A	12.2*	10A	11.6*	10A	10A
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→		
RANGE	700	700	700	500	700	700	700	500		
VOLTAGE	488	496	496	394	484	500	500	392		
CURRENT	10A	11.4*	10A	10A	10A	11.6*	10A	10A		

FREQUENCIES .05 1.0

SENDER NO. Mk 3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR Keith Henson

COMMENTS:

* indicates 0-1.5 ammeter reading

98

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 3 HALF W SP. 1 DATE 7-24-80

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	0-1.5W	1.5-3.0	→	3.0-4.5			4.5-6.0			
RANGE	1000	1000	100	100	100	10	100	100	100	10 100
DC 1	0	10	.9	4.2	4.6	+.7	1.0	2.6	1.4	+.7
DC 2	16	0	.3	6.4	1.2	+4	.7	2.2	1.2	-.2
DC 3	1	+9	.2	4.2	4.2	-.3	1.0	2.3	1.2	+.4
DC 4	14	5	1.4	6.2	1.0	+1.1	.9	1.8	1.4	-.4
DC 5	-10	11	0	4.0	4.4	+.1	1.0	2.4	1.3	+.6
DC 6	+22	4	1.8	6.3	1.0	1.1	.9	2.0	1.4	0
DC 7	-10	6	.8	3.8	4.2	-.2	1.3	2.4	1.2	+.4
DC 8	+23 (A)	6	1.4	6.8	1.0	.8	.8	2.3	1.2	-1 B
DC AVG.	147 100	159	11.2	10.49	46.4	5.84	20.7	45.7	21.4	324 3.13
AC 1	139	152	10.3	99.7	43.7	5.38	19.7	43.4	20.1	2.95
AC 2	140	152	10.3	100.5	43.7	5.38	19.9	43.4	20.1	2.95
AC AVG.	139.5	152	10.3	100.1	43.7	5.38	19.8	43.4	20.1	2.95
S.P.	+4	+39	—	-5	—	—	+5	—	—	—
AC NOISE	1-2mV	~.5	—	1-.2	—	—	~.1	—	—	—
POT RES.	900Ω	700Ω	—	700	—	—	1500	—	—	—

d .10
.48
-.46
+.56
-.32
+.50
-.16
+.70

e .3
1.4
.3
1.0
.1
1.4
.3
1.3

f -.2
.5
.2
.6
.5
1.4
1.0
.4
.6
.4
.5
.5

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT _____
LINE ____ HALF ____ SP. ____ DATE ____

SEND	12	23	34	45	12	23	34	45		
RECEIVE	6-7.5				7.5-9.0					
RANGE	10	100	100	1	10	1.1				
DC 1	+.4	1.6	1.4		.2	.3	.60			
DC 2	-.1	1.9	.4		.2	1.1	.34			
DC 3	+.3	1.8	1.6		.1	0	.34			
DC 4	0	1.8	.4		0	1.3	.18			
DC 5	+.4	1.8	1.4		.2	-.1	.2			
DC 6	-.1	1.7	.4		.1	2.0	.4			
DC 7	+.4	2.1	1.5		.5	.4	.5			
DC 8	-.1	1.4	.3		.3 (D)	1.6 (C)	.4 (B)			
DC AVG.	7.11	19.5	10.86		3.02	5.21	4.85			
AC 1	6.96	17.7	9.93	1.64	2.78	8.35	4.44	.90		
AC 2	6.96	18.2	9.93	1.64	2.82	8.35	4.44	.90		
AC AVG.	6.96	18.2	9.93	1.64	2.80	8.35	4.44	.90		
S.P.	0				+10					
AC NOISE	.1				.05-.15					
POT RES.	900				1800					

a = 500'

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 4 HALF S SP. 1 DATE 7-25

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	0-.5	15-1.05	—	1.0-1.5	—	—	1.5-2.0	—	—	—
RANGE	1000	1000	1000	1000	1000	100	1000	1000	100	100
DC 1	3	5.2	12	14	8	.4	10	11	3.8	1.0
DC 2	30	5.2	0	14	8	2.0	26	11	3.8	1.1
DC 3	-2	4.6	8	17	9	.6	6	9	3.8	1.0
DC 4	30	5.4	0	13	3	2.0	33	13	3.8	1.1
DC 5	0	4.8	10	14	9	.6	5	10	3.8	.9
DC 6	33	5.6	-1	12	6	2.0	32	9	3.8	1.2
DC 7	2	4.6	10		10	.4	5	8		
DC 8	28	5.2	0		6	2.0	32	12		
DC AVG.	448	1055	150	350	148	36.6	473	232	101.0	31.9
AC 1	433	1004	145	335	141	35.3	454	222	97.2	30.8
AC 2	433	1006	145	335	141	35.3	454	222	97.2	30.6
AC AVG.	433	1005	145	335	141	35.3	454	222	97.2	30.7
S.P.	-20	-26	—	-20	—	—	+24	—	—	—
AC NOISE	.2	.08	—	.01-.1	—	—	~.1	—	—	—
POT RES.	15K	10K	—	5K	—	—	5K	—	—	—

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 4 HALF S SP. L DATE 7-29

SEND	12	23	34	45	12	23	34	45		cal
RECEIVE	2.0-2.5				2.5-3.0					
RANGE	100	100	100	100	100	100	100	100		
DC 1	3.4	3.8	2.6	1.9	1.6	1.2	1.4	.2		9
DC 2	4.4	3.3	3.0	-.2	.6	1.4	1.3	.8		11
DC 3	3.5	3.8	2.6	2.0	1.6	1.1	1.2	.2		9
DC 4	4.2	3.1	3.0	-.2	.6	1.4	1.3	.9		11
DC 5	3.6	3.8	2.4	2.1	1.7	1.2	1.2	.1		9
DC 6	4.0	3.2	3.1	-.2	1.5	1.4	1.4	1.0		
DC 7	3.4	3.8	2.4	2.2	1.8		1.2	0		
DC 8	3.4 4.7	3.2	3.1	-.3	.4		1.4	1.0		
DC AVG.	98.4	102.6	65.8	23.4	31.3	37.4	32.4	13.0		110
AC 1	94.5	99.1	63.0	22.5	30.2	36.1	31.1	12.5		108
AC 2	95.5	99.1	63.0	22.5	30.2	36.1	31.1	12.5		108
AC AVG.	95.0	99.1	63.0	22.5	30.2	36.1	31.1	12.5		108
S.P.	+9				-4					
AC NOISE	~.1				.04					
POT RES.	4K				1.5K					

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 4 HALF N SP. 1 DATE 2-25-91

SEND	45	34	23	12	45	34	23	12		Cal
RECEIVE										
RANGE	100	100	10	10	100	100	10	10		100
DC 1	.8	1.0	.16	.07	1.0	1.3	.20	.12		9.5
DC 2	.4	.3	.07	.06	.4	.4	.10	0		10.0
DC 3	.6	1.0	.22	.01	.7	1.2	.26	.18		10.5
DC 4	.7	.3	0	.12	.7	.4	.10	-.06		9.5
DC 5	.4	1.1	.30	-.05	.6	1.2	.34	.22		10.5
DC 6	.8	.2	-.01	.19	.8	.4	.02	-.10		9.5
DC 7	.4	1.2	.40	-.11	.5	1.2	.34	.30		
DC 8	.8	.1	-.18	+.26	.8	.4	0 Ⓓ	-.18		
DC AVG.	21.4	16.4	4.19	1.91	21.8	20.4	6.43	2.68		110
AC 1	20.8	15.8	4.08	1.84	21.1	19.6	6.26	2.62		108
AC 2	20.8	15.8	4.08	1.84	21.1	19.4	6.26	2.62		108
AC AVG.	20.8	15.8	40.8	184	21.1	19.5	6.26	2.62		
S.P.	+26				+1					
AC NOISE	.04				.65					
POT RES.	1.5K				2K					

(6)

.36
-.04
.42
-.08
.4
-.12
.60
-.20

PAGE

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 4 HALF South SP. 1 DATE 7/31/67

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-.5	.5-1 →	→	1-1.5 →	→	→	1.5-2 →	→	→	→
RANGE	700	800	700	800	800	700	500	700	700	700
VOLTAGE	500	508	500	324	500	500	252	484	500	496
CURRENT	3A	4A	3A	2A	4A	3A	1A	3A	4A	3A

SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
RECEIVE	2-2.5 →	→	→	→	2.5-3 →	→	→	→		
RANGE	500	700	700	700	500	600	700	700		
VOLTAGE	248	512	500	488	248	480	500	492		
CURRENT	1A	*4.0	4A	3A	1A	3A	4A	3A		

FREQUENCIES 1.0 .05

SENDER NO. Mk III

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR K. Henson

COMMENTS:

* indicates 0-15 ammeter reading

use 1.000 cal for *

a=500'

PAGE 4-1

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT ADC
LINE 4 HALF N SP. 1 DATE 7-25-77

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-.5N	.5-1.0		1.0-1.5			1.5-2.0			
RANGE	1000	1000	100	1000	100	10	100	100	10	10
DC 1	12	-2	1.6	X	.9	.42	1.6	1.6	.12	+.02
DC 2	10	+16	1.2	4	.4	.08	2.6	1.6	.36	.15
DC 3	8	-2	1.6	8	.9	.40	1.6	1.6	.08	0
DC 4	12	+16	1.2	4	.4	.11	2.6	1.6	.40	.22
DC 5	10	+4	1.6	6	.9	.40	1.6		.04	-.7
DC 6	10	+12		8	.4	.13	2.6		.44	.26
DC 7	10	+6		4		.38			0	-.11
DC 8	10	+12		5		.13			.46	.29
DC AVG.	245	280	48.4	179	21.45	7.50	71.7	39.6	7.82	3.34
AC 1	235	272	47.0	173	20.8	7.24	69.6	38.0	7.58	3.24
AC 2	235	272	47.0	173	20.8	7.24	69.8	38.0	7.58	3.22
AC AVG.	235	272	47.0	173	20.8	7.24	69.8	38.0	7.58	3.23
S.P.	-16	-16		+10			+12			
AC NOISE	.1	.02		.02			.04			
POT RES.	3K	7K		5K			1.5K			

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 4 HALF North SP. 1 DATE 7/31/67

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-.5	.5-1	→	1-1.5	→	→	1.5-2	→	→	→
RANGE	800	800	500	800	800	700	700	800	800	500
VOLTAGE	388	556	380	520	544	384	508	516	544	380
CURRENT	1A	2A	1A	4A	2A	1A	3A	4A	2A	1A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Cal	
RECEIVE	2-2.5	→	→	→	2.5-3	→	→	→		
RANGE	700	800	800	500	700	800	800	500	400	
VOLTAGE	508	516	528	376	508	516	528	376	230	
CURRENT	3A	4A	2A	1A	3A	4A	2A	1A	1A	

FREQUENCIES 1.0 .05

SENDER NO. Mk3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR K. Henson

COMMENTS:

1-2 - 1

2-3 - 2

3-4 - 4

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page 1

Project APC Line 4 N½ Field date 7-31-67 Data page _____ Comp. date 8-1 . Comp by _____

(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-.5	←.5-1→		←1-1.5→			←1.5-2→					
(C) n separation	1000	1000	100	1000	100	10	100	100	10	10		
(D) I	1 AMP	2A	1A	4A	2A	1A	3A	4A	2A	1A		
(E) Vdc (avg)	245	280	48.4	179	21.45	7.5	71.7	39.6	7.82	3.34		
(F) DCcal	0.91	→								→		
(G) Kn x 10^{-3}	1.5	1.5	6.0	1.5	6.0	15	1.5	6.0	15	30		
(H) ρdc=ExFxGx10^3/D	334	191	264	61	59	102	33	54	53	91		
(I) Vac Σ	235	272	41.0	173	20.8	7.24	69.8	38.0	7.58	3.23		
(J) AC noise x 2	.1	.02		.02			.04					
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	0.981	→								→		
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)	2.3	1.0	1.0	1.5	1.2	1.6	0.8	2.2	1.2	1.4		
(O) MCF=(M-1)(10^5)/H	7	5	4	25	20	16	24	41	23	15		
	-16	-16		+10			+12					

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	←2-2.5→				←2.5-3→							
(C) n separation	100	100	10	10	100	100	10	10		100		
(D) I	3A	4A	2A	1A	3A	4A	2A	1A		1A		
(E) Vdc (avg)	21.4	16.4	4.19	1.91	21.8	20.4	6.43	2.68		110		
(F) DCcal								→				
(G) Kn x 10^{-3}	6.0	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	39	56	57	91	99	139	154	205				
(I) Vac Σ	20.8	15.8	4.08	1.84	21.1	19.5	6.26	2.62		108		
(J) AC noise x 2	.04				.05							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.								→				
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)	0.9	1.8	0.7	1.8	1.4	2.6	0.8	0.3				
(O) MCF=(M-1)(10^5)/H	23	32	12	20	14	19	5	1				
	+26				+1							

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 4 S 1/2 Field date 7-3-16 Data page_____ Comp. date 8-1 . Comp by_____

(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-.5	←.5-1→		←1-1.5→			←1.5-2→					
(C) n separation	1000	1000	1000	1000	1000	100	1000	1000	100	100		
(D) I	3A	4A	3A	2A	4A	3A	1A	3A	4A	3A		
(E) Vdc (avg)	448	1055	150	350	148	36.6	473	232	101	31.9		
(F) DCcal	0.91	→										
(G) Kn x 10^{-3}	1.5	1.5	6.0	1.5	6.0	15	1.5	6.0	15	30		
(H) ρdc=ExFxGx10^3/D	204	360	273	239	202	167	646	422	345	290		
(I) Vac Σ	433	1005	145	335	141	35.3	454	222	97.2	30.7		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	0.981	→										
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)	1.5	3.0	1.5	2.5	3.0	1.7	2.2	2.5	1.9	1.9		
(O) MCF=(M-1)(10^5)/H	7	8	5	10	15	10	3	6	6	7		
	-20	-26		-20			+24					

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	←	2-2.5	→	←	2-2.5-3	→						
(C) n separation	100	→										
(D) I	1A	4A	4A	3A	1A	3A	4A	3A				
(E) Vdc (avg)	98.4	102.6	65.8	23.4	31.3	37.4	32.4	13.0		110		
(F) DCcal	0.91	→										
(G) Kn x 10^{-3}	6.0	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	537	350	449	373	427	340	387	331				
(I) Vac Σ	95.0	99.1	63.0	22.5	30.2	36.1	31.1	12.5		108		
(J) AC noise x 2	~.1				.04							
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	0.981	→										
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)	1.6	1.6	2.5	2.0	1.7	1.6	2.2	2.0				
(O) MCF=(M-1)(10^5)/H	3	5	6	5	4	5	6	6				
	+9				-4							

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page _____

Project APC Line 5 5½ Field date 8-4-67 Data page _____ Comp. date 8-4-67 . Comp by KA

(A) Send	45	34	45	23	34	45	12	23	34	45		
(B) Receive	0-1.5	1.5-3	———	3-4.5	———	———	4.5-6	———	———	———		
(C) n separation												
(D) I	9	10	9	10	10	9	8	10	10	9		
(E) Vdc (avg)	134	170	46.4	224	51.7	21.3	263	75.5	26.1	13.3		
(F) DCcal	.90	———	———	———	———	———	———	———	———	———		
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρ dc=ExFxGx10^3/D	60	69	84	91	84	96	133	122	106	120		
(I) Vac Σ	130	169.5	45.0	216	49.65	20.5	253.5	73.9	25.0	912.8		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .98	———	———	———	———	———	———	———	———	———	———		
(M) ρ dc/ρac=ExL/K	1.010	1.013	1.010	1.016	1.020	1.018	1.017	1.001	1.023	1.018		
(N) PFE=(M-1)(10^2)	1.0	1.3	1.0	1.6	2.0	1.8	1.7	0.1	2.3	1.8		
(O) MCF=(M-1)(10^5)/H	17	19	12	18	24	19	13	1	22	15		

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

(A) Send	12	23	34	45	12	23	34	45		Cal		
(B) Receive	6-7.5	———	———	———	7.5-9	———	———	———				
(C) n separation												
(D) I	8	10	10	10.6	8	10	10	9		1A		
(E) Vdc (avg)	98.2	39.5	16.1	10.08	41.1	19.75	9.06	5.23				
(F) DCcal	———	———	———	.98	.90	———	———	———		111		
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252		109.5		
(H) ρ dc=ExFxGx10^3/D	199	162	130	147	208	160	128	144				
(I) Vac Σ	95.15	34.3	15.4	9.70	39.25	19.0	8.63	5.48				
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	———	———	———	———	———	———	———	———				
(M) ρdc/ρac =ExL/K	1.011	1.021	1.025	1.018	1.026	1.019	1.029	1.025				
(N) PFE=(M-1)(10^2)	1.1	2.1	2.5	1.8	2.6	1.9	2.9	2.5				
(O) MCF=(M-1)(10^5)/H	6	13	19	12	13	12	23	17				

* * * * *

* .15 cps

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page _____

Project APC Line 5 N½ Field date 8-4-67 Data page _____ Comp. date 8-5-67 Comp by IC H

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive	0-1.5N	1.5-3.0	—	3.0-4.5	—	—	4.5-6.0	—	—	—		
(C) n separation												
(D) I	9.2	10	9.6	10.0	10	9.3	10.0	10.6	10	9.6		
(E) Vdc (avg)	147	149	46.0	304	95.5	43.8	419	84.0	44.7	25.6		
(F) DCcal .900	.98	.90	.98	.98	.90	.98	.98	.98	.90	.98		
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρ dc=ExFxGx10^3/D	70	60	85	134	155	208	185	140	181	235		
(I) Vac Σ	143	144.5	44.55	288	92.0	42.1	406	80.35	43.2	24.7		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .98	—	—	—	—	—	—	—	—	—	—		
(M) ρ dc/ρac=ExL/K	1.007	1.011	1.012	1.034	1.017	1.020	1.011	1.025	1.014	1.016		
(N) PFE=(M-1)(10^2)	0.7	1.1	1.2	3.4	1.7	2.0	1.1	2.5	1.4	1.6		
(O) MCF=(M-1)(10^5)/H	10	18	14	25	11	13	6	18	8	7		

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

(A) Send	45	34	23	12	45	34	23	12			Cal	
(B) Receive	6.0-7.5	—	—	—	7.5-9	—	—	—				
(C) n separation												
(D) I	9	9	10	9.2	8	10	10	9			1A	
(E) Vdc (avg)	107	34.1	20.35	—	24.3	10.4	—	—			111.25	
(F) DCcal	.90	—	—	.98	.90	—	—	—				
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	192	153	165	189	123	84	85	96				
(I) Vac Σ	103	32.6	19.6	11.25	23.4	9.9	6.0	3.8			109.2	
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	—	—	—	—	—	—	—	—			.98	
(M) ρdc/ρac =ExL/K	1.018	1.025	1.018	—	1.018	1.029	—	—				
(N) PFE=(M-1)(10^2)	1.8	2.5	1.8	—	1.8	2.9	—	—				
(O) MCF=(M-1)(10^5)/H	9	16	11	—	15	34	—	—				

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 5 HALF North SP. 1 DATE 8/3/67

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0-1.5N	1.5-3N	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	800	700	800	700	700	800	800	700	700	800
VOLTAGE	549	496	568	448	500	540	529	472	500	560
CURRENT	9.2A*	10A	9.6A*	10A*	10A	9.3A*	10A*	10.6A*	10A	9.6A*
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	CAL	
RECEIVE	6-7.5	→	→	→	8.5-9	→	→	→		
RANGE	800	700	700	800	700	700	700	800	400	
VOLTAGE	512	420	496	540	480	460	492	550	100	
CURRENT	9A	9A	10A	9.2A*	8A	10A	10A	9A	1A	

FREQUENCIES 1.0 .05

SENDER NO. MK 3

OPERATOR F. HEINRICHS

RECEIVER NO. DUPP BROWN

OPERATOR K. HENSON

COMMENTS:

1-2 800 - 1.2

2-3 700 - 10A

3-4 700 - 9A

4-5 800 - 9A

* INDICATES READ ON 0-15 AMMETER

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 5 HALF South SP. 1 DATE 8/4/67

PAGE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0-1.5	1.5-3	→	3-4.5	→	→	4.5-6	→	→	→
RANGE	800	700	800	800	700	800	800	700	700	700
VOLTAGE	516	476	516	492	476	516	504	492	472	512
CURRENT	9A	10A	9A	10A	10A	9A	8A	10A	10A	9A
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	Cal	Cal
RECEIVE	6-7.5	→	→	→	7.5-9	→	→	→		
RANGE	700	700	700	800	700	700	700	700	200	500
VOLTAGE	500	488	460	532	496	480	452	500	100	
CURRENT	8A	10A	10A	10.6*	8A	10A	10A	9A	1A	5.0*

FREQUENCIES 1.0 .05 & .15

SENDER NO. Mk 3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR K. Henson

COMMENTS:

* indicates 0-15 ammeter reading

1-2 8-800
2-3 10-800
3-4 10-700
4-5 9-800

* Use .98

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 5 HALF N SP. 1 DATE 8-3-87

SEND	45	34	23	12	45	34	23	12		Cal
RECEIVE	6.0-7.5	~		~	7.5-8.0		~	~		
RANGE	1000	100	100	100	100	100				100
DC 1	3	2.5	1.0	1.3	1.3	.2				111
DC 2	5	.8	.3		1.5	.8				111.5
DC 3	4	2.8	1.0		.6	.5				111
DC 4	3	.8	.4		.4	.5				111.5
DC 5	6	2.0	1.2		.6	.3				
DC 6	-1	.9	.6		1.2	.6				
DC 7	4	2.7	.8		.8	.5				
DC 8	4	1.0	.7		1.0 @	.6				
DC AVG.	107	34.1	20.35		24.3	10.4				111.28
AC 1	103	32.4	19.6	11.2	23.4	9.9	~6.0	~3.8		109.2
AC 2	103	32.4	19.6	11.5	23.4	9.9				109.2
AC AVG.	103	32.6	19.6	11.25	23.4	9.9				109.2
S.P.	-35	~	~	~						
AC NOISE	~.2	~	~	~						(.98)
POT RES.	2.5K	~	~	~						

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 5 HALF N SP. 1 DATE 8/30

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-1.5N	1.5-3.0N		3.0-4.5			4.5-6.0			
RANGE	100	1000	100	1000	100	100	1000	101	100	100
DC 1	8	2	2.1	10	3.2	2.0	14	3.8	1.0	1.2
DC 2	2	4	.9	20	4.1	1.3	14	3.8	2.4	.6
DC 3	6	9	2.1	11	2.9	1.7	12	4.4	.2	.8
DC 4	-1	4	1.0	23	3.8	1.5	15	3.5	2.6	.8
DC 5	7	7	2.1	6	3.1	1.8	17	4.8	.5	1.1
DC 6	3	2	1.0	24	4.0	1.8	9	3.3	2.6	.6
DC 7	5	9	2.0	3	3.2	1.4	20	2.8	.8	1.4
DC 8	5	4	.9	30	3.6	2.0	9	4.4	.20	.4
DC AVG.	147	149	46.0	304	95.5	43.8	419	84.0	44.7	25.6
AC 1	143	144	44.5	288	92.0	42.1	405	80.1	43.2	24.7
AC 2	143	145	44.6	288	92.0	42.1	407	80.6	43.2	24.7
AC AVG.	143	144.5	44.55	288	92.0	42.1	406	80.35	43.2	24.7
S.P.	+4	-2		+6			+1			
AC NOISE		~.1		~.1			3.5K			
POT RES.	1K	2K		800			.1-.2+			

10 amp → 10.8

a 1.5
2.4
.2
2.0
1.2
2.2
1.1
1.8

(c) -.2
1.3
.6
1.3
.1
1.5
.2
1.6

11
19
19
16
18
18
10
18
18

25
32
8 | 57
7

$\sqrt{17}$
$\sqrt{18}$

1

9

(b) all are
8 8 6 4 6 -2 13 0 13 -1 8 4 10 3 16 -2 18 -2 12 4 10 6 0 2 14 -4 16 -2

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Steve
LINE ____ HALF ____ SP. ____ DATE ____

PAGE

SEND	45									
RECEIVE										
RANGE	100									
DC 1	.4	22								
DC 2	1.8									
DC 3	.1	20								
DC 4	1.9									
DC 5	0	20								
DC 6	2.0									
DC 7	1.1	21								
DC 8	2.0									
DC AVG.	29.4									
AC 1	28.4									
AC 2	28.4									
AC AVG.	28.4									
S.P.	13									
AC NOISE	.2-.4									
POT RES.	11.7 K									

(a)

.2

.6

.5

.6

.4

0

.8

1.0

.4

0

.3

.8

.6

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Ape
LINE 5 HALF S SP. 1 DATE 8-4-64

PAGE C-8

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	0-1.5	1.5-3.0	—	3.0-4.5	—	—	4.5-6.0	—	—	—
RANGE	1000	1000	100	1000	100	100	100	100	100	100
DC 1	-3	1	1.5	8	1.8	.8	1.1	2.1	1.1	.8
DC 2	-17	10	1.3	12	2.1	.8	1.1	3.0	.8	.4
DC 3	-2	2	1.4	7	1.8	.6	1.3	2.0	1.4	1.0
DC 4	11	11	1.2	11	2.4	.8	.6	3.1	.9	.2
DC 5	-4	1	1.8	7	1.6	.8	1.2	2.0	1.4	.8
DC 6	+15	12	1.3	10	2.6	.8	.7	3.0	.9	.4
DC 7	-11	1	1.7	6	1.6		1.4	2.2	1.4	.7
DC 8	+19	11	1.2	12	2.8		.6	3.0	.6/1.6	.2 (W)
DC AVG.	134	170	46.4	234	51.7	21.3	263	75.5	26.1	13.3
AC 1	130	164	45.0	215	49.6	20.5	253	73.9	25.0	12.8
AC 2	130	165	45.0	217	49.7	20.8	254	73.9	25.0	12.8
AC AVG.	130	164.5	45.0	216	49.65	20.5	253.5	73.9	25.0	12.8
S.P.	+3	-2	—	-3	—	—	-3	—	—	—
AC NOISE	—	.05	—	.05	—	—	.05	—	—	—
POT RES.	1.5K	1.5K	—	800	—	—	700	—	—	—

a	b (15 qs)	c	f	d	e
1.2	14	7	6	60	1.5
1.4	14	6	10	18	2.1
1.6	12	10	4	44	1.6
1.4	14	4	10	28	2.4
1.3	14	10	7	44	1.5
2.0	12	7	5	32	2.2
1.6	12	5	12	48	1.2
1.7	15	12	1	26	2.7
	12	1	13	50	
	16	13	4	18	
	14	4	8	60	
		8		24	
				46	

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 5A HALF N SP. 1 DATE 8/9/67

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	1.5-2	2-2.5	→	2.5-3	→	→	3-3.5	→	→	→
RANGE	800	700	800	700	600	800	300	300	300	400
VOLTAGE	520	480	524	496	484	528	298	153	104	288
CURRENT	10A	10A	10A	10A	10A	11.3*	3A	3A	3A	5A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Cal	
RECEIVE	3.5-4	→	→	→	4-4.5	→	→	→	200	
RANGE	300	300	400	500	500	500	600	600	200	
VOLTAGE	298	200	256	400	384	268	298	400	108	
CURRENT	3A	3A	5A	7A	5A	5A	7A	7A	1A	

FREQUENCIES 1.0 .05

SENDER NO. MK3

OPERATOR Fred

RECEIVER NO. Barr-Brown

OPERATOR Keith

COMMENTS:

1-2 10-500

2-3 10-300

3-4

4-5

* 0-15 ammeter reading

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 5 HALF S SP. I DATE 8-4-67

SEND	12	23	34	45	1L	23	34	45		Cal
RECEIVE	6.0-7.5				7.5-9.0				5A	1A
RANGE	100	100	100,15		100					100
DC 1	4.6	1.7			2.0					111
DC 2	2.0	1.9			1.4					111
DC 3	4.5	1.4			2.1					111
DC 4	1.6	1.1			1.6					
DC 5	5.0	1.5	(b)		2.0					
DC 6	1.9	2.0			1.7					
DC 7	5.4	1.7			2.3					
DC 8	1.5	1.6 (a)	(c)	d	1.9 (e)	f	g	h		
DC AVG.	98.2	39.9	16.1	10.08	41.1	19.75	9.66	5.73	509	111
AC 1	94.9	38.3	15.4	9.70	39.2	19.0	8.63	5.50	502	109.5
AC 2	95.2	38.3	15.4	9.70	39.3	19.0	8.63	5.46	502	119.5
AC AVG.	95.15	38.3	15.4	9.70	39.25	19.0	8.63	5.48		
S.P.	-5				-16					
AC NOISE	.66				.1-.2					
POT RES.	1K				1K					

(f) .15

7
8
7
8
6
12
1
14
2
10
6
12
2
13
4

(g) .15

54
48
44
44
48
28
74
8
58
60
-24
+94
+18
44

42
72
8
86
14
66
26
68
20

(h) .15

32
56
-20
60
30
-34
90
- 26
32
32
10
32
8
40
0
6
90

-62
+69
24
18
69
08
14
38
-22
28
-46
52

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE

PROJECT APC

LINE 6A HALF N SP. 1 DATE [illegible]

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	1.5-2.0N	2.0-2.5		2.5-3.0			3.0-3.5			
RANGE	1000	1000	1000	1000	100	100	1000	100	100	100
DC 1	8	10	3.8	20	3.2	1.4	18	2.6	1.0	1.2
DC 2	16	11	2.6	10	5.5	1.6	3	1.6	.3	.8
DC 3	7	10	3.8	20	3.5	1.1	17	2.6	1.1	1.0
DC 4	14	12	2.6	8	5.8	1.4	0	2.4	1.1	.8
DC 5	8	10		23	3.3	1.0	20	2.2	.7	.6
DC 6	13	12		10	5.8	1.6	-1	2.4	1.5	1.0
DC 7	10	12			[+100]	1.4	22	2.6	.9	.8
DC 8		10				1.8	-1	2.2	1.2	1.0
DC AVG.	334.7	349	96.2	380	104.5	47.2	302	72.7	29.85	26.0
AC 1	322	338	93.0	365	101.8	45.8	292	70.4	29.0	25.1
AC 2	325	340	93.0	367	101.8	~~47.8~~	292	70.4	29.0	25.1
AC AVG.	323.5	339	93.0	366	101.8	45.8?	292	70.4	29.0	25.1
S.P.	-1	0		+4			+32			
AC NOISE	<.1	<.1		<.1			<.1			
POT RES.	3.3K	3K		2.5K			2K			

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT MPC
LINE 57E HALF N SP. 1 DATE 9-1-67

PAGE

SEND	45	34	23	12	45	34	23	12		
RECEIVE	3.5-4.0				4.0-4.5					
RANGE	100	100	100	100	100	100	100	10		
DC 1	2.4	1.5	.8	0	1.5	.6	.7	.64		
DC 2	2.9	.7	.7	1.3	1.8	1.0	.5	.02		132
DC 3	2.2	1.6	.8	0	1.4	.8	.7	.74		112.8
DC 4	2.8	.4	.8	1.5	2.0	1.0	.6	-.08		
DC 5	2.4	1.3	1.0	-.2	1.5	.6	.7	.58		
DC 6	2.8	.6	.6	1.4	1.5	1.1	.6	.20		
DC 7	2.4	1.5		~~1.2~~	1.5	.7	.6	.50		113.0
DC 8	2.8	.5			1.9	1.0	.6	.28		
DC AVG.	75.5	26.9	22.5	18.47	49.1	21.25	16.4	10.09		114
AC 1	72.6	25.5	21.7	17.8	47.4	20.4	15.8	9.73		111.2
AC 2	72.8	25.9	21.7	17.8	47.4	20.4	15.8	9.73		111.2
AC AVG.	72.7	25.9	21.7	17.8	47.4	20.4	15.8	9.73		
S.P.	+3				-5					
AC NOISE	2.1-.2				~.1					
POT RES.	2.6K				1K					

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE 5A HALF S SP. 1 DATE 8-9-(6)

SEND	45	34	45	28	34	45	12	23	34	45
RECEIVE	15N-10N	10N-5N		.5N-0N/S			0N5-	.5S		
RANGE	1000	1000	100	1000	100	100	1000	100	100	100
DC 1	8	10	2.0	10	3.5	1.4	16	3.4	1.6 1.5	
DC 2	9	21	1.8	14	3.8	.5	5	1.8	1.4 1.5	1.0
DC 3	4	7	1.9	8	3.5	1.4	16	3.1	1.6	1.7
DC 4	9	22	1.9	10	3.7	.5	7	1.8	1.5	.7
DC 5	4	10	1.8	8	3.6	1.4	14	3.3	1.6	.7
DC 6	5	22	2.0	16	3.7	.5	10	1.8	1.5	.7
DC 7	10	8	1.8	6	3.7		16	3.3	1.5	
DC 8	4	21	2.1	14	3.7		6	1.8	1.4	
DC AVG.	837.6	337	67.4	354	85.35	33.55	311.25	84.0	37.9	18.7
AC 1	231	328	65.5	343	81.7	32.6	300	81.5	36.4	18.0
AC 2	231	324	65.4	343	81.8	32.7	300	81.5	36.4	18.0
AC AVG.	231	323	65.45	343	81.75	32.65	300	81.5	36.4	18.0
S.P.	-5	+6		+12			+20			
AC NOISE	<.1	<.1		<.1			<.1			
POT RES.	1K	1.5K		1K			45K			

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE 5A HALF S SP. 1 DATE 8/9/67

PAGE

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	1.5-10N	10N-5N	→	.5N-0	←	→	0-.5S	→	→	→
RANGE	800	800	700	700	800	800	800	700	800	800
VOLTAGE	512	508	516	484	504	580	488	498	504	564
CURRENT	7A	10A	7A	10A	10A	8A	9A	10A	10A	8A
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	Cal	
RECEIVE	.5S-1.0S	→	→	→	1.05-1.5S	→	→	→	2-3	
RANGE	700	700	800	700	800	700	600		200	
VOLTAGE	492	492	504	508	496	484	?		100	
CURRENT	9A	10A	10A	7A	10A	10A	8A		1A	

FREQUENCIES 1.0 .05

SENDER NO. MK3

OPERATOR HEINRICHS

RECEIVER NO. BURR BROWN

OPERATOR HENSON

COMMENTS:

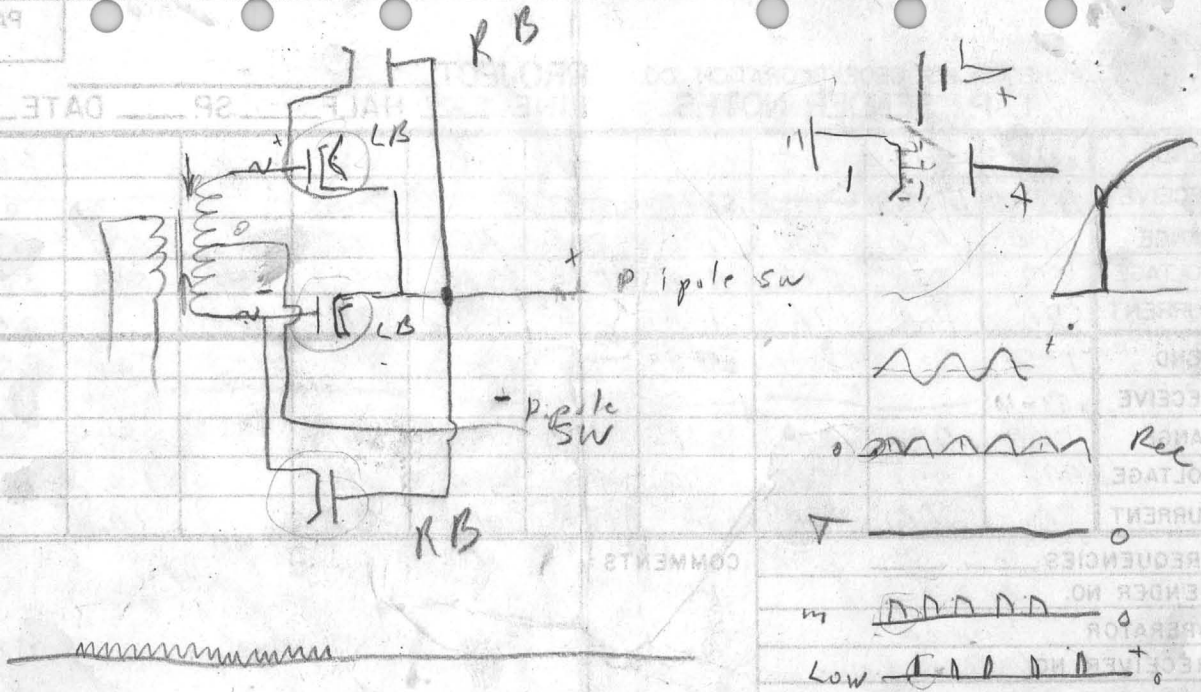
1-2 800 - 9

2-3 700 - 10

3-4 800 - 10

4-5 800 - 7

(6


RB
LB
LB
+
p ipole sw
- p.pole SW
RB
Rec
Low

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT _____
LINE ____ HALF ____ SP. ____ DATE ____

SEND	12	23	34	45	12	23	34	45		Cal
RECEIVE	.55-.65				1.0-1.5					
RANGE	100	100	100	.36	100	150	100			
DC 1	2.5	1.1	.8	.10	1.0	.6	.42			112
DC 2	2.1	1.4	1.0	.32	5.4	.7	.24			109.5
DC 3	2.4	1.0	.8	.18	.9	.6	.44			112
DC 4	2.1	1.3	1.2	.32	1.4	.7	.18			109.5
DC 5	2.5	1.1	.7	.20	.9	.6	.42			
DC 6	2.2	1.2	1.2	.28	1.6	.6	.14			
DC 7	2.4			.14	.8		.44			
DC 8	2.4	38.4		.28	1.6		.14			
DC AVG.	7 9.1	37.2	20.15	9.85	37.6	20.03	10.63			111.25
AC 1	7.68	36.0	19.6	9.57	3.4	19.4	9.73	3.0		
AC 2	7.70	36.0	19.6	9.53	36.6	19.4	—			109.5
AC AVG.	76.9	36.0	19.6	9.55	36.45	19.4	9.73			109.5
S.P.	+1V				0					109.5
AC NOISE	<.1				<.1					
POT RES.	3.5K				3K					

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____. Comp by_____

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive	1.5-2.0	2.0-2.5	"	2.5-3.0	"	"	3.0-3.5	"	"	"		
(C) n separation												
(D) I	10	10	10	10	10	11.3	3	3	3	5		
(E) Vdc (avg)	334.7	349	96.2	380	104.5	47.2	302	72.7	29.85	26.0		
(F) DCcal						.980	.900					
(G) Kn x 10^{-3} x.900 too high	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρdc=ExFxGx10^3/D	13645	14147	15652	15451	16956	18461	408|136	39313	40334	42140		
(I) Vac Σ	323.5	339	93.0	366	101.8	45.8?	292	70.4	29.0	25.1		
(J) AC noise x 2												
(K) Vac(corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .914												
(M) ρ dc/ρac=ExL/K	1.018	1.013	1.018	1.022	1.010	1.014	1.018	1.016	1.013	1.019		
(N) PFE=(M-1)(10^2)	13	9	12	14	6	8	4	1.6	1.3	1.9		
(O) MCF=(M-1)(10^5)/H	40	28	35	43	18	23	13	4|12	3 10	5 14		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	45	34	23	12	45	34	23	12		cal		
(B) Receive	3.5-4.0	"	"	"	4.0-4.5	"	"	"				
(C) n separation												
(D) I	3	3	5	7	5	5	7	7		1		
(E) Vdc (avg)	75.5	26.9	22.5	18.47	49.1	21.25	16.4	10.05		113.5		
(F) DCcal												
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5	252				
(H) ρ dc=ExFxGx10^3/D	408|136	36321	36522	37425	39413	34415	33211	32709				
(I) Vac Σ	72.7	25.9	21.7	17.8	47.4	20.4	15.8	9.73		111.2		
(J) AC noise x 2												
(K) Vac (corr) =$\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.022	1.022	1.020	1.021	1.019	1.025	1.021	1.020				
(N) PFE=(M-1)(10^2)	5	6	5	6	5	7	6	6				
(O) MCF=(M-1)(10^5)/H	16	18	16	17	14	22	19	18				

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project APC Line 5-A 5½ Field date 8-9-67 Data page_____ Comp. date 8-10-67 Comp by KH

(A) Send	45	34	45	23	34	45	12	23	34	45		
(B) Receive	1.5N-1.0	1.0-0.5	—	.5-0	—	—	0-0.5S	—	—	—		
(C) n separation												
(D) I	7	10	7	10	10	4	9	10	10	8		
(E) Vdc (avg)	237.6	337	67.4	359	85.35	33.55	311.25	84.0	32.9	18.7		
(F) DCcal .900 X3 too high												
(G) Kn x 10^{-3}	4.5	4.5	18	4.5	18	45	4.5	18	45	90		
(H) ρdc=ExFxGx10^3/D	13746	13645	15652	14348	13746	17057	14047	13645	15351	18963		
(I) Vac Σ	231	323	65.45	343	81.75	32.65	300	81.5	36.4	18.0		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal. .984												
(M) ρdc/ρac=ExL/K	1.012	1.027	1.013	1.016	1.027	1.011	1.021	1.026	1.025	1.022		
(N) PFE=(M-1)(10^2)	1.2	2.7	1.3	1.6	2.7	1.1	2.1	2.6	2.5	2.2		
(O) MCF=(M-1)(10^5)/H	9	20	8	11	20	6	15	19	16	12		
	26	60	25	33	59	19	45	58	49	35		

Project_____ Line_____ Field date_____ Data page_____ Comp. date_____ Comp by_____

(A) Send	12	23	34	45	12	23	34	45		Cal		
(B) Receive	.5S-1.0S	—	—	—	1.0-1.5S	—	—	—				
(C) n separation												
(D) I	9	10	10	7	10	10	10	—				
(E) Vdc (avg)	78.1	32.2	20.15	9.85	38.6	20.03	10.03	—		111.25		
(F) DCcal .900												
(G) Kn x 10^{-3}	18	45	90	157.5	45	90	157.5					
(H) ρdc=ExFxGx10^3/D	16047	15150	16354	19966	15251	16254	14247					
(I) Vac Σ	76.9	36.6	19.6	9.55	36.45	19.4	9.73			109.5		
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρdc/ρac =ExL/K	1.012	1.017	1.012	1.016	1.015	1.016	1.014					
(N) PFE=(M-1)(10^2)	1.2	1.7	1.2	1.5	1.5	1.6	1.4					
(O) MCF=(M-1)(10^5)/H	8	11	7	8	10	10	9					
	26	34	22	23	29	30	30					

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT APC

LINE 5B HALF N SP. 2 DATE 8-15-8

PAGE

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	5-5.5	6.5-7.0		7.0-7.5			7.5-8.0			
RANGE	1000	1000	1000	1000	1000	1000	1000	100	100	100
DC 1	12	30	7	6	4	1.0	4	1.0	1.4	1.2
DC 2	10	20	2	-1	4	1.6	5	1.2	2.0	.8
DC 3	9	33	6	7	2	1.1	6	.7	1.6	1.2
DC 4	7	16	2	1	5	1.6	3	1.4	2.1	.7
DC 5	13	35	7	8	4	1.1	5	.6	1.5	1.2
DC 6	8	14	3	0	6	1.6	3	1.4	2.2	.7
DC 7	16			9	0			.7	1.4	1.2
DC 8	6 10			-2	6			1.4	2.2	.8
DC AVG.	336.125	823.66	179.5	137.5	107.875	48:13	156.33	47.55	63.8	37.475
AC 1	326	799	175	134	104	46.8	152	46.6	62.6	36.5
AC 2	326	799	175	134	104	46.8	151	46.1	62.4	36.5
AC AVG.	326	799	175	134	104	46.8	151.5	46.3	62.0	36.5
S.P.	-10	+45		-3			-12			
AC NOISE	<.1	.9	<.1	<.1			<.1			
POT RES.	21K	21K		1.5K				1.5K		

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PAGE

PROJECT ARC

LINE 5B HALF N SP. 2 DATE 8-15-9

SEND	45	34	23	12	45	34	23	12		Cal
RECEIVE	8-0-80				8.5-90					
RANGE	100	100	100	100	100	100	100	100		
DC 1	1.7	1.1	2.0	1.2	.5	.3	1.2	.6		
DC 2	3.5	1.0	1.5	1.3	1.2	.6	1.0	1.2		109.4
DC 3	1.7	1.6	2.2	1.0	.2	1.0	1.1	.9		109.6
DC 4	3.5	.6	1.4	1.0	1.4	.4	.6	.7		
DC 5	1.1	1.6	2.2	1.2	.2	.4	1.4	1.2		
DC 6	3.3	1.2	1.1	1.0	1.8	.1	1.0	.7		
DC 7	1.3	1.0	2.1	1.6	-.4	.6	1.6	1.2		
DC 8	3.4	1.6	1.3	.9	2.0	.6	.7	1.0		
DC AVG.	84.24	34.01	55.8	36.64	27.06	16.65	32.88	24.54		109.5
AC 1	81.8	32.8	54.1	35.5	26.2	16.1	31.8	23.6		107.5
AC 2	81.8	32.8	54.1	35.5	26.8	16.1	31.8	23.6		107.5
AC AVG.	81.8	32.8	54.1	35.5	26.5	16.1	31.8	23.6		107.5
S.P.	-14				+20					
AC NOISE	<.1				<.1					
POT RES.	2.5K				2.5K					

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT Apex

LINE 5B HALF S SP. 2 DATE 8-15-6?

PAGE

SEND	12	23	34	45	12	23	34	45		
RECEIVE	3,0,2,5				2.5 2.0					
RANGE	1800	100	10	10	100	100	10	10		
DC 1	8	2.4	.30	.18	1.8	.6	.26	.16		108.9
DC 2	3	1.4	.29	.21	1.6	1.1	.14	-.04		109.4
DC 3	7	2.4	.34	.22	1.8	.7	.20	.18		1090
DC 4	4	1.4	.28	.20	1.7	1.0	.09	.01		109.4
DC 5	6	2.4	.33	.15	1.9	.7	.28	.16		1090
DC 6	0	1.4	.32	.23	1.9	1.1	.06	-.06		1094
DC 7	6		.30	.09	2.2	.6	.23	.06 (2)		1090
DC 8	5		.32	.26	1.9	1.1				
DC AVG.	142.88	58.3	8.38	5.47	49.05	24.96	4.29	3.11		109.2
AC 1	138	56.4	8.07	5.28	47.2	24.1	4.11	3.04		107.1
AC 2	138	56.4	8.07	5.26	47.5	24.1	4.10	3.01		1027
AC AVG.				5.27	47.35		4.105	3.025		107.7
S.P.	-3				0					
AC NOISE	1				2M					
POT RES.	850				680					

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE 5B HALF S SP. 2 DATE 8-15-

PAGE

SEND	45	34	45	23	34	45	12	23	34	45
RECEIVE	5-45	4.5-4.0	—	4.0-35	—	—	35-30	—	—	—
RANGE	1000	1000	100	1000	100	100	1000	1000	100	100
DC 1	5	4	1.0	27	2.0	.5	28	6	1.4	.6
DC 2	1	5	1.6	31	1.7	.8	37	14	.7	.4
DC 3	9	5	.6	29	1.9	.5	27	4	1.5	.4
DC 4	4	4	2.1	32	1.6	.8	34	12	.6	.2
DC 5	-2	4	.3	24	1.8	.5	30	8	1.8	.6
DC 6	7	7	2.6	35	1.7	.9	35	13	.4	.2
DC 7	-1	7	-.1	24	1.9	.4	30	7	1.8	.7
DC 8	9	6	2.8	35	1.7	.9	34	15	.3	.2
DC AVG.	161.0	114.63	35.26	881.63	50.59	20.06	31.88	277.88	29.36	15.86
AC 1	157	110	33.9	852	48.8	19.4	917	268	28.3	15.4
AC 2	157	110	33.9	852	48.8	19.4	917	268	28.3	15.3
AC AVG.										15.35
S.P.	+8	+8	—	-9	—	—	-19	—	—	—
AC NOISE	7.1	>.2	—	>.2	—	—	~.1	—	—	—
POT RES.	600	115	—	1.5	—	—	1.6K	—	—	—

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APL

LINE 56 HALF N SP. 1 DATE 8/15/67

PAGE

SEND	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2
RECEIVE	5-5.5	5.5-6	→	6-6.5	→	→	6.5-7	→	→	→
RANGE	400	400	500	500	400	500	600	500	400	500
VOLTAGE	256	244	408	396	244	408	440	392	244	404
CURRENT	3A	5A	5A	1A	5A	5A	1A	1A	5A	5A
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2	Cal	
RECEIVE	7-7.5	→	→	→	7.5-8	→	→	→		
RANGE	600	500	400	500	600	500	400	500	800	
VOLTAGE	432	392	244	400	432	388	240	400	600†	
CURRENT	1A	1A	5A	5A	1A	1A	5A	5A	1A	

FREQUENCIES 1.0 .05

SENDER NO. Mk 3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR Henson

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE S6 HALF S SP. 1 DATE 8/14/69

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	5-4.5	4.5-4	→	4-3.5	→	→	3.5-3	→	→	→
RANGE	600	500	600	400	500	500	500	300	500	500
VOLTAGE	416	380	416	232	372	412	388	232	372	412
CURRENT	1A	1A	1A	5A	1A	1A	5A	5A	1A	1A
SEND	1-2	2-3	3-4	4-5	1-2	2-3	3-4	4-5	Cal	
RECEIVE	3-2.5	→	→	→	2.5-2	→	→	→		
RANGE	500	300	500	500	500	300	500	500	200	
VOLTAGE	376	228	368	408	376	232	360	408	96	
CURRENT	5A	5A	1A	1A	5A	5A	1A	1A	1A	

FREQUENCIES 1.0 .05

SENDER NO. Mk 3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR Henson

COMMENTS:

4-5 - 800 - 1

3-4 - 500 - 1

2-3 - 300 - 5

1-2 - 500 - 5

HEINRICHS GEOEXPLORATION COMPANY

INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project A.P.C. Line 5-B N1/2 Field date 8-15-67 Data page_____ Comp. date_____. Comp by HRM (C.S.L.)

(A) Send	1-2	2-3	1-2	3-4	2-3	1-2	4-5	3-4	2-3	1-2		
(B) Receive	5-5.5	5.5-6	→	6-6.5	→	→	6.5-7	→	→	→		
(C) n separation												
(D) I	3A	5A	5A	1A	5A	5A	1A	1A	5A	5A		
(E) Vdc (avg)	336	824	179.5	137.5	107.9	48.1	156.3	47.6	63.8	37.5		
(F) DCcal	.913	→	→	→	→	→	→	→	→	→		
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	153	226	197	188	118	132	214	261	175	205		
(I) Vac Σ	326	799	175	134	104	46.8	151.5	46.3	62.0	36.5		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.982	→	→	→	→	→	→	→	→	→		
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)	1.2	1.3	0.7	0.8	1.3	0.9	1.3	1.0	1.1	0.9		
(O) MCF=(M-1)(10^5)/H	8	6	4	4	11	7	6	4	6	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	1-2	CAL			
(B) Receive	7-7.5	→	→	→	7.5-8	→	→	→				
(C) n separation												
(D) I	1	1	5	5	1	1	5	5	1			
(E) Vdc (avg)	84.2	34.0	55.8	36.6	22.1	16.65	32.9	24.5	109.5			
(F) DCcal	→	→	→	→	→	→	→	→	.913→			
(G) Kn x 10^{-3}	6	15	30	52.5	15	30	52.5	84				
(H) ρ dc=ExFxGx10^3/D	461	466	306	351	371	456	315	376				
(I) Vac Σ	81.8	32.8	54.1	35.5	26.5	16.10	31.8	23.6	107.5			
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	→	→	→	→	→	→	→	→	.982			
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)	1.1	1.8	1.3	1.2	0.4	1.6	1.6	1.9				
(O) MCF=(M-1)(10^5)/H	2	4	4	3	1	4	5	5				

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page _____

Project APC Line 4-B-5½ Field date 8-15-67 Data page _____ Comp. date 8/19/67 . Comp by C.S.L.

(A) Send	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5		
(B) Receive												
(C) n separation												
(D) I	1	1	1	5	1	1	5	5	1	1		
(E) Vdc (avg)	161.0	114.6	35.3	882	50.6	20.06	949	278	29.4	15.86		
(F) DCcal	.916											
(G) Kn x 10^{-3}	1.5	1.5	6	1.5	6	15	1.5	6	15	30		
(H) ρ dc=ExFxGx10^3/D	221	157	194	242	278	276	261	306	404	436		
(I) Vac Σ	157.0	110.0	33.9	852	48.8	19.40	917	268	28.3	15.35		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.	.986											
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10^2)	1.1	2.7	2.7	2.1	2.2	2.0	2.0	2.3	2.4	1.9		
(O) MCF=(M-1)(10^5)/H	5	17	14	9	8	7	8	8	6	4		

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												
(C) n separation												
(D) I	5	5	1	1	5	5	1	1		1000		
(E) Vdc (avg)	142.9	58.3	8.78	5.47	49.1	25.0	4.29	3.11		109.2		
(F) DCcal										.916		
(G) Kn x 10^{-3}	6	15	70	52.5	15	70	52.5	84				
(H) ρ dc=ExFxGx10^3/D	157	160	230	269	135	137	206	239				
(I) Vac Σ	138.0	56.4	8.07	5.27	47.35	24.1	4.11	3.025		107.7		
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.										.986		
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)	2.1	1.9	2.4	2.3	2.2	2.3	2.9	1.4				
(O) MCF=(M-1)(10^5)/H	13	12	10	9	16	17	14	6				

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE Expand #HALF #2 SP. 1 DATE 8/17/6

PAGE

SEND	1	2	3	4	5	6	7	8	9	
RECEIVE	125-250	250-500	500-1000	750-1500	1000-2000	1500-3000	2000-4000	2500-5000	3000-6000	
RANGE	400	700	700	700	700	700	700	700	700	
VOLTAGE	264	484	488	432	482	428	424	480	412	
CURRENT	2A	4A	5A	6A	6A	7A	10A	6A	9A	
SEND	Cal									
RECEIVE										
RANGE	200									
VOLTAGE	120									
CURRENT	1A									

FREQUENCIES .10 .05 1.15

SENDER NO. 463

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR Henson

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT APC

LINE Exp 4 HALF #1 SP. 1 DATE 8 Aug

PAGE

SEND	1	2	3	4	5	6	7	8	9	
RECEIVE	125-250	250-500	500-1000	750-1500	1000-2000	1500-3000	2000-4000	2500-5000	3000-6000	
RANGE	400	700	700	400	700	700	700	700	700	
VOLTAGE	272	512	448	272	508	464	464	352	480	
CURRENT	3A	4A	4A	5A	9A	7A	9A	7A	8A	
SEND	Cal									
RECEIVE										
RANGE	200									
VOLTAGE	132									
CURRENT	1A									

FREQUENCIES 1.0 .05 & 1.5

SENDER NO. MK 3

OPERATOR Cruze

RECEIVER NO. Burr-Brown

OPERATOR Henson

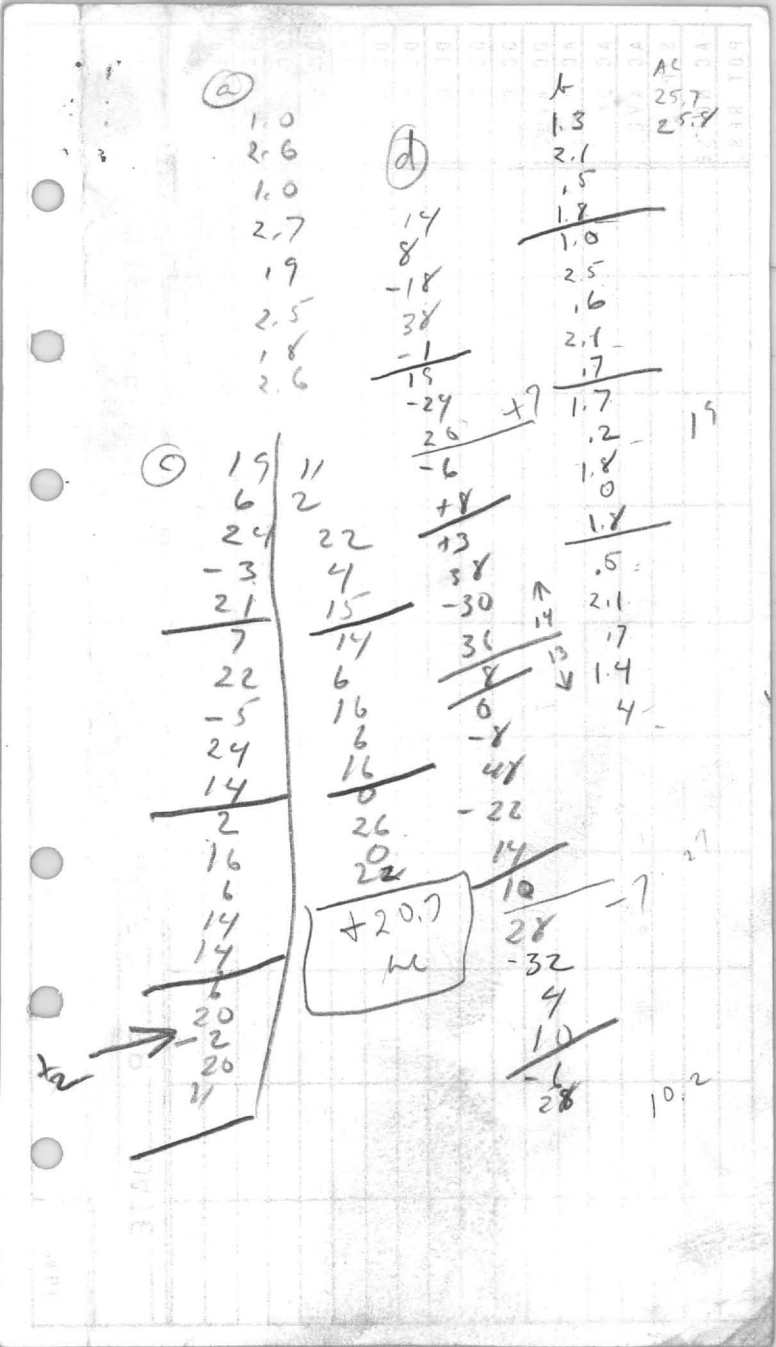
COMMENTS:

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT Expand 2
LINE ____ HALF ____ SP. ____ DATE 8-12

PAGE

SEND	1	2	3	4	5	6	7	8	9	cal
RECEIVE	125	250	500	750	1000	1500	2000	2500	3000	
RANGE	100	100	100	100	100	100			100	100
DC 1	3.2	2.0	1.0	2.2 | 2.0	1.0 | .8	1.5 | 1.7	2.0 | 3.3			.4
DC 2	1.4	4.4	2.6	1.4 | 1.6	1.7 | 1.9	.8 | .4	-.1 | -1.4			2.5
DC 3	3.1	1.9	1.0	2.2 | 2.3	.5 | .7	.6 | 1.5	2.1 | 3.9			.4
DC 4	1.2	4.4	2.8	1.7 | 1.4	1.7 | 2.0	1.6 | .7	.4 | -1.2			2.5
DC 5	3.2	2.0	.7	2.2	.6 | .5	1.1 | 1.1	2.2			
DC 6	1.2	4.6	2.8	1.4	1.9 | 2.0	2.0 | 1.7	3			
DC 7	3.5	1.9	1.3	2.3	.8 | .4	1.1 | 1.4	2.6	20.0		
DC 8	1.4	4.6	2.9	1.7	2.0 | 2.2	1.3 | .8	-.8	d		
DC AVG.	88.0	89.4	54.1	42.1	30.4	26.7 | 26.9	21.91 | 21.86	19.63 | 19.75	21.9 | 21.84	97.05
AC 1	86.2	86.2	52.3	40.2	29.1	25.5	20.9	19.0	20.6	95.5
AC 2	86.2	86.2	52.3	40.2	29.3	25.7	20.7	19.0	20.6	95.6
AC AVG.	86.2	86.2	52.3	40.2	29.2	25.6 | 25.75	20.8 | 20.7	19.0	20.6	95.6
S.P.	+12	+15	+7	+14	+9	+3	+6	+9		*
AC NOISE	~.1	~.1	~.2	~.1	.1-.2	.1-.2+	.2	~.5-1.5	.5-1	
POT RES.	800	900	900	700	1100	900	1100	1500	1.5K	



(a)

1.0
2.6
1.0
2.7
.9
2.5
.8
2.6

(d)

14
8
-18
38
-1
19
-24
20
-6
+8
+3
38
-30
36
8
0
-8
48
-22
14
10
28
-32
4
10
-6
28

+7

b

1.3
2.1
.5
1.8
1.0
2.5
.6
2.1
.7
1.7
.2
1.8
0
1.8
.5
2.1
.7
1.4
4

AC
25.7
25.8

19

(c)

19
6
24
-3
21
7
22
-5
24
14
2
16
6
14
14
6
20
-2
20
11

11
2
22
4
15
14
6
16
6
16
0
26
0
22

+20.7
ac

+2

-7

2.7

10.2

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PROJECT APC
LINE Exp I HALF ____ SP. ____ DATE ____

PAGE

SEND	1	2	3	4	5	6	7	8	9	cal
RECEIVE	225	250	500	750	1000	1500	2500	2500	3000	
RANGE	10	100	100	100	100	100				
DC 1	1.0	.3	2.6	2.2	.6	1.1				.7
DC 2	1.1	1.2	1.9	1.1	1.6	1.2				2.2
DC 3	1.0	.6	2.6	2.7	.3	2.4				.7
DC 4	1.1	1.2	1.8	1.1	2.0	.3				2.2
DC 5	1.1	.6	2.4	2.6	1.2	1.4				2.5
DC 6		1.0	1.6	.8	1.9	.4				1.45
DC 7		.4	2.3	3.1	.8 (b)	1.3				
DC 8		1.1	1.7	.7 (a)	1.7	.6 (c)	d	e	f	
DC AVG.	39.45	26.5	44.3	41.6 41.8	46.1	33.3	35.4	17.47	14.486	97.45
AC 1	38.4	25.7	42.2	44.0	45.3	31.4	33.0	16.0	13.4	96.0
AC 2	38.4	25.7	42.1	44.2	45.5	31.4	33.2	16.0	13.4	96.0
AC AVG.	38.4	25.7	42.15	44.1 44.2	45.4	31.4	33.1	16.0	13.4	96.0
S.P.	-8	0	-6	-11	+6	+23	+2	+17	+13	
AC NOISE	<.1	<.1	<.1	<.1	<.1	~.5 MV	~.4	~.4	~.4	
POT RES.	1.2K	900	750	2K	9K	3.2K	1.5K	2.5K	2.5K	

E4 #5

(a)

.8
2.7
.6
2.8
.6
2.4
9
2.2

44.2
44.2

(b)

45.5
45.7

2.0 2.6 2.4
2.6 3.4 1.9
2.9 2.0 3.4
2.9 2.2 2.2
3.4 1.9 3.1
3.1 1.6 .8
2.2 1.6 .2
2.4 .15

(c)

.15

1.5
2.2
2.2
4.0

AC

.15

15 .15

31/11 20 2/28
16 18 14 28
17 16 27 20
14 31 6/30 24
32 0/26 24 0
2/27 18 22 40/14
11 22 12 14
20 6 28/7 11
9 32/17 24 42
15 4
24

(D)

3.4 .4 1 8 2.2 1 8 2/36 16 18 12/34 10 24 23
.15
19 10 18 33 4 24/18 12 26 11 23 24/4 (26)
34 26 8 34/20 16 12 25 20/28 4 40 8
20 24 24 -4 54 -2/25 14 32 -2/38 2 34

d
20 20 22 26 22 24 20 25 22 26 26 22 25 28 24 24 26 18 24 28 23 25 24 26

e
6 22 8 20 4/26 6 24 8 22/12 22 9 16 14 19 14 18 18 16 14
10 12 12 14 16 14 11 14 12 20 12 8 11 10 11 10 12 12 24 6 26 7

f
10 14 -4 8 6/2 24 -8 24 22 22 -4 24 0 24 24 22 6/15 -1 31 -6
28 4 24 -12 26 -4 24 4/26 6 26 30 -10/20 0

N10°W-S10°E

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page ____

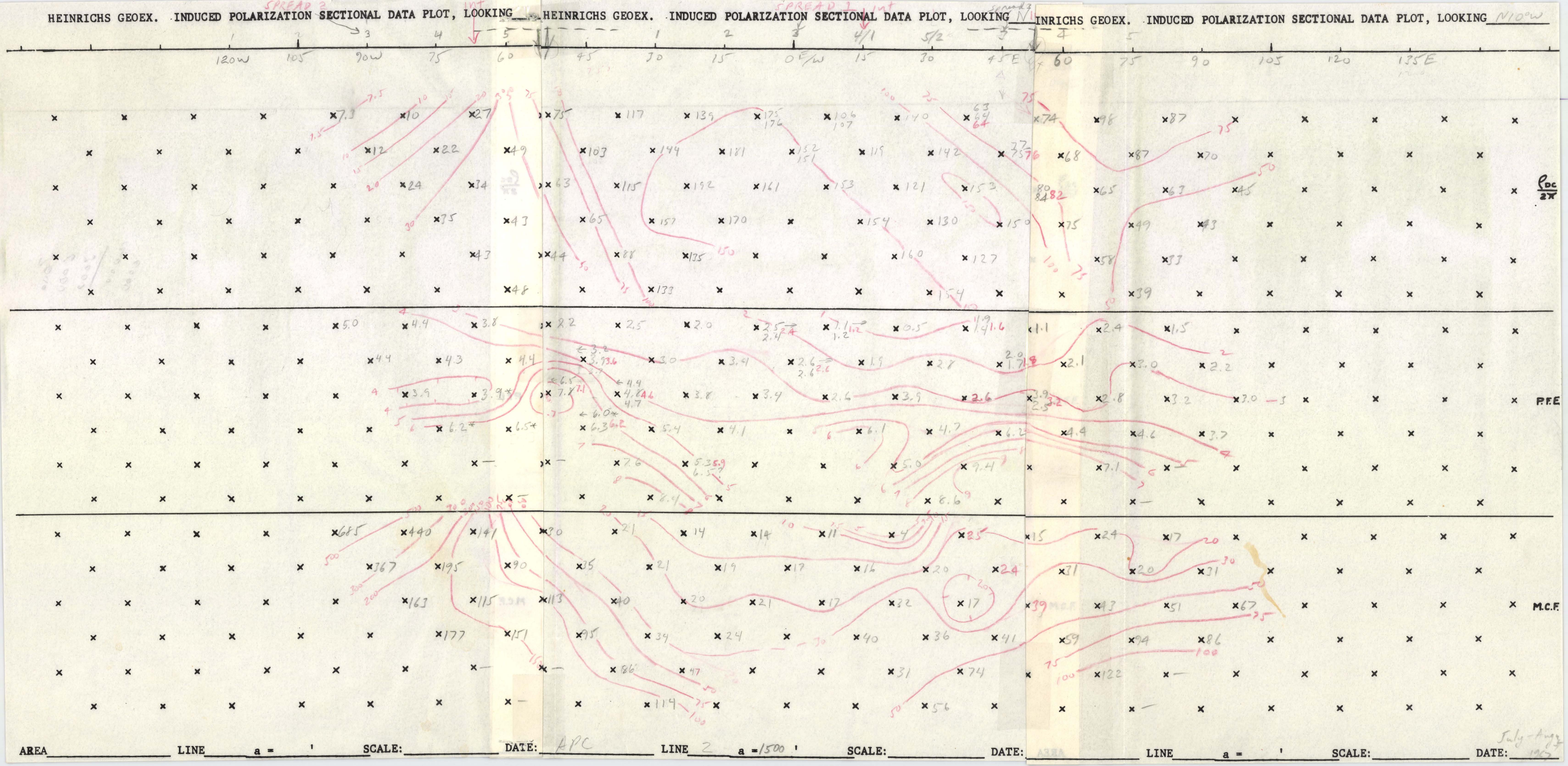
Project APC Line E expand Field date 8-17-67 Data page ____ Comp. date ____ Comp by KH

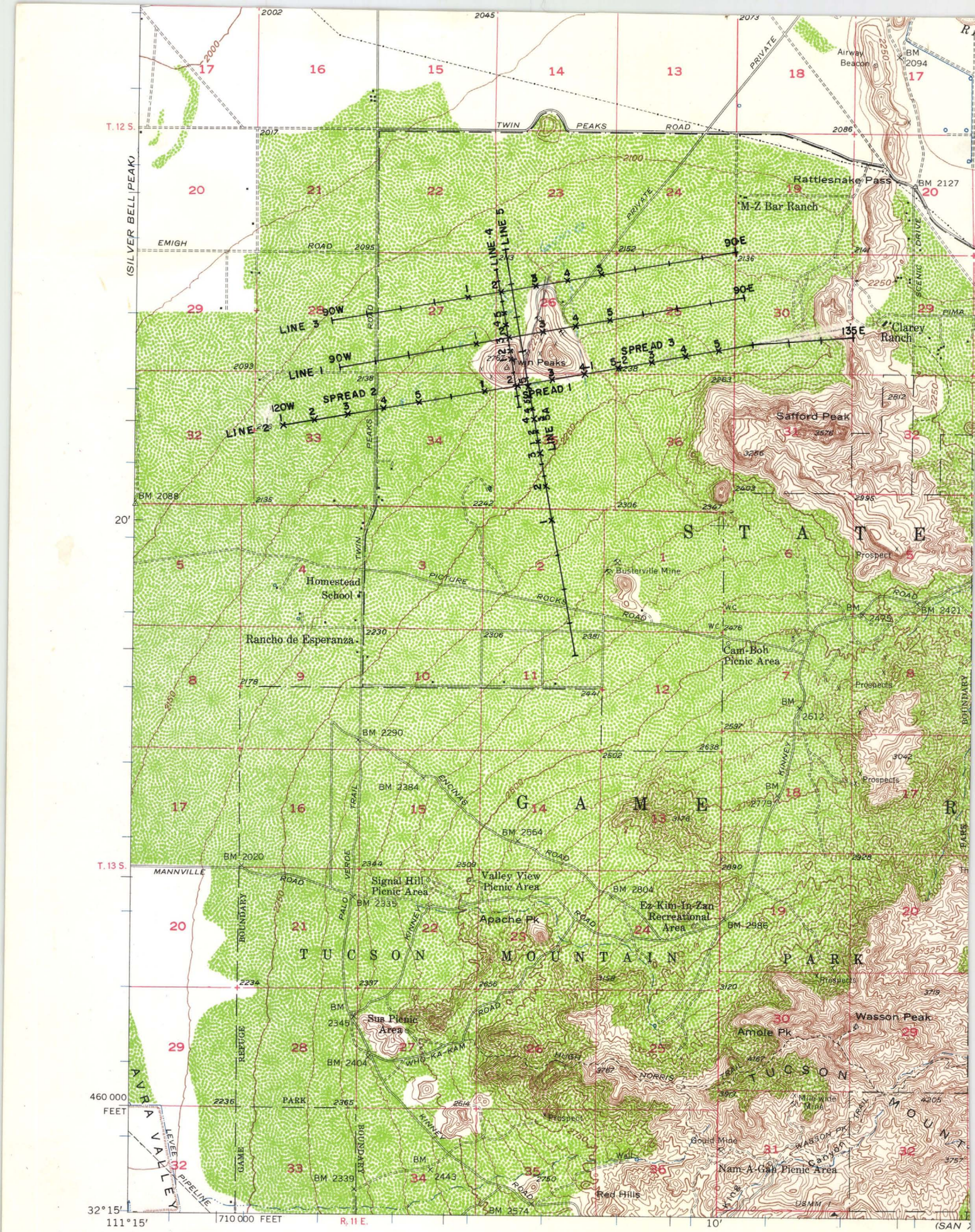
(A) Send	125	250	500	750	1000	1500	2000	2500	3000		Cal	
(B) Receive											*	
(C) n separation	2	—	—	—	—	—	—	—	—			
(D) I	2	4	5	6	6	7	6	6	9		1	
(E) Vdc (avg)	88.0	89.4	54.1	42.1	30.4	26.7 | 26.9	21.91 | 21.86	17.63 | 17.75	21.71 | 21.74		97.05	
(F) DCcal 1.030	—	—	—	—	—	—	—	—	—			
(G) Kn x 10^{-3}	1½	3	6	9	12	18	24	30	36			
(H) ρdc=ExFxGx10^3/D	67	69	67	65	63	71	90	101	90			
(I) Vac Σ	86.2	86.2	52.3	40.2	29.2	25.6 | 25.5	20.8 | 20.7	19.0	20.6		95.6	
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$	0.5	2.1	1.9	3.0	2.4	2.6	3.4	3.1	3.1	PFE	Corr	
(L) AC-DC cal. .985	—	—	—	—	—	—	—	—	—			
(M) ρdc/ρac=ExL/K PFE	0.5	2.1	1.9	3.1	2.5	2.8 | 2.9	3.7 | 4.0	1.8 | 2.2	4.7 | 4.4			
(N) PFE=(M-1)(10^2)	.0095.0	.0186.0	.0378	.0586.5	.0779.11	.110.29	.131.47	.158.77	.196 1.44			
(O) MCF=(M-1)(10^5)/H Corr	7	30	28	46	34	37	38	31	34			

* * *

Project ____ Line W Expand Field date 8-16-67 Data page ____ Comp. date ____ Comp by KH

(A) Send a	125	250	500	750	1000	1500	2000	2500	3000		Cal	
(B) Receive												
(C) n separation	2	—	—	—	—	—	—	—	—			
(D) I	3	4	4	5	9	7	9	7	8		1000	
(E) Vdc (avg)	39.45	26.5	44.3	45.6 | 45.8	47.34	33.3	25.4	17.47	14.49		97.45	
(F) DCcal	1.5	3	6	9	12	18	24	30	36		1.026	
(G) Kn x 10^{-3}	1.026	—	—	—	—	—	—	—	—			
(H) ρdc=ExFxGx10^3/D	20	20	68	84	65	88	97	77	67			
(I) Vac Σ	38.4	25.7	42.15	44.1 | 44.2	45.6	31.4	33.1	16.0	13.4		96.0	
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$	1.2	1.6	3.5	2.0	2.2	4.3	4.9	6.4	4.2	PFE Corr		
(L) AC-DC cal.	.985	—	—	—	—	—	—	—	—		.985	
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10^2)	1.2	1.6	3.5	1.92 2.1	2.3	4.5	5.3	7.5	6.5			
(O) MCF=(M-1)(10^5)/H	60	80	51	24	35	51	55	97	97			


HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING
HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N10°W
SPREAD 2
INT
SPREAD 1
INT
120W
105
90W
75
60
45
30
15
0E/W
15
30
45E
60
75
90
105
120
135E
P.F.E.
M.C.F.
AREA
LINE
a =
SCALE:
DATE:
APC
LINE 2
a = 1500 '
SCALE:
DATE:
LINE
a =
SCALE:
DATE:
July-Aug.



Mapped, edited, and published by the Geological Survey

Control by USGS, and USC&GS

Topography by planetable surveys 1946
Culture revised from aerial photographs taken 1954
Field check 1957

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Not used in rpt APC

APPROXIMATE MEAN DECLINATION, 1957

CONTOU
DATUM

FOR SALE BY U. S. GEOLOGICAL SURVEY,
A FOLDER DESCRIBING TOPOGRAPHIC

Nov 19, 1969

~~Jack Brooks~~

Jack Joyce — Calif Portland

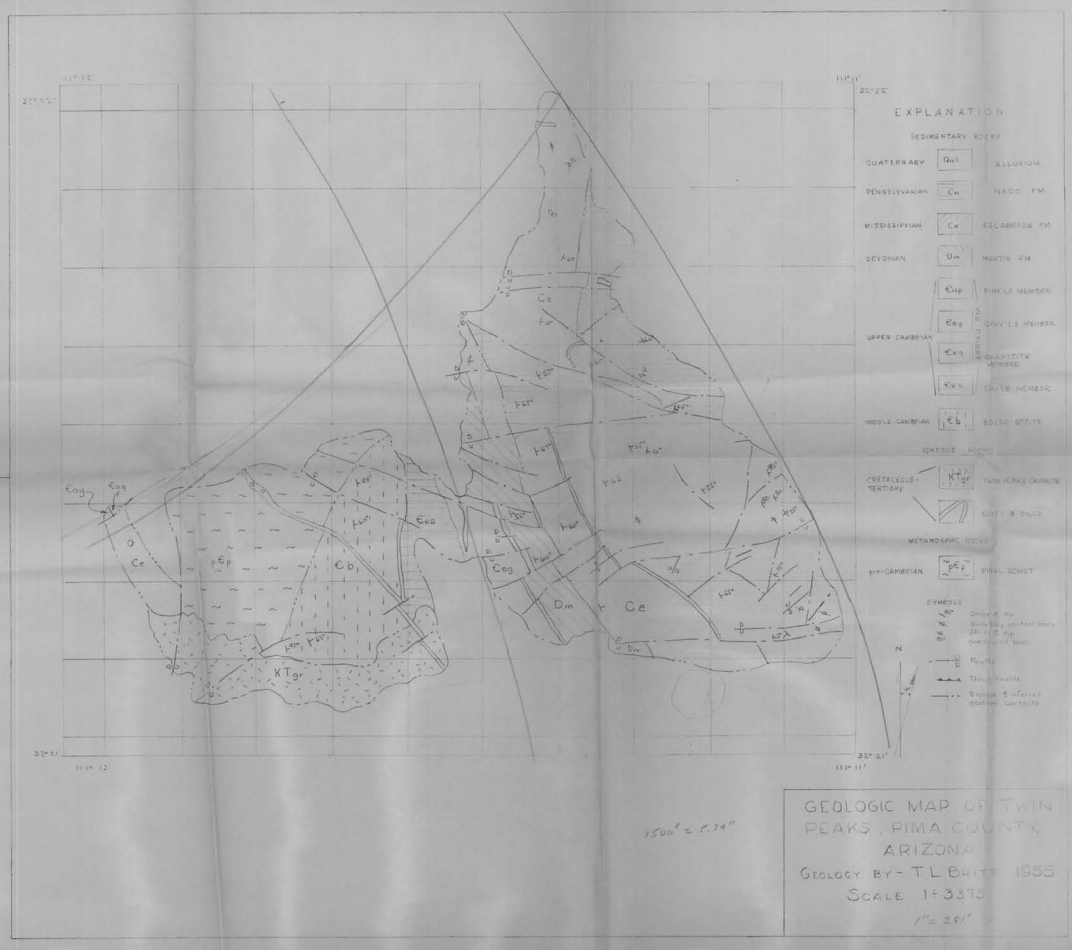
Approved — get equipment

grad geol - surveyor -

Depth of overburden

Thursday Boring.

Oscar Palmer — Electra Tech


EXPLANATION
SEDIMENTARY ROCKS
QUATERNARY
Qal
ALLUVIUM
PENNSYLVANIAN
Cn
NACO FM
MISSISSIPPIAN
Ce
ESCABROSA FM
DEVONIAN
Dm
MARTIN FM
UPPER CAMBRIAN
Ꞓap
PINKLE MEMBER
Ꞓeg
GRAVEL MEMBER
Ꞓeq
QUARTZITE MEMBER
Ꞓes
SHALE MEMBER
MIDDLE CAMBRIAN
Ꞓb
BOLSA QTZITE
IGNEOUS ROCKS
CRETACEOUS-TERTIARY
KTgr
TWIN PEAKS GRANITE
DIKES & SILLS
METAMORPHIC ROCKS
pre-CAMBRIAN
pꞒp
PINAL SCHIST
SYMBOLS
Faults
Thrust Faults
Exposed & inferred geology contacts
N
Ce
Ꞓap
Ꞓeg
Ꞓes
Ꞓb
pꞒp
KTgr
Dm
1500' = 5.34"
GEOLOGIC MAP OF TWIN PEAKS, PIMA COUNTY, ARIZONA
GEOLOGY BY - T.L. BRITT 1955
SCALE 1:3375
1" = 281'