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Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
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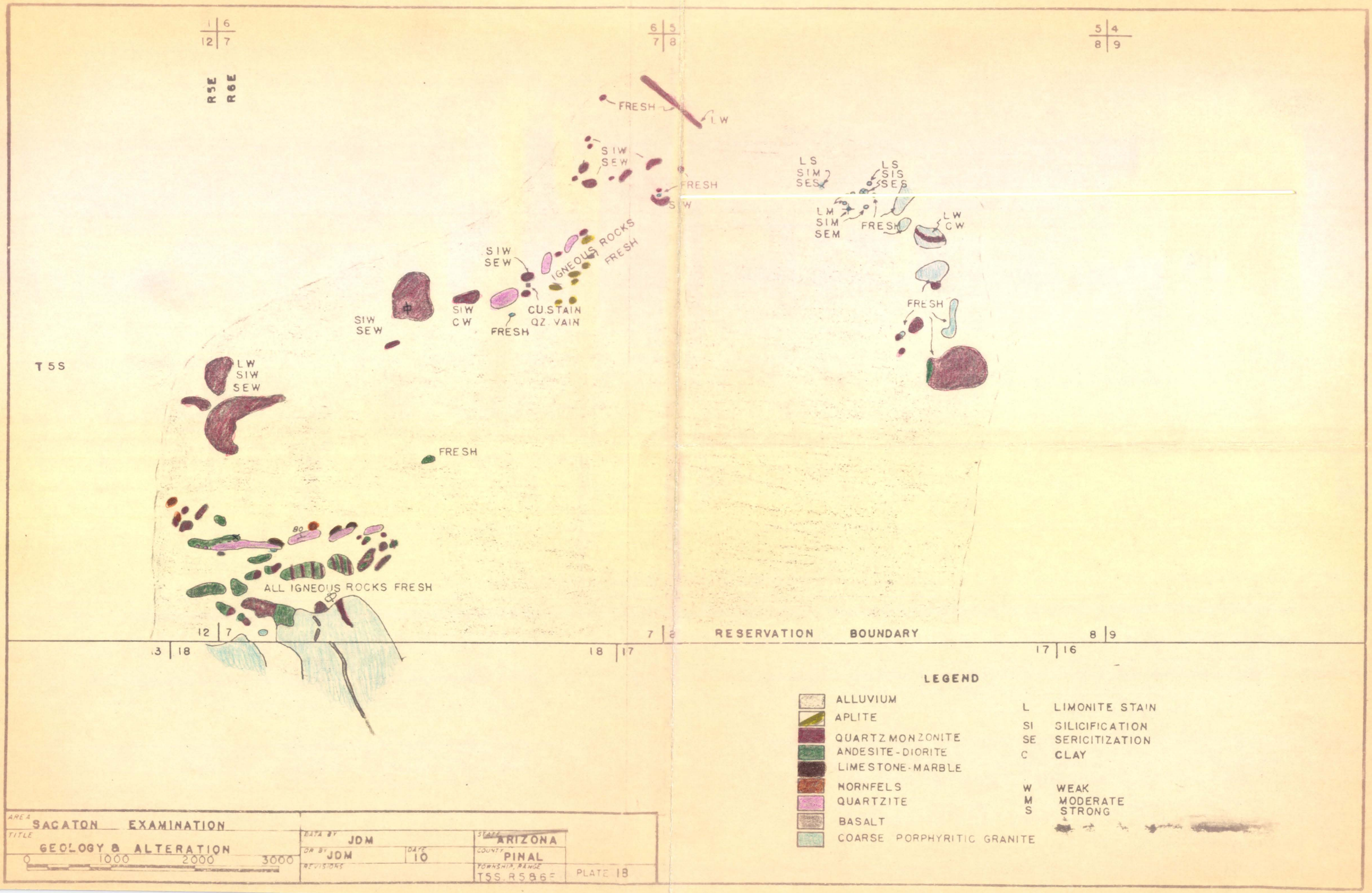
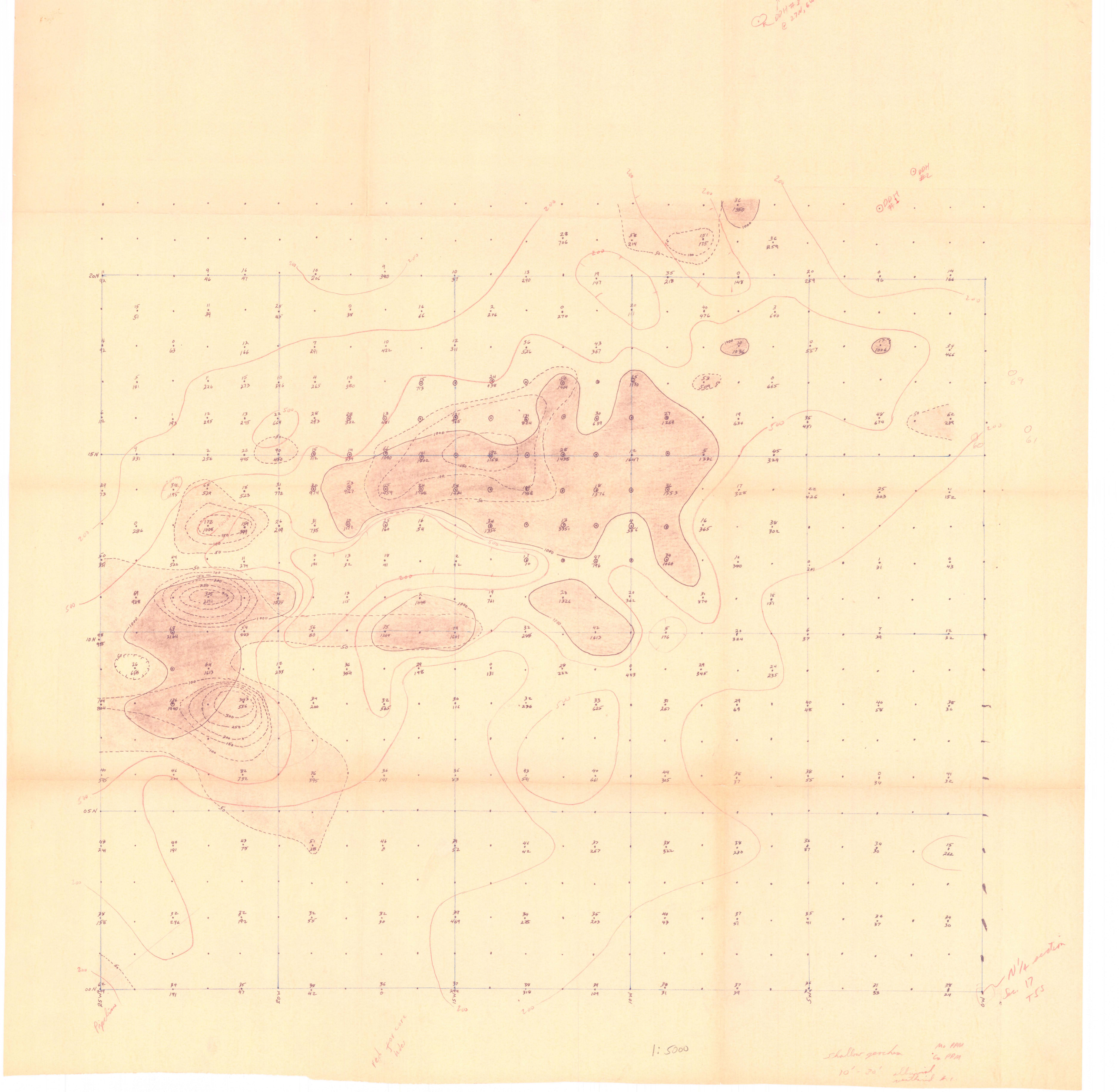
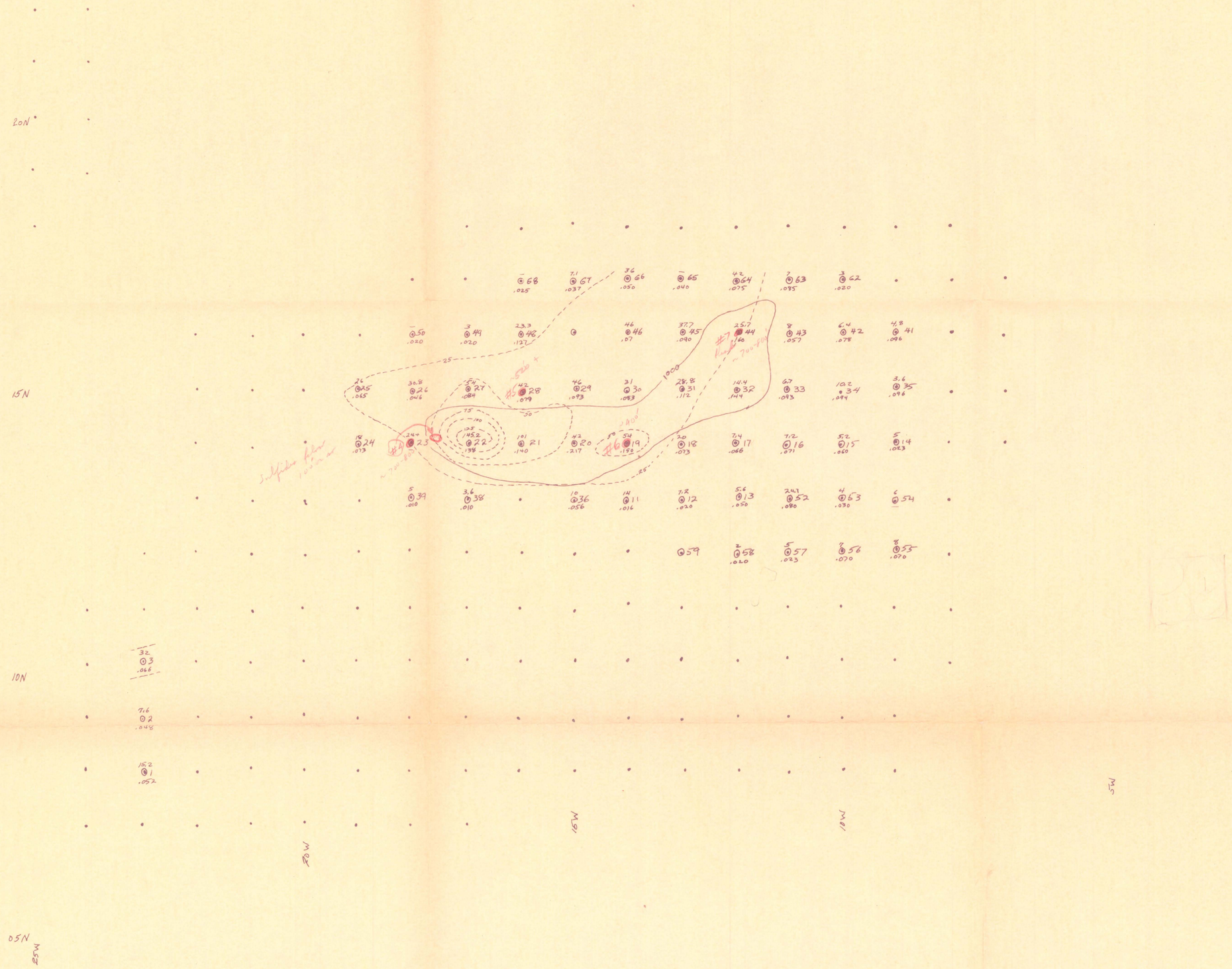

R5E
R6E
T5S
FRESH
LW
SIW
SEW
FRESH
SIW
LS
SIM
SES
LS
SIS
SES
LM
SIM
SEM
FRESH
LW
CW
SIW
SEW
IGNEOUS ROCKS
FRESH
SIW
SEW
SIW
CW
FRESH
CU STAIN
QZ. VAIN
FRESH
LW
SIW
SEW
FRESH
80
ALL IGNEOUS ROCKS FRESH
RESERVATION BOUNDARY
LEGEND
ALLUVIUM
APLITE
QUARTZ MONZONITE
ANDESITE-DIORITE
LIMESTONE-MARBLE
HORNFELS
QUARTZITE
BASALT
COARSE PORPHYRITIC GRANITE
L LIMONITE STAIN
SI SILICIFICATION
SE SERICITIZATION
C CLAY
W WEAK
M MODERATE
S STRONG
AREA SACATON EXAMINATION
TITLE GEOLOGY & ALTERATION
0 1000 2000 3000
DRAWN BY JDM
CHK BY JDM
DATE 10
REVISIONS
STATE ARIZONA
COUNTY PINAL
TOWNSHIP, RANGE T5S R5&6E
PLATE 18



DDH #3 @ 27N, 6W
DDH #2
DDH #1
20N
15N
10N
05N
00N
25W
20W
15W
10W
5W
0W
N 1/4 section Sec. 17 T5S
Pipeline
red for core holes
1:5000
shallow geochem
Mo PPM
Cu PPM
10' - 30' alluvial weathered b.c.



100m? grid spacing on drill holes

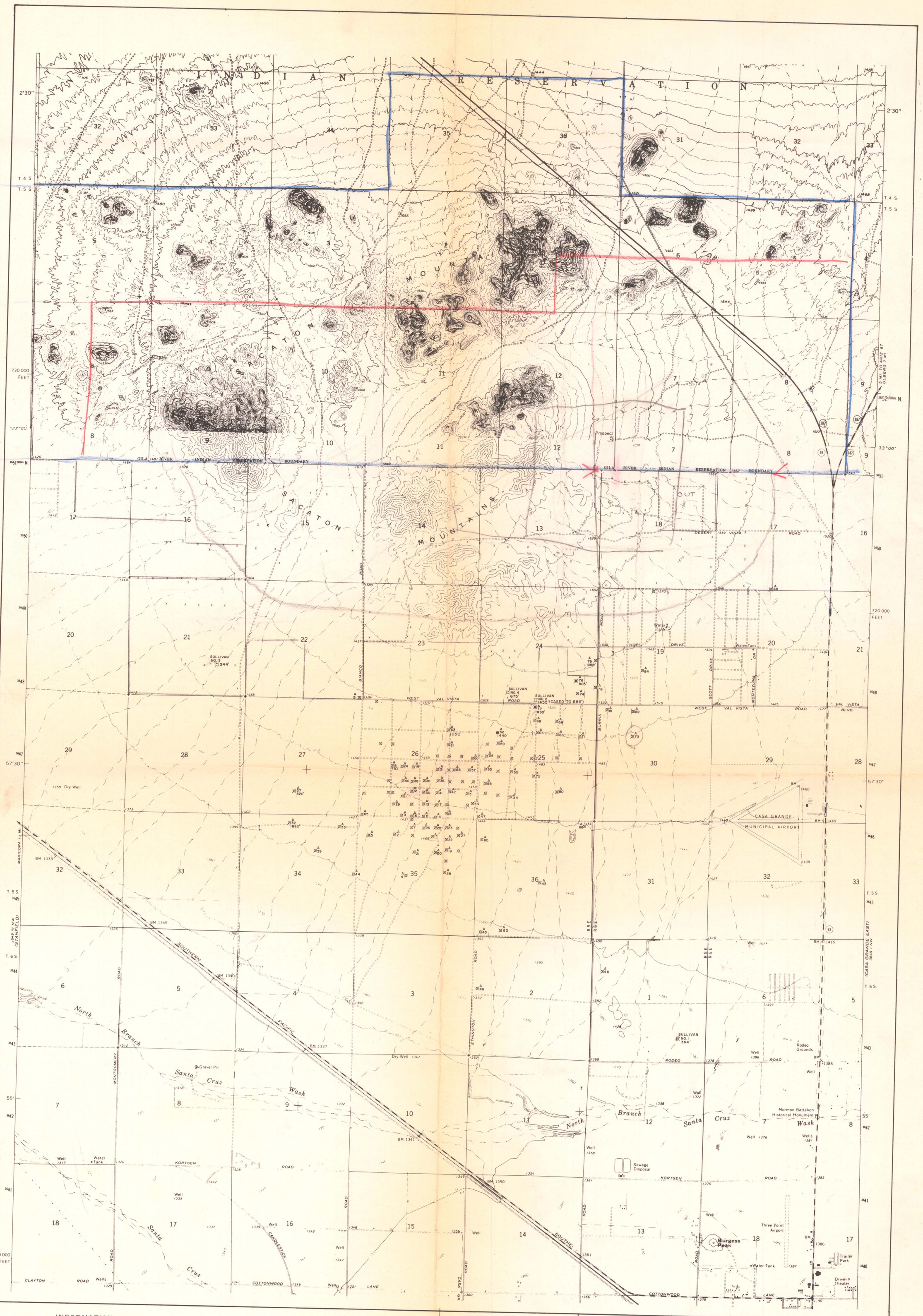
1:5000

~ ≈ 1" = 417'

Deep gerchen

Mo PPM

Cu% = (Cu TOTAL − Cu OX) avg below 100'



INFORMATION

- ⊠ A 28 / 620' — DENOTES DRILL HOLE SITE; A = A.S.&R.; 620' = TOTAL DEPTH; 28 = DRILL HOLE NUMBER
- ⊠ = DRILL HOLE LOCATION
- ■ = MINERALIZED DRILL HOLE
- ⌑ DENOTES DRILL HOLE FOR SULLIVAN
- x LOCATION PIT

1 CC @ 1800
40'-90

0°27' 8 MILS
15' 240 MILS
MAGNETIC NORTH DECLINATION

0 1/4 1/2 1 MILE

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

SCALE: 5.26" = 1 MILE	CONTOUR INTERVAL: 10'	REVISIONS
	DATA BY:	
DATE: NOV 5TH 1968	SHEET 2 OF 3	
DRAWN BY: RCM	DRAWING NO.: 100	FILE:

PROPERTY OF

JAMES SULLIVAN

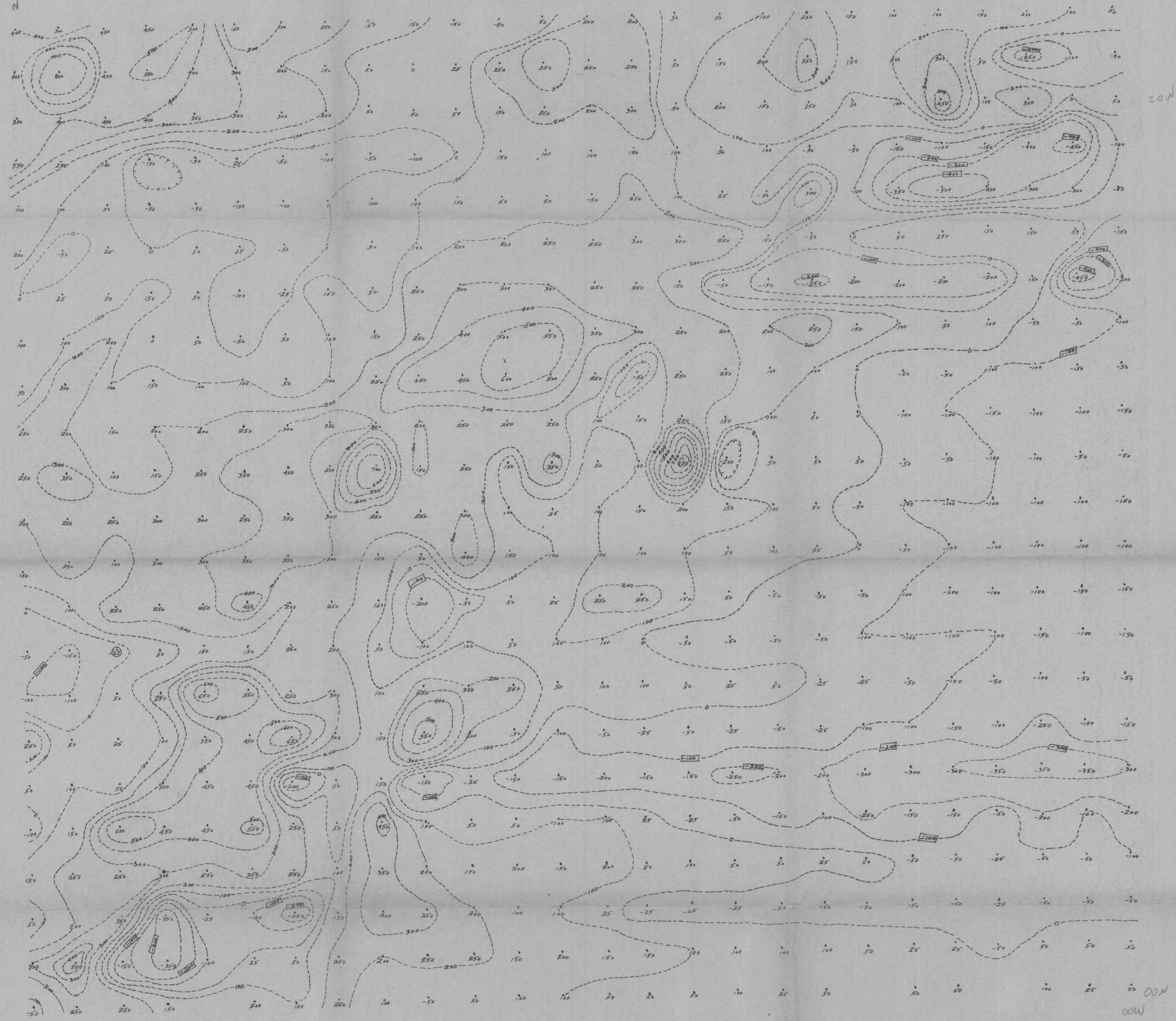
LOCATIONS

FOR

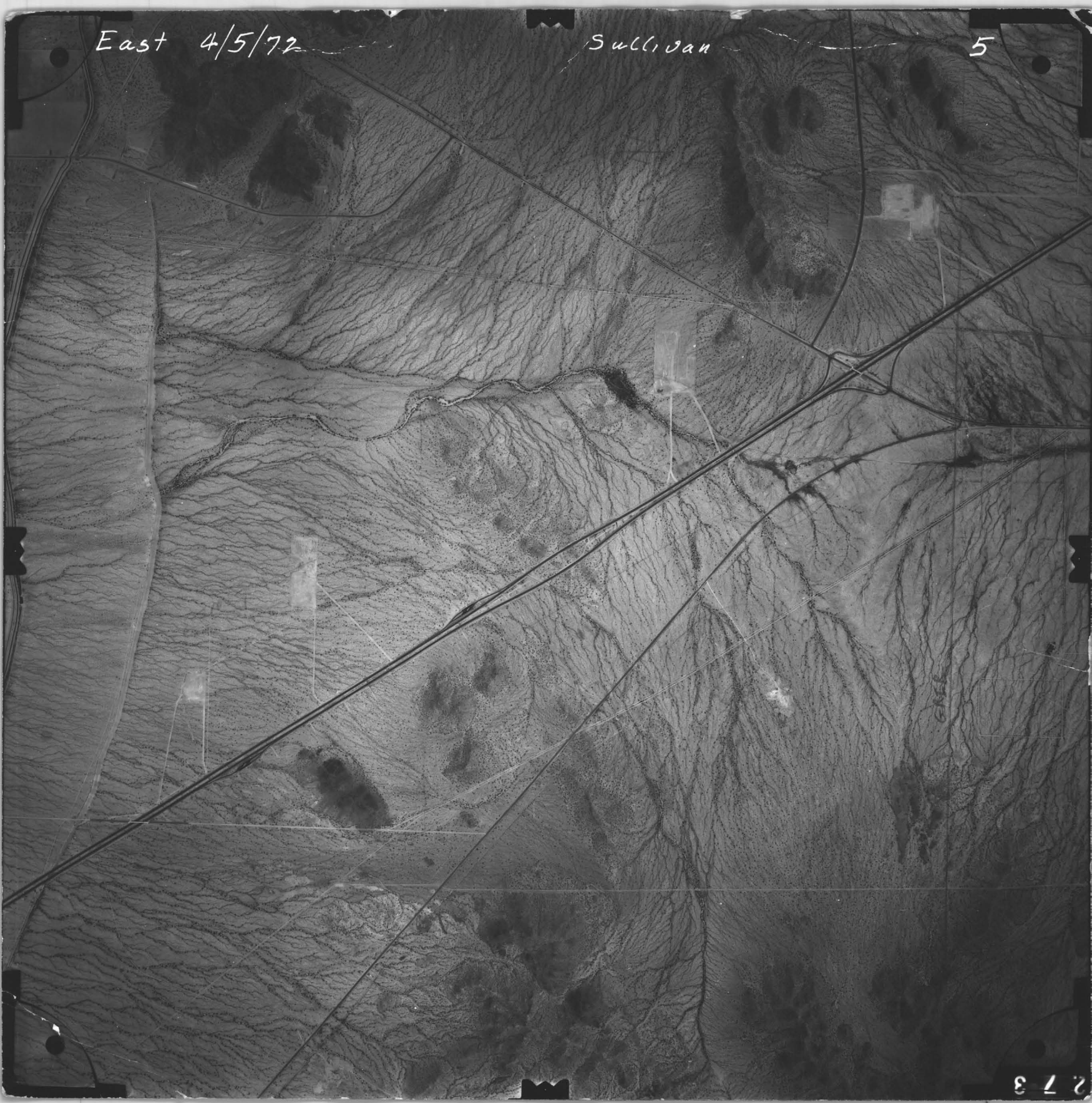
BASE MAP BY: J. SULLIVAN & CO.
P.O. BOX 3241
SCOTTSDALE, ARIZONA

INFORMATION: HEINRICHS GEOEXPLORATION CO.
P.O. BOX 5671
TUCSON, ARIZONA

SACATON PROJECT
CASA GRANDE
PINAL COUNTY, ARIZONA



Magnetics
? type
probably crude vertical


East 4/5/72
Sullivan
5
273

KENNEY AERIAL MAPPING INC.
1148 E. Indian School Rd.
Phoenix, Arizona 85014

Green is additional recommended coverage C.S.L. 5/10/72

S E R V A T I O N

2'30"

T. 4 S.

T. 5 S.

5 MI. TO ARIZ. 87
OLBERG 7 MI.

3652000m. N.

33°00'

etc as needed to completely define mineralization

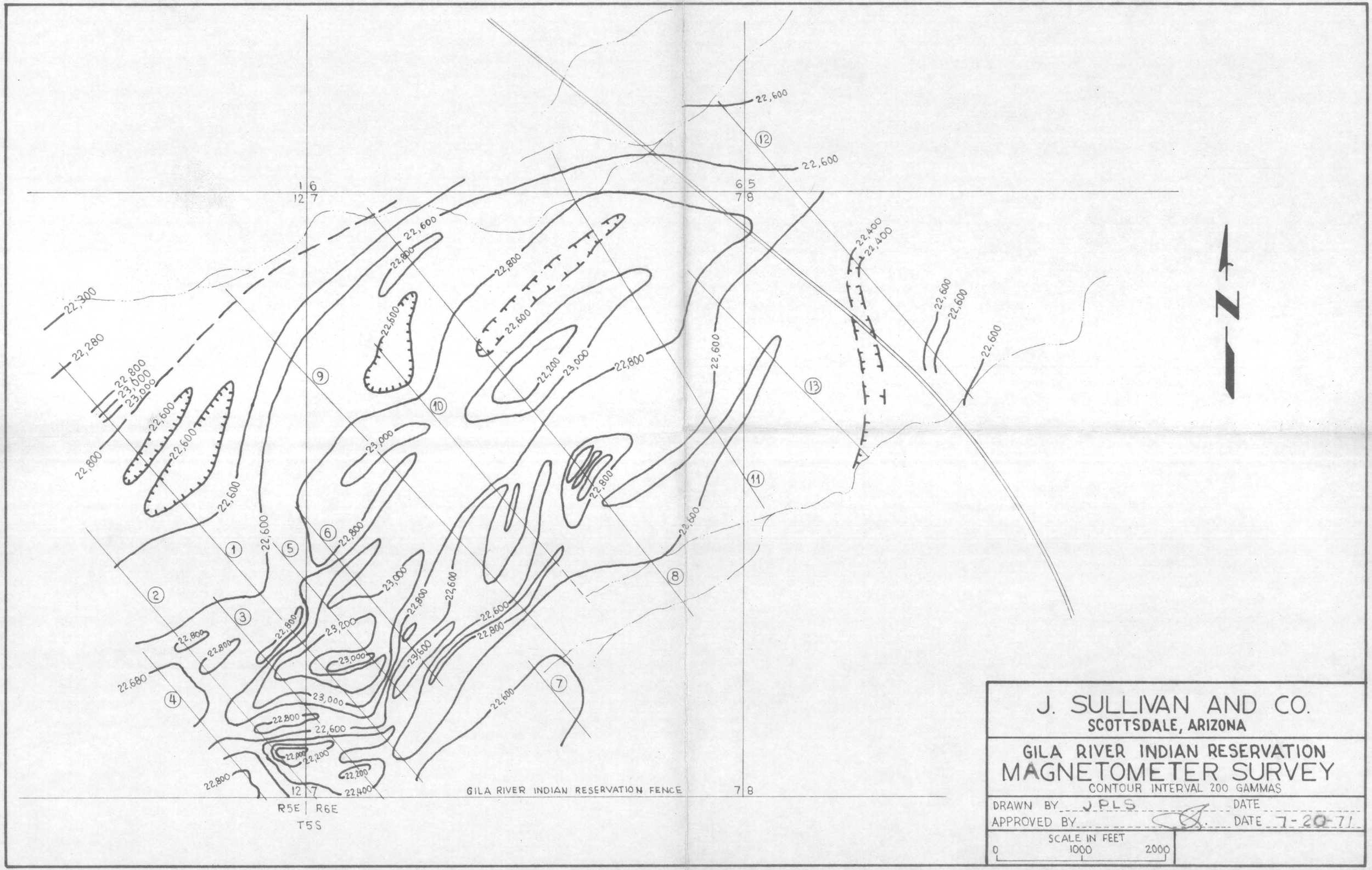
Prospect

GILA RIVER INDIAN RESERVATION BOUNDARY

Scale: 1"=1000'

A-8	186	174	172	170	168	166-A	M-6	M-5	M-4	M-3	M-2	M-1	263	262			
													265	264			
													267	266			
													269	268			
-1-14	A-1-13												271	270			
													261	260			
													259	258	273	272	
													257	256	275	274	

ROAD

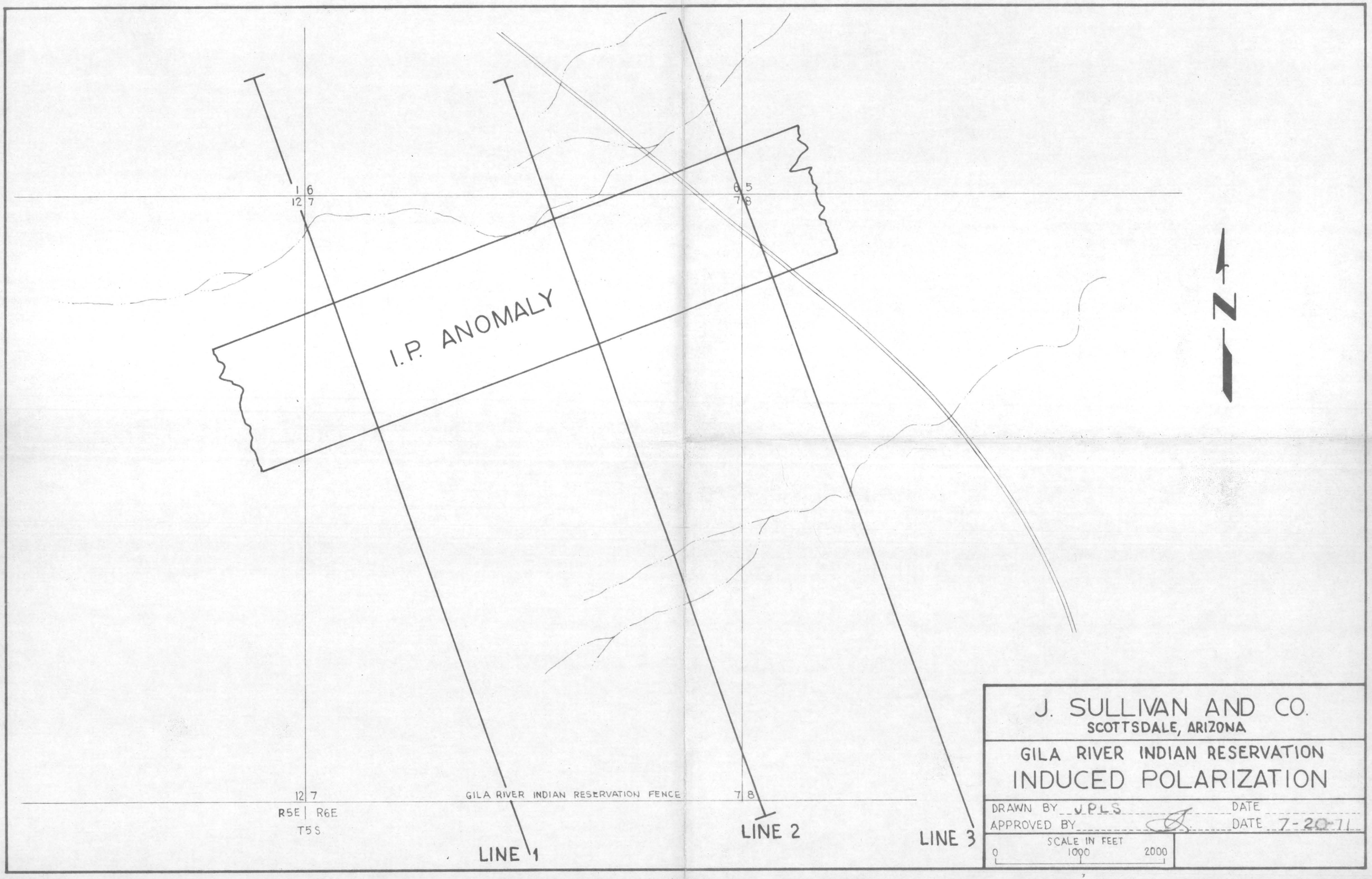


J. SULLIVAN AND CO.
SCOTTSDALE, ARIZONA

GILA RIVER INDIAN RESERVATION
MAGNETOMETER SURVEY
CONTOUR INTERVAL 200 GAMMAS

DRAWN BY J.P.L.S. DATE
APPROVED BY DATE 7-20-71

SCALE IN FEET
0 1000 2000


1 6
12 7
6 5
7 8
I.P. ANOMALY
N
12 7
GILA RIVER INDIAN RESERVATION FENCE
7 8
R5E | R6E
T5S
LINE 1
LINE 2
LINE 3
J. SULLIVAN AND CO.
SCOTTSDALE, ARIZONA
GILA RIVER INDIAN RESERVATION
INDUCED POLARIZATION
DRAWN BY J.P.L.S.
DATE
APPROVED BY
DATE 7-20-71
SCALE IN FEET
0
1000
2000

mining
geophysical surveys

2400 EAST GRANT ROAD - TUCSON, ARIZONA 85719
TELEPHONE - 602 326-8619

March 21, 1974

J. Sullivan and Co., Inc.
P.O. Box 3241
Scottsdale, Arizona 85257

Gentlemen:

Mr. Larry Loidolt has requested that we send you a copy of our Sacaton Project IP report done on behalf of U.S. Borax and Chemical Corp. The copy of the report and profiles are enclosed. We do not have copies of the plan map as the mylar originals were sent to U.S. Borax. Mr. Loidolt says he can supply you with a copy of the map.

Sincerely,

W. Gordon Wieduwilt
Geophysicist

cc: L. Loidolt, U.S. Borax

Enclosures

WGW/kan

INDUCED POLARIZATION AND

RESISTIVITY SURVEY

SACATON PROJECT

PINAL COUNTY, ARIZONA

FOR

U.S. BORAX & CHEMICAL CORP.

PROJECT 0324-B

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geophysical surveys

TABLE OF CONTENTS

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INTRODUCTION	1
SURVEY PROCEDURE	2
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ACCOMPANYING THIS REPORT:

1 PLAN MAP

5 PROFILES

1 INTERPRETATION

DISTRIBUTION:

Original & 2 copies: U.S. Borax & Chemical Corp.
P.O. Box 75128 Sanford Station
Los Angeles, California 90075
Attn: Mr. L. Loidolt

mining
geophysical surveys

INDUCED POLARIZATION AND
RESISTIVITY SURVEY
SACATON PROJECT
PINAL COUNTY, ARIZONA
FOR
U.S. BORAX & CHEMICAL CORP.

INTRODUCTION:

During the period of June 27 through July 9, 1973, an induced polarization and resistivity survey was performed on the titled property. The field survey was under the direction of Adam Sotelo, technician for Mining Geophysical Surveys. The line layout was presented by L. Loidolt, consultant to U.S. Borax & Chemical Corp. The final report and interpretation are by W. Gordon Wieduwilt, geophysicist for Mining Geophysical Surveys.

Various geophysical surveys have indicated that anomalous IP response occurs over a large area under thin alluvial cover in the eastern half of the Sacaton Mountains. The anomalous trends are complex, likely made up of numerous sulfide zones possibly structurally controlled. There are fence and pipeline effects that further distort the rock response and complicate an interpretation.

The coverage to date has established locally the east and west margins of the anomalous IP response, but has not determined boundaries to the north and south. The anomalous response

that occurs in low resistivity material south of the Gila Indian Reservation has in prior reports been interpreted as an alluvial(clay?) response. We suggest that the resistivities are not necessarily low enough to reflect a clay-groundwater response phenomena and one should keep an open mind to the possibility of highly altered bedrock as a source of the low resistivity. The State gravity map further supports a shallow bedrock extending south-southeast from the Sacaton Mts. in this area.

SURVEY PROCEDURE:

The induced polarization and resistivity measurements are made in the time-domain mode of operation. A conventional system of measurements which uses a time cycle of 2.0 seconds "on" and 2.0 seconds "off" - 2.0 seconds "on" and 2.0 seconds "off" (current reversed) was employed.

The commencement of the measurement of the secondary voltage is delayed by 0.45 seconds to avoid coupling and other transient effects. The integration is performed during the period from 0.45 seconds to 1.10 seconds after the cessation of current.

To conform to a standard presentation, the integral time constand is adjusted to give induced polarization readings equivalent to those obtained with transmitter cycles of 3.0 seconds "on" and 3.0 seconds "off", with integration of the secondary

voltage during the first second of the "off" period.

Throughout the survey, a conventional inline dipole-dipole array of seven current electrodes was used with the dipole length "a" equal to 1,000'. Measurements were made for dipole separation factors "n" 1 to 6. The potential electrodes occupied positions on both sides of the current-electrode spread, thereby providing a line coverage of approximately nine times the dipole length for a standard line of seven electrodes. The total length of line is determined by the number of spreads or additional current-electrodes used.

Apparent polarization response is in units of millivolt-seconds per volt, or milliseconds (ms), and apparent resistivity is in units of ohmmeters. The data from each line is plotted in quasi-section to facilitate presentation of data at all spacings used.

INTERPRETATION:

LINE 1 (offset)

This line was inadvertently laid out along an incorrect bearing. No production costs were charged. Apparent broad moderate response of 25 ms$^{\pm}$ occurs at a relatively shallow depth throughout the line. This response could be made up of two dike-like zones, one centered about electrode C_2, the second centered about the interstate highway. The dike characteristics

are not clearly apparent, however. Low response surface material lies in the vicinity of electrodes C_4 and C_5 to a depth of 500'. A decrease in response is noted at both ends of the line, suggesting local boundaries to the anomaly.

A resistivity contact occurs about electrode C_5 with 35 ohmmeter material to the southwest and 400 ohmmeters^{+} to the northeast. A subtle SW'ly dip characteristic may be more apparent (due to strike) than real (due to dip).

Fence and pipeline influences are suspected in the IP response, although they do not manifest themselves clearly. No cultural effects are noted in the resistivity data.

LINE 1

Anomalous IP response occurs in the form of dike-like or tabular bodies. The east half of the line shows characteristics similar to line 1 (offset) except that the apparent widths are narrower, indicating a line direction normal to the strike of the response feature. The narrow dike-like anomaly at the interstate highway is suspiciously characteristic of a fence effect.

The anomalous response in the vicinity of electrode C_1 could be the edge effect of a larger anomalous response feature south of the line.

A dike-like or tabular response zone occurs at electrodes C_4 and C_5, spread 2. A true response of 50-60 ms occurs in a

zone within 200' of surface, is approximately 1000' wide, and could have a bottom depth in the order of 500' to 1000'. Additional data should be collected in this area to determine the strike and extent of the body.

A resistivity contact occurs at electrode C_3, spread 1 with a low resistivity of 35 ohmmeters to the southwest and 300 ohmmeters$^{\pm}$ to the northeast. A moderate resistivity of 100 ohmmeters$^{\pm}$ lies west of electrode C_7 to electrode C_1, spread 2. A high resistivity of 400 ohmmeters lies west of C_1 and dips E'ly under spread 1.

LINE 2

Anomalous IP response occurs over a broad zone in the east half (spread 1) of the line. The response pattern is complex with an apparent E'ly dipping contact at electrode C_5, spread 1. A response of 25 to 35 ohmmeters continues west of the contact to a high response dike-like feature at the pipeline west of electrode C_1, spread 1. The dike-like response zone is not entirely characteristic of a pipeline effect and suggests a possible highly mineralized contact. A moderate response of 20 ms occurs in a wide zone from this dike(?) contact west to the vicinity of electrode C_6, spread 2.

A buried dike response of 80 ms$^{\pm}$ occurs at 1000'$^{\pm}$ below electrodes C_2 and C_3, spread 2. There may be a connection between this zone and the dike or tabular response at surface on line 1.

Additional data may be of some value here.

A high resistivity dike of 800 ohmmeters± occurs at electrode C_4, spread 1 with resistivities of 100 ohmmeters± to the northeast and resistivities of 50-100 ohmmeters to the southwest. An E'ly dipping multi-layered high resistivity characteristic occurs at the west end of the line with individual resistivity layers of 100 to 500 ohmmeters.

LINE 3

Broad zones of anomalous IP response occur adjacent to each other across the full width of the line. A possible E'ly boundary to the anomalous response occurs in the vicinity of electrode C_6, spread 1. The boundary characteristics are multi or gradational reflecting the skew angle of the contact to the line direction. East of the contact background response of <10 ms is suggested. An anomalous response of 25 ms± occurs in a broad zone west of the contact to the vicinity of electrode C_2, spread 1. The apparent IP response increases to 35 to 40 ms in a broad zone W'ly adjacent to the moderate response zone. This high response is flanked on the west by a broad moderate response of 15-20 ms. The contact centered about electrode C_6, spread 2 has strong dike-like response characteristics which may be due to pipeline effects rather than a rock response. The broad zone of moderate response continues to the west end of the line and may terminate against a

dike(?) contact 1000' west of electrode C_1, spread 2.

Low resistivity surface material of 100 ohmmeters lies off the east end of the line with higher resistivities at depth. A broad area of high resistivity of 600 to 800 ohmmeters is coincident to the main IP response zone.

The west boundary of the high resistivity material is somewhat in question, as resistivity values are highly variable west of the interstate highway and some fence or pipeline effects may be distorting the data in this area.

LINE 4

Anomalous response occurs throughout the line. A broad area of 28 ms$^{\pm}$ lies east of the interstate highway. A zone of variable high response of 50 ms$^{\pm}$ occurs at the highway and continues to the west. This higher response may be due to fence interference in part.

Resistivities of 200 ohmmeters, decreasing to the east, lie east of line center. High resistivity material of 1000 ohmmeters$^{\pm}$ west of electrode C_4, dips E'ly under the lower resistivity rock.

SUMMARY:

Broad zones of anomalous response occur over a large part of the survey area. The zones contain different levels of IP response possibly reflecting changes in particle size or volume % sulfide mineralization. Certain dike features are possible indications of

local concentrations of mineralization at the contacts of the broad zones. Complex IP anomaly characteristics at these response contacts occur coincident to pipelines or fences and may in part be effects from these features. Anomalous IP response in relatively low resistivity material south of the Reservation boundary towards the Casa Grande airport should be explored further.

RECOMMENDATIONS:

There are a number of possible steps to follow at this stage of exploration. One is to drill specific targets to determine the economic potential of the IP anomalies in this locale. The drilling results would reveal the source of the IP response as well as the type of rock and alteration. Four target areas are suggested:

1) The dike-like or tabular body response on line 1 in the SW corner of section 7;
2) The broad response zone in moderate to high resistivity material in sections 5 and 6 of T5S, R6E, and 31 and 32 of T4S, R6E;
3) The apparent broad response in low resistivity material in the west half of section 17 of T5S, R6E;
4) The broad moderate response shoulder in the north half of section 7 and west half of section 6 of T5S, R6E.

A second possibility would be to expand the IP-resistivity coverage to completely delineate the anomalous response and select targets for drilling based on the overall geophysical characteristics. Extending the coverage to the north and south would require perhaps an additional 10 days of survey. The risk here is that one cannot predetermine the size or extent of response.

I personally do not like to engage in a geophysical program that has the nebulous direction of "closing out" anomalous IP response. At the same time, because of lack of outcrop, difficult land position, the repercussions of drills on a property, etc., it is often necessary for the geophysical survey to proceed blindly beyond the initial geological concepts of an exploration program. This decision, however, should be made by the project geologist.

Respectfully submitted,

W. Gordon Wieduwilt
Geophysicist

August 1, 1973

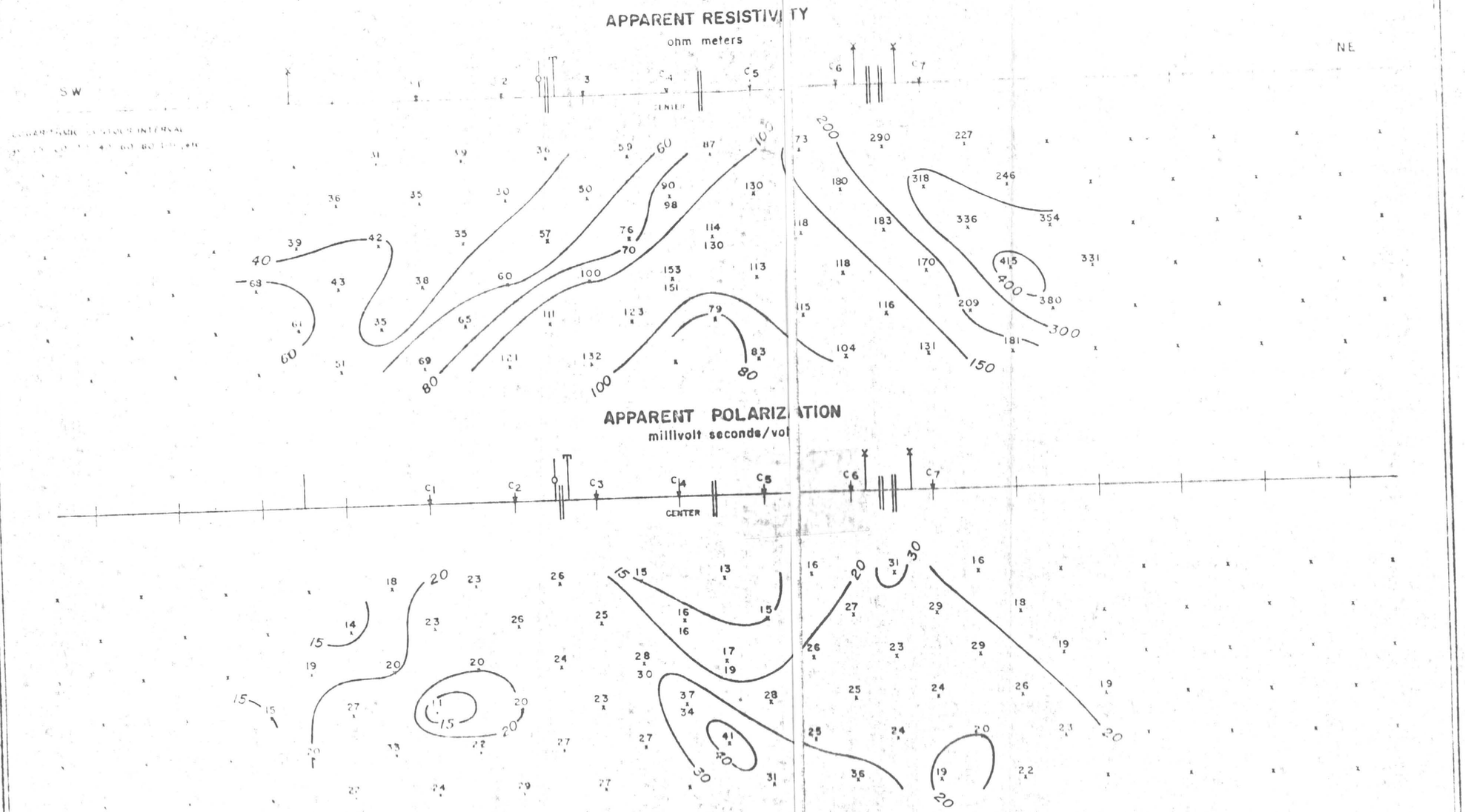
Tucson, Arizona

TIME DOMAIN INDUCED POLARIZATION AND RESISTIVITY SURVEY

SACATON PROJECT-PINAL COUNTY ARIZONA

FOR

U.S. BORAX & CHEMICAL CORP.



DIPOLE DIPOLE ARRAY

CURRENT DIPOLE POTENTIAL DIPOLE

PLOT POINT

LINE .....1 (OFFSET)

LOOKING .....N'LY

DIPOLE LENGTH .....1000'

DATE JUN 28/1973

LEGEND

FENCE.....

PIPELINE.....

POWERLINE.....

ROAD, RR.

mining geophysical surveys

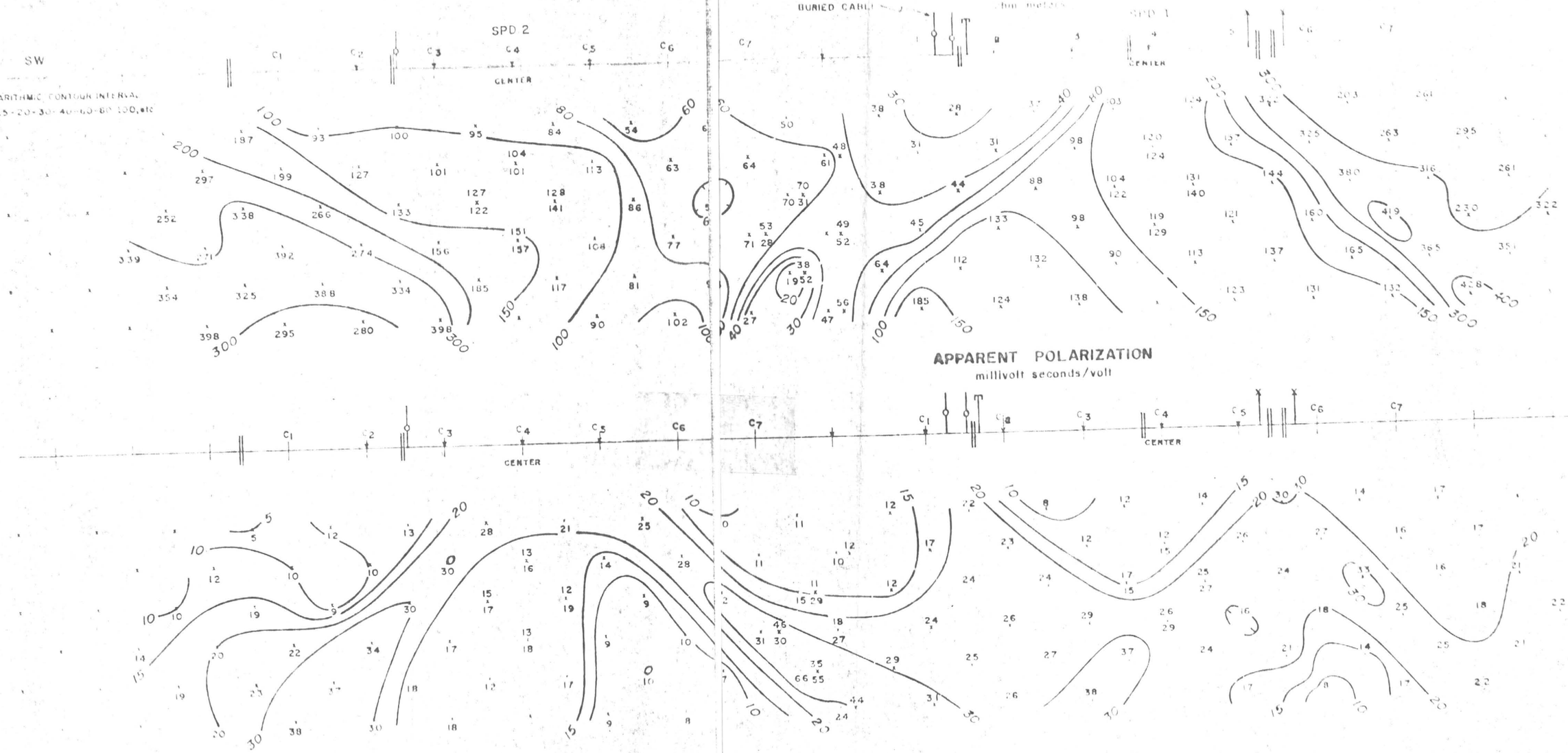
M U S 0324

TIME DOMAIN INDUCED POLARIZATION AND RESISTIVITY SURVEY

SACATON PROJECT - PINAL COUNTY ARIZONA

FOR

U.S. BORAX & CHEMICAL CORP.



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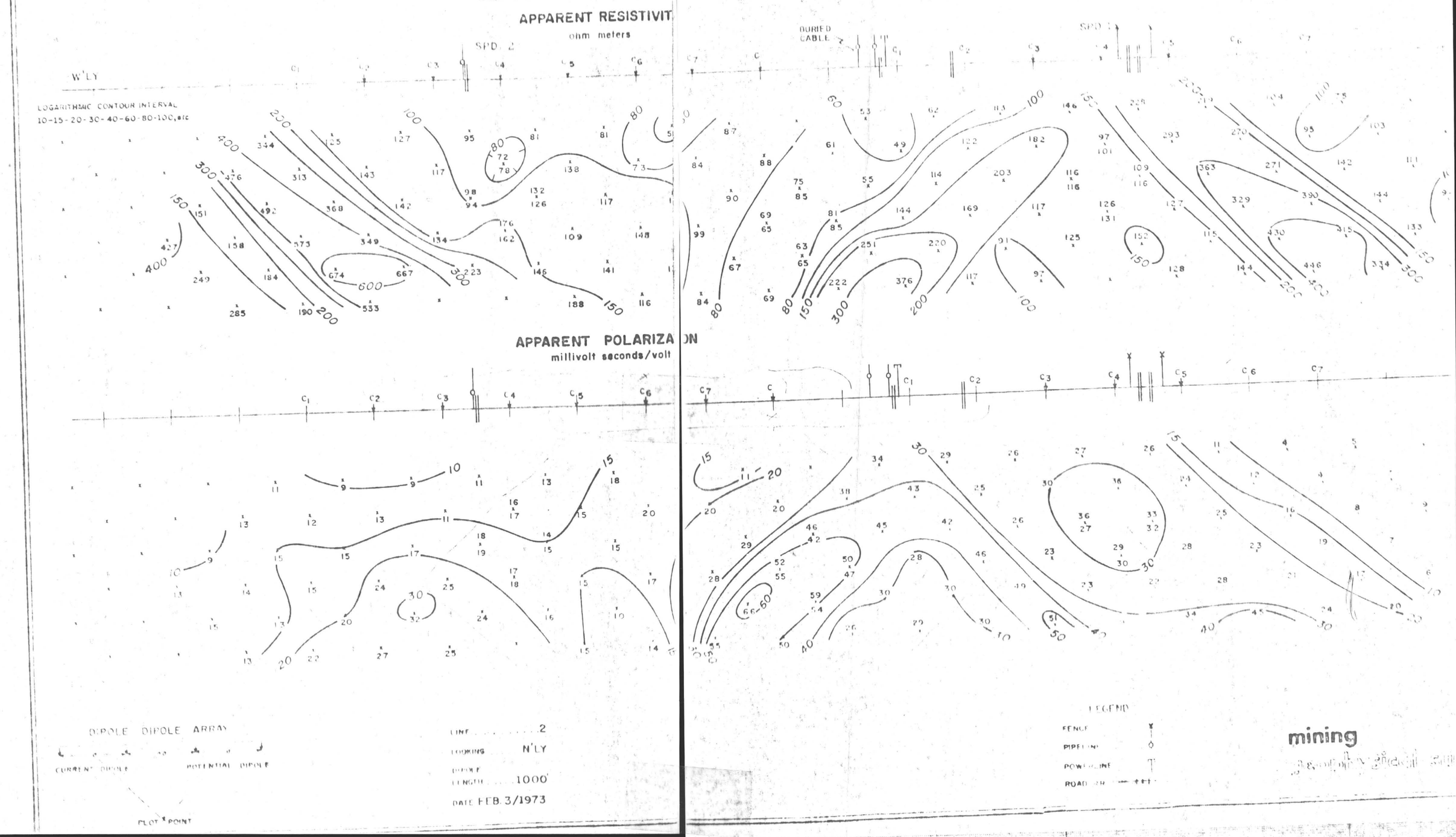
TIME DOMAIN INDUCED POLARIZATION AND RESISTIVITY SURVEY

SACATON PROJECT - PINAL COUNTY ARIZONA

FOR

U.S. BORAX & CHEMICAL CORP.



mining

TIME DOMAIN INDUCED POLARIZATION AND RESISTIVITY SURVEY

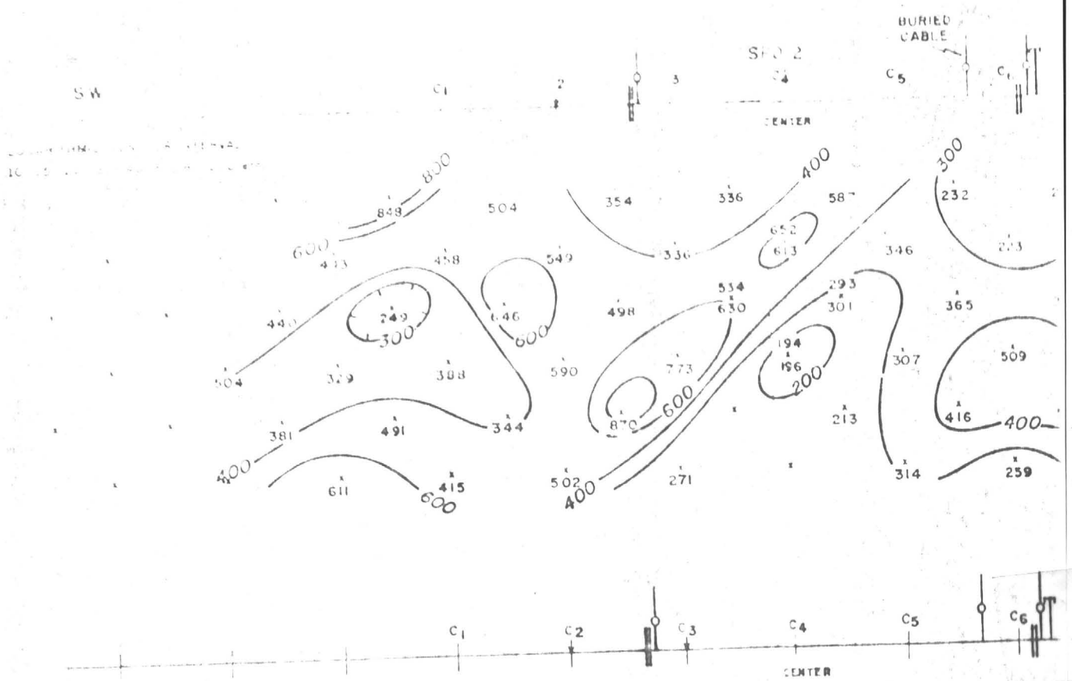
SACATON PROJECT-PINAL COUNTY ARIZONA

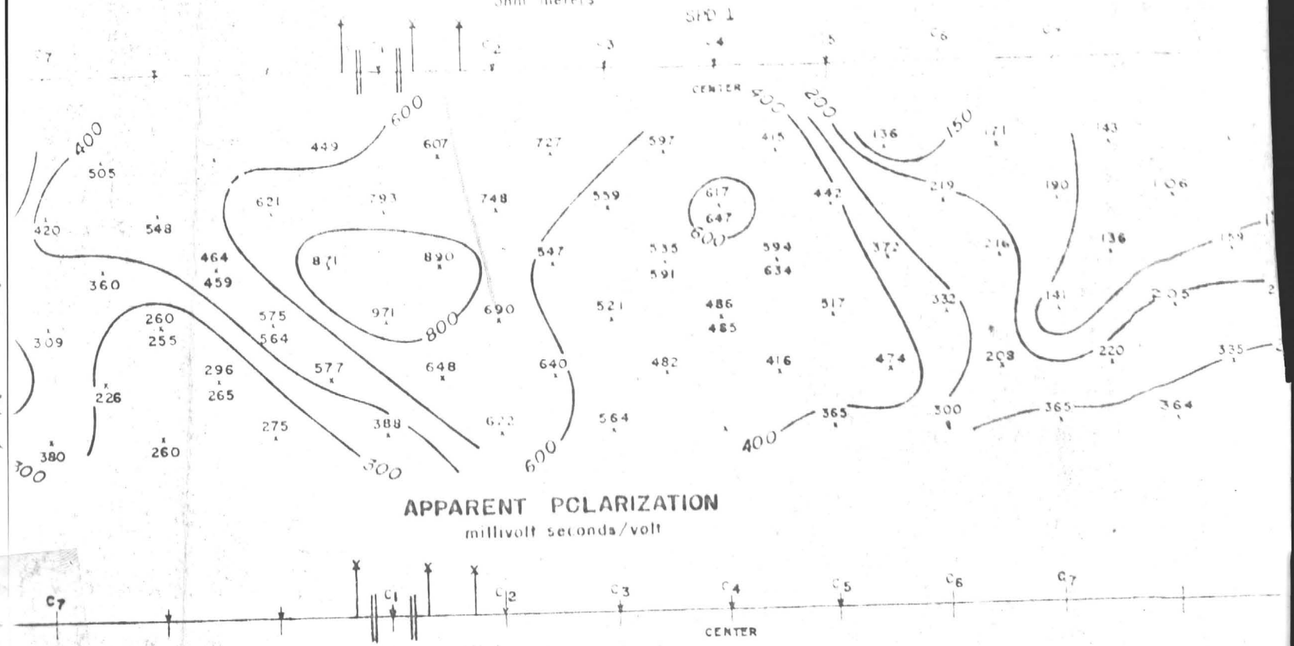
FOR

U.S. BORAX & CHEMICAL CORP

APPARENT RESISTIVITY

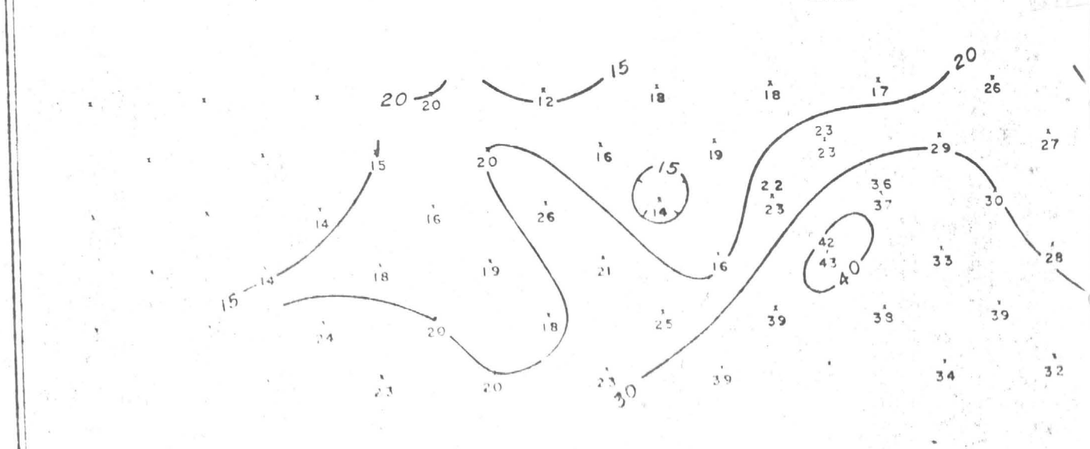
ohm meters





APPARENT POLARIZATION

millivolt seconds/volt



DIPOLE DIPOLE ARRAY

CURRENT DIPOLE — POTENTIAL DIPOLE

PLOT POINT

LINE 3

LOOKING . . . . . N'LY

DIPOLE LENGTH 100d

DATE JUN. 7/1973.

LEGEND

FENCE

PIPELINE

POWERLINE

ROAD, RR.

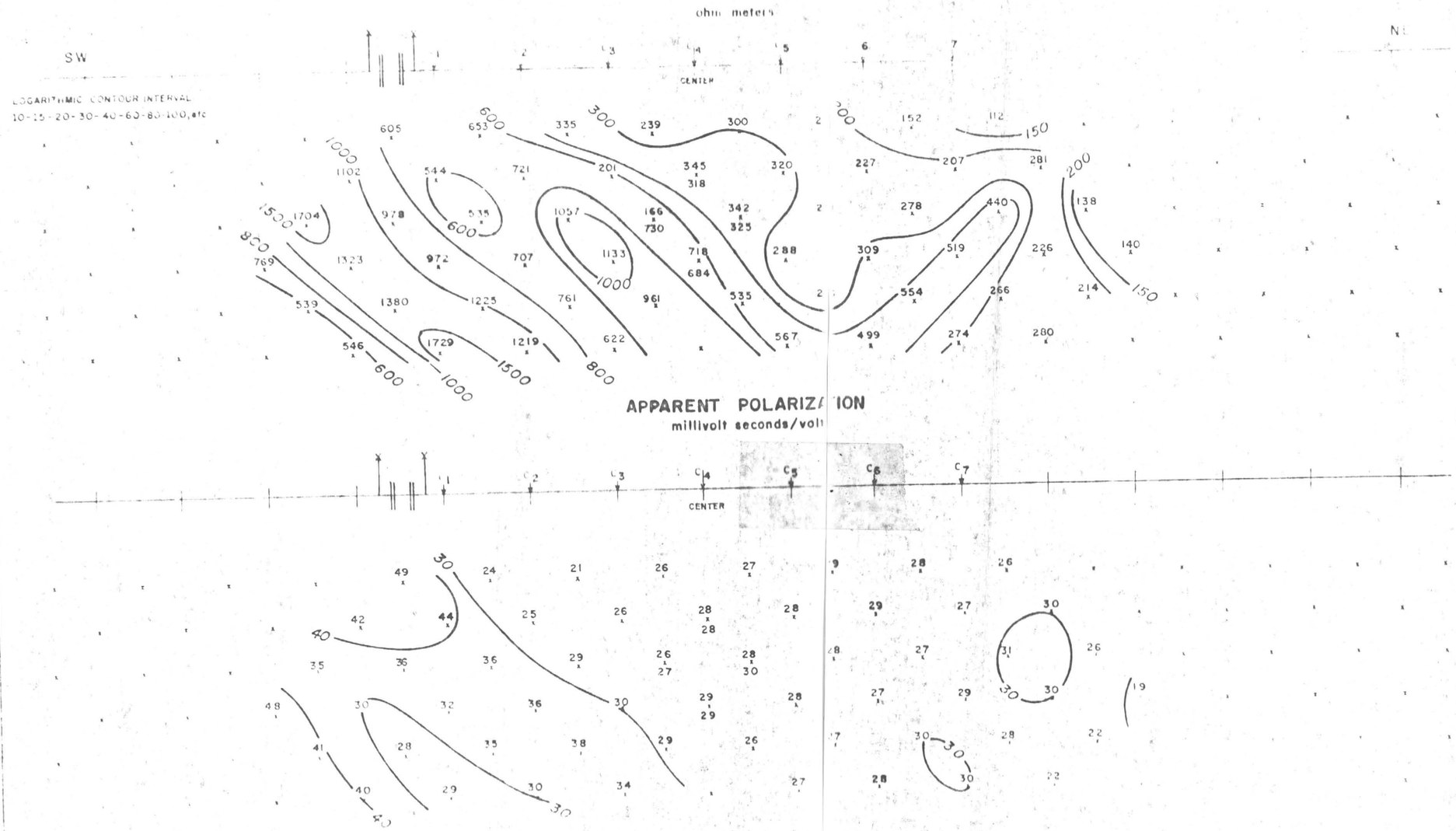
mining geophysical su

TIME DOMAIN INDUCED POLARIZATION AND RESISTIVITY SURVEY

SACATON PROJECT-PINAL COUNTY ARIZONA

FOR

U.S. BORAX & CHEMICAL CORP.



DIPOLE DIPOLE ARRAY

CURRENT DIPOLE POTENTIAL DIPOLE

PLOT POINT

LINE 4

LOOKING N'LY

DIPOLE LENGTH 1000

DATE JUN. 9/1973

LEGEND

POLINE

POLYLINE

ROAD RR

mining geophysical surveys

M.G.S. 0324B

INDUCED POLARIZATION AND MAGNETIC SURVEY

GILA RIVER INDIAN RESERVATION

PINAL COUNTY, ARIZONA

for

J. Sullivan & Company, Inc.

May 1972

by

HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5964, Tucson, Arizona 85703

GEOEX Job # 710

INDUCED POLARIZATION AND MAGNETIC SURVEY

GILA RIVER INDIAN RESERVATION

PINAL COUNTY, ARIZONA

for

J. Sullivan & Company, Inc.

May 1972

by

HEINRICHS GEOEXPLORATION COMPANY
P.O. Box 5964, Tucson, Arizona 85703

GEOEX Job # 710

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In Map Pocket	
Induced Polarization Location and Interpretation Plan	

INTRODUCTION

At the request of Mr. James Sullivan of J. Sullivan & Company, Inc., Heinrichs GEOEXploration Company completed a preliminary induced polarization (I. P.) and magnetic survey on a portion of the Gila River Indian Reservation, Pinal County, Arizona. The field work was done during the interim April 26 to May 1, 1972.

This survey was mostly done in Sections 5, 6, 7, 8, and 9 of T.5 S., R.6 E., G&SRM, and consists of three approximately parallel NW trending lines as shown on the accompanying plan. A dipole - dipole electrode configuration was used with a dipole length of 1,000 feet. The frequency domain I. P. technique was used with a GEOEX Mk 4 Sender and a GEOEX Mk 4 Receiver with transmitting frequencies of 0.1 and 1.0 hertz.

The magnetometer readings were obtained with a Jalander vertical intensity fluxgate instrument on 250 foot stations along the entire length of all three I. P. lines.

The total surface coverage for both I. P. and magnetics was 8.52 line miles which, on the I. P. coverage, corresponds to 5.11 line miles of "subsurface" plotted data. Resolvable penetration for the I. P. coverage, with the above survey parameters and resistivity distributions encountered, likely ranged from roughly 300 to 1,500 or so feet below surface.

The data are presented on "pseudo - sectional" data plot sheets, one for each line, with the I. P. and associated resistivity information in "sectional" contour form and the self potential and magnetic results in profile form. An Induced Polarization Location and Interpretation Plan is also presented showing the line location and plan projected I. P. interpretation with respect to the land survey net. For additional information on I. P. as to presentation, theory and interpretation, see the appended Basis of the Induced Polarization Method.

The purpose of this preliminary survey was to define any sizeable I. P. responsive subsurface sulfide zones and magnetically responsive geologic structure related to or associated with a zone of alteration and copper - molybdenum geochemical anomalism partially defined by previous work.

Project supervision, interpretation and report are by C. S. Ludwig, Senior Geophysicist assisted by the GEOEX staff.

CONCLUSIONS AND INTERPRETATION

Anomalous I. P. response is present in several zones on all three lines. Because of the wide line separation it is difficult to make line to line correlations although it appears that the anomalism is elongated in an ENE direction.

Even though the anomalous I. P. response is not strong, it could be quite significant in that at least some of the responsive zone correlates with an interesting copper - molybdenum geochemical high trending ENE through the northern half of Section 7. However, much of the anomalous I. P. response is outside the geochemically sampled area and/or is alluvial covered and therefore its copper - molybdenum significance cannot be assessed at this time.

The I. P. response in general shows a slight increase in strength with depth and some depth to the top of the causative source is implied - ranging from several hundred feet to perhaps as deep as 1,000 feet.

The strength of I. P. response in the anomalous zones is such that it could be reflecting 1 or 2% by volume total sulfides which could be economically interesting if a favorable copper to iron ratio is present, i.e., a favorable chalcopyrite to pyrite ratio. The widths of the anomalous zones are unknown because of insufficient coverage to delineate their entire anomalous extent.

None of the zones of anomalous I. P. response appear to correlate with any particular resistivity feature. However, anomalism southeast of 25 SE on Line 1 and southeast of 10 SE on Line 2 appears to relate to lower resistivity material, in part likely caused by alluvial cover. Anomalism northwest of 5 NW on Line 1 and northwest of 15 NW on Line 2 correlates with intermediate resistivity material while both anomalous zones on Line 3 appear to relate to rather high resistivity rocks.

Several level changes in apparent resistivity were indicated on the sections and plan as interfaces and are probably caused by rock type changes and could therefore be of some geologic significance.

The self potential effects show only minor background variations along the three traverses implying a lack of sizeable shallow, actively oxidizing, relatively interconnected (massive) sulfide zones. This is not in opposition to the anomalous I. P. results which are likely reflecting disseminated sulfide mineralization.

There are several grounded metal post fences in the southern part of the area surveyed which could possibly be contributing to the anomalous I. P. response in that area; more coverage being needed to evaluate the level of interference involved.

The magnetics show considerable variation along and between the three traverses. The southern halves of Lines 1 and 2 are quite flat and are probably reflecting several hundred feet of alluvial overburden. Line 1

shows an 1,100 gamma magnetic crossover near 37.5 NW associated with a minor level change and is probably the effect of a rock type change perhaps with a narrow, steeply dipping magnetic dike - like zone along or near the contact. This contact is probably equivalent to the interface indicated near 35 NW on the resistivity coverage.

A magnetic low near 25 NW on Line 2 seems to relate to the stronger part of the northern I. P. anomaly but most of the I. P. response on the three lines shows no obvious direct magnetic correlation. As more magnetic and geologic information becomes available, it is likely the magnetics will become more useful in distinguishing between rock types and could conceivably show some useful correlation with the mineralized zones.

The magnetics to date also indicate that the alluvial thickness is probably less than 200 feet everywhere traversed except perhaps the southern halves of Lines 1 and 2 as previously mentioned.

Respectfully submitted,
Heinrichs GEOEXploration Company

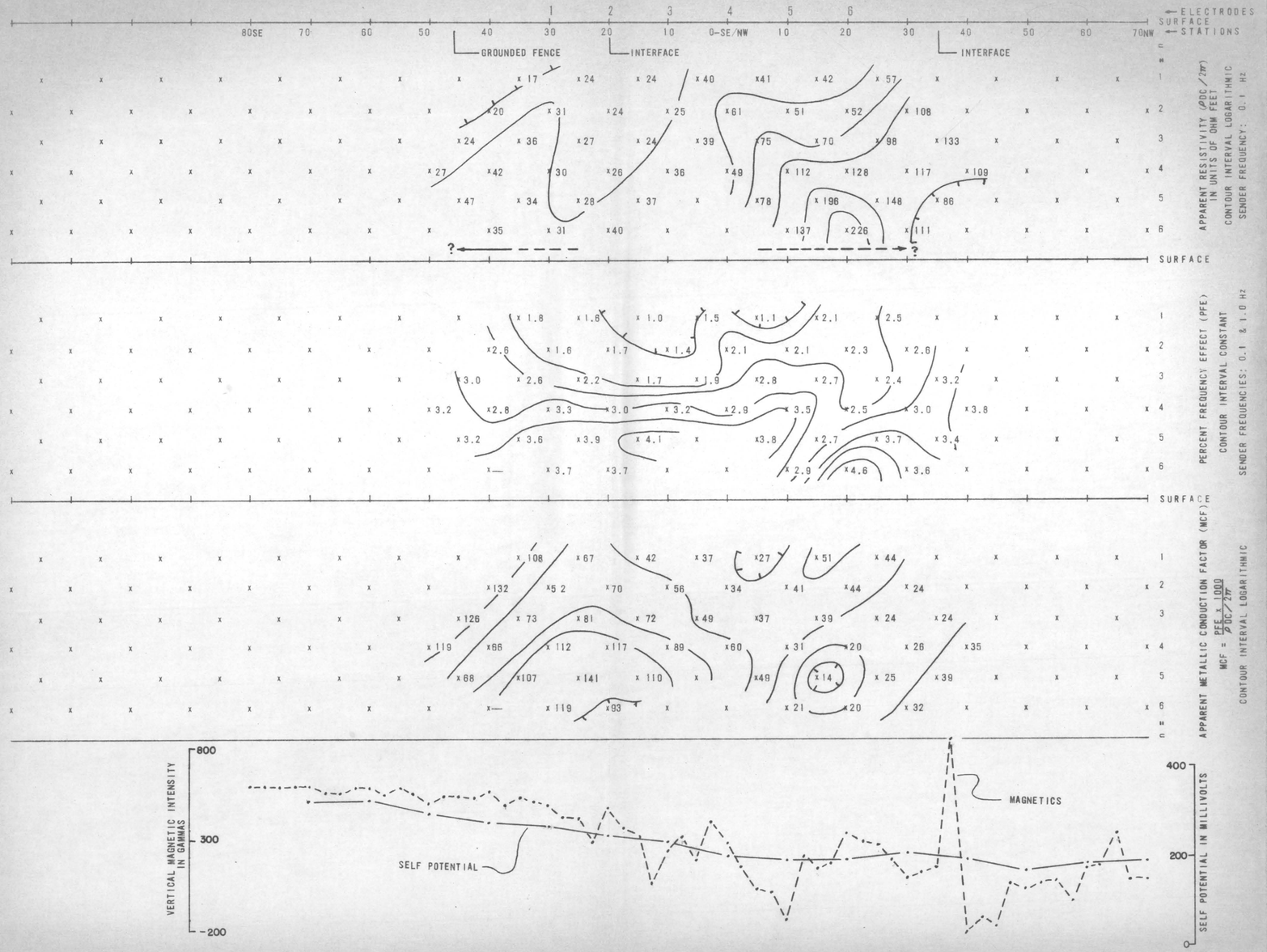
Chris S. Ludwig

Chris S. Ludwig
Senior Geophysicist

Approved by:
Walter E. Heinrichs, Jr.
President

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 19
ARIZONA, U. S. A.

P. O. Box 5964
Tucson, Arizona 85703
May 1972
GEOEX Job # 710



710-72

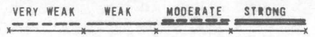
LINE NO. 1

SPREAD(S) 1

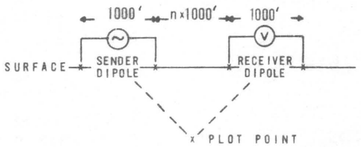
INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for

J. SULLIVAN & COMPANY, INC.

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA

GILA RIVER INDIAN RESERVATION

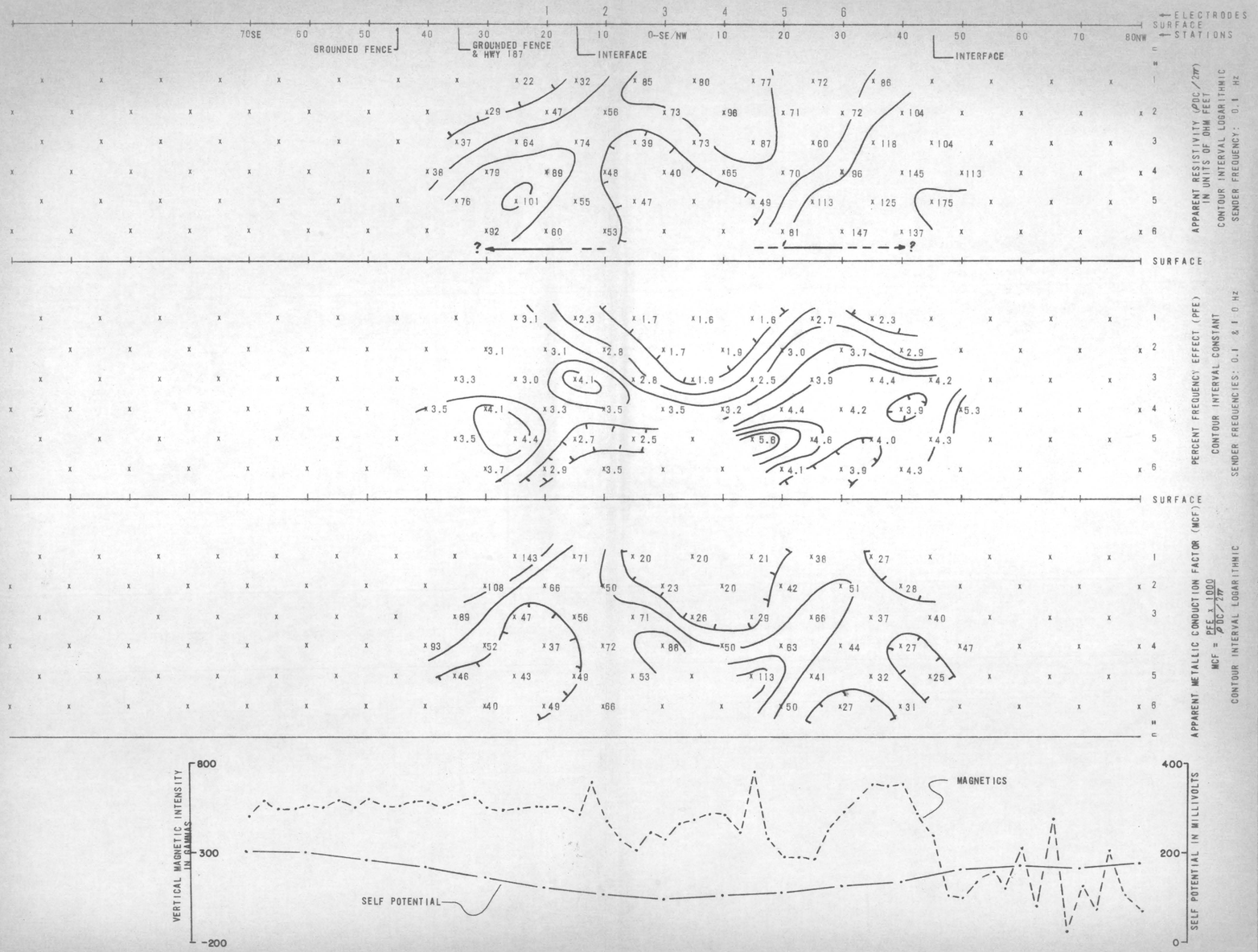
LOOKING

S 58° W

DATE

APR 1972

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS
AUSTRALIA
(SYDNEY)
39 Hume Street
Crows Nest, NSW
Phone: 439-1793
U.S.A.
Post Office Box 5964
Tucson, Arizona 85703
Phone: (602) 623-0578
Cable: GEOEX, Tucson



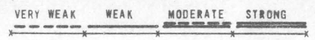
710-72

LINE NO. 2

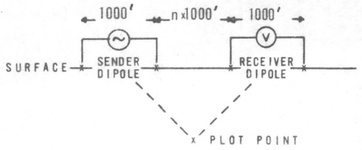
SPREAD(S) 1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET for J. SULLIVAN & COMPANY, INC.

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
GILA RIVER INDIAN RESERVATION

LOOKING
S 58° W

DATE
APR 1972

HEINRICHS
GEOEXPLORATION COMPANY
GEOPHYSICAL ENGINEERS
AUSTRALIA
(SYDNEY)
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Crows Nest, NSW
Phone: 439-1793
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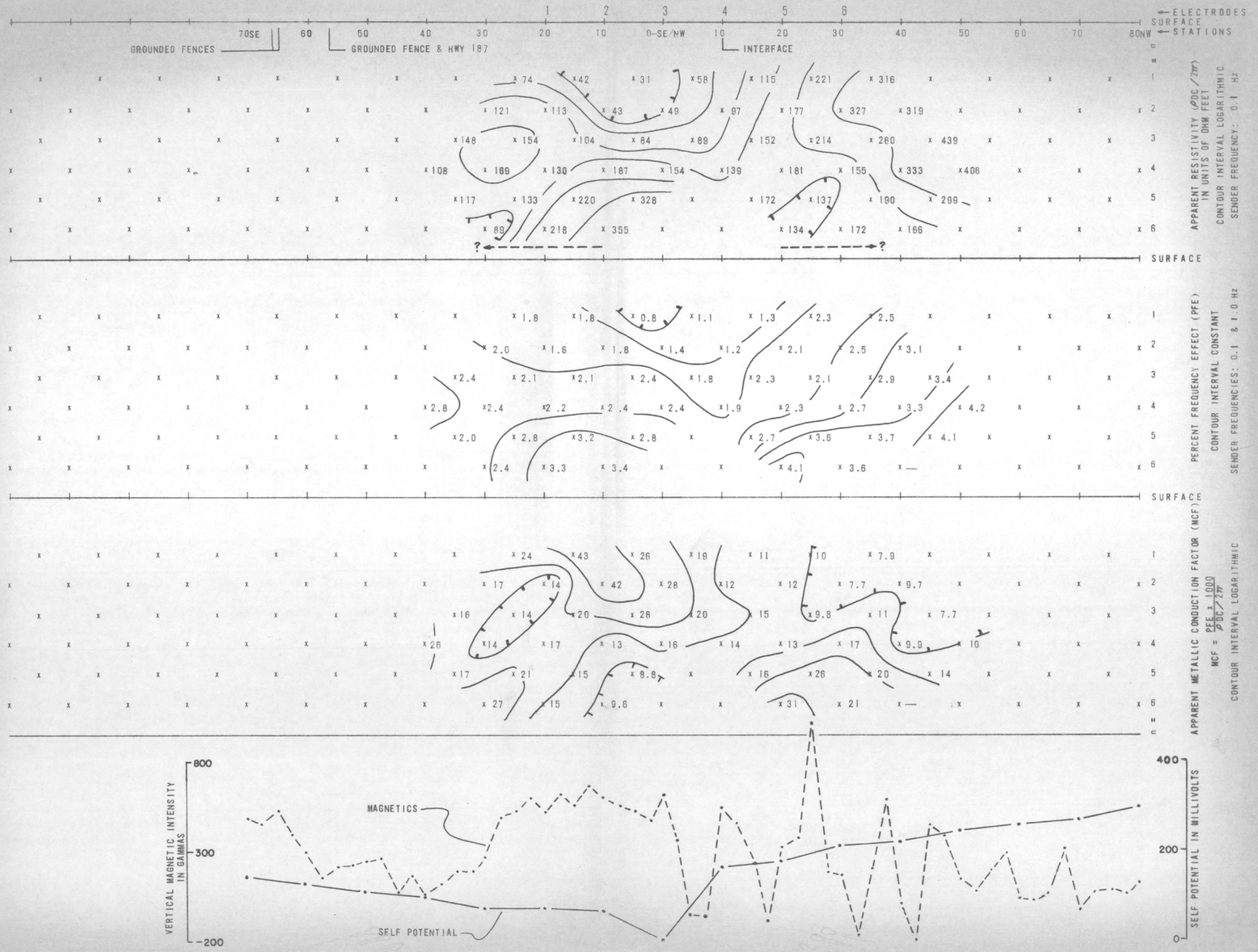
Cable: GEOEX, Tucson

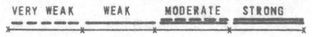


710-72

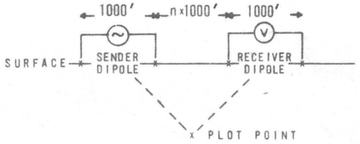
LINE NO.
3
SPREAD(S)
1

INDUCED POLARIZATION TRAVERSE SECTIONAL DATA SHEET
for
J. SULLIVAN & COMPANY, INC.

RELATIVE ANOMALY STRENGTH



DIPOLE DIPOLE ELECTRODE ARRAY



AREA
GILA RIVER INDIAN RESERVATION
LOOKING
S 65° W
DATE
APR 1972

HEINRICHS
GEOEXPLORATION COMPANY
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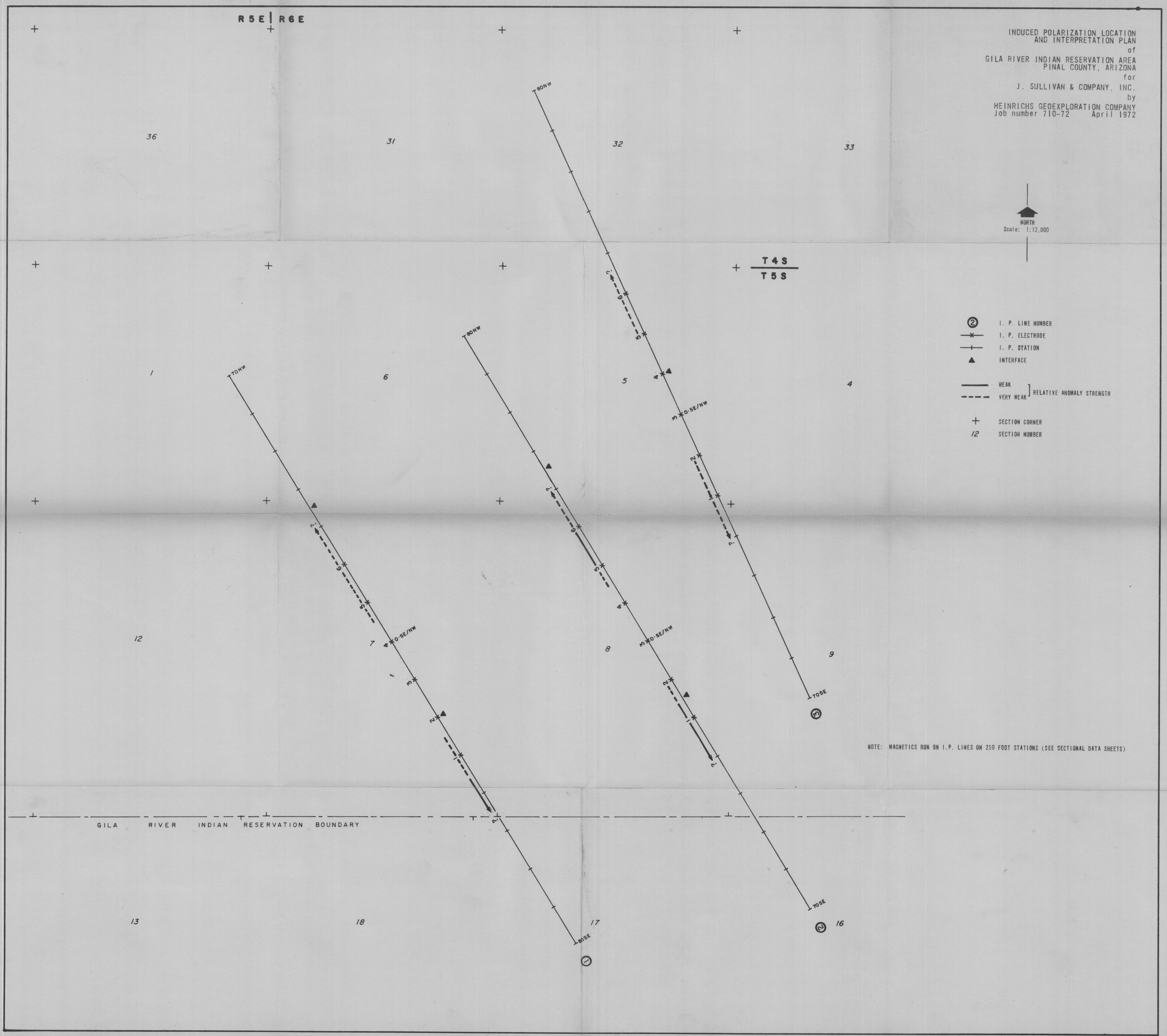
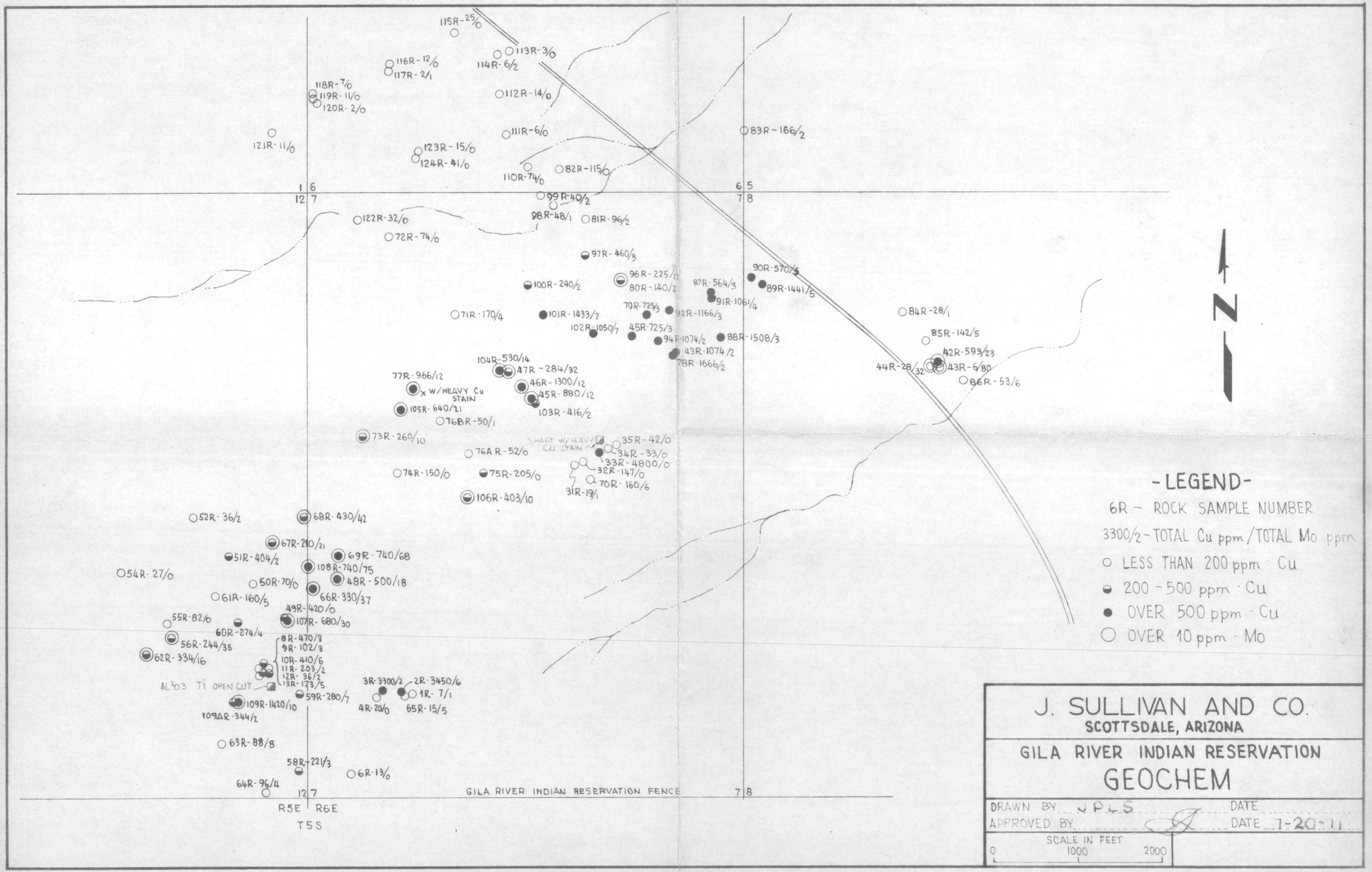
Cable: GEOEX, Tucson

INDUCED POLARIZATION LOCATION
AND INTERPRETATION PLAN
of
GILA RIVER INDIAN RESERVATION AREA
PINAL COUNTY, ARIZONA
for
J. SULLIVAN & COMPANY, INC.
by
HEINRICHS GEOEXPLORATION COMPANY
Job number 710-72 April 1972



NOTE: MAGNETICS RUN ON I.P. LINES ON 250 FOOT STATIONS (SEE SECTIONAL DATA SHEETS)


115R-25/0
113R-3/0
114R-6/2
116R-12/0
117R-2/1
118R-7/0
119R-11/0
120R-2/0
112R-14/0
111R-6/0
83R-166/2
121R-11/0
123R-15/0
124R-41/0
110R-74/0
82R-115/0
99R-40/2
98R-48/1
81R-96/2
122R-32/0
72R-74/0
97R-460/3
96R-225/12
80R-140/2
100R-240/2
90R-570/5
87R-564/3
89R-1441/5
91R-1061/4
79R-725/3
92R-1166/3
71R-170/4
101R-1433/7
102R-1050/7
45R-725/3
94R-1074/2
88R-1508/3
43R-1074/2
78R-1666/2
84R-28/1
85R-142/5
42R-593/23
44R-28/32
43R-6/80
86R-53/6
104R-530/14
47R-284/32
46R-1300/12
45R-880/12
103R-416/2
77R-966/12
W/HEAVY Cu STAIN
105R-640/21
76BR-50/1
73R-260/10
SHAFT W/HEAVY CU STAIN
35R-42/0
34R-33/0
33R-4800/0
32R-147/0
70R-160/6
31R-19/1
76AR-52/0
74R-150/0
75R-205/0
106R-403/10
52R-36/2
68R-430/42
67R-210/21
69R-740/68
51R-404/2
108R-740/75
54R-27/0
50R-70/0
48R-500/18
66R-330/37
61R-160/5
49R-420/0
107R-680/30
55R-82/0
60R-274/4
56R-244/35
62R-334/16
8R-470/3
9R-102/3
10R-410/6
11R-203/2
12R-36/2
13R-173/5
AL2O3 Ti OPEN CUT
3R-3300/2
2R-3450/6
1R-7/1
59R-280/7
4R-20/0
65R-15/5
109R-1420/10
109AR-344/2
63R-88/8
58R-221/3
6R-13/0
64R-96/4
GILA RIVER INDIAN RESERVATION FENCE
1 6
12 7
6 5
7 8
12 7
7 8
R5E R6E
T5S
N
-LEGEND-
6R – ROCK SAMPLE NUMBER
3300/2 - TOTAL Cu ppm / TOTAL Mo ppm
○ LESS THAN 200 ppm Cu
◒ 200 – 500 ppm Cu
● OVER 500 ppm Cu
○ OVER 10 ppm Mo
J. SULLIVAN AND CO.
SCOTTSDALE, ARIZONA
GILA RIVER INDIAN RESERVATION
GEOCHEM
DRAWN BY J.P.L.S.
DATE
APPROVED BY
DATE 7-20-71
SCALE IN FEET
0 1000 2000

Job #710, Line 3, Spread 1, 5½, 5/1/72 1000.

I.P. RECEIVER NOTES

PAGE 1

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 3 BEARING S32° E HALF S SP. 1 DATE 5-1-72

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	S.P.	S.P.	2-3
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	0-10s	10-20s	20-30s
MULT.	10	1.0	1.0	0.1	1.0	1.0	10			1.0
PFE		0.7	1.3	1.7	1.0	1.1	1.2			1.7
1	0.0									
0.3	-0.1									
0.1	-0.1									
Cur	2	4	—	3	4	3	—			4
#	1	1	2	3	4	5	6			7
n		1	2	3	1	2	1			1
PFE Avg.										
AC	202.	40.9	16.4	8.83	76.7	24.1	115.			55.5
DRIFT	—	—	—	—	—	—	—			—
S.P.	1.0							+65.0	+8.6	-2.3
AC NOISE	0.1									
POT RES.								7K	50K	25K

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT #710 G.R.I.R.

LINE 3 BEARING S32°E HALF S SP. 1 DATE 5-1-72

SEND	3-4	4-5	5-6	1-2	2-3	3-4	4-5	5-6	1-2	2-3
RECEIVE	20-30s	→	→	30-40	s	→	→	→	40-50s	→
MULT.	1.0	1.0	0.1	1.0	1.0	1.0	1.0	0.1	1.0	1.0
PFE	1.7	2.3	2.3	1.7	1.5	2.0	2.3	~2.7	1.9	2.0
						~~1.3 - 3.0~~	~~2.0 - 3.6~~	~~0.8 - 4.2~~		
								~~8.78~~		
3 Cur	—	—	3	4	—	—	—	~~2.23~~	4	—
# 0.3	8	9	10	11	12	13	14	~~4.015~~	16	17
n 0.1	2	3	4	1	2	3	4	~~5.55~~	2	3
								~~4.65~~		
PFE Avg.										
AC	14.1	11.1	7.58	98.0	37.5	13.7	12.3	8.94	39.9	20.3
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				+27.1					+11.0	
AC NOISE										
POT RES.				80k					70K	

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 3 BEARING S32°E HALF 5 SP. 1 DATE 5-1-72

SEND	3-4	4-5	5-6	1-2	2-3	3-4	4-5	1-2	2-3	3-4
RECEIVE	40-50	→	→	50-60	5	→	→	60-70	→	→
MULT.	0.1	0.1	0.1	1.0	1.0	0.1	0.1	0.1	0.1	0.1
PFE	2.1	3.1	3.3	2.3	2.3	2.7	3.2	2.7	1.9	2.3
3										~~2.07~~
Cm 1.0	→	→	3	4	→	→	→	→	→	~~1.2~~
# 0.3	18	19	20	21	22	23	24	25	26	~~2.427~~
n 0.1	4	5	6	3	4	5	6	4	5	~~4.66~~
PFE Avg.										
AC	8.54	8.19	6.19	19.4	11.1	4.97	5.08	7.06	4.40	2.09
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				+17.7				+14.1		
AC NOISE										
POT RES.				60K				60K		

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT # 710 GRIR

LINE 3 HALF S SP. 1 DATE 5-1-72

PAGE 1

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	2-3	3-4	4-5
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	20-30	→	→
RANGE	10X200	10X400	10X400	10X300	10X400	10X300	10X300	10X400	10X400	10X400
VOLTAGE	210	380	690	875	690	875	875	420	380	690
CURRENT	2A	4.0	4.0	3.0	4.0	3.0	3.0	4.0	4.0	4.0
SEND	5-6	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5
RECEIVE	20-30	30-40	→	→	→	→	40-50	→	→	→
RANGE	10X300	10X400	10X400	10X400	10X400	10X300	10X400	10X400	10X400	10X400
VOLTAGE	875	500	420	380	690	875	500	420	380	690
CURRENT	3.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0

FREQUENCIES 1 .1

SENDER NO. 23706

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR (W FREEMAN)

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT #710 GRTR

LINE S HALF S SP. 1 DATE 5-1-22

PAGE 2

SEND	5-6	1-2	2-3	3-4	4-5	1-2	2-3	3-4		
RECEIVE	40-50	50-60	—	—	—	60-70	—	—		
RANGE	10X300	10X400	10X400	10X400	10X400	10X400	10X400	10X400		
VOLTAGE	875	500	420	380	690	500	420	380		
CURRENT	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 1

SENDER NO. 23706

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

Job 710, Line 3, Spread 1, N½, 5/1/72 1000.

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 3 BEARING N32°W HALF N SP. 1 DATE 5-1-72

SEND	CAL	S.P.	S.P.	S.P.	4-5	3-4	2-3	1-2	5-6	4-5
RECEIVE	3-4	0-10N	10-20N	20-30N	30-40N	—	—	→	40-50N	→
MULT.	10				10	1.0	1.0	0.1	10	1.0
PFE	0.0				2.3	2.1	2.3	1.9	2.5	2.5
Cum	2				4	—	—	—	3	—
#	2				1	2	3	4	5	6
"					1	2	3	4	1	2
PFE Avg.										
AC	201.				290.	58.1	19.9	9.13	310.	80.1
DRIFT	—				—	—	—	—	—	—
S.P.	1.0	+165.0	+12.6	+34.6	+5.7				←	+24.3
AC NOISE	0.1									
POT RES.		15k	40k	60k	30k				←	60k

I.P. RECEIVER NOTES

PAGE 5

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 3 BEARING N32°W HALF N SP. 1 DATE 5-1-72

SEND	3-4	2-3	1-2	5-6	4-5	3-4	2-3	1-2	5-6	4-5
RECEIVE	40-50	N	→	58-60	→	→	→	→	60-70	→
MULT.	1.0	0.1	0.1	1.0	1.0	1.0	0.1	0.1	1.0	1.0
PFE	2.1	2.3	2.7	3.1	2.9	2.7	3.6	4.1	3.4	3.3
							~~1.0-6.2~~	~~2.3-8.2~~		
Cm	—	—	—	3	4	—	—	—	3	4
#	7	8	9	10	11	12	13	14	15	16
n	3	4	5	2	3	4	5	6	3	4
PFE Avg.										
AC	21.1	8.88	4.81	77.8	33.9	10.1	5.05	3.09	42.7	21.6
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				+17.0					+9.7	
AC NOISE										
POT RES.				140 K					50k	

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 3 BEARING N32°W HALF N SP. 1 DATE 5-1-72

SEND	3-4	2-3	5-6	4-5	3-4					
RECEIVE	→		70-80 N		→					
MULT.	60-70	→	1.0	1.0	0.1					
PFE	0.1	0.1	4.2	4.1	0.0					
	3.7	3.6			Too					
DRIFT	2.0-4.0				Noisy					
					-2 to 8					
line	—	—	3	4	—					
#	17	18	19	20	21					
n	5	6	4	5	6					
PFE Avg.										
AC	7.01	3.97	19.6	11.0	3.97					
DRIFT	—	—	—	—	—					
S.P.			+29.0							
AC NOISE										
POT RES.			80 K							

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT # 710 GRTR

LINE 3 HALF N SP. 1 DATE 5-1-72

SEND	CAL	4-5	3-4	2-3	1-2	5-6	4-5	3-4	2-3	1-2
RECEIVE	3-4	30-40	—	—	—	40-50	—	—	—	—
RANGE	10X200	10X400	10X400	10X400	10X400	10X300	10X400	10X400	10X400	10X400
VOLTAGE	220	690	380	410	500	875	690	380	410	500
CURRENT	2.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0
SEND	5-6	4-5	3-4	2-3	1-2	5-6	4-5	3-4	2-3	5-6
RECEIVE	50-60	—	—	—	—	60-70	—	—	—	70-80
RANGE	10X300	10X400	10X400	10X400	10X400	10X300	10X400	10X400	10X400	10X300
VOLTAGE	875	690	380	410	500	875	690	380	410	875
CURRENT	3.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	3.0

FREQUENCIES 1 .1

SENDER NO. 23706

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT #710 GRER

LINE 3 HALF N SP. 1 DATE 5-1-74

SEND	4-5	3-4								
RECEIVE	70-80	—1								
RANGE	10X400	10X400								
VOLTAGE	690	380								
CURRENT	4.0	4.0								
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 .1

SENDER NO. 23706

OPERATOR K RICHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5964
TUCSON, ARIZONA (85703)
PHONE 623-0578

JOB 710, LINE 3, SPREAD 1, S 1/2, 5/1/72 — 1000 FEET=DIPOLE LENGTH

CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	-.10	202.000	0.00	1.00	.10	-.1000	.9901

COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	30.61	.80	26.1	.72	23.4	.08	**	.70	4.00	1	1	40.900	0.00
2	2	49.39	1.40	28.3	1.24	25.1	.16	**	1.30	4.00	2	2	16.400	0.00
3	3	89.00	1.80	20.2	1.64	18.4	.16	**	1.70	3.00	3	3	8.830	0.00
4	1	57.58	1.10	19.1	1.10	19.1	0.00	**	1.00	4.00	4	1	76.700	0.00
5	2	96.59	1.20	12.4	1.20	12.4	0.00	**	1.10	3.00	5	2	24.100	0.00
6	1	115.34	1.30	11.3	1.30	11.3	0.00	**	1.20	3.00	6	1	115.000	0.00
7	1	41.95	1.80	42.9	1.80	42.9	0.00	**	1.70	4.00	7	1	55.500	0.00
8	2	42.64	1.80	42.2	1.61	37.7	.19	**	1.70	4.00	8	2	14.100	0.00
9	3	84.40	2.40	28.4	2.22	26.4	.18	**	2.30	4.00	9	3	11.100	0.00
10	4	153.70	2.40	15.6	2.25	14.7	.15	**	2.30	3.00	10	4	7.580	0.00
11	1	74.08	1.80	24.3	1.80	24.3	0.00	**	1.70	4.00	11	1	98.000	0.00
12	2	113.17	1.60	14.1	1.60	14.1	0.00	**	1.50	4.00	12	2	37.500	0.00
13	3	103.87	2.10	20.2	1.97	19.0	.13	**	2.00	4.00	13	3	13.700	0.00
14	4	187.06	2.40	12.8	2.29	12.2	.11	**	2.30	4.00	14	4	12.300	0.00
15	5	318.48	2.80	8.8	2.71	8.5	.09	**	2.70	3.00	15	5	8.940	0.00
16	2	120.89	2.00	16.5	2.00	16.5	0.00	**	1.90	4.00	16	2	39.900	0.00
17	3	153.91	2.10	13.6	2.10	13.6	0.00	**	2.00	4.00	17	3	20.300	0.00
18	4	129.62	2.20	17.0	2.02	15.6	.18	**	2.10	4.00	18	4	8.540	0.00
19	5	219.67	3.20	14.6	3.05	13.9	.15	**	3.10	4.00	19	5	8.190	0.00
20	6	354.88	3.40	9.6	3.28	9.2	.12	**	3.30	3.00	20	6	6.190	0.00
21	3	147.52	2.40	16.3	2.32	15.7	.08	**	2.30	4.00	21	3	19.400	0.00
22	4	168.81	2.40	14.2	2.27	13.5	.13	**	2.30	4.00	22	4	11.100	0.00
23	5	132.79	2.80	21.1	2.50	18.8	.30	**	2.70	4.00	23	5	4.970	0.00
24	6	218.22	3.30	15.1	3.07	14.1	.23	**	3.20	4.00	24	6	5.080	0.00
25	4	107.79	2.80	26.0	2.56	23.8	.24	**	2.70	4.00	25	4	7.060	0.00
26	5	116.64	2.00	17.1	1.64	14.1	.36	**	1.90	4.00	26	5	4.400	0.00
27	6	89.00	2.40	27.0	1.61	18.1	.79	**	2.30	4.00	27	6	2.090	0.00

HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5964
TUCSON, ARIZONA (85703)
PHONE 623-0578

JOB 710, LINE 3, SPREAD 1, N 1/2, 5/1/72 1000 FEET=DIPOLE LENGTH
CAL GROUP NO. 2

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	0.00	201.000	0.00	1.00	.10	0.0000	.9950

COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	221.40	2.30	10.4	2.30	10.4	0.00	**	2.30	4.00	1	1	290.000	0.00
2	2	177.07	2.10	11.9	2.10	11.9	0.00	**	2.10	4.00	2	2	58.100	0.00
3	3	151.92	2.30	15.1	2.22	14.6	.08	**	2.30	4.00	3	3	19.900	0.00
4	4	138.86	1.90	13.7	1.73	12.5	.17	**	1.90	4.00	4	4	9.130	0.00
5	1	316.17	2.50	7.9	2.50	7.9	0.00	**	2.50	3.00	5	1	310.000	0.00
6	2	326.78	2.50	7.7	2.50	7.7	0.00	**	2.50	3.00	6	2	80.100	0.00
7	3	214.36	2.10	9.8	2.10	9.8	0.00	**	2.10	3.00	7	3	21.100	0.00
8	4	180.78	2.30	12.7	2.18	12.1	.12	**	2.30	3.00	8	4	8.880	0.00
9	5	172.04	2.70	15.7	2.49	14.5	.21	**	2.70	3.00	9	5	4.810	0.00
10	2	319.25	3.10	9.7	3.10	9.7	0.00	**	3.10	3.00	10	2	77.800	0.00
11	3	260.32	2.90	11.1	2.90	11.1	0.00	**	2.90	4.00	11	3	33.900	0.00
12	4	154.82	2.70	17.4	2.56	16.5	.14	**	2.70	4.00	12	4	10.100	0.00
13	5	136.65	3.60	26.3	3.31	24.2	.29	**	3.60	4.00	13	5	5.050	0.00
14	6	134.43	4.10	30.5	3.65	27.1	.45	**	4.10	4.00	14	6	3.090	0.00
15	3	439.32	3.40	7.7	3.40	7.7	0.00	**	3.40	3.00	15	3	42.700	0.00
16	4	333.03	3.30	9.9	3.30	9.9	0.00	**	3.30	4.00	16	4	21.600	0.00
17	5	189.87	3.70	19.5	3.52	18.5	.18	**	3.70	4.00	17	5	7.010	0.00
18	6	171.88	3.60	20.9	3.28	19.1	.32	**	3.60	4.00	18	6	3.970	0.00
19	4	406.43	4.20	10.3	4.20	10.3	0.00	**	4.20	3.00	19	4	19.600	0.00
20	5	299.09	4.10	13.7	4.00	13.4	.10	**	4.10	4.00	20	5	11.000	0.00
21	6	165.91	0.00	0.0	-.34	-2.0	.34	**	0.00	4.00	21	6	3.970	0.00

Moore Business Forms, Inc.

Job 710, Line 2, Spread 1, Nt 5½, 4/27/72 1000.

25705 (D.D.) I.P. RECEIVER NOTES

PAGE 1

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 2 BEARING N32W HALF N SP. 1 DATE 4-27-72

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	S.P.	S.P.	S.P.
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	0-10N	10-20N	20-30
MULT.	10	10	1.0	0.1	10	1.0	1.0			
PFE	0.2	1.9	1.9	2.1	1.8	2.1	1.8			
Cu	2	4								
#	1	1	2	3	4	5	6			
n		1	2	3	1	2	1			
PFE Avg.										
AC	201.	112.	24.1	9.62	106.	31.7	101.1			
DRIFT	—	—	—	—	—	—	—			
S.P.	1.0							+8.0	+10.2	+10.2
AC NOISE	0.1									
POT RES.								80 K	16 K	20 K

I.P. RECEIVER NOTES

PAGE 2

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 2 BEARING N32°W HALF N SP. 1 DATE 4-27-72

SEND	4-5	3-4	2-3	1-2	5-6	4-5	3-4	2-3	1-2	5-6
RECEIVE	30-40N	→	→	→	40-50	N	→	→	→	50-60N
MULT.	1.0	1.0	1.0	0.1	10	1.0	0.1	1.0	0.1	1.0
PFE	2.9	3.2	2.7	3.4	2.5	3.9	4.1	4.6	5.8	3.1
3									~~1.73~~	
1									~~3.9~~	
0.3									~~7.1~~	
0.1									~~10.3~~	
Cur										
#	7	8	9	10	11	12	13	14	15	16
n	1	2	3	4	1	2	3	4	5	2
PFE Avg.										
AC	93.8	23.1	38.9	4.19	112.	23.3	7.68	14.2	17.9	33.9
DRIFT	—	—	—	—	—	—	—	—	—	
S.P.	+10.7				+24.1					+9.1
AC NOISE										
POT RES.	20K				18K					100K

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 2 BEARING N 32° W HALF N SP. 1 DATE 4-22-7

SEND	4-5	3-4	2-3	1-2	5-6	4-5	3-4	2-3	5-6	4-5
RECEIVE	50-60	→	→	→	60-70	→	→	→	70-80	→
MULT.	1.0	0.1	1.0	0.1	1.0	0.1	0.1	0.1	0.1	0.1
PFE	4.6	4.4	4.8	4.3	4.4	4.1	4.2	4.1	5.5	4.5
Cur										
#	17	18	19	20	21	22	23	24	25	26
n	3	4	5	6	3	4	5	6	4	5
PFE Avg.										
AC	15.2	6.19	12.4	1.87	13.4	9.32	4.60	9.98	7.18	6.42
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.					-5.6				+12.5	
AC NOISE										
POT RES.					60k				90K	

STA 70 N ~250'-300' NW of 1/4 Cor Sec. 5 & 6

I.P. RECEIVER NOTES

PAGE 4

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R

LINE 2 BEARING N32°W HALF N SP. 1 DATE 4-27-71

SEND	3-4	3-4	2-3							
RECEIVE	70-80	70-80s	20-30s							
MULT.	0.1	0.1	1.0							
PFE	4.5?	4.5	2.5							
	4-1									
3	3.01									
Gen 1	4.6	—	—							
# 0.3	7.2	27	28							
n 0.12-	9.3	6	1							
	—									
PFE Avg.										
AC	3.15	3.15	42.3							
DRIFT		—	—							
S.P.										
AC NOISE	Very									
POT RES.	Noisy									

I.P. RECEIVER NOTES

PAGE 6

ROAD @ 23.5 S
Grounded fence @ 32 S

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 2 BEARING S32°E HALF S SP. 1 DATE 4-27-72

SEND	3-4	4-5	5-6	1-2	2-3	3-4	4-5	5-6	1-2	2-3
RECEIVE	20-30	S →		30-40	S				40-50	S →
MULT.	1.0	0.1	0.1	1.0	1.0	0.1	0.1	0.1	0.1	0.1
PFE	3.0	3.0	3.7	3.3	3.3	4.3	3.7	2.7	3.3	3.2
							~~2.8 4.3~~			
							~~NOISY~~			
Cur										
# 3	29	30	31	32	33	34	35	1.74 36	37	38
n 1	2	3	4	1	2	3	4	2.05	2	3
0.3								3.4		
0.1								4.8		
PFE Avg.										
AC	18.3	5.12	2.57	28.1	15.2	9.47	3.13	1.77	9.36	8.37
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				+26.9					+10.3	
AC NOISE										
POT RES.				60K					20K	

G.F. @

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I. Res.

LINE 2 BEARING S 320 E HALF ____ SP. ____ DATE 4-28-72

SEND	3-4	4-5	5-6	1-2	2-3	3-4	4-5	1-2	2-3	5-4
RECEIVE	40-50s	→	→	50-60s	→	→	→	60-70	s →	→
MULT.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PFE	3.5	2.9	3.7	3.5	4.3	4.6	3.1	3.7	3.7	3.9
					~~1.3 4.8~~	~~3.0 5.7~~			~~2.3 4.3~~	~~3.0 4.7~~
3			1.20							
1			3.2							
0.3			5.2							
0.1			6.3							
line	→	→	→	→	3	→	→	4	3	→
#	39	40	41	42	43	44	45	46	47	48
n	4	5	6	3	4	5	6	4	5	6
PFE Avg.										
AC	5.79	2.05	1.23	4.82	3.81	2.79	1.04	2.45	2.12	1.60
DRIFT	—	—	—	—	—	—		—	—	—
S.P.				+15.0				+0.6		
AC NOISE										
POT RES.				50K				26K		

I.P. RECEIVER NOTES

$PFE = \frac{V_1 - V_2}{V_1} 100$

PAGE 1 (5)

HEINRICHS GEOEXPLORATION CO. **PROJECT** 710 G.R.I.R.

LINE 2 BEARING S32°C **HALF** S **SP.** 1 **DATE** 4-27-7

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	S.P	S.P.	2-3
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	0-10s	10-20s	20-30s
MULT.	10	10	1.0	1.0	10	1.0	1.0			1.0
PFE 1	0.0	1.9	1.9	2.1	1.8	2.1	1.8			2.5
0.3	-0.1					2.0				
0.1	0.0									
PFE Avg.					130.0	4.0				
AC 3 Hz	201.	112.	24.2	9.62	106.	31.7	101.3			42.3
DRIFT	—	—	—	—	—	—	—			
S.P.								W/F +11.8	W/F +13.7	+24.2
AC NOISE										
POT RES.								30K	16K	30K

CROSSED WIRE! I.P. RECEIVER NOTES

1=2 finally switched @ 20s.

HEINRICHS GEOEXPLORATION CO. PROJECT 710

LINE 2 BEARING S 32°E HALF 5 SP. 1 DATE

PAGE 5

SEND	CAL	S.P.	S.P.	2-3	3-4	4-5	5-6			
RECEIVE	3-4	0-10s	10-20s	20-30s	→	→	→			
MULT.	10			1.0	1.0					
PFE 1	0.0			2.7	3.0					
0.3	-0.1									
0.1	-0.1									
PFE Avg.										
AC 3 Hz	201.			60.8	18.3					
DRIFT	—			—	—					
S.P.		+11.8	+13.7	+11.5						
AC NOISE										
POT RES.		30k	16k	50k						

NOID

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT # 710 GRIR

LINE 2 HALF N SP. 1 DATE 4-27-72

PAGE 1 4-27-72

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	4-5	3-4	2-3
RECEIVE	34	1-2	—	—	2-3	—	3-4	30-40	—	→
RANGE	10X200	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400
VOLTAGE	460	900	780	860	740	810	810	680	800	700
CURRENT	2A	4A	4A	4A	4A	4A	4A	4A	4A	4A
SEND	1-2	5-6	4-5	3-4	2-3	1-2	5-6	4-5	3-4	2-3
RECEIVE	30-40	40-50	—	—	—	—	50-60	—	—	→
RANGE	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400
VOLTAGE	480	740	680	800	700	475	720	680	780	675
CURRENT	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A

FREQUENCIES 1 .1

SENDER NO. 237065

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT #710 GRIR

LINE 2 HALF N SP. 1 DATE 4-27-72

PAGE 2

SEND	1-2	5-6	4-5	3-4	2-3	6-6	4-5	3-4		
RECEIVE	50-60	60-70	—	—	—	70-80	—	—		
RANGE	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400		
VOLTAGE	470	700	650	780	650	700	650	770		
CURRENT	4A	4A	4A	4A	4A	4A	4A	4A		
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 .1

SENDER NO. 23706 S

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 710 G.R.I.D.R.

LINE 2 HALF S SP. 1 DATE 4.27.72

PAGE 1

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	2-3	3-4	4-5
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	20-30	S	→
RANGE	10X200	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400
VOLTAGE	390	730	610	660	610	660	660	575	700	600
CURRENT	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
SEND	5-6	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5
RECEIVE	→	30-40	S	→	→	→	40-50	S	→	→
RANGE	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400	10X400
VOLTAGE	650	450	575	700	600	650	450	575	700	600
CURRENT	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

FREQUENCIES 1 0.1

SENDER NO. 23706 S

OPERATOR K. Ritchie

RECEIVER NO. 25705 R

OPERATOR W. FREEMAN

COMMENTS: CROSSED WIRE TAKEN CARE OF - Restart on South half

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 710 G.R.I.R.

LINE 2 HALF S SP. 1 DATE 4-28-72

PAGE 2

SEND	5-6	1-2	2-3	3-4	4-5	1-2	2-3	3-4		
RECEIVE	40-50S	50-60	S →			60-70	S →			
RANGE	10X400	10X400	10X300	10X300	10X300	10X400	10X300	10X300		
VOLTAGE	625	450	430	500	450	450	430	500		
CURRENT	4.0	4.0	3.A	3A	3A	4.0	3.0	3.0		
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 .1

SENDER NO. 237065

OPERATOR ~~KRITCHIE~~ KRITCHIE

RECEIVER NO. 25705

OPERATOR W PLUSMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT # 710 GRIR

LINE 2 HALF S SP. 1 DATE 4-27-72

SEND	CAL	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	5-6
RECEIVE	3-4	20-30	—	—	—	30-40	—	—	—	—
RANGE	10X200	10X400	10X400	10X400						
VOLTAGE	390	575	700	625						
CURRENT	2A	4A	4A	4A						
SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	1-2
RECEIVE	40-50	—	—	—	—	50-60	—	—	—	60-70
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 .1

SENDER NO. 23706S

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT # 700 GRIR

LINE 2 HALF S SP. 1 DATE 4-27-76

PAGE 4

SEND	2-3	3-4								
RECEIVE	60-70	—1								
RANGE										
VOLTAGE										
CURRENT										
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 11

SENDER NO. 237065

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5964
TUCSON, ARIZONA (85703)
PHONE 623-0578

JOB 710, LINE 2, SPREAD 1, N+S 1/2, 4/27/72 — 1000 FEET=DIPOLE LENGTH
CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	.20	201.000	0.00	1.00	.10	.2000	.9950

COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	85.00	1.70	20.0	1.70	20.0	0.00	**	1.90	4.00	1	1	112.000	0.00
2	2	73.16	1.70	23.2	1.61	22.0	.09	**	1.90	4.00	2	2	24.100	0.00
3	3	73.16	1.90	26.0	1.69	23.0	.21	**	2.10	4.00	3	3	9.620	0.00
4	1	80.37	1.60	19.9	1.60	19.9	0.00	**	1.80	4.00	4	1	106.000	0.00
5	2	96.42	1.90	19.7	1.90	19.7	0.00	**	2.10	4.00	5	2	31.700	0.00
6	1	76.65	1.60	20.9	1.60	20.9	0.00	**	1.80	4.00	6	1	101.100	0.00
7	1	71.89	2.70	37.6	2.70	37.6	0.00	**	2.90	4.00	7	1	93.800	0.00
8	2	71.02	3.00	42.2	2.91	40.9	.09	**	3.20	4.00	8	2	23.100	0.00
9	3	297.56 198	2.50	8.4 13	2.50	8.4	0.00	**	2.70	4.00	9	3	38.900	0.00
10	4	64.54	3.20	49.6	2.72	42.1	.48	**	3.40	4.00	10	4	4.190	0.00
11	1	85.50	2.30	26.9	2.30	26.9	0.00	**	2.50	4.00	11	1	112.000	0.00
12	2	72.13	3.70	51.3	3.61	50.0	.09	**	3.90	4.00	12	2	23.300	0.00
13	3	59.55	3.90	65.5	3.61	60.7	.29	**	4.10	4.00	13	3	7.680	0.00
14	4	221.27 141	4.40	19.9 31	4.31	19.5	.09	**	4.60	4.00	14	4	14.200	0.00
15	5	493.72	5.60	11.3	5.60	11.3	0.00	**	5.80	4.00	15	5	17.900	0.00
16	2	104.13	2.90	27.9	2.90	27.9	0.00	**	3.10	4.00	16	2	33.900	0.00
17	3	118.42	4.40	37.2	4.29	36.2	.11	**	4.60	4.00	17	3	15.200	0.00
18	4	96.27	4.20	43.6	3.92	40.7	.28	**	4.40	4.00	18	4	6.190	0.00
19	5	338.78 208	4.60	13.6 22	4.52	13.3	.08	**	4.80	4.00	19	5	12.400	0.00
20	6	81.35	4.10	50.4	3.21	39.4	.89	**	4.30	4.00	20	6	1.870	0.00
21	3	104.20	4.20	40.3	4.07	39.1	.13	**	4.40	4.00	21	3	13.400	0.00
22	4	144.53	3.90	27.0	3.74	25.9	.16	**	4.10	4.00	22	4	9.320	0.00
23	5	124.96	4.00	32.0	3.67	29.4	.33	**	4.20	4.00	23	5	4.600	0.00
24	6	433.34 260	3.90	9.0 15	3.81	8.8	.09	**	4.10	4.00	24	6	9.980	0.00
25	4	112.84	5.30	47.0	5.08	45.0	.22	**	5.50	4.00	25	4	7.180	0.00
26	5	174.90	4.30	24.6	4.10	23.4	.20	**	4.50	4.00	26	5	6.420	0.00
27	6	137.30	4.30	31.3	3.86	28.1	.44	**	4.50	4.00	27	6	3.150	0.00
28	1	32.29	2.30	71.2	2.22	68.8	.08	**	2.50	4.00	28	1	42.300	0.00
29	2	56.16	2.80	49.9	2.67	47.5	.13	**	3.00	4.00	29	2	18.300	0.00
30	3	39.28	2.80	71.3	2.29	58.4	.51	**	3.00	4.00	30	3	5.120	0.00
31	4	39.70	3.50	88.2	2.57	64.8	.93	**	3.70	4.00	31	4	2.570	0.00
32	1	21.62	3.10	143.4	2.96	137.0	.14	**	3.30	4.00	32	1	28.100	0.00
33	2	46.78	3.10	66.3	2.93	62.6	.17	**	3.30	4.00	33	2	15.200	0.00
34	3	73.57	4.10	55.7	3.89	52.8	.21	**	4.30	4.00	34	3	9.470	0.00
35	4	48.35	3.50	72.4	2.79	57.6	.71	**	3.70	4.00	35	4	3.130	0.00
36	5	47.39	2.50	52.8	1.29	27.3	1.21	**	2.70	4.00	36	5	1.770	0.00
37	2	28.81	3.10	107.6	2.77	96.0	.33	**	3.30	4.00	37	2	9.360	0.00
38	3	64.34	3.00	46.6	2.74	42.6	.26	**	3.20	4.00	38	3	8.370	0.00
39	4	89.27	3.30	37.0	2.99	33.5	.31	**	3.50	4.00	39	4	5.790	0.00
40	5	54.99	2.70	49.1	1.71	31.1	.99	**	2.90	4.00	40	5	2.050	0.00
41	6	53.20	3.50	65.8	1.94	36.4	1.56	**	3.70	4.00	41	6	1.230	0.00
42	3	37.16	3.30	88.8	2.75	74.1	.55	**	3.50	4.00	42	3	4.820	0.00
43	4	78.93	4.10	51.9	3.73	47.3	.37	**	4.30	3.00	43	4	3.810	0.00
44	5	101.44	4.40	43.4	3.97	39.1	.43	**	4.60	3.00	44	5	2.790	0.00
45	6	59.63	2.90	48.6	1.55	26.1	1.35	**	3.10	3.00	45	6	1.040	0.00
46	4	37.85	3.50	92.5	2.51	66.3	.99	**	3.70	4.00	46	4	2.450	0.00
47	5	76.41	3.50	45.8	2.86	37.5	.64	**	3.70	3.00	47	5	2.120	0.00
48	6	92.45	3.70	40.0	2.95	31.9	.75	**	3.90	3.00	48	6	1.600	0.00

Job 710, Line 1, Spread 1, N½, 4/26/72 1000.

Rec. # 25705

I.P. RECEIVER NOTES

PAGE 1

HEINRICHS GEOEXPLORATION CO. **PROJECT** 710 Gica Rn. Ind. Res.

LINE 1 BEARING N320E **HALF** N **SP.** 1 **DATE** 4-26-72

SEND	CAC	3-4	4-5	5-6	4-5	5-6	5-6	S.P.	S.P.	4-5
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	0-10N	10-20N	20-30N
MULT.	10	1.0	0.1	0.1	1.0	1.0	1.0			1.0
PFE	0.2	1.2	1.6	2.1	1.7	2.3	1.3			2.3
Cur	2	3	4	3	4	3	—			4
#	1	1	2	3	4	5	6			7
n		1	2	3	1	2	1			1
PFE Avg.										
AC	200.	23.5	8.16	3.80	52.8	15.0	40.7			54.2
DRIFT	—	—	—	—	—	—	—			—
S.P.	1.0							-6.3	+2.2	+7.8
AC NOISE	0.1									
POT RES.								35k	16k	60k

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 1 BEARING N32°W HALF N SP. 1 DATE 4-26-74

SEND	3.4	2.3	1.2	5.6	4.5	3.4	2.3	1.2	5.6	4.5
RECEIVE	20.30	N →		30.40	N →				40.50 N	→
MULT.	1.0	0.1	0.1	1.0	1.0	0.1	0.1	0.1	1.0	1.0
PFE	2.3	3.0	3.1	2.7	2.5	2.9	3.7	4.0	2.8	2.6
3			~~3.46~~					~~3.13~~		
1			~~2.3~~					~~3.5~~		
0.3			~~4.2~~					~~5.2~~		
0.1			~~5.7~~					~~7.2~~		
Cm	3	—	4.5	3	4	3.5	—	4.5	3	4.5
#	8	9	10	11	12	13	14	15	16	17
n	2	3	4	1	2	3	4	5	2	3
PFE Avg.										
AC	12.5	7.29	3.55	55.8	17.1	7.90	6.32	3.23	26.2	14.4
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				−7.0					−26.3	
AC NOISE										
POT RES.				60K					23K	

I.P. RECEIVER NOTES

STA. SON just over saddle ~ 150'

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 1 BEARING N 32° W HALF N SP. 1 DATE 4-26-7

SEND	3-4	2-3	1-2	5-6	4-5	3-4	2-3	5-6	4-5	3-4
RECEIVE	40-50	→	→	50-60	→	→	→	60-70	→	→
MULT.	0.1	0.1	0.1	1.0	0.1	0.1	0.1	0.1	0.1	0.1
PFE	2.7	2.9	3.1	3.4	3.2	3.9	4.8	4.0	3.6	3.8
3										~~2.17~~
1										~~3.1~~
0.3										~~5.8~~
0.1										~~7.3~~
~~Sea~~	3.5	—	4.5	3	4.5	3.5	—	3	4.5	3.5
E	18	19	20	21	22	23	24	25	26	27
n	4	5	6	3	4	5	6	4	5	6
PFE Avg.										
AC	7.27	6.35	3.57	12.9	8.50	4.77	4.50	5.25	3.58	2.24
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				+12.7				+5.2		
AC NOISE										
POT RES.				35K				25K		

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

#710

PROJECT GRIR

LINE 1 HALF N SP. 1 DATE 4-26-72

PAGE 1

SEND	3-4	3-4	4-5	5-6	4-5	5-6	5-6	4-5	3-4	2-3
RECEIVE	CAL	1-2	—	—	2-3	→	3-4	20-30	"	→
RANGE	10X200	10X300	10X400	10X300	10X400	10X300	10X300	10X400	10X300	10X300
VOLTAGE	350	480	470	500	440	480	485	440	450	430
CURRENT	2A	3	4A	3A	4A	3A	3A	4A	3A	3A
SEND	1-2	5-6	4-5	3-4	2-3	1-2	5-6	4-5	3-4	2-3
RECEIVE	20-30A	30-40	"	—			→	40-50	"	—	→
RANGE	10X450	10X300	10X400	10X350	10X350	10X450	10X300	10X450	10X350	10X350
VOLTAGE	440	480	430	490	480	430	470	470	490	470
CURRENT	4½	3A	4A	3½	3½	4½	3A	4½	3½	3½

FREQUENCIES 1 .1

SENDER NO. 23706 S

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT #710 GRIR

LINE 1 HALF N SP. 1 DATE 4-26-72

PAGE 2

SEND	1-2	5-6	4-5	34	23	56	45	34		
RECEIVE	40-50	50-60	—	—	—	60-70	—	—		
RANGE	10X450	10X300	10X450	10X350	10X350	10X300	10X450	10X350		
VOLTAGE	440	470	460	485	465	465	430	440		
CURRENT	4½	3A	4½	3½	3½	3A	4½	3½		
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES I II

SENDER NO. 23706 S

OPERATOR K RITCHIE

RECEIVER NO. 25208

OPERATOR W FREEMAN

COMMENTS:

Job 710, Line 1, Spread 1, 5½, 4/26/72 1000.

I.P. RECEIVER NOTES

Jim Sullivan

PAGE 4

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I. Res.

LINE 1 BEARING S32°E HALF S SP. ____ DATE ____

SEND	S.P.	S.P.	S.P.	(CAL)	2-3	3-4	4-5	5-6	1-2	2-3
RECEIVE	0-10s	10-20s	20-30s	1-2	30-40	s	—	—	40-50	→
MULT.					1.0	0.1	0.1	0.1	1.0	0.1
PFE			~~3~~	201.	1.7	1.8	1.8	3.3	1.9	1.7
			~~1~~	~~0.0~~						
			~~0.3~~	0.1						
			~~0.1~~	~~0.1~~						
				0.1						
Lm				2	3.5	—	4.5	3	4.5	3.5
"				2	1	2	3	4	5	6
"					1	2	3	4	1	2
PFE Avg.										
AC				201.	27.7	6.98	3.52	1.75	24.8	8.84
DRIFT				—	—	—	—	—	—	—
S.P.	+33.7	+13.4	+19.8	1.0	+10.8				+20.5	
AC NOISE				0.1						
POT RES.	24K	40K	21K		30K				22K	

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. PROJECT 710 O.R.I. Res.

LINE 1 BEARING S32°E HALF S SP. 1 DATE 4-26-72

SEND	3-4	4-5	5-6	1-2	2-3	3-4	4-5	5-6	1-2	2-3
RECEIVE	40-50	→	→	50-60	→	→	→	→	60-70	→
MULT.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.01	0.1	0.1
PFE	2.3	3.1	4.2	2.7	2.7	3.4	4.0	3.8	3.1	2.9
							~~3-10~~	~~5-8~~		
							~~Noisy~~	~~Noisy~~		
Cm	—	4.5	3	4.5	3.5	—	4.5	3	4.5	3.5
#	7	8	9	10	11	12	13	14	15	16
n	3	4	5	2	3	4	5	6	3	4
PFE Avg.										
AC	3.12	1.88	1.03	7.23	4.10	1.68	1.15	0.692	3.48	2.41
DRIFT	—	—	—	—	—	—	—	—	—	—
S.P.				+25.4					−1.5	
AC NOISE								BAD	RADIO	COMM.
POT RES.				40k					30k	

I.P. RECEIVER NOTES

PAGE 6

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R. Ind Res.

LINE 1 BEARING S32°E HALF 5 SP. 1 DATE 4.26.7

SEND	3-4	4-5	1-2	2-3	3-4					
RECEIVE	60-70	→	70-80		→					
MULT.	0.1	0.01	0.1	0.1	0.01					
PFE	3.7	3.8	3.3	3.3	0.0					
					~~100~~					
					Noisy					
Cm	—	4.5	—	3.5	—					
#	17	18	19	20	21					
n	5	6	4	5	6					
PFE Avg.										
AC	1.09	0.806	1.97	1.54	0.740					
DRIFT	—	—	—	—	—					
S.P.										
AC NOISE										
POT RES.										

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT #710 GRIR

LINE 1 HALF 5 SP. 1 DATE 4/26/74

SEND	CAL	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	5-6
RECEIVE	1-2	30-40	—	—	—	40-50	—	—	—	—
RANGE	10X200	10X350	10X350	10X450	10X300	10X450	10X350	10X350	10X450	10X300
VOLTAGE	210	445	465	450	460	430	450	465	450	450
CURRENT	2A	3½	3½	4½	3A	4½A	3½A	3½A	4½A	3A
SEND	1-2	2-3	3-4	4-5	5-6	1-2	2-3	3-4	4-5	1-2
RECEIVE	50-60	—	—	—	—	60-70	—	—	—	70-80
RANGE	10X450	10X350	10X350	10X450	10X300	10X450	10X350	10X350	10X450	10X450
VOLTAGE	400	440	460	440	450	420	440	455	450	420
CURRENT	4½A	3½A	3½A	4½A	3A	4½A	3½	3½	4½	4½A

FREQUENCIES 1 11

SENDER NO. 237065

OPERATOR K RITCHIE

RECEIVER NO. 25705

OPERATOR W FREEMAN

COMMENTS:

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT # 710 GR.I.R.

LINE 1 HALF S SP. 1 DATE 4 8 72

PAGE 4

SEND	2-3	3-4								
RECEIVE	70-80	—								
RANGE	10X350	10X350								
VOLTAGE	435	450								
CURRENT	3½A	3½A								
SEND										
RECEIVE										
RANGE										
VOLTAGE										
CURRENT										

FREQUENCIES 1 .1

SENDER NO. 23706 S

OPERATOR K RITCHIE

RECEIVER NO. 25765

OPERATOR W FREEMAN

COMMENTS:

20693

I.P. RECEIVER NOTES

Double DAMP (X)

PAGE 1

HEINRICHS GEOEXPLORATION CO. PROJECT 710 G.R.I.R.

LINE 1 BEARING N32°E HALF N SP. 1 DATE 4-26-7

SEND	CAL	3-4	4-5	5-6	4-5	5-6	5-6	S.P.	S.P.	4-5
RECEIVE	3-4	1-2	→	→	2-3	→	3-4	0-10N	10-20N	20-30N
MULT.	10	1.0	0.1	0.1			1.0			
PFE	0.1	0.1	1.1	0.3			1.0			
PFE Avg.										
AC	202	23.7	8.25	3.85			41.1			
DRIFT	—	—	—	—						
S.P.										
AC NOISE										
POT RES.										

HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5964
TUCSON, ARIZONA (85703)
PHONE 623-0578

JOB 710, LINE 1, SPREAD 1, N 1/2, 4/26/72 — 1000 FEET=DIPOLE LENGTH

CAL GROUP NO. 1

CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	.20	200.000	0.00	1.00	.10	.2000	1.0000

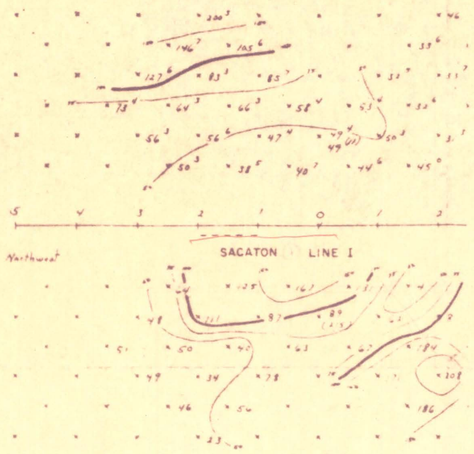
COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	23.73	1.00	42.1	.88	37.1	.12	**	1.20	3.00	1	1	23.500	0.00
2	2	24.82	1.40	56.4	.99	39.9	.41	**	1.60	4.00	2	2	8.160	0.00
3	3	38.72	1.90	49.1	1.38	35.8	.52	**	2.10	3.00	3	3	3.800	0.00
4	1	40.19	1.50	37.3	1.50	37.3	0.00	**	1.70	4.00	4	1	52.800	0.00
5	2	61.26	2.10	34.3	1.98	32.4	.12	**	2.30	3.00	5	2	15.000	0.00
6	1	41.15	1.10	26.7	1.10	26.7	0.00	**	1.30	3.00	6	1	40.700	0.00
7	1	41.50	2.10	50.6	2.10	50.6	0.00	**	2.30	4.00	7	1	54.200	0.00
8	2	51.05	2.10	41.1	1.95	38.2	.15	**	2.30	3.00	8	2	12.500	0.00
9	3	74.94	2.80	37.4	2.59	34.6	.21	**	3.00	3.00	9	3	7.290	0.00
10	4	48.71	2.90	59.5	2.19	45.0	.71	**	3.10	4.50	10	4	3.550	0.00
11	1	57.19	2.50	43.7	2.50	43.7	0.00	**	2.70	3.00	11	1	55.800	0.00
12	2	52.48	2.30	43.8	2.15	41.1	.15	**	2.50	4.00	12	2	17.100	0.00
13	3	69.54	2.70	38.8	2.47	35.5	.23	**	2.90	3.50	13	3	7.900	0.00
14	4	112.13	3.50	31.2	3.27	29.2	.23	**	3.70	3.50	14	4	6.320	0.00
15	5	78.23	3.80	48.6	3.18	40.7	.62	**	4.00	4.50	15	5	3.230	0.00
16	2	107.52	2.60	24.2	2.60	24.2	0.00	**	2.80	3.00	16	2	26.200	0.00
17	3	98.30	2.40	24.4	2.26	23.0	.14	**	2.60	4.50	17	3	14.400	0.00
18	4	127.74	2.50	19.6	2.31	18.1	.19	**	2.70	3.50	18	4	7.270	0.00
19	5	195.64	2.70	13.8	2.53	12.9	.17	**	2.90	3.50	19	5	6.350	0.00
20	6	137.15	2.90	21.1	2.46	17.9	.44	**	3.10	4.50	20	6	3.570	0.00
21	3	133.13	3.20	24.0	3.11	23.3	.09	**	3.40	3.00	21	3	12.900	0.00
22	4	116.73	3.00	25.7	2.79	23.9	.21	**	3.20	4.50	22	4	8.500	0.00
23	5	148.39	3.70	24.9	3.44	23.2	.26	**	3.90	3.50	23	5	4.770	0.00
24	6	225.94	4.60	20.4	4.38	19.4	.22	**	4.80	3.50	24	6	4.500	0.00
25	4	108.99	3.80	34.9	3.57	32.7	.23	**	4.00	3.00	25	4	5.250	0.00
26	5	86.37	3.40	39.4	2.86	33.1	.54	**	3.60	4.50	26	5	3.580	0.00
27	6	111.39	3.60	32.3	3.02	27.1	.58	**	3.80	3.50	27	6	2.240	0.00

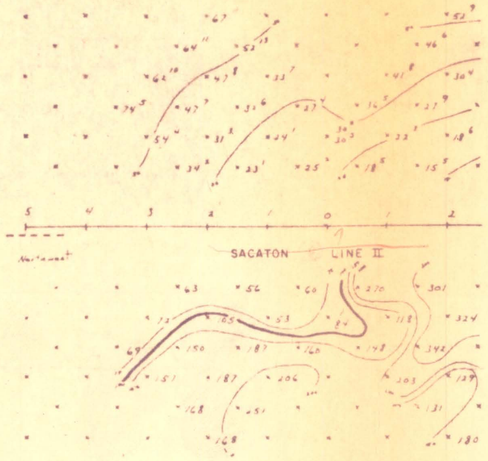
HEINRICHS GEOEXPLORATION CO.
POST OFFICE BOX 5964
TUCSON, ARIZONA (85703)
PHONE 623-0578

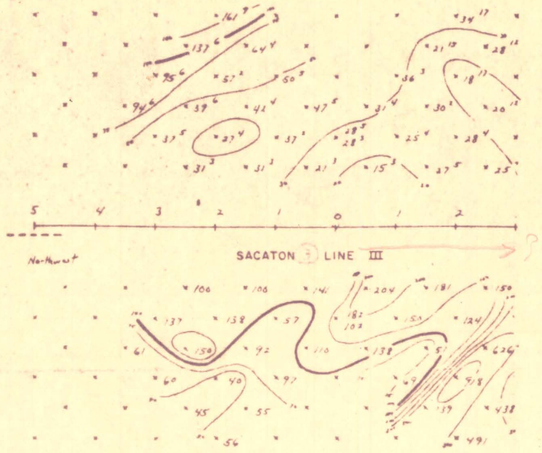
JOB 710, LINE 1, SPREAD 1, S 1/2, 4/26/72 1000 FEET=DIPOLE LENGTH
CAL GROUP NO. 2

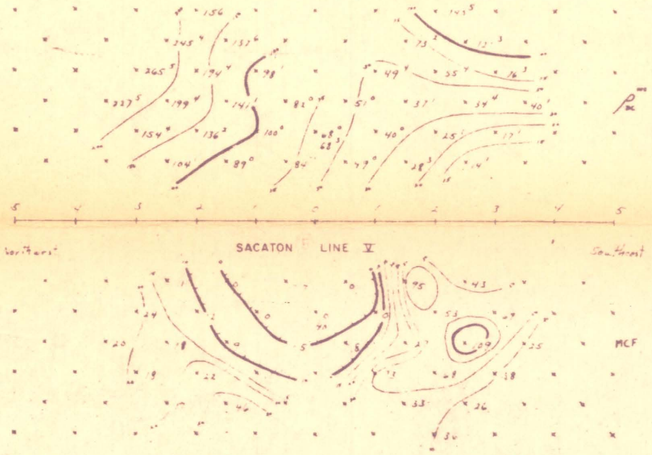
CAL CUR	PFE	AC1	AC2	AC FREQ	DC FREQ	PFE CAL	RHO CAL
2.000	.10	201.000	0.00	1.00	.10	.1000	.9950

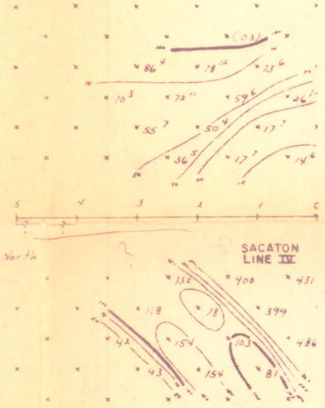
COMPUTED DATA									FIELD DATA					
POINT NO.	N	RHO	PFE	MCF	CCPFE	CCMCF	CPFE		PFE	CUR	PT.	N	AC1	AC2
1	1	24.00	1.60	66.7	1.48	61.7	.12	**	1.70	3.50	1	1	27.700	0.00
2	2	24.22	1.70	70.2	1.28	52.7	.42	**	1.80	3.50	2	2	6.980	0.00
3	3	23.75	1.70	71.6	.71	29.7	.99	**	1.80	4.50	3	3	3.520	0.00
4	4	35.94	3.20	89.0	2.14	59.5	1.06	**	3.30	3.00	4	4	1.750	0.00
5	1	16.75	1.80	107.5	1.60	95.8	.20	**	1.90	4.50	5	1	24.800	0.00
6	2	30.64	1.60	52.2	1.29	42.2	.31	**	1.70	3.50	6	2	8.840	0.00
7	3	27.20	2.20	80.9	1.37	50.4	.83	**	2.30	3.50	7	3	3.120	0.00
8	4	25.69	3.00	116.8	1.35	52.6	1.65	**	3.10	4.50	8	4	1.880	0.00
9	5	37.34	4.10	109.8	2.45	65.7	1.65	**	4.20	3.00	9	5	1.030	0.00
10	2	19.68	2.60	132.1	2.04	103.5	.56	**	2.70	4.50	10	2	7.230	0.00
11	3	35.88	2.60	72.5	2.03	56.5	.57	**	2.70	3.50	11	3	4.100	0.00
12	4	29.60	3.30	111.5	1.93	65.2	1.37	**	3.40	3.50	12	4	1.680	0.00
13	5	27.74	3.90	140.6	1.48	53.5	2.42	**	4.00	4.50	13	5	1.150	0.00
14	6	39.99	3.70	92.5	1.44	36.0	2.26	**	3.80	3.00	14	6	.692	0.00
15	3	23.78	3.00	126.2	2.01	84.4	.99	**	3.10	4.50	15	3	3.480	0.00
16	4	42.26	2.80	66.3	1.95	46.0	.85	**	2.90	3.50	16	4	2.410	0.00
17	5	33.71	3.60	106.8	1.72	51.0	1.88	**	3.70	3.50	17	5	1.090	0.00
18	6	31.05	3.70	119.2	.58	18.7	3.12	**	3.80	4.50	18	6	.806	0.00
19	4	26.97	3.20	118.6	1.65	61.3	1.55	**	3.30	4.50	19	4	1.970	0.00
20	5	47.44	3.20	67.5	2.00	42.1	1.20	**	3.30	3.50	20	5	1.540	0.00
21	6	35.31	-.10	-2.8	-2.75	-77.9	2.65	**	0.00	3.50	21	6	.740	0.00











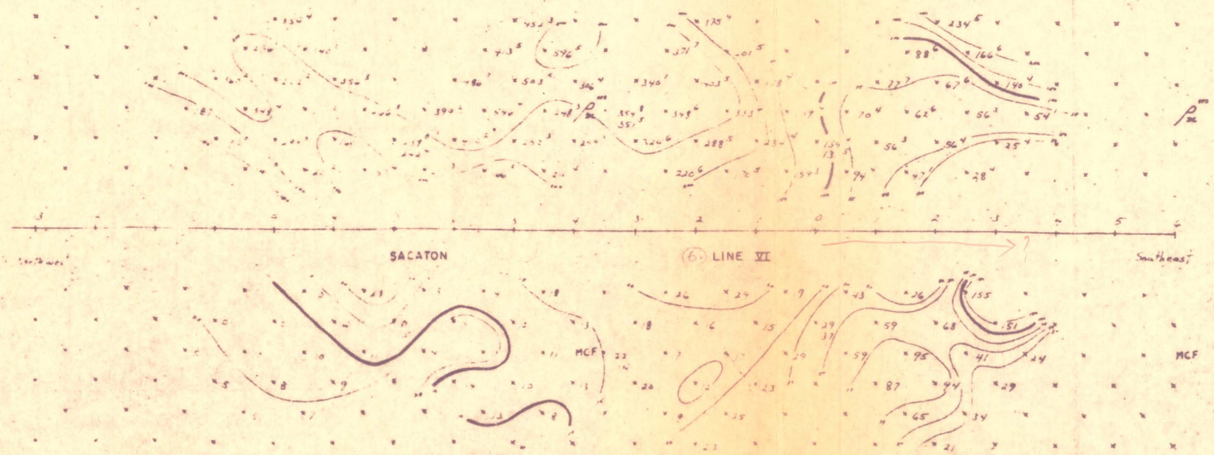


PLATE 24

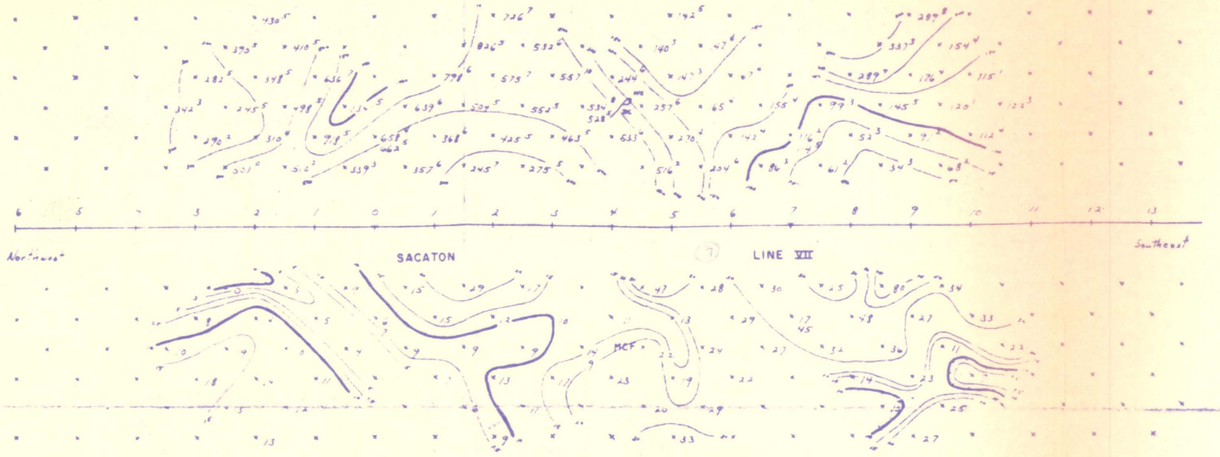
ANOMALY CLASSIFICATION LEGEND

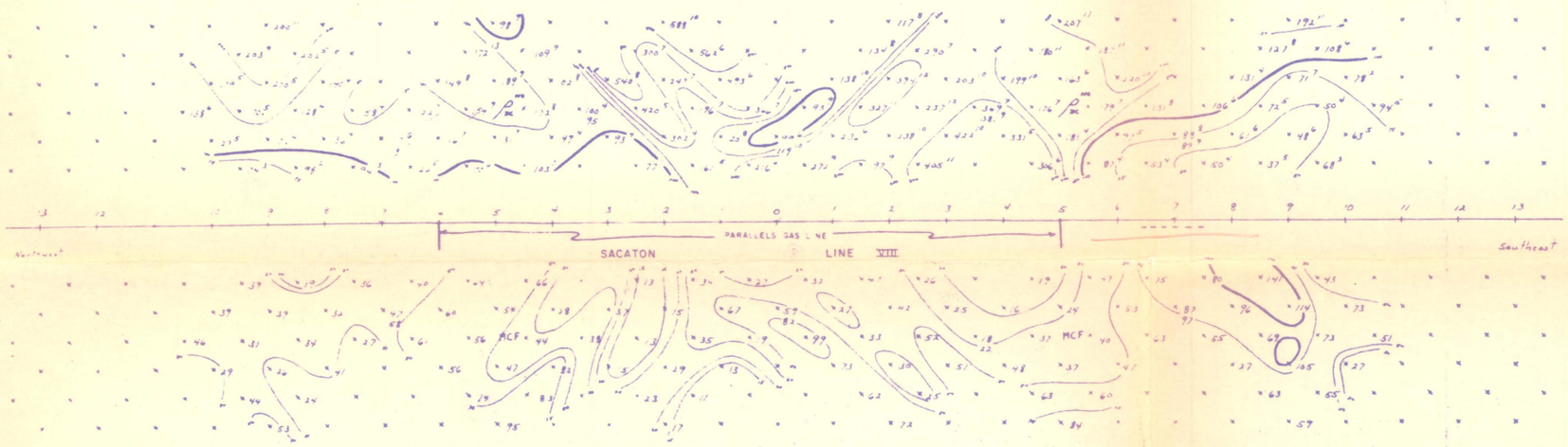
- END OF LINE
- NO ANOMALY
- WEAK OR QUESTIONABLE ANOMALY
- MODERATE ANOMALY
- MODERATE TO STRONG ANOMALY
- STRONG ANOMALY
- ANOMALY CONTINUES TO OR BEYOND LAST DATA POINT
- LINE ALONG WHICH DATA WAS TAKEN

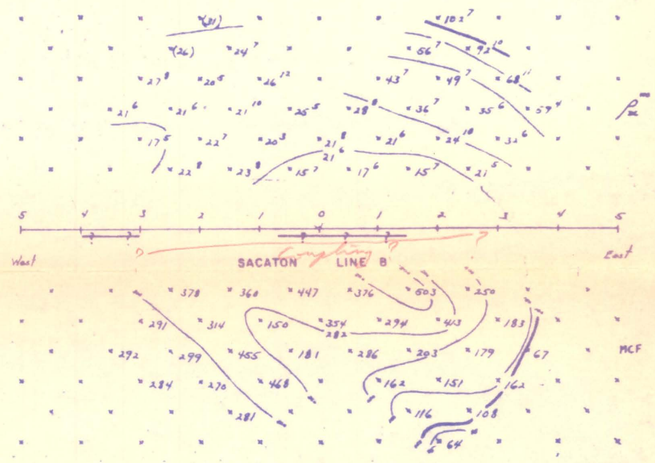
NOTE LAST NUMBER IN LINE NAME OR NUMBER IS THE DIPOLE SPACING USED, AND IS THE DISTANCE BETWEEN THE STATIONS ON THE PROFILE LINE.

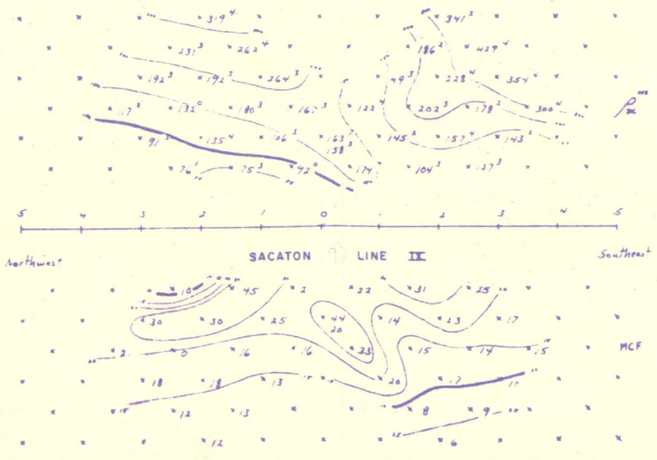
GEOPHYSICS DIVISION		BEAR CREEK MINING COMPANY
INDUCED POLARIZATION PROFILES SACATON AREA		
PINAL COUNTY, ARIZONA		AREA No. 61-116
SCALE:	CONTOUR INTERVAL:	REVISIONS
1000' DIPOLES	DATA BY: H.R.E.	
DATE: FEBRUARY 1964	SHEET 1 OF 2	
DRAWN BY H.R.E.	DRAWING NO.: S 31-554	FILE:

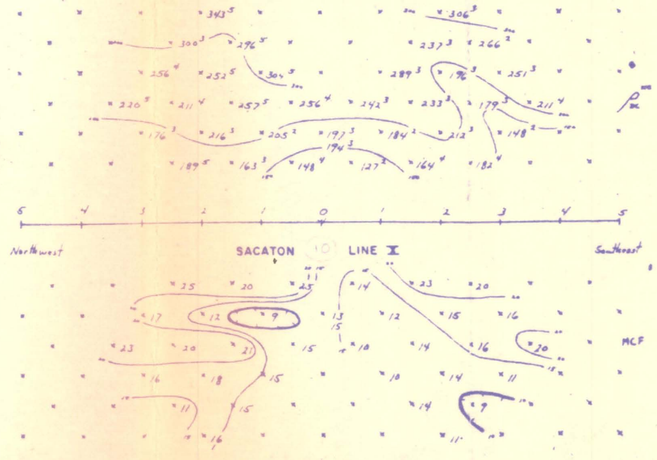
61-116
C5080











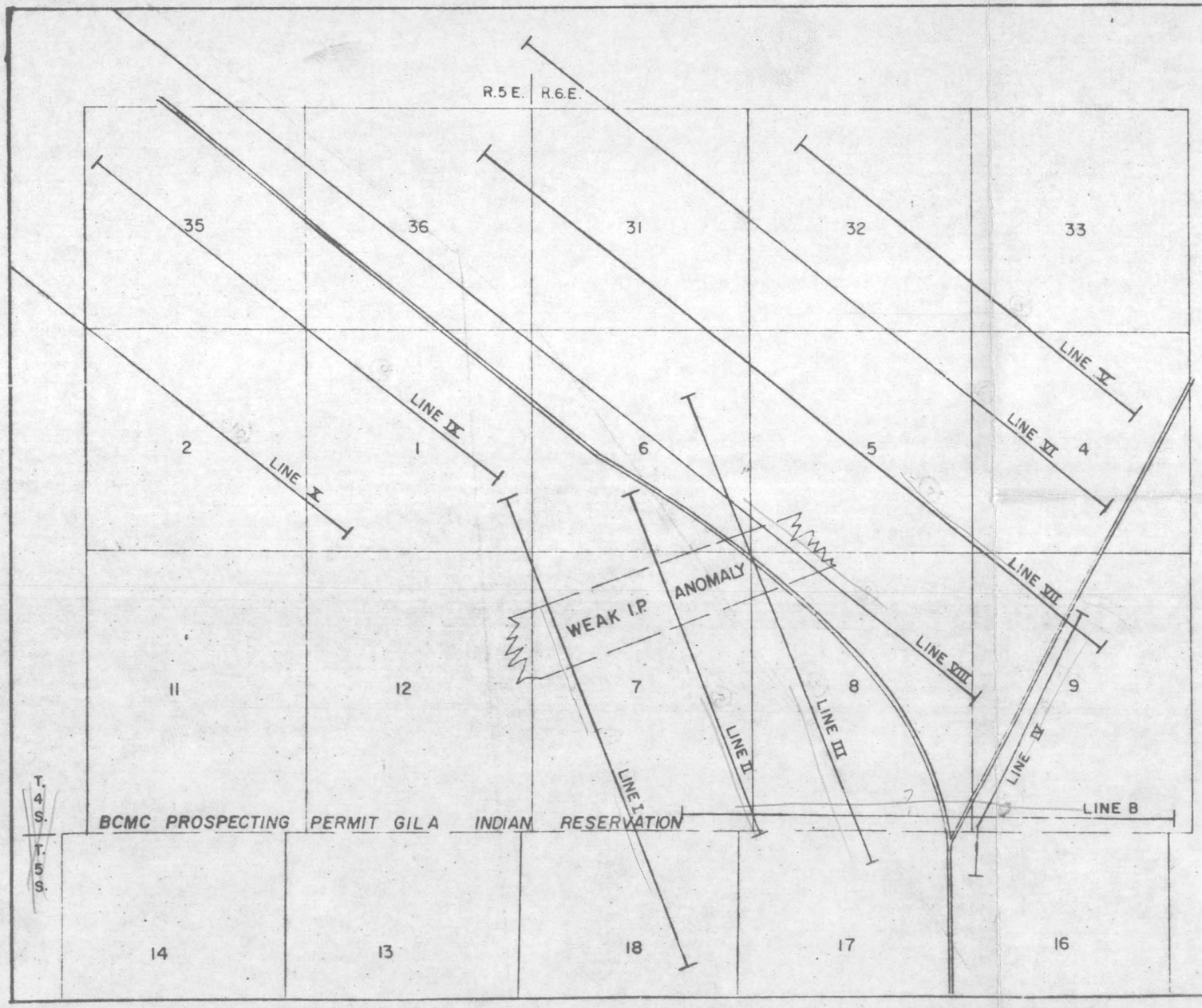
ANOMALY CLASSIFICATION LEGEND

- END OF LINE
- NO ANOMALY
- WEAK OR QUESTIONABLE ANOMALY
- MODERATE ANOMALY
- MODERATE TO STRONG ANOMALY
- STRONG ANOMALY
- ANOMALY CONTINUES TO OR BEYOND LAST DATA POINT
- LINE ALONG WHICH DATA WAS TAKEN

PLATE 25

GEOPHYSICS DIVISION		BEAR CREEK MINING COMPANY
INDUCED POLARIZATION PROFILES SACATON AREA		
PINAL COUNTY, ARIZONA		AREA No. 61-116
SCALE:	CONTOUR INTERVAL:	REVISIONS
1000' DIPOLES	DATA BY: H.R.E.	
DATE: FEBRUARY 1964	SHEET 2 OF 2	
DRAWN BY: H.R.E.	DRAWING NO.: 531-554	FILE:

61-116
C5001



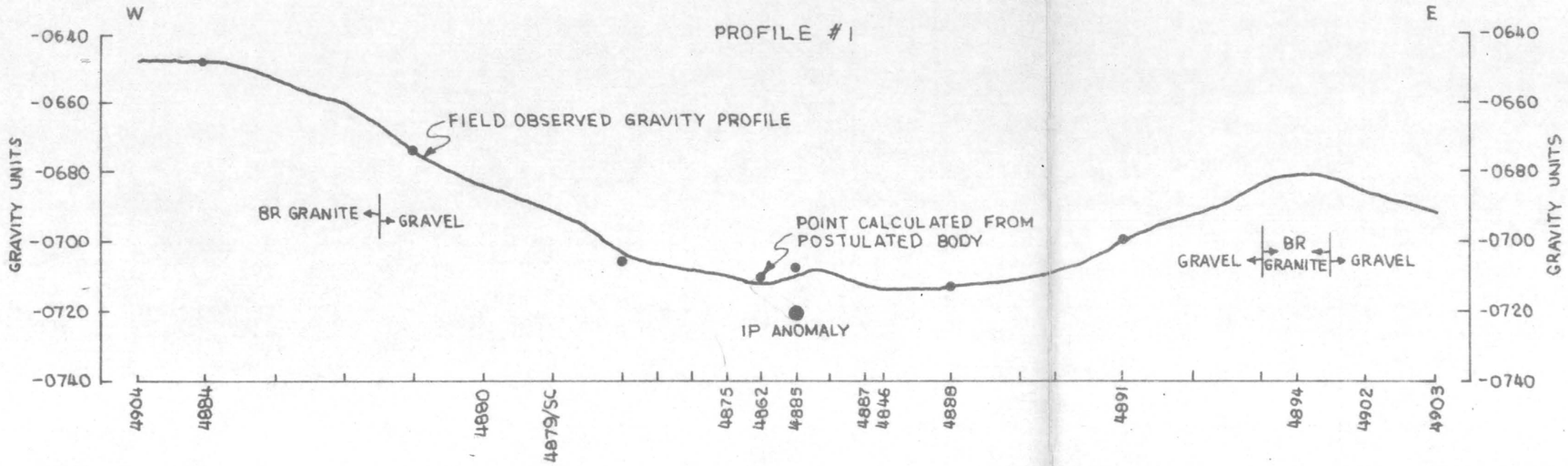
T4S
T5S

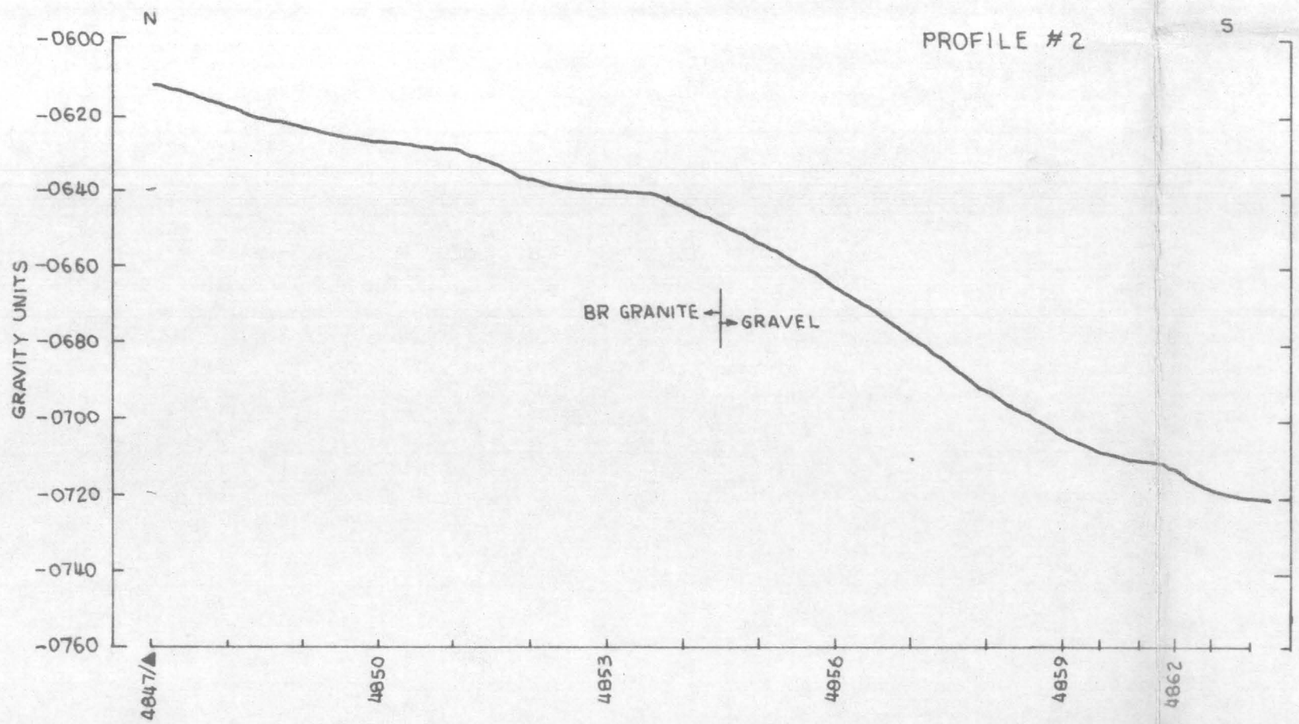
BEAR CREEK MINING COMPANY - SOUTHWEST DISTRICT

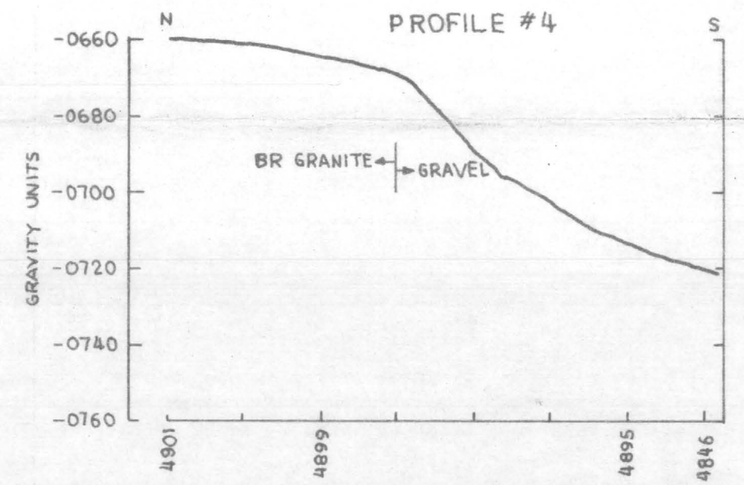
PROJECT-AREA: SACATON	STATE: ARIZONA
TITLE: INDUCED POLARIZATION SURVEY	COUNTY: PINAL
	TOWNSHIP & RANGE: 4-5S 5-6E
GEOLOGIST ENGINEER: H.R. EISENBEIS, R. HOLT	REVISIONS BY / DATE
DATE: DEC. 1963 / DRAFTSMAN: T.L. MAYHALL	MAP NUMBER: 61-116 C993

3000' 0' 3000' 6000'

SCALE 1" = 3000'





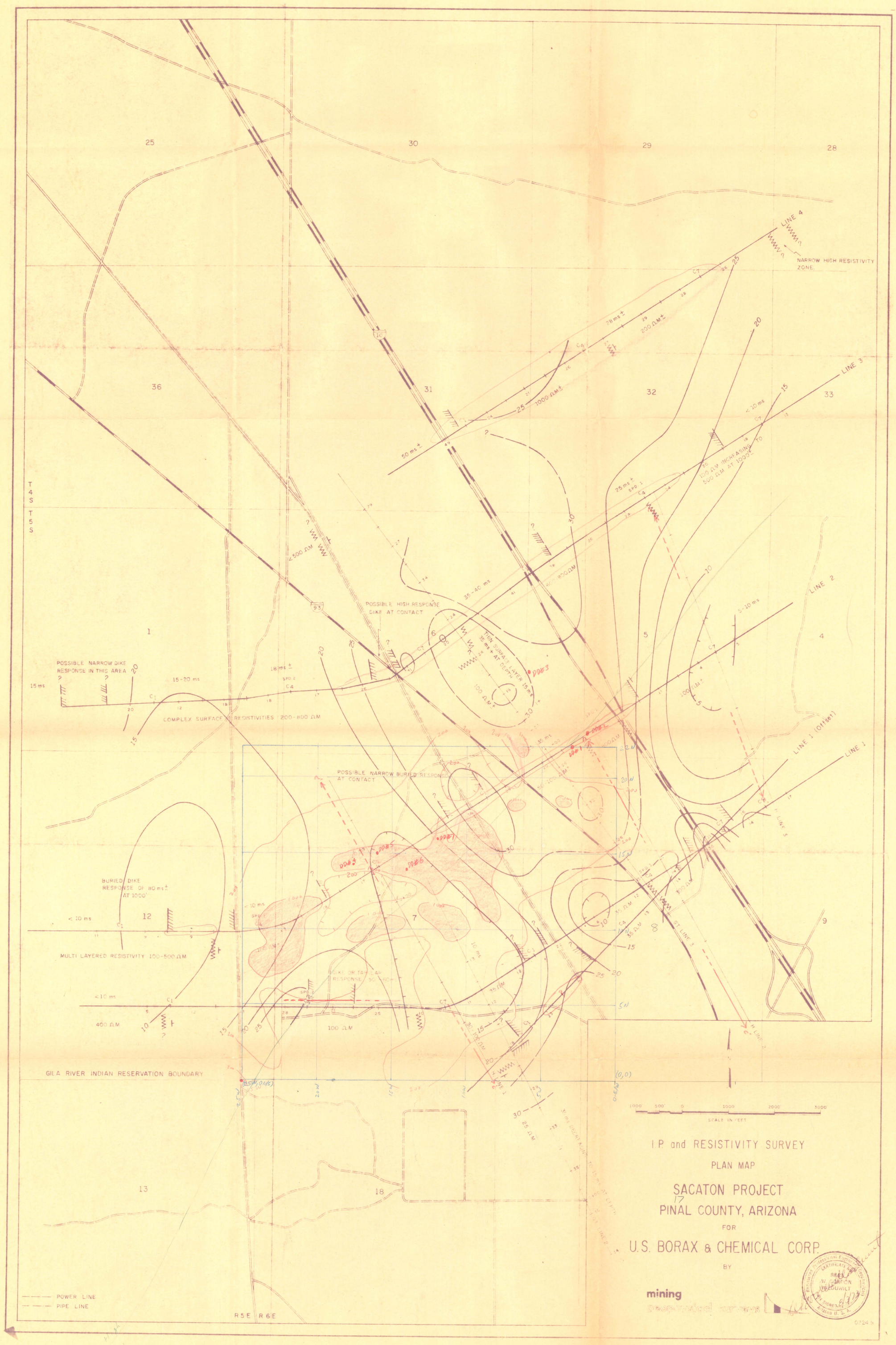


J. SULLIVAN AND CO.
SCOTTSDALE, ARIZONA

GILA RIVER INDIAN RESERVATION
GRAVITY PROFILES

DRAWN BY JPLS DATE
APPROVED BY DATE 7-20-71

SCALE:
1" = 2000 FT.


LINE 4
NARROW HIGH RESISTIVITY ZONE.
LINE 3
LINE 2
LINE 1 (offset)
LINE 1
POSSIBLE HIGH RESPONSE DIKE AT CONTACT
POSSIBLE NARROW DIKE RESPONSE IN THIS AREA
COMPLEX SURFACE RESISTIVITIES 200-800 ΩM
THIN SURFACE LAYER 15 ms AT DEPTH
POSSIBLE NARROW BURIED RESPONSE AT CONTACT
BURIED DIKE RESPONSE OF 80 ms± AT 1000'
MULTI LAYERED RESISTIVITY 100-500 ΩM
DIKE OR TABULAR RESPONSE 50-60 ms
GILA RIVER INDIAN RESERVATION BOUNDARY
POWER LINE
PIPE LINE
R5E R6E
T4S T5S
SCALE IN FEET
I.P. and RESISTIVITY SURVEY
PLAN MAP
SACATON PROJECT
PINAL COUNTY, ARIZONA
FOR
U.S. BORAX & CHEMICAL CORP.
BY
mining geophysical surveys

#710

Date: 4/8/71

TR.MK. REG. U.S. PAT. OFF.

Pg..... Line.....

Oper..... Asst. #1 Scale

Const. (S) ..... Base ..... Normal (5) ..... Day to Day (6) .....

Sta.	Time	READ ~~N-E~~	N-W	STA ~~Ave.~~	TIME ~~X-S~~	READ ~~M~~	(2) Val	STA ~~(3) 1+2~~	TIME (4) ~~Diur.~~	~~3+4+5+6 AZ~~	Rem.
2.5	8:30	32		3.75	8:49	180		BASE	9:19	120	
5	:31	5		40	50	-45					
7.5	:32	0		4.25	51	-30					
10	:33	-25		4.50	53	-40					
12.5	:35	42		4.75	55	10					
15	:36	30		50	58	5					
17.5	:38	35		5.25	9:00	10					
20	:40	70		5.50	9:01	15					
22.5	41	60		5.75	02	-10					
25	42	55		60	04	30					
27.5	44	40		6.25	05	35					
30	45	20		6.50	06	70					
32.5	46	25		6.75	08	12					
35.0	48	30		70 N.	9:10	12					

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SPEC. FORM L-1620.

600	560
585	500
625	590
600	560
600	560
610	570
600	560
625	590
610	570
635	600
610	570
610	570
625	590
625	590

600	560
625	590
650	610
600	560
585	550
585	550
600	560
600	570
600	560
550	520
800	750
500	470
400	380
325	310

450	420
400	380

Pg..... Line IP LINE 2

Oper..... Asst. SP1

COSO GRANDE
GRIP
710
Date: 4/28/72

TR.MK. REG. U.S. PAT. OFF.

Const. (S) ..... Base ..... Normal (5) ..... Day to Day (6) .....

Sta.	Time	READ ~~N-E~~	~~N-W~~	STA ~~Ave.~~	TIME ~~X-S~~	READ ~~M~~	~~(2) Val~~	(3) STA ~~1+2~~	(4) TIME ~~Diur.~~	READ ~~3+4+5+6~~ ~~AZ~~	Rem.
BASE	9:03	120		375	9:27	120		2.50	9:46	90	
70(S)	9:13	117		35	9:28	125		0 N/S	9:47	80	
675	14	125		325	9:30	130					
65	15	120		30	9:32	120					
625	16	120		275	34	117					
60	17	122		25	36	117					
575	18	120		225	37	120					
55	19	125		20	38	122					
525	20	122		17.5	39	120					
50	21	127		15	40	110					
475	22	122		125	41	160					
45	23	122		10	43	100					
425	24	125		7.5	44	80					
40	25	125		5.0	45	65					

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SPEC. FORM L-1520.

485	460
510	480
550	520
550	620
450	420
800	750
400	380
310	290
285	270
275	260
460	430
575	540
650	610
725	680

710	670
725	680
550	520
425	400
75	70
50	150
160	150
210	200
125	120
350	330
10	10
510	490
-150	-140
75	120

-10	-10
325	310
75	70
-10	-10

#710

Date: / /

TR.MK. REG. U.S. PAT. OFF.

Const. (S) ..... Base ..... Normal (5) ..... Day to Day (6) .....

Sta.	Time	READ		STA	TIME	READ		STA	TIME	READ	Rem.
2.5	9:50	97		37.5	10:05	142		72.5	10:24	-2	
5	9:51	102		40	10:07	145		75	10:25	65	
7.5	52	110		42.5	08	110		77.5	26	15	
10	53	110		45	09	85		80	10:27	-2	
12.5	54	90		47.5	10	15					
15	55	160		50	12	10		BASE			
17.5	56	80		52.5	13	32		BASE	10:38	115	
20	57	62		55	14	42					
22.5	58	57		57.5	16	25					
25	10:00	55		60	17	70					
27.5	10:01	92		62.5	18	2					
30	02	115		65	19	105					
32.5	03	130		67.5	21	-30					
35	04	145		70	22	25					

Line..... Asst.....

Pg..... Oper.....

SPEC. FORM L-1620. PRINTED BY LEFAX, PHILA. 7, PA., U.S.A.

Const. (S) ..... Base ..... Normal (5) ..... Day to Day (6) .....

Sta.	Time	N-E	N-W	Ave.	×S	M	(2) Val	(3) 1+2	(4) Diur.	3+4+5+6 ΔZ	Rem.

Date: / /

TR.MK. REG. U.S. PAT. OFF.

Pg..... Line..... Asst.....

Oper.....

SPEC. FORM L-1620. PRINTED BY LEFAX, PHILA. 7, PA., U.S.A.

560
600
590
590
590
590
560
560
590
590
560
590
560
490

540
540
540
560
490
530
500
480
430
420
280
470
360
310

70
240
310
190
100
280

Pg. 1 Line IP Line 1 Spl

Oper. Asst. #1 Scale

Case Hoarde #710

Date: 4/28/77

TR.MK. REG. U.S. PAT. OFF.

Const. (S) ..... Base ..... Normal (5) ..... Day to Day (6) .....

Sta.	Time	Polarity N-E	Scale N-W	Ave.	STA ~~X-S~~	TIME ~~M~~	READ (2) ~~Val~~	(3) ~~1+2~~	STA (4) ~~Diur.~~	TIME ~~3+4+5+6 ΔZ~~	READ ~~Rem.~~
Base	7:30	600	120		47.5	8:00	575 115		12.5	8:19	75 15
80(S)	7:40	640	128		45	8:01	575 115		10	8:21	260 52
77.5	43	625	125		42.5	8:03	575 115		7.5	22	335 67
75.	45	625	125		40.	8:04	600 120		5.0	23	200 40
72.5	46	625	125		37.5	05	525 105		2.50	24	425 85
70(S)	47	625	125		35	06	560 112		ON/S	8:25	300 60
67.5	49	600	120		32.5	08	535 107				
65	51	600	120		30	09	510 102				
62.5	53	625	125		27.5	8:11	460 92				
60	54	625	125		25	12	450 90				
57.5	54	600	120		22.5	13	300 60				
55	55	625	125		20	14	500 100				
52.5	56	600	120		17.5	15	385 77				
50	58	525	105		15	17	335 67				

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SPEC. FORM L-1620.

150	950
20	-210
0	-140
-120	-190
200	50
140	20
160	50
330	70
280	-50
260	140
190	160
90	330
120	60
140	60

164

I.P. RECEIVER NOTES

PAGE

HEINRICHS GEOEXPLORATION CO. PROJECT Mag. - Coro Grande

LINE _____ BEARING _____ HALF _____ SP. _____ DATE May 1 '77

SEND	STA	READING	TIME							
RECEIVE	45	17	↑	80						
MULT.	47.5	57		270						
PFE	50	52		240						
	52.5	50		230						
	55	47		220						
	57.5	35		160						
	60	65		300						
	62.5	85		400	→ 530					
	65	112		NEAR STEEL FENCE						
	67.5	95	Scale 1	450						
	70 S.	105		Winda difficult to read chosen than 5 divisions						
PFE Avg.	~~72.5~~			→ 490						
AC	~~75~~									
DRIFT	~~77.5~~									
S.P.	~~80~~									
AC NOISE										
POT RES.	BASE									

I.P. RECEIVER NOTES

HEINRICHS GEOEXPLORATION CO. **PROJECT** _____ SP. _____ DA

LINE _____ BEARING _____

STA. Base Checks 115 4:50

SEND	STA.	READING	TIME		STA	READING		STA.	READING	
RECEIVE	BASE	115	2:50	540	40	+2	10	25	37	490
MULT.	80 N	28	4:31	130	37.5	125	590	5.0	40	530
PFE	77.5	13		60	35	+43	200	7.5	42	560
	75	17	4:29	80	32.5	-36	-170	10.5	45	600
	72.5	+14		70	30	37	170	12.5	50	660
	70	-4		-20	27.5	38	180	15	42	560
	67.5	66	4:26	310	25	218	1020	17.5	47	630
	65	13		60	22.5	82	380	20	40	530
	62.5	7		30	20	71	330	22.5	45	600
	60	9	4:23	40	17.5	-19	-90	25	40	530
	57.5	61		290	15	56	260	27.5	37	490
PFE Avg.	55	42	4:21	200	12.5	97	460	30	20	270
AC	52.5	19		90	10	116	550	32.5	15	200
DRIFT	50	31	4:19	150	7.5	9	40	35	15	200
S.P.	47.5	82		390	5.0	13	60	37.5	27 *	130
AC NOISE	45	96	4:16	450	2.5	78	370	40	12	60
POT RES.	42.5	-41		Scale #1 -190	0	131	620	42.5	37	170

$$\Delta g = 12.77\, \Delta\rho\, T$$

$$\therefore T = \frac{\Delta g}{12.77\, \Delta\rho}$$

$$\Delta\rho \simeq 0.7$$

$$\Delta g \simeq 6.6 \rightarrow 3.3$$

$$\therefore T \sim \frac{3.3 \rightarrow 6.6}{12.8 \times 0.7} \rightarrow 370' \rightarrow 740'$$

$$\Delta g = 8.0$$

$$T \sim \frac{8}{12.8 \times 0.7} \approx 900'$$

AGREEMENT

AGREEMENT made as of _____, 1972, between HEINRICHS GEOEXPLORATION COMPANY, 806 West Grant Road, Tucson, Arizona 85703 (hereinafter referred to as "Heinrichs"), and J. SULLIVAN & COMPANY, INC., 4821 North Scottsdale Road, Suite A-9, Scottsdale, Arizona 85251 (hereinafter referred to as "Sullivan").

WITNESSETH:

WHEREAS "Sullivan" has an acceptable application for an exclusive prospecting permit on the Gila Indian Reservation, Number GRMPP-71-1, the area more particularly described in "Exhibit A" attached hereto; and

WHEREAS "Heinrichs" and "Sullivan" are both desirous to combine efforts on developing the property, as set forth in "Exhibit A" on the terms and conditions hereinafter set forth; and

NOW, THEREFORE, in consideration of the premises and the mutual agreement hereinafter set forth, the parties hereto agree as follows:

1. APPOINTMENT AND RESPONSIBILITY. "Heinrichs" hereby is appointed "Sullivan's" nonexclusive geophysical agent and "Heinrichs" will provide the following geophysical service and groundwork on the lands covered in "Exhibit A":

a. Induced polarization (hereinafter referred to as I. P.). Using applicable "Heinrichs" equipment, personnel and procedures as prescribed by "Heinrichs", more or less according to customary industry practice and as results and circumstances dictate or indicate, and warrant, sixteen line miles, more or less, of I. P. coverage using a 1,000 foot dipole spacing and "n" intervals ranging from 1 through 6 will be provided at customary rates.

b. Hand magnetometer survey.

Same as Item 1 a. (I. P.) above, except coverage provided will be 16 line miles, more or less, on a station interval of 250 feet (and or 330 feet) along the I. P. lines.

c. Geochemistry.

Same as Item 1 a. (I. P.) above, except coverage provided will be sample collection only (no analyses) along the I. P. line on a station interval of from 250 to 330 feet to total 16 line miles, more or less.

d. Gravity.

Same as Item 1 a. (I. P.) above, except gravity coverage may prove valuable in possible future extensions to this agreement. None will be done under the initial $5,000.00 of work.

e. Computing, drafting and clerical.

As necessary to prepare a final report and interpretation with appropriate illustrations at customary rates.

f. Billing to Sullivan.

"Heinrichs" will invoice "Sullivan" for the complete competitive geophysical service rendered, by billing an amount not less than $5,000.00 (Five Thousand Dollars), and "Heinrichs" will receipt said invoice or billing by marking it "paid in full" upon demand by "Sullivan," when said work has been essentially completed.

2. SERVICES RENDERED. For the services rendered by "Heinrichs" to "Sullivan," "Sullivan" agrees to remit to "Heinrichs" out of proceeds from a sale, lease, or option transaction, funds equal to twice the amount of the total profit due "Heinrichs" (the profit being $1,500.00--formula: $1,500.00 x 2 = $3,000.00). This amount paid to "Heinrichs" from "Sullivan" shall not be less than 10% of the funds, and as "Sullivan" receives said funds.

That is to say: (Example: "Heinrichs" will perform not less than $5,000.00 (Five Thousand Dollars) worth of geophysical services and "Sullivan" will pay to "Heinrichs" $3,500.00 (Three Thousand Five Hundred Dollars) in the form of a cashier's check in two (2) equal installments, $1,750.00 (One Thousand Seven Hundred Fifty Dollars) prior to the starting of the geophysical services and $1,750.00 (One Thousand Seven Hundred Fifty Dollars) on the completion of the geophysical services. When said service is paid in full by "Sullivan" (not less than $3,500.00 (Three Thousand Five Hundred Dollars), "Heinrichs" will invoice "Sullivan" for an amount not less than $5,000.00 (see 1g above).

If "Sullivan" receives installment payment of $10,000.00 (Ten Thousand Dollars), "Heinrichs" is to receive $1,000.00 (One Thousand Dollars), leaving a balance of $2,000.00 (Two Thousand Dollars) to be paid through subsequent installments. Upon completion of payments to "Heinrichs" of any balance, "Sullivan" has then fulfilled his obligations and this agreement with "Heinrichs" automatically terminates.

3. INFORMATION TO "HEINRICHS." It is further agreed that "Sullivan" will keep "Heinrichs" informed as to all progress and will provide "Heinrichs" with copies of any and all information (at cost to, and upon written request by, "Heinrichs") relating to the sale or lease or option of the property.

4. TERMINATION OF AGREEMENT. It is hereby acknowledged that this is a speculative venture between both parties and, upon such time as "Sullivan" no longer has an interest in, or is not in control of, Prospecting Permit No. GRMPP-71-1 by virtue of termination by the Gila River Indian Community or the Bureau of Indian Affairs, then this agreement shall terminate and the obligation of "Sullivan" to "Heinrichs" and that of "Heinrichs" to "Sullivan" thereby becomes null and void, and upon written notice to "Sullivan", "Heinrichs" desires to be no longer involved in the venture and has effectively completed all of the services called for in Paragraph 1, Subparagraph a through

f. "Heinrichs" may terminate by said written notice and this agreement will become null and void.

The notice above mentioned from "Sullivan" to "Heinrichs" and/or "Heinrichs" to "Sullivan" will be sent by certified mail.

5. AUTHORITY AND BENEFIT. It is further agreed that both parties hereto are authorized to enter into and have the authority to make such an agreement and that this agreement shall be binding upon and inure to the benefit of the parties hereto and their respective heirs, personal representatives and successors.

6. TIME IS OF THE ESSENCE. It is further agreed that time is of the essence of this agreement and every part thereof.

7. INTERPRETATIVE LAWS. It is further agreed that this agreement shall be applied and interpreted in accordance with the laws of the State of Arizona.

8. MEMORANDUM OR NOTICE. It is further agreed that this agreement shall not be recorded by either party, but a short memorandum or notice thereof may be recorded upon the request of "Sullivan."

9. DOCUMENTS. It is further agreed that either party, on notice from the other, will execute such further documents as may be necessary to effectuate the purposes of this agreement.

IN WITNESS WHEREOF, the below signed have caused these presents to be executed on this _____ day of _____, 1972, by their officers thereunto duly authorized and by their respective corporate seals.

Attest: J. SULLIVAN & COMPANY, INC.

_____ By: _____

Florence Sullivan, Secretary J. Sullivan, President

(SEAL)

Attest:

HEINRICHS GEOEXPLORATION COMPANY

_____

By: _____
Walter E. Heinrichs, Jr.

(SEAL)

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

This instrument was acknowledged before me this _____ day of _____ 1972, by J. SULLIVAN, the President of J. Sullivan & Company, Inc., as the free act and deed of said corporation.

In witness whereof, I have hereunto set my hand and seal as of said date.

_____
Notary Public

(SEAL)

My commission expires: _____

STATE OF ARIZONA)
) ss.
COUNTY OF PIMA)

The foregoing instrument was acknowledged before me this _____ day of _____ 1972, by WALTER E. HEINRICHS, JR., as President of Heinrichs Geoexploration Company, as the free act and deed of said corporation.

_____
Notary Public

(SEAL)

My commission expires: _____

"EXHIBIT A"

The tract of land covered under Prospecting Permit Number GRMPP-71-1 is more particularly described as Sections 35 and 36, Township 4 South, Range 5 East, G&SRB&M, Pinal County, Arizona, containing 1,280.00 acres more or less; Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, Township 5 South, Range 5 East, G&SRB&M, Pinal County, Arizona, containing 9,205.51 acres, more or less; Sections 5, 6, 7, 8, Township 5 South, Range 6 East, G&SRB&M, Pinal County, Arizona, containing 3,011.61 acres, more or less, for an aggregate of 13,497.12 acres, more or less, in this tract.

AGREEMENT

AGREEMENT made as of _____, 1972, between HEINRICHS GEOEXPLORATION COMPANY, 806 West Grant Road, Tucson, Arizona 85703 (hereinafter referred to as "Heinrichs"), and J. SULLIVAN & COMPANY, INC., 4821 North Scottsdale Road, Suite A-9, Scottsdale, Arizona 85251 (hereinafter referred to as "Sullivan").

WITNESSETH:

WHEREAS "Sullivan" has an acceptable application for an exclusive prospecting permit on the Gila Indian Reservation, Number GRMPP-71-1, the area more particularly described in "Exhibit A" attached hereto; and

WHEREAS "Heinrichs" and "Sullivan" are both desirous to combine efforts on developing the property, as set forth in "Exhibit A" on the terms and conditions hereinafter set forth; and

NOW, THEREFORE, in consideration of the premises and the mutual agreement hereinafter set forth, the parties hereto agree as follows:

1. APPOINTMENT AND RESPONSIBILITY. "Heinrichs" hereby is appointed "Sullivan's" nonexclusive geophysical agent and "Heinrichs" will provide the following geophysical service and groundwork on the lands covered in "Exhibit A":

a. Induced polarization (hereinafter referred to as I. P.). Using applicable "Heinrichs" equipment, personnel and procedures as prescribed by "Heinrichs", more or less according to customary industry practice and as results and circumstances dictate or indicate, and warrant, sixteen line miles, more or less, of I. P. coverage using a 1,000 foot dipole spacing and "n" intervals ranging from 1 through 6 will be provided at customary rates.

b. Hand magnetometer survey.

Same as Item 1 a. (I. P.) above, except coverage provided will be 16 line miles, more or less, on a station interval of 250 feet (and or 330 feet) along the I. P. lines.

c. Geochemistry.

Same as Item 1 a. (I. P.) above, except coverage provided will be sample collection only (no analyses) along the I. P. line on a station interval of from 250 to 330 feet to total 16 line miles, more or less.

d. Gravity.

Same as Item 1 a. (I. P.) above, except gravity coverage may prove valuable in possible future extensions to this agreement. None will be done under the initial $5,000.00 of work.

e. Computing, drafting and clerical.

As necessary to prepare a final report and interpretation with appropriate illustrations at customary rates.

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"Heinrichs" will invoice "Sullivan" for the complete competitive geophysical service rendered, by billing an amount not less than $5,000.00 (Five Thousand Dollars), and "Heinrichs" will receipt said invoice or billing by marking it "paid in full" upon demand by "Sullivan," when said work has been essentially completed.

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If "Sullivan" receives installment payment of $10,000.00 (Ten Thousand Dollars), "Heinrichs" is to receive $1,000.00 (One Thousand Dollars), leaving a balance of $2,000.00 (Two Thousand Dollars) to be paid through subsequent installments. Upon completion of payments to "Heinrichs" of any balance, "Sullivan" has then fulfilled his obligations and this agreement with "Heinrichs" automatically terminates.

3. INFORMATION TO "HEINRICHS." It is further agreed that "Sullivan" will keep "Heinrichs" informed as to all progress and will provide "Heinrichs" with copies of any and all information (at cost to, and upon written request by, "Heinrichs") relating to the sale or lease or option of the property.

4. TERMINATION OF AGREEMENT. It is hereby acknowledged that this is a speculative venture between both parties and, upon such time as "Sullivan" no longer has an interest in, or is not in control of, Prospecting Permit No. GRMPP-71-1 by virtue of termination by the Gila River Indian Community or the Bureau of Indian Affairs, then this agreement shall terminate and the obligation of "Sullivan" to "Heinrichs" and that of "Heinrichs" to "Sullivan" thereby becomes null and void, and upon written notice to "Sullivan", "Heinrichs" desires to be no longer involved in the venture and has effectively completed all of the services called for in Paragraph 1, Subparagraph a through

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The notice above mentioned from "Sullivan" to "Heinrichs" and/or "Heinrichs" to "Sullivan" will be sent by certified mail.

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IN WITNESS WHEREOF, the below signed have caused these presents to be executed on this _____ day of _____, 1972, by their officers thereunto duly authorized and by their respective corporate seals.

Attest: J. SULLIVAN & COMPANY, INC.

_____ By: _____

Florence Sullivan, Secretary J. Sullivan, President

(SEAL)

Attest:

HEINRICHS GEOEXPLORATION COMPANY

_____

By: _____
Walter E. Heinrichs, Jr.

(SEAL)

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

This instrument was acknowledged before me this _____ day of _____ 1972, by J. SULLIVAN, the President of J. Sullivan & Company, Inc., as the free act and deed of said corporation.

In witness whereof, I have hereunto set my hand and seal as of said date.

_____
Notary Public

(SEAL)

My commission expires: _____

STATE OF ARIZONA)
) ss.
COUNTY OF PIMA)

The foregoing instrument was acknowledged before me this _____ day of _____ 1972, by WALTER E. HEINRICHS, JR., as President of Heinrichs Geoexploration Company, as the free act and deed of said corporation.

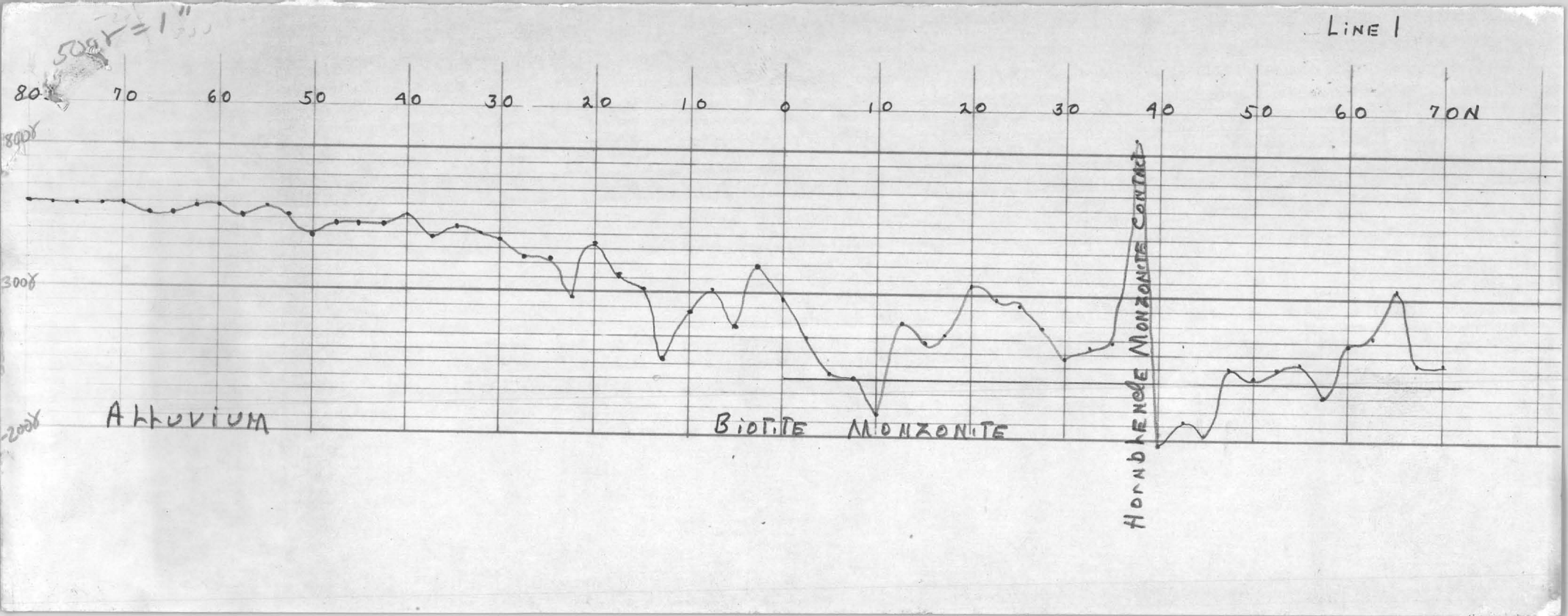
_____
Notary Public

(SEAL)

My commission expires: _____

"EXHIBIT A"

The tract of land covered under Prospecting Permit Number GRMPP-71-1 is more particularly described as Sections 35 and 36, Township 4 South, Range 5 East, G&SRB&M, Pinal County, Arizona, containing 1,280.00 acres more or less; Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, Township 5 South, Range 5 East, G&SRB&M, Pinal County, Arizona, containing 9,205.51 acres, more or less; Sections 5, 6, 7, 8, Township 5 South, Range 6 East, G&SRB&M, Pinal County, Arizona, containing 3,011.61 acres, more or less, for an aggregate of 13,497.12 acres, more or less, in this tract.

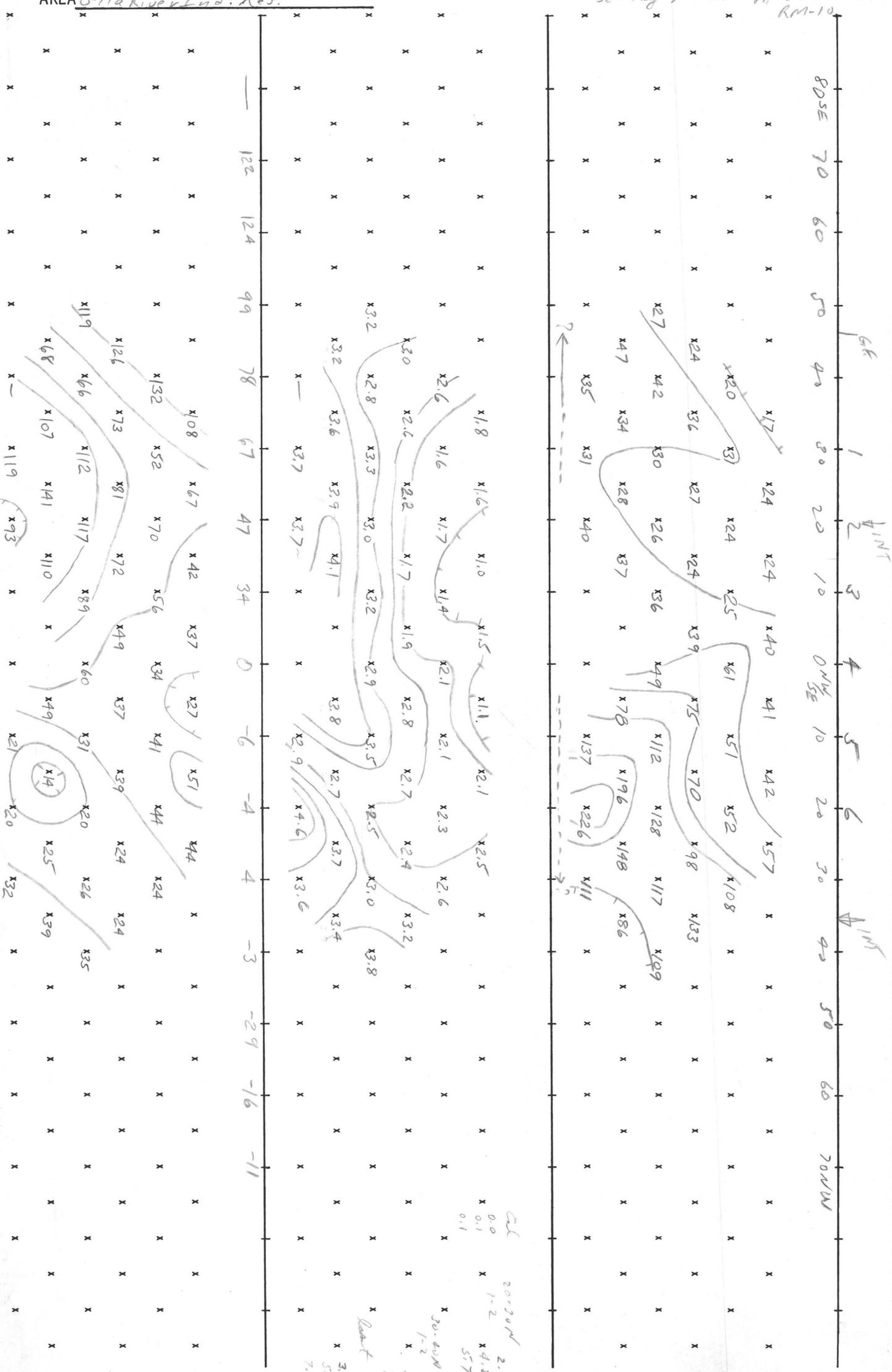

LINE 1
500γ = 1"
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70N
800γ
300γ
-200γ
ALLUVIUM
BIOTITE MONZONITE
HORNBLENDE MONZONITE CONTACT

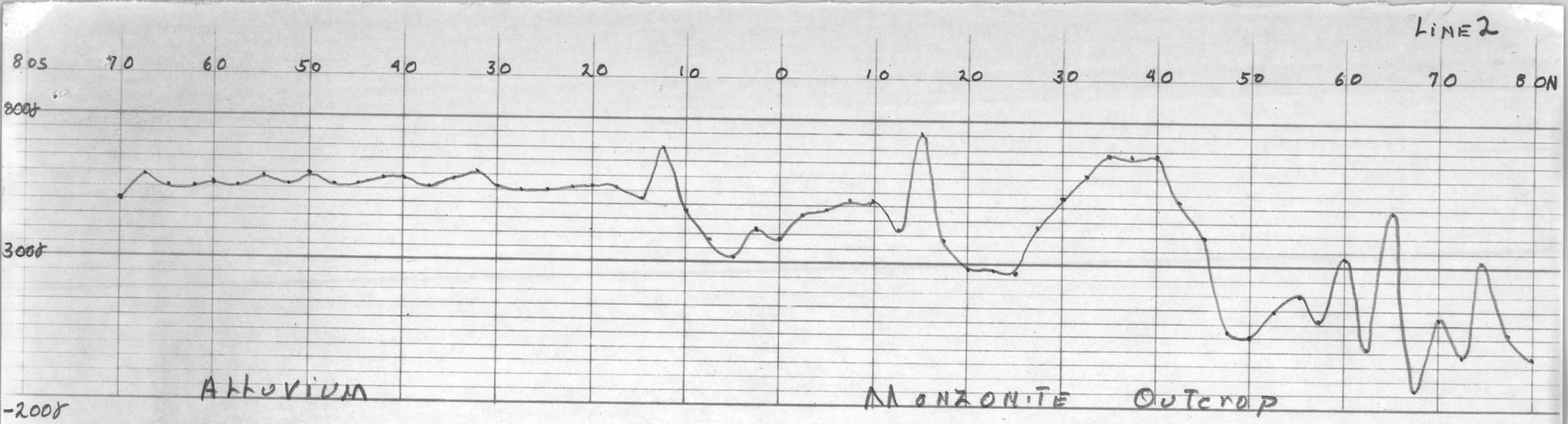
JOB# 710 LINE# 1 SP 1 a = 1000' LOOKING S58W

CLIENT J. Sullivan & Company, Inc. DATE April 1972 FREQUENCIES 0.1 & 1.0 Hz

AREA Gila River Ind. Res.

Se-Tay Muted Ph 836-7489 RM-10

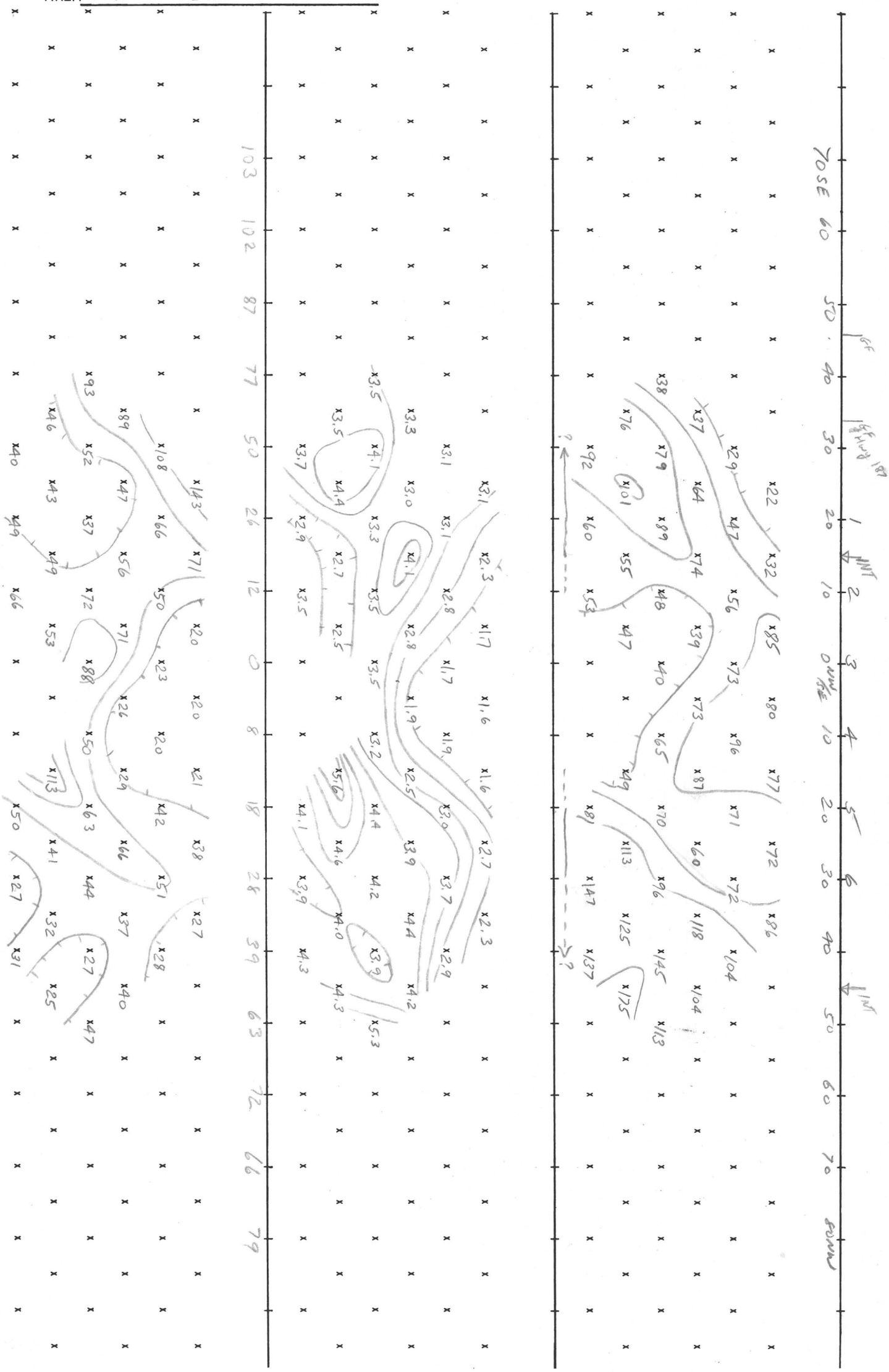


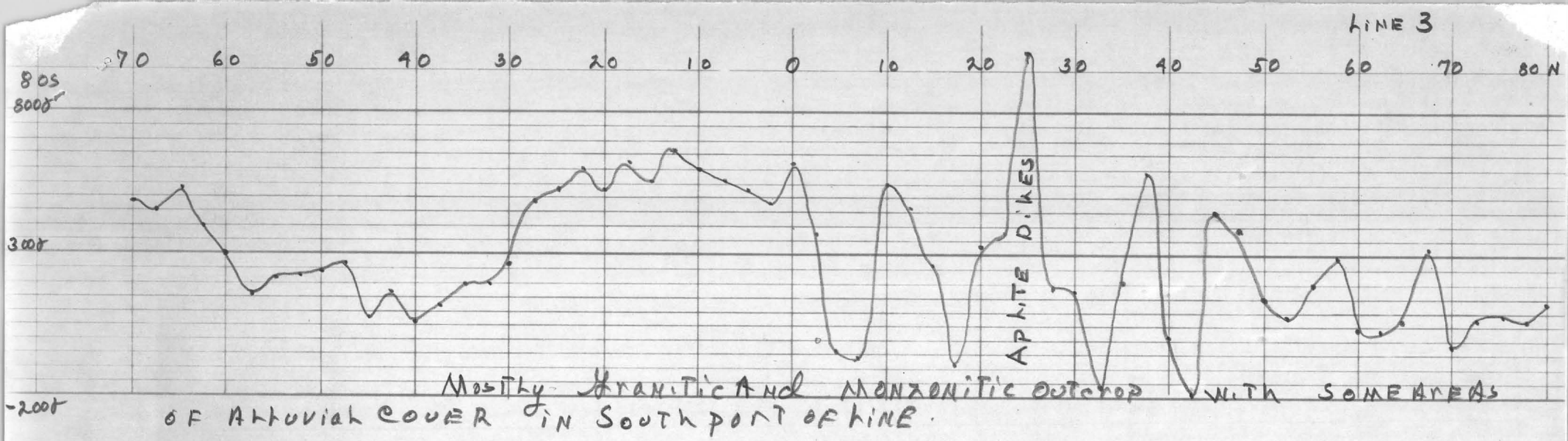

LINE 2
80S
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80N
800γ
300γ
-200γ
ALLUVIUM
MONZONITE OUTCROP

JOB# 710 LINE# 2 SP 1 a = 1000' LOOKING 558W

CLIENT J. Sullivan & Company, Inc. DATE April 1972 FREQUENCIES 1.0 & 0.1 Hz

AREA Gila River Ind. Res.

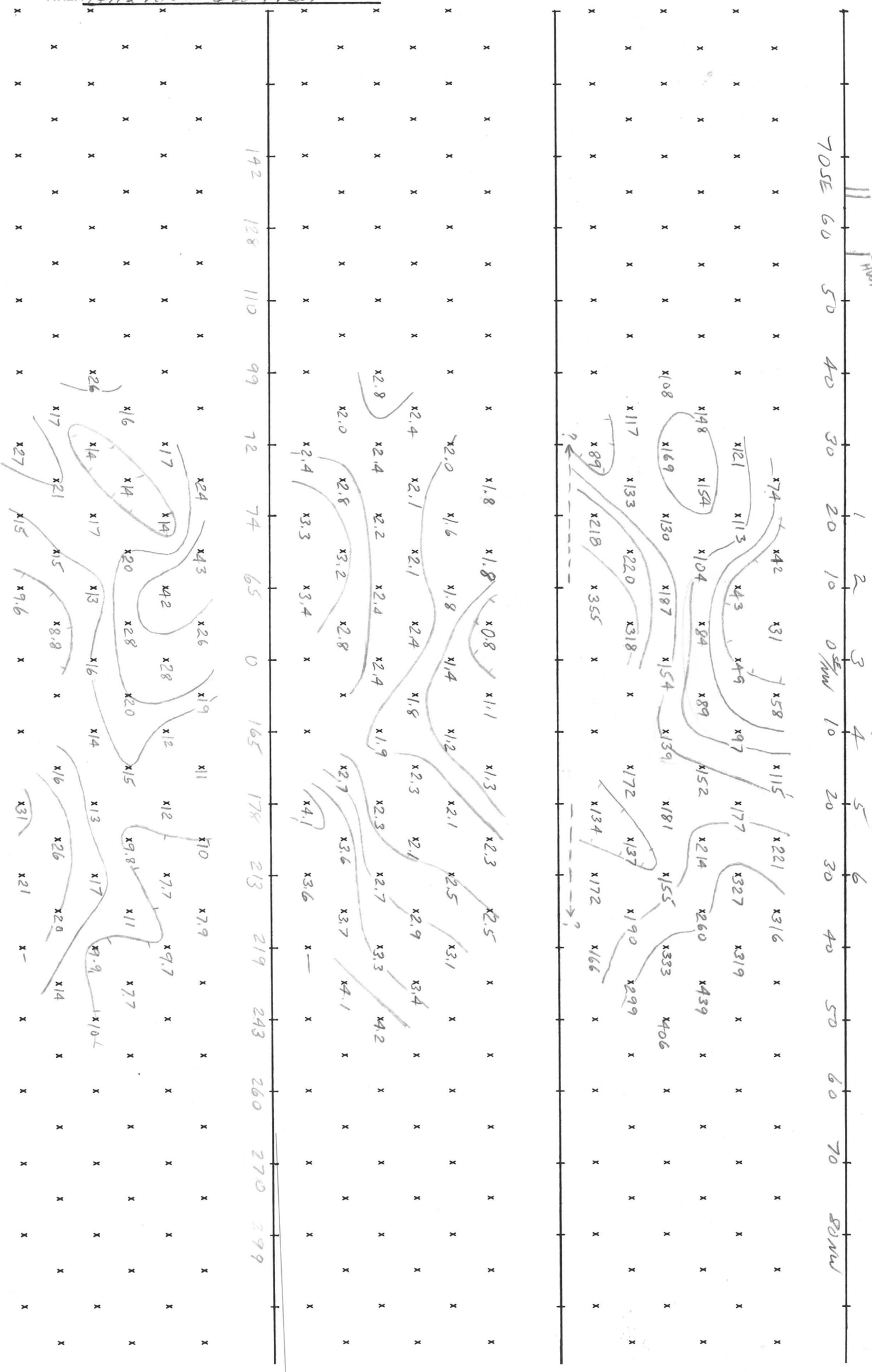



LINE 3
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80 N
80 S
800ft
300ft
-200ft
APLITE DIKES
Mostly Granitic And Monzonitic outcrop with some areas
of Alluvial cover in South part of line.

JOB# 710 LINE# 3 SP 1 a = 1000' LOOKING S65°W

CLIENT J. Sullivan & Company, Inc. DATE May 1972 FREQUENCIES 0.1 & 1.0 Hz

AREA Gila River Ind. Res.



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
Pima Indian Agency
Sacaton, Arizona 85247

Lease No. _____
Contract No. _____

MINING LEASE-INDIAN LANDS
(For Minerals Other Than Oil and Gas)
Gila River Indian Reservation

This indenture of lease made and entered into on the 1st day of March, 1971, by and between THE GILA RIVER INDIAN COMMUNITY whose address is Box 97, Sacaton, Arizona 85247, hereinafter called "LESSOR," and J. SULLIVAN & COMPANY, INC., whose address is 4821 N. Scottsdale Road, Scottsdale, Arizona 85251, hereinafter called "LESSEE."

NOW THEREFORE, in consideration of the mutual covenants herein contained, the parties do hereby agree as follows:

1. LESSOR, in consideration of $1.00, receipt of which is hereby acknowledged, of the rent and royalty to be paid and of the agreements contained in this lease made by LESSEE, grants and leases unto LESSEE for the sole purposes of exploring for, developing, mining, producing, processing and marketing minerals, as follows: All minerals, excluding oil, gas and other hydrocarbons, sand, gravel and building stone.

2. The description of the leased premises is as follows:

Containing _____ acres, more or less, and subject to prior valid existing claims, rights, title and interests. LESSEE may occupy as much of the surface of the land as is necessary to carry on the work of exploring for, developing, mining, producing, processing, marketing, and removing said minerals, including milling and storing, subject to payments to be made as hereinafter set forth. Subject to the limitations hereinafter provided, LESSEE shall have the right and license in connection with the operation of mining on the lands to construct thereon buildings, pipelines, plants, tanks and other structures used or useful in the production, processing, and transportation of said minerals; make excavations, openings, stockpiles, dumps, ditches, drains, roads, railroads, spur tracks, transmission lines, and other improvements used or useful in said production, processing and transportation; produce electrical power for its own use; erect and operate power lines;

place machinery and other equipment and fixtures upon the lands; use and transport all water developed by LESSEE on the lands and any other water made available to LESSEE; prepare for market, remove, process, and sell minerals; do all other things upon said leased premises that may be necessary in the efficient operation of the leased premises for the purposes permitted hereunder; and occupy so much of the surface of the leased premises as may be necessary to carry on the mining operations hereunder, including the right of ingress and egress.

(a) Survey of Leased Premises:

Within one hundred eighty (180) days of the approval of this lease, LESSEE at its own expense shall have the leased premises surveyed by a registered surveyor, the boundaries posted with substantial monuments and a tie established with the nearest United States Public Survey marker. A plat map of the leased premises shall be furnished the Superintendent of the Pima Indian Agency, Sacaton, Arizona 85247, in quadruplicate and two additional copies furnished the Permittee.

3. DEFINITIONS

(a) "Superintendent" refers to the Superintendent of the Pima Indian Agency, Sacaton, Arizona 85247, who has jurisdiction over the lands leased.

(b) "Supervisor" refers to the Regional Supervisor, United States Geological Survey, P. O. Box 1716, Carlsbad, New Mexico 88220, who is authorized and empowered to supervise and direct operations under mining leases, upon the lands leased, to furnish scientific and technical information and advice, and to ascertain and record the amount and value of production, and to determine and record rentals and royalties due and paid.

(c) "Secretary" refers to the Secretary of Interior, or his authorized representative.

4. TERM

Subject to the other provisions herein contained, this lease is for a term of ten (10) years from the date of its approval and as long thereafter as the minerals specified are produced in paying quantities.

5. ROYALTY

(a) MINIMUM ROYALTY Lessee agrees to pay or cause to be paid to the Superintendent, Pima Agency, Sacaton, Arizona, for the use and benefit of the Lessor, at the beginning of the second year of this lease, an advance minimum royalty of ten dollars ($10) for each acre under this lease; Provided all such advance royalties paid shall be credited against production royalties

...alue per short ton of:

only in the year for which they are paid. If the lease is surrendered or canceled, the advance minimum royalty accruing to the Lessor will not be refunded.

(b) PRODUCTION ROYALTY LESSEE agrees to pay, or cause to be paid, to the Superintendent, for the use and benefit of LESSOR, a royalty, calculated on a monthly weighted average on the basis of dry short tons of ore mined and delivered to a treatment plant. All production royalty accruing for any month shall be due and payable before the twenty-fifth (25th) day of the following month.

(i) For gold, silver, copper, lead, zinc, molybdenum.

For gold, silver, copper, lead, zinc, and molybdenum the royalty will be computed from the net smelter return. Net smelter return (abbreviated as NR) shall mean the net proceeds, including all subsidies and mine production bonuses (after subtracting freight, hauling, smelter treatment, smelter deduction, and all other such charges away from lessee's plant) received or receivable for the ore mined, for concentrates, and for mill products produced by lessee from the premises when sold to a bona fide purchaser; but should such ores, concentrates or mill products be retained by the lessee, the charges above-mentioned shall not exceed those of custom mills or smelters for comparable services.

(ii) The following graduated royalty rates shall apply on NR for ore with net value per short ton of:

5%				3.00 or less
6%	more than $	3.00	to less than $	3.25
7%	"	3.25	"	3.50
8%	"	3.50	"	3.75
9%	"	3.75	"	4.00
10%	"	4.00	"	7.00
11%	"	7.00	"	10.00
12%	"	10.00	"	11.00
13%	"	11.00	"	12.00
14%	"	12.00	"	13.00
15%	"	13.00	"	14.00
16%	"	14.00	"	15.00
17%	"	15.00	"	16.00
18%	"	16.00	"	17.00
19%	"	17.00	"	18.00
20%	"	18.00	"	19.00
21%	"	19.00	"	20.00
22%	"	20.00	"	21.00
23%	"	21.00	"	22.00
24%	"	22.00	"	23.00
25%	"	23.00	"	26.00

26%	more than	$ 26.00	to less than	$ 29.00
27%	"	29.00	"	32.00
28%	"	32.00	"	35.00
29%	"	35.00	"	38.00
30%	"	38.00	"	41.00
31%	"	41.00	"	44.00
32%	"	44.00	"	47.00
33%	"	47.00	"	50.00
34%	"	50.00	"	53.00
35%	"	53.00	"	56.00
36%	"	56.00	"	59.00
37%	"	59.00	"	62.00
38%	"	62.00	"	65.00
39%	"	65.00	"	68.00
40%	"	68.00	"	71.00
41%	"	71.00	"	74.00
42%	"	74.00	"	77.00
43%	"	77.00	"	80.00
44%	"	80.00	"	83.00
45%	"	83.00	"	86.00
46%	"	86.00	"	89.00
47%	"	89.00	"	92.00
48%	"	92.00	"	95.00
49%	"	95.00	"	100.00
50%	"	100.00	AND UP	

(c) LEACHING Lessee agrees to pay a twelve percent (12%) royalty of net smelter return on amounts realized on all sales of minerals recovered by leaching ores and other minerals in place on the leased property or by leaching such materials after they have been mined or extracted from the leased property, or by leaching the waste material resulting from the leased property.

(d) FOR ALL OTHER MINERALS For all other minerals, the royalty provisions shall be negotiated between the Lessor and Lessee and approved by the Secretary following discovery of said minerals in commercial quantities and prior to the production or sale thereof.

(e) ADJUSTMENT OF ROYALTY Royalty rates will be subject to reasonable adjustment by the Secretary at the end of the first five (5) year period and each successive five (5) year period thereafter based on market conditions as supported by evidence from the field.

6. ANNUAL RENTAL

LESSEE agrees to pay, or cause to be paid, to the Superintendent for the use and benefit of LESSOR, in advance, beginning with the date of approval of the lease, as annual rental, the sum of One Dollar ($1.00) per

acre for the first lease year, and One Dollar ($1.00) per acre per year, in advance of each anniversary date of the lease, for each and every year thereafter during the continuance of the lease. The rent is not to be credited on the royalties accruing to LESSOR under this lease. If the lease is surrendered or cancelled, no rent accruing to LESSOR will be refunded.

7. GENERAL REQUIRMENTS FOR THE PROTECTION OF NONMINERAL RESOURCES

(a) This lease is subject to the reasonable requirements of LESSOR, the Superintendent and the Supervisor which will minimize surface damage, avoid the pollution or contamination of surface and subsurface waters and prevent air pollution and rockslides. Such requirements may provide that: (1) LESSEE will furnish information concerning the location and manner of construction of any roads that may be necessary for access by LESSEE, as well as the measures it will take to avoid or control soil erosion and rockslides, the cost of which will be borne solely by it. (2) LESSEE shall agree to terrace and landscape waste disposal areas in a reasonable manner at its own cost and expense subject to the acceptance and satisfaction of LESSOR and the Superintendent. The landscaping shall include, but is not limited to, the planting of grasses, shrubs and other vegetation which will partially screen the area from view and control water and wind erosion. The surface of the dump shall be left reasonably flat and tailings will be covered with soil to a depth that will permit the early establishment and propogation of vegetation upon completion of the use of the leased premises or the said waste or tailings dump or deposits. LESSEE shall submit to LESSOR, the Superintendent and the Supervisor plans for the seeding or planting of such areas prior to abandonment. (3) Gates and cattleguards will be constructed in fences through which an access road passes. Gates will be kept closed at all times. (4) Any valuable subsurface water encountered in mining will be kept open and the right to use the water is reserved to the LESSOR unless such water endangers or threatens to endanger the mining operation in which event LESSEE may request permission from LESSOR and the Superintendent to seal off or otherwise halt the flow of water. Such permission to restrict or halt the flow of water so encountered will not be unreasonably withheld. LESSOR and the Superintendent will be advised promptly of any subsurface water encountered.

8. EXTRALATERAL RIGHTS

For the purpose of computing royalties under this lease, patented or unpatented mining claims shall not be considered as having extralateral rights extending on the dip into lands under this lease; the vertical boundaries of the properties of the respective parties shall govern.

9. COMMINGLED ORES

LESSEE shall have the right to commingle ores mined under this

lease, hereinafter called "lease ores," with other ores. The lease ores, before any commingling, will be weighed or measured and sampled for moisture and metal content in accordance with sound mining and metallurgical practices by LESSEE and a representative sample of ores, concentrates or cement copper shipped shall be furnished to LESSOR. Assays of these ores will be made before commingling to determine metal content. Detailed records will be kept by LESSEE showing weights, moisture, assays of metal content and gross metal content of lease ores for the purpose of computing the net smelter return.

10. CAMPSITES

LESSEE agrees to pay to the Superintendent for the use and benefit of LESSOR, THREE HUNDRED DOLLARS ($300.00) per acre for all land used for campsite purposes within the leased premises, it being understood that the payment of $300 per acre is in addition to all other payments made under this lease and is a sum which shall be charged only once for campsite acreage. The campsite selected shall be the minimum acreage necessary for operation of the mill and shall not include a complete housing and community development for LESSEE'S employees.

11. EXCAVATION, WASTE AND CONSTRUCTION AREAS

It is further agreed that in addition to all payments of bonuses, royalties and rentals heretofore set forth LESSEE shall pay to the Superintendent for the use and benefit of LESSOR, THREE HUNDRED DOLLARS ($300.00) per acre for each acre and a proportionate amount for each part of an acre within the leased premises used for permanent construction or dumping of waste materials. The rights contained herein do not include the right to dump waste material or tailings from properties not included in this Lease. This amount shall become due and payable at the end of the lease year in which the use of the acreage commences and shall be payable one time only. Before any such use commences, LESSEE shall furnish to LESSOR reasonable evidence that no commercial ores are beneath the surface of the land or that because of the depth of any commercial ore body, such surface use of the land will not interfere with mining such ore body.

12. OWNERSHIP OF WASTE MATERIAL

LESSEE may remove to other lands overburden and waste materials extracted from the leased premises or waste materials which are residual waste products of processed ores from the leased premises; provided, if minerals are removed from such materials by LESSEE, LESSEE shall pay LESSOR royalty as provided under the provisions of this lease. Upon cancellation, termination, or expiration of this lease, LESSEE will have no obligation to remove alluvium and waste materials from the leased premises and they will become the property of LESSOR.

13. MINING PLAN

LESSEE agrees that:

(a) Pursuant to 25 CFR 177, before mining operations may commence under this lease, LESSEE shall file a mining plan with LESSOR, the Superintendent, and the Supervisor and obtain their approval of the plan. Depending upon the size and nature of the operation and the requirements established pursuant to Article 7. hereof, LESSOR, the Superintendent and the Supervisor may require the mining plan submitted by LESSEE to include any or all of the following:

(1) A description of the location and area to be affected by the operations;

(2) Two copies of a suitable map, or aerial photograph showing the topography, the area covered by the lease, the name and location of major topographic and cultural features, and the drainage plan away from the area affected;

(3) A statement of proposed methods of operating, including a description of proposed roads or vehicular trails; the size and location of structure and facilities to be built;

(4) An estimate of the quantity of water to be used and pollutants that are expected to enter any receiving waters;

(5) A design for the necessary impoundment, treatment or control of all runoff water and drainage from workings so as to reduce soil erosion and sedimentation and to prevent the pollution of receiving water;

(6) A description of measures to be taken to prevent or control fire, soil erosion, pollution of surface and ground water, damage to fish and wildlife, and hazards to public health and safety; and

(7) A statement of the proposed manner and time of performance of work to reclaim areas disturbed by LESSEE'S operation.

(b) If the approved mining plan requires the revegetation of an area of land to be affected, the plan shall show:

(1) Proposed methods of preparation and fertilizing the soil prior to replanting;

(2) Types and mixtures of shrubs, trees, or tree seedlings, grasses or legumes to be planted; and

(3) Types and methods of planting, including the amount of grasses or legumes per acre, or the number and spacing of trees, or tree seedlings, or combination of grasses and trees.

(c) In those instances in which the mining plan requires regrading and backfilling, the mining plan shall show the proposed methods and the timing of grading and backfilling of areas of land to be affected by the operation.

(d) LESSOR, the Superintendent, and the Supervisor shall review the mining plan submitted to them by LESSEE and shall promptly indicate to LESSEE any changes, additions, or amendments necessary to meet the requirements formulated pursuant to Article 7. hereof, and the other terms of the lease. LESSEE shall comply with the provisions of the approved mining plan.

(e) The mining plan may be changed by mutual consent of LESSOR, the Superintendent, and the Supervisor and LESSEE at any time to adjust to changed conditions or to correct any oversight. To obtain approval of a change or supplemental plan, LESSEE shall submit a written statement of the proposed changes or supplement and the justification for the changes proposed. LESSOR, the Superintendent and the Supervisor shall promptly notify LESSEE that they consent to the proposed changes or supplement, or in the event they do not consent they shall specify the modifications thereto under which the proposed changes or supplement would be acceptable. After mutual acceptance of a change of a plan, LESSEE shall not depart therefrom without further approval.

(f) If circumstances warrant or if development of a mining plan for the entire operation is dependent upon unknown factors which cannot or will not be determined except during the progress of the operations, a partial plan may be approved and supplemented from time to time. LESSEE shall not, however, perform any operation except under an approved plan.

14. GOVERNMENT RESERVES RIGHT TO BUY MINERALS PRODUCED

In time of war or other public emergency all of the executive departments of the United States Government shall have the option to purchase at the posted market price on the day of sale all or any part of the substance or substances produced under this lease.

15. DILIGENCE, PREVENTION OF WASTE

LESSEE agrees to exercise diligence in the conduct of prospecting and mining operations, to carry on development and operations in a workmanlike manner and to the fullest possible extent; to neither commit waste upon the

leased premises nor suffer waste to be committed upon the portion in its occupancy or use; to comply with the applicable laws of the State in which the land is located; to take appropriate steps to preserve the property and provide for the health and safety of workmen; to surrender and return promptly the premises upon the termination of this lease to whoever is lawfully entitled thereto, in as good condition as received, except for the ordinary wear and tear and depletion incident to underground and/or strip mining, and unavoidable accidents in their proper use of the premises; not to remove any building or permanent improvement erected on the leased property during the lease. If the payments agreed upon by this lease have been made and the other lease terms and applicable regulations have been complied with, the office fixtures and records, personal property, tools, pumping, and drilling outfits, boilers, engines, and mining machinery may be removed by LESSEE at any time before one hundred eighty (180) days after the lease expires by forfeiture or otherwise.

16. FOREST PROTECTION

LESSEE agrees:

(a) Not to cut, destroy or damage timber without prior authority of the Secretary, such authorization to be made only where required by the pursuance of necessary mining operations.

(b) To pay for all such timber cut, destroyed or damaged by LESSEE at rates prescribed by the Secretary, such rates to be determined on the basis of sales of similar timber in the vicinity.

(c) Not to interfere with the sale or removal of timber from the land covered by this lease by contractors operating under an approved timber sales contract now in effect or which may be entered into during the period of this lease.

(d) To do all in its power to prevent and suppress forest, brush or grass fires on the leased premises and in its vicinity, and to require its employees, contractors, subcontractors, and employees of contractors or subcontractors to do likewise. To place its employees, its contractors, subcontractors, and the employees of such contractors or subcontractors employed on the leased premises at the disposal of any authorized officer of the Indian Service for the purpose of suppressing forest, brush or grass fires with the understanding that the payment for such services shall be made at rates to be determined by the Secretary, which rates shall not be less than the rates of pay prevailing in the vicinity for services of similar character: Provided, that no payment shall be made for services rendered in the suppression of fires for which LESSEE, its employees, contractors or subcontractors, or the employees of such contractor or subcontractors are responsible.

(e) To pay for the loss of all timber ten inches or more in diameter occasioned by fires for which it, or any of its employees, its contractors, subcontractors, or the employees of such contractors are responsible for the start or spread, the assessment of the value of such damages to be determined by the Secretary on the basis of the value of such timber on sales of similar timber in the vicinity. Also, to pay liquidated damages of ONE HUNDRED DOLLARS ($100.00) per acre for all young timber less than ten (10) inches in diameter destroyed by such fires unless a lesser rate of damages shall be approved by the Secretary, and to pay all costs for the suppression of fires for which it, or any of its employees, contractors or subcontractors, or the employees of such contractors or subcontractors are responsible.

(f) Not to burn rubbish, trash, or other inflammable materials except with the consent of the Secretary, and not to use explosives in such manner as to scatter inflammable materials on the surface of the land during the fire season, except as authorized to do so by such representative.

17. DEVELOPMENT

The land under this lease shall not be held by LESSEE for speculative purposes. LESSEE agrees it will not treat any ore reserves developed in the lands as a reserve to be held in reserve for some future exploitation, but will bring the reserves into production in an orderly manner and consistent with sound business practice any commercially profitable ore body as it shall be developed. If LESSEE fails to diligently develop or operate the mine, except when operation is interrupted by a strike, an act of God, or casualty, not attributable to LESSEE, this lease will be subject to cancellation.

LESSEE agrees to expend on or for the benefit of the leased premises in actual exploration, development, mining and processing operations and improvements, at least THIRTY DOLLARS ($30.00) per acre during the first lease year for each acre included under this lease; at least FORTY DOLLARS ($40.00) per acre during the second lease year for each acre under this lease; at least FIFTY DOLLARS ($50.00) per acre during the third lease year for each acre under this lease; and commencing with the fourth lease year and each lease year thereafter, to expend at least ONE HUNDRED DOLLARS ($100.00) per acre for such purposes for each acre included under this lease except during any lease year of this lease when prevented by a strike, an act of God, or casualty not attributable to LESSEE or whenever, during the primary term of this lease, the Secretary considers the marketing facilities inadequate or the economic conditions unsatisfactory and, after obtaining the consent of LESSOR, authorizes the suspension of operations for such time as he considers advisable, but this does not release LESSEE from paying the advance annual rental or the minimum royalty. Capital expenditures on or for the benefit of the leased premises, except those made for vehicles, tractors, shovels, scrapers, and drilling rigs, shall be included as minimum expenditures under this Section.

With respect to vehicles, tractors, shovels, scrapers, and drilling rigs used on or for the benefit of the leased premises, LESSEE shall be entitled to charge the reasonable rental of such equipment as a minimum expenditure under this Section. Expenditures during any lease year in excess of the amount required for said lease year under this Section shall be applied as a credit against the obligation for development expenditures under this Section for the next or succeeding years. Within forty-five (45) days following each lease year, LESSEE shall file in duplicate with the Superintendent, and one copy with LESSOR, an itemized statement of the amount and character of the expenditures during the lease year. The statement must be certified under oath by LESSEE or its Agent. Payment of minimum royalty will not excuse complying with the provisions of this Section.

18. MONTHLY STATEMENTS

LESSEE agrees to keep an accurate record of the mining operations, showing the sale, prices, dates, purchasers, and the amount of minerals mined, the amount of minerals removed, and the gross receipts, and to furnish the Superintendent sworn monthly reports before the twenty-fifth (25th) of the succeeding month. All royalty and advance rental due shall be a lien on all implements, tools, movable machinery, and all other chattels used in the operation and upon all of the unsold minerals obtained under the lease. An audit of the accounts and books of LESSEE pertaining to operations under this lease shall be made annually or at any other time directed by the Superintendent by a certified public accountant approved by the Secretary and at the expense of LESSEE. LESSEE shall furnish, through the Superintendent, a free copy of the audit to the Secretary within thirty (30) days after the completion of each audit and annually a copy of its audited annual report.

LESSEE specifically agrees to furnish monthly statements in accordance with provisions of 25 CFR 171.18, 25 CFR 177, 30 CFR 231.26, 231.27, and 231.28. Whenever reports and other data are required to be furnished under the terms of this lease or the above cited regulations, copies of said reports and data will also be furnished to the Superintendent, in duplicate, and a single copy to the LESSOR.

19. REPORTS

LESSEE agrees that:

(a) Within thirty (30) days after the end of each calendar year, or if operations cease before the end of a calendar year, within thirty (30) days after the cessation of operations, LESSEE shall submit an operations report to LESSOR, the Superintendent and the Supervisor containing the following information:

(1) An identification of the lease and the location of the operation.

(2) A description of the operations performed during the period of time for which the report is filed.

(3) An identification of the area of land affected by the operations and a description of the manner in which the land has been affected.

(4) A statement as to the number of acres disturbed by the operations and the number of acres which were reclaimed during the period of time.

(5) A description of the method utilized for reclamation and the results thereof.

(6) A statement and description of reclamation work remaining to be done.

(b) Upon completion of such grading and backfilling as may be required by the approved mining plan, LESSEE shall make a report thereon to LESSOR, the Superintendent and the Supervisor and request inspection for approval. Whenever it is determined by such inspection that backfilling and grading have been carried out in accordance with the established requirements and approved mining plan, the Superintendent shall issue a release of an appropriate amount of the performance bond for the area graded and backfilled. Appropriate amounts of the bond shall be retained to assure that satisfactory planting, if required, is carried out.

(c) Whenever planting is required by the approved mining plan, LESSEE shall file a report with the Superintendent whenever such planting is completed. The report shall:

(i) Identify the lease;

(ii) Show the type of planting or seeding, including mixtures and amounts;

(iii) Show the date of planting or seeding;

(iv) Identify or describe the areas of the lands which have been planted;

(v) Contain such other information as may be relevant.

(1) The Superintendent, as soon as possible after the completion of the first full growing season, shall make an inspection and evaluation of the vegetative cover and planting to determine if a satisfactory growth has been established.

(2) If it is determined that a satisfactory vegetative cover has been established and is likely to continue to grow any remaining portion of the surety bond may be released if all requirements have been met by LESSEE.

(d) Not less than thirty (30) days prior to cessation or abandonment of operations, LESSEE shall report to LESSOR, the Superintendent and the Supervisor its intention to cease or abandon operations, together with a statement of the exact number of acres of lands affected by its operations, the extent of reclamation accomplished and other relevant information.

(e) Upon receipt of such report an inspection shall be made to determine whether operations have been carried out in accordance with the approved mining plan.

(f) In addition to the above requirements, LESSEE shall within thirty (30) days after the termination of the lease furnish the Superintendent, the LESSOR and the Supervisor detailed and complete written reports of the prospecting done and all information concerning the nature and value of the minerals, including but not limited to aerial photographs, geological and geophysical maps, drill cores, logs, assays, charts, or sections prepared on which the detailed and complete written reports are based.

20. REGULATIONS

LESSEE agrees to abide by and conform to any and all lawful regulations of the Secretary now or hereafter in force relative to such leases including 25 CFR 171, 25 CFR 177 and 30 CFR 231. Rate of royalty, the annual rental, the amount of acreage covered hereby or the term of the lease may not be changed by a future regulation without the written consent of the parties to this lease.

21. ASSIGNMENT OF LEASE

LESSEE agrees not to assign this lease or any interest therein by an operating agreement or otherwise, nor to sublet any portion of the leased premises before restrictions are removed, except with the approval of the Secretary,

22. BOND

LESSEE agrees to:

(a) Furnish to the Superintendent and LESSOR an acceptable surety bond in the amount of FIFTEEN THOUSAND DOLLARS ($15,000). The right is reserved to the Secretary to increase the amount of bond above the sum named.

(b) As specified in 25 CFR 177.8, in addition to the aforementioned bond, LESSEE shall post a separate and acceptable surety bond in such amount as is determined by the Superintendent to be sufficient to satisfy the reclamation requirements of the approved mining plan.

23. LIQUOR

LESSEE agrees that it will not use or permit to be used any part of said premises for any unlawful conduct or purpose whatsoever; that it will not use or permit to be used any part of said premises for the manufacture, sale, gift, transportation, drinking, or storage of intoxicating liquors or beverages in violation of existing laws relating thereto, and that any violation of this clause by LESSEE or with its knowledge, shall render this lease voidable at the option of the Superintendent.

24. INSPECTION: NOTICE OF NONCOMPLIANCE: REVOCATION

LESSEE agrees that:

(a) LESSOR, Supervisor, and the Superintendent shall have the right to enter upon the lands under this lease, at any reasonable time, for the purpose of inspection or investigation to determine whether the terms and conditions of the lease and the requirements of the mining plan have been complied with.

(b) If LESSOR or the Supervisor determine that LESSEE has failed to comply with the terms and conditions of the lease, or with the requirments of the mining plan, or with the provisions of applicable regulations, the Superintendent shall serve a notice of noncompliance upon LESSEE by delivery in person to it or its agent or by certified or registered mail addressed to LESSEE at its last known address.

(c) A notice of noncompliance shall specify in what respect LESSEE has failed to comply with the terms and conditions of the lease or the requirements of the mining plan, or the provisions of applicable regulations, and shall specify the action which must be taken to correct the noncompliance and the time limits within which such action must be taken.

(d) Failure of LESSEE to take action in accordance with the notice of noncompliance shall be grounds for suspension by LESSOR and Supervisor of operations, or for the initiation of action for the cancellation of the lease and forfeiture of the surety bond required under Article 22. hereof.

25. DISPOSITION OF MINERALS AND SURFACE

(a) LESSOR expressly reserves the right to lease, sell, or

otherwise dispose of the oil and gas and the surface of the lands in this lease under existing law or laws hereafter enacted, such disposition to be subject to the right of LESSEE to use as much of the surface as is necessary in the extraction and removal of the minerals from the leased premises.

There is further reserved to LESSOR, after consultation with LESSEE, the right to construct, use and maintain canals, pipelines and syphons on and across the leased premises for the purpose of irrigation projects, and to construct, use and maintain roads, power lines, pipelines and telephone lines on and across said lands; provided such use and facilities will not unreasonably interfere with LESSEE'S mining operations and rights under this lease.

(b) LESSOR may hereafter grant to other persons, firms or corporations oil and gas leases, non-mineral leases, licenses, oil and gas prospecting permits, or rights-of-way upon the leased premises; and oil and gas drilling and producing activities may be carried out concurrently with LESSEE'S mining operations; provided, however, that no oil rights or installations of any kind shall be situated so as to unduly interfere with LESSEE'S right to carry on its mining operations and related activities; and provided further, that no well may be drilled for oil or gas at any location which, in the opinion of the Supervisor, would result in undue waste of mineral deposits or constitute a hazard to or interfere with mining operations being conducted by LESSEE on the leased premises. The provisions of this Section 25 shall be included in any oil and gas lease, license, prospecting permit or right-of-way granted by LESSOR or Secretary on the leased premises.

(c) Notwithstanding any other provision of this lease, LESSOR and Secretary reserve the right without liability of any kind, except as provided in this lease, to grant to qualified applicants rights-of-way for pipelines for the transportation of oil, gas, helium or petroleum products, for power lines, telephone, telegraph and water lines incident to the operation of such pipelines, across the lands embraced in this lease, upon the condition that prior to the granting of any such right-of-way, the applicant therefor, as a condition precedent to such grant, shall file with the Secretary the following express undertakings in writing for the express benefit of LESSEE:

(1) That applicant will either bury the pipeline to a sufficient depth or, at a place to be designated by LESSEE, construct and maintain, at applicant's expense, a ramp, so that loaded vehicles, including LESSEE'S heavy mining equipment, may pass unhindered over said pipeline. Whenever said pipeline is relocated pursuant to subparagraph (2) of this subsection (c) of this Section 25, applicant will either bury the relocated pipe or promptly construct and maintain, at its own expense, a suitable ramp in a new place designated by LESSEE. LESSEE shall not be responsible for damage to

said pipeline caused by such vehicles and equipment so crossing said pipeline.

(2) That applicant will make adequate provisions in the construction of said pipeline, power transmission lines, telephone, telegraph or water lines so that, in the event it is determined by LESSEE that mining operations should be conducted within the area of the right-of-way or that a power or industrial plant or other building should be built in such area, the line can be expeditiously relocated so as not to interfere with LESSEE'S operations; and applicant shall make such relocation, including any necessary bridging, at its own expense, within six (6) months from receipt of notice in writing from LESSEE requesting such relocation. If applicant fails to make such relocation within such six (6) months period, LESSEE may relocate the line without liability and at the expense of applicant.

(3) Applicant, will, at all times, keep, maintain and repair, at its own expense, the portion of the pipeline crossing the leased premises in good working order and repair and in such condition as not to injure, endanger or interfere with LESSEE or any person or property on or about the leased premises.

(4) That applicant will promptly pay any lawful taxes, charges, or assessments placed upon or levied against the pipeline or improvements or appurtenances in connection therewith; provided that applicant may contest the validity or amount of any such tax, charge or assessment and shall not be considered in violation of this stipulation until a reasonable time after final determination of such contest by a competent tribunal.

(5) That applicant will be responsible for any damage to or loss of property or injury to or death of any person directly or indirectly caused by the enjoyment of pipeline rights, and shall hold LESSEE harmless and indemnify it against any and all claims therefor; and shall further hold LESSEE harmless from and indemnify it against damage to or loss of property belonging to applicant or injury to or death of any person on or about the pipeline crossing on behalf of or at the invitation of applicant.

(6) That applicant shall specify in writing the address to which all notices and requests to be given or made by LESSEE may be mailed.

(d) LESSOR agrees that:

(1) No pipeline right-of-way granted across the leased premises shall exceed one hundred feet (100') in width. Rights-of-way for power lines and other purposes granted across the leased premises shall be of such widths as will accommodate themselves to LESSEE'S permitted use of the leased premises.

(2) LESSEE shall be given timely written notice of any application for rights-of-way over the leased premises before the same are granted.

(3) An executed duplicate of the undertakings specified in subsection 1. above and a true copy of the grant of rights described therein shall be furnished LESSEE upon the granting of any application for rights over the leased premises.

26. RELINQUISHMENT OF SUPERVISION BY THE SECRETARY

Should the Secretary, at any time during the life of this instrument, relinquish supervision as to all or part of the acreage covered hereby, the relinquishment does not bind LESSEE until the Secretary has given thirty (30) days written notice. Until the requirements are fulfilled, LESSEE shall continue to make all payments due under Sections 5 and 6. After notice of relinquishment has been received by LESSEE, this lease is subject to the following further conditions;

(a) All rentals and royalties accruing shall be paid directly to LESSOR or its successors in title.

(b) If at the time supervision is relinquished by the Secretary as to all lands under this lease, and LESSEE has made all payments due under the lease and has fully performed all obligations on its part to be performed up to the time of such relinquishment, then the bond given to secure the performance of the lease and on file in the Indian Office shall be of no further force or effect.

27. WATER WELLS

LESSEE may, at its own expense, drill and equip water wells on the leased premises and agrees that all wells will be left intact and properly cased at the termination of the lease by expiration of its term or otherwise. LESSEE shall have the right to remove all mechanical pumping equipment installed by it at any wells. If any wells are developed by LESSEE which disrupt any existing water wells on the reservation, PERMITTEE shall either deepen the existing well or make such other provisions as are necessary to insure that a supply of water remains intact.

28. DAMAGES

LESSEE shall conduct all operations authorized in this lease with due regard to preventing unnecessary damages to vegetation, timber, soil, roads, bridges, cattleguards, fences, and other improvements, including construction, operation, or maintenance of any of the facilities on or connected with this lease which causes damage to the watershed or pollution of the water resources. On termination of operations under this lease, LESSEE shall make provisions for the construction, repair, and protection of the property and leave all of the areas on which LESSEE has worked in a condition that will not be hazardous to life or limb, and will be to the satisfaction of the Superintendent.

29. LIABILITY FOR DAMAGE

LESSEE is liable for any and all damages resulting from its operations under this lease; including injury to LESSOR, the tenants, and surface owners, and for any and all damage to, or destruction of, all property, caused by LESSEE'S operations hereunder. LESSEE agrees to save and hold LESSOR and the United States, its employees, and the surface owner or their tenants harmless from all suits for injury or claims for damages to persons and property resulting from LESSEE'S operations under this lease.

30. ROADS

LESSEE may use existing roads, if any, on the land and, subject to Section 7. hereof, may construct, and maintain, at its own expense, any additional roads across LESSOR'S lands that are necessary in carrying on the actual mining, prospecting, and exploration work after the location of these roads has been approved in writing by the Superintendent. The public obtains no rights to these roads, and upon termination of this lease or if at any time it becomes unnecessary for LESSEE to use the road for conducting the operations authorized under this lease, the right to use the road shall thereupon cease and all the rights shall revest in LESSOR in accordance with law. LESSEE shall hold LESSOR and the United States harmless and indemnify them against any loss or damage that might result from the negligent construction or maintenance by LESSEE of the road.

In addition to the agreements set forth hereinbefore, LESSOR shall have the right to use or cross all roads so constructed or improved and maintained by LESSEE and may grant licenses to third parties for the use of such roads providing third parties first compensate LESSEE for the prorata share of the construction and maintenance of such roads. If LESSEE and the third party licensee are unable to agree on the amount of construction and maintenance costs to be paid or compensated for by the licensee, the Secretary shall determine such amounts upon the request of either LESSEE or licensee.

31. INDIAN LABOR

LESSEE shall employ Indians, giving priority to members of the Gila River Indian Community in all positions for which they are qualified and available and shall pay the prevailing wage rates for similar services in the area. LESSEE shall do everything practicable to employ qualified Indians, giving priority to members of the Gila River Indian Community, and their equipment in the hauling of all materials under this lease, insofar as LESSEE does not use its own equipment for that purpose. LESSEE agrees to make special efforts to work Indians, giving priority to members of the Gila River Indian Community, into skilled, technical, and other higher jobs in connection with LESSEE'S operations under this lease.

32. INSURANCE, SOCIAL SECURITY, TAXES, ETC.

LESSEE agrees to carry such insurance covering all persons working in, on, or in connection with the leased premises for LESSEE as will fully comply with the provisions of the statutes of the State of Arizona covering workmen's compensation and occupational disease, as are now in force or as may be amended. Further, LESSEE agrees to comply with all the terms and provisions of all applicable laws of the State of Arizona, and of the United States of America as now exist or as may be amended, pertaining to Social Security, unemployment compensation, wages, hours, and conditions of labor; and to indemnify and hold the LESSOR and the United States harmless from payment of any damages occasioned by LESSEE'S failure to comply with these laws. LESSEE shall pay all taxes lawfully levied or assessed on the sale, severance, production, extraction, or removal of any of the minerals covered by this lease. Nothing in this Article 32, or elsewhere in this lease, shall be deemed a waiver of the Tribe's immunity from taxation.

33. SUCCESSORS IN INTEREST

It is further covenanted and agreed that each obligation under this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the successors and assigns of the parties to this lease.

34. GOVERNMENT EMPLOYEES CANNOT ACQUIRE LEASE

No lease, assignment thereof, or interest therein will be approved to any employee or employees of the United States Government whether connected with the Bureau of Indian Affairs or otherwise, and no employee of the Interior Department shall be permitted to acquire any interest in such leases by ownership of stock in corporations having leases or in any other manner.

35. SURRENDER AND TERMINATION

LESSEE may at any time terminate this lease or any part thereof

upon the payment of all rentals, royalties, and other obligations due to LESSOR, and the further sum of TEN DOLLARS ($10.00), and in the event restrictions have not been removed, upon a showing satisfactory to the Secretary that full provision has been made for the conservation and protection of the property, the lease to continue in full force and effect as to the lands not so surrendered. If this lease has been recorded, LESSEE shall file a recorded release with its application to the Superintendent for termination of this lease.

36. PENALTIES

Failure of LESSEE to comply with any provisions of the lease, of the operating regulations, of the regulations set forth in 25 CFR 171, order of the Superintendent or his representative, or of the order of the Supervisor or his representative, shall subject the lease to cancellation by the Secretary or the LESSEE to a penalty of not more than FIVE HUNDRED DOLLARS ($500.00) a day for each and every day the terms of the lease, the regulations, or such orders are violated; or to both such penalty and cancellation; provided, that LESSEE shall be entitled to notice and hearing, within thirty (30) days after such notice, with respect to the terms of the lease, regulations, or orders violated, which hearing shall be held by the Supervisor, whose findings shall be conclusive unless an appeal be taken to the Secretary within thirty (30) days after notice of the Supervisor's decision, and the decision of the Secretary upon appeal, shall be conclusive.

37. CANCELLATION AND FORFEITURE

When, in the opinion of the Secretary, there has been a violation of any of the terms or conditions of this lease before restrictions are removed, the Secretary has the right at any time after thirty (30) days' notice to LESSEE, specifying the terms and conditions violated, and after a hearing, if LESSEE shall so request within thirty (30) days of receipt of notice, to declare this lease void, and LESSOR may then take immediate possession of the lands. After restrictions are removed, LESSOR may use any available remedy in law or equity for breach of this contract by LESSEE. The remedies specified hereunder are in addition to the remedies specifically provided in 25 CFR §§ 171.22 and 171.24.

38. APPEALS

If LESSEE or LESSOR be aggrieved by a decision or order of the Supervisor or the Superintendent, it may appeal such decision or order. An appeal from a decision or order of the Superintendent shall be made pursuant to 25 CFR Part 2. An appeal from a decision or order of the Supervisor shall be made pursuant to 30 CFR Part 231.

IN WITNESS WHEREOF, the said parties have hereunto subscribed their names and affixed their seals on the day and year first above-mentioned.

ATTEST:

LESSOR: GILA RIVER INDIAN COMMUNITY

By: _____

GOVERNOR

_____

Secretary, Gila River Indian Community Council

RECOMMENDED FOR APPROVAL:

_____

Superintendent, Pima Indian Agency

ATTEST:

LESSEES: J. SULLIVAN & COMPANY, INC.

By: _____

_____

Secretary

APPROVED THIS _____ day of _____, 19___
By:

_____

Area Director

ACKNOWLEDGEMENT OF LESSOR

STATE OF _____)
) ss.
COUNTY OF _____)

On _____, 19___, before me, the undersigned, a Notary Public in and for the said County and State, personally appeared _____ and _____, to me known to be the Governor and Secretary respectively of The Gila River Indian Community, and acknowledged to me that they executed the same as their free and voluntary act and deed, and as the free and voluntary act and deed of such Community for the uses and purposes set forth therein.

_____
Notary Public in and for the
County and State aforesaid.

My Commission Expires:

_____

ACKNOWLEDGEMENT OF LESSEE

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 19____, before me appeared _____ and _____, to me personally known, who being by me duly sworn did say that they are the _____ and _____ respectively of _____ (and that the seal affixed to said instrument is the corporate seal of said corporation), and that the said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and said _____ _____ and _____ acknowledge said instrument to be the free act and deed of said corporation.

WITNESS my hand and seal the day and year first above written.

_____
Notary Public in and for
County and State aforesaid

My Commission Expires:

_____

ACKNOWLEDGMENT OF APPROVING OFFICER

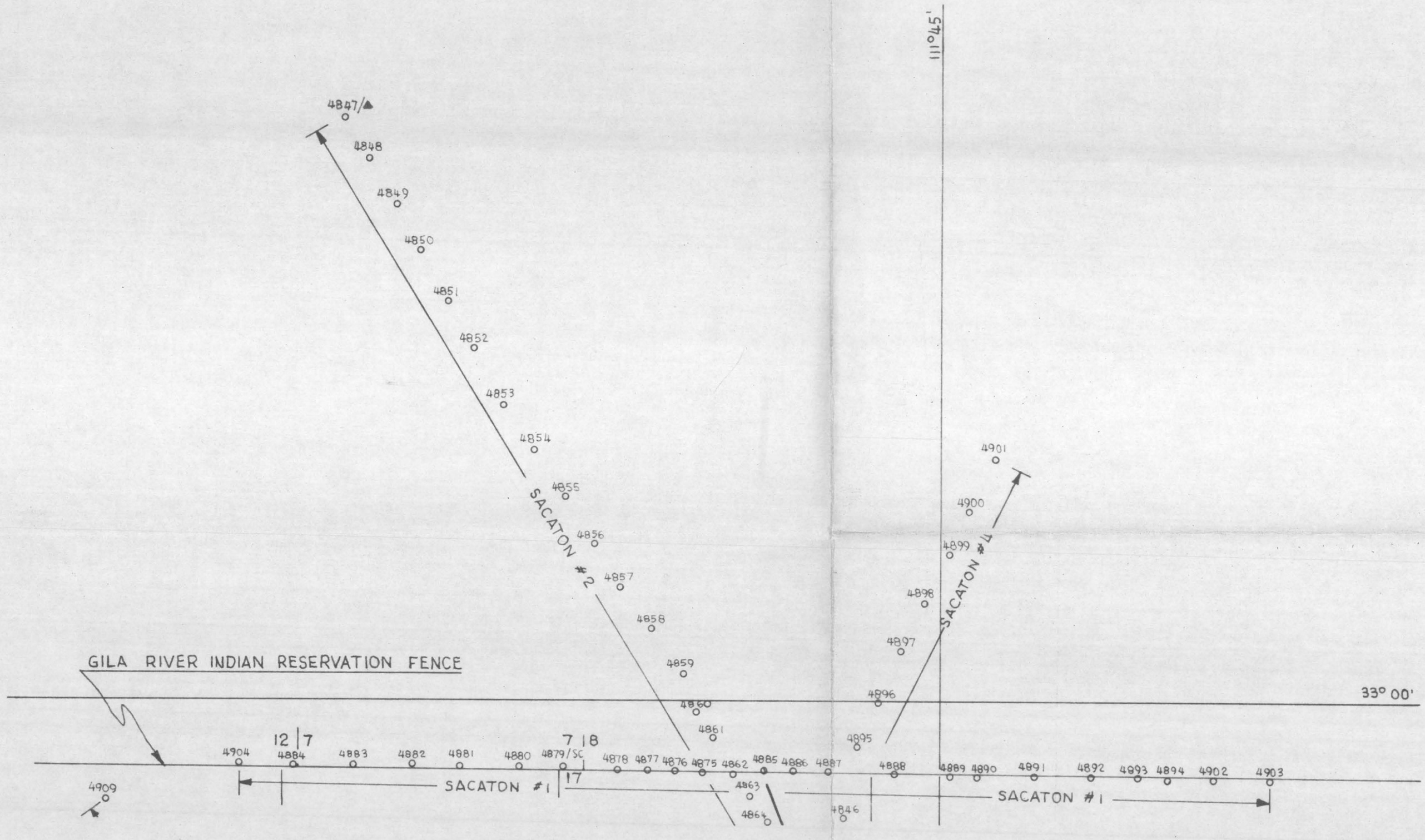
STATE OF _____)
) ss.
COUNTY OF _____)

Before me, a Notary Public, in and for said County and State, on this _____ day of _____, 19___, personally appeared _____ whose name is subscribed to the foregoing lease, Contract No. _____ dated _____ _____, as _____ Area Director, Phoenix Area Office, Bureau of Indian Affairs, now is and was at the time of signing the same _____ Area Director of the Phoenix Area Office, Bureau of Indian Affairs; and he personally acknowledged to me that he executed the said lease in his official capacity for the uses and purposes set forth therein.

_____
Notary Public in and for the
County and State aforesaid

My Commission Expires:

_____

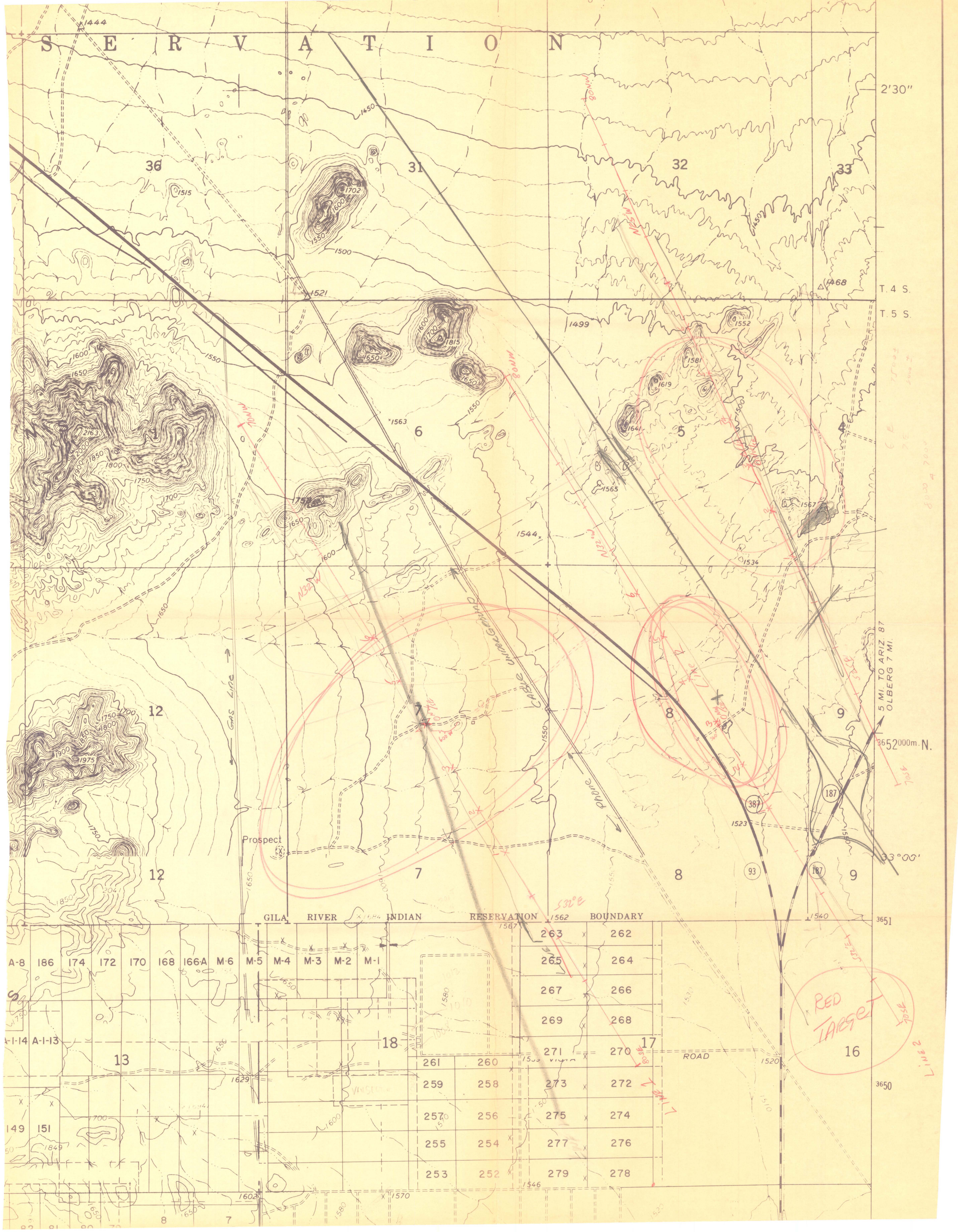


J. SULLIVAN AND CO.
SCOTTSDALE, ARIZONA

GILA RIVER INDIAN RESERVATION
GRAVITY STATIONS & PROFILES

DRAWN BY J.P.L.S. DATE
APPROVED BY DATE 7-20-71

SCALE:
1" = 2000 FT.


S E R V A T I O N
2'30"
T. 4 S.
T. 5 S.
36
31
32
33
6
5
4
12
7
8
9
13
18
17
16
Prospect
Gas Line
Underground Cable Phone
5 MI. TO ARIZ 87
OLBERG 7 MI.
3652000m. N.
33°00'
GILA RIVER INDIAN RESERVATION BOUNDARY
A-8 186 174 172 170 168 166-A M-6 M-5 M-4 M-3 M-2 M-1
A-1-14 A-1-13
149 151
263 262
265 264
267 266
269 268
271 270
261 260
259 258
273 272
257 256
275 274
255 254
277 276
253 252
279 278
ROAD
RED TARGET
LINE 2
3651
3650

May 11, 1972

Mr. James Sullivan
J. Sullivan & Company, Inc.
4821 North Scottsdale Road
Suite A-9
Scottsdale, Arizona 85251

Re: I. P. and Magnetic Survey
Gila River Indian Reservation
GEOEX Job # 710

Dear Jim:

Enclosed please find an original and two copies of our report "Induced Polarization and Magnetic Survey, Gila River Indian Reservation, Pinal County, Arizona" on the survey we recently completed. Reproducibles are being submitted under separate cover for the diagrams.

As you requested the recommendations have been left out of the report but are discussed here.

More data, mainly I. P. and perhaps magnetics is needed before any drilling recommendations can be properly made. A plan showing recommended additional coverage is attached. The additional coverage to the south is needed to better define the southern anomaly seen on Lines 1 and 2 although we realize this coverage is out of your permit area. To obtain an indication of anomalism near the edge of an area of interest we need a minimum of two receiving stations outside the area. However, to properly interpret and define the anomaly to the area edge, we need a minimum of two transmitting stations plus the associated receiving stations all outside the area. For 1,000 foot dipoles this means 6,000 to 7,000 feet of surface coverage outside the area.

The recommended extensions to the north may not all be necessary depending on where the northern anomaly cuts off to the north. Several lines should go at least to the property boundary to obtain reconnaissance information.

Correlating the 1963 Bear Creek I. P. data with ours is difficult due to the poor quality of the old data and lack of frequency information. However, in general, their data also crudely defines a northern and southern anomaly probably relating to the northern and southern zones on our Lines 1 and 2. Their information plus our data further supports the importance of obtaining more coverage mainly in Sections 5, 6, 7 and 8, T. 5 S., R. 6 E.

No I. P. information is available in Section 12, T. 5 S., R. 5 E., however, the geochemical anomaly extends into this area and the I. P. anomalism defined to date has not been cut off in that direction. This is also considered a critical target area.

A gridded copper - molybdenum geochemical survey, as you are planning, should be quite helpful. We suggest taking residual soil samples (or alluvium soil samples where no residual material is present) at every station and rock chip samples where practical. The geochemical results to date plus their correlation with the I. P. results is encouraging enough to warrant a major geochemical program in the area.

If it becomes important to determine the alluvial thickness in the covered areas, gravity studies could prove useful.

For your budget planning purposes it looks like approximately $300.00 to $350.00 per line mile of plotted "subsurface" I. P. data plus accompanying magnetics should suffice.

If you have any questions on the report, please feel free to contact us.

Sincerely,
Heinrichs GEOEXploration Company

Chris

Chris S. Ludwig
Senior Geophysicist

CSL:sb
cc: GEOEX Job # 710 file

February 29, 1972

HEINRICHS GEOEXPLORATION CO.
806 West Grant Road
Tucson, Arizona 85703

HEINRICHS GEOEX
Cable: GEOEX

REC'D MAR 2 1972 REC'D

BOX 5964 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

Attention: Mr. Chris Ludwig

Dear Chris:

Enclosed, please find my check for $15.00, a copy of an unexecuted permit and lease on the Gila River Indian Reservation, and a short memorandum that you may discuss with your principals.

I will be out of town for a few days after the second of March.

Sincerely,

James Sullivan

James Sullivan
4821 N. Scottsdale Road
Suite A-9
Scottsdale, Arizona 85251

JS/jb

enc.