CONTACT INFORMATION
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Arizona Geological Survey
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Phoenix, AZ, 85012
602-771-1601
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inquiries@azgs.az.gov

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RECONNAISSANCE
INDUCED POLARIZATION - ELECTRICAL RESISTIVITY
and
TOTAL INTENSITY MAGNETIC SURVEY

for
WILLEN CORPORATION
San Mateo, California

SUNIZONA ACRES PROJECT
Cochise County, Arizona

April, 1962

by

HEINRICHS GEOEXPLORATION COMPANY
P. O. Box 5671 TUCSON, ARIZONA

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MAPS

Base Map

Sectional Data Sheets (6)

In Pocket----------10 Mobile Magnetometer Records

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Data were obtained on 10 separate profile spreads. Each profile consisted of 6,000 linear feet; however, in some cases it was necessary to overlap the profiles in order to obtain a subsurface tie. Note profiles Line 1, Spreads 1, 2 & 3.

A plan map is included with this report. This map shows the location of all known wells on or near Sunizona Acres as well as the location of the geophysical surveys and other pertinent data necessary for interpretation of the survey.

In addition to the electrical surveys, as an over all aid to interpretation, 13.8 miles of total intensity magnetic profiles were made during part of one day by continuous recording mobile magnetometer.

Geophysical approach used was to correlate existing test wells with our surveys, then extend the coverage into relatively less known areas (such as the northwest and northeast corners of the property) thus gaining comparative knowledge of the subsurface water possibilities. This is in addition to any absolute indications obtained, which are usually much less reliable.

PROCEDURE

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It must be emphasized that the sectional presentation has no linear vertical scale and that the values plotted are at the

intersection of 45° lines extending from the center of the sender position to the center of the receiver position. This is somewhat arbitrary and we must stress that the actual depths of the values is an indeterminant function of the absolute D. C. resistivity distribution. In general, it may be said that the data acquired will most apt to vary from a depth of from 0.2 to 2.0 times the dipole spacing (500 ft.). The data is contoured again as a matter of convenience in interpretation only.

INTERPRETATION

Line 1, Spreads 1, 2 & 3

The most favorable water zones interpreted from the resistivity data, tentatively are at "A", "B", "C" & "D". This is based on the best apparent correlation of better production to zones of relatively lower resistivities to a greater depth. This assumption has been made throughout this report, however, future drilling should be closely correlated with the resistivity data and as more subsurface information is obtained a better and more absolute interpretation can be made.

The higher resistivities to the east end of the line may be an expression of a broad magnetic high and is marked as Zone "X" on the plan map. This magnetic feature is probably a buried volcanic hill and it would be expected to be a poor aquifer.

If future well excavation (say deeper than 400 ft.) is contemplated this zone also the broad mag highs Zone "Z", for example, should be considered as a possibly poorer zone than any zone in a magnetic low gradient area, such as Zones "W" & "Y". For shallow wells (400 ft. or less) this Zone "X" appears to be a favorable one with the areas marked "A" & "B" (deeper gravel lenses?), the better areas within Zone "X".

Line 2, Spread 4.

A significant change in resistivity values occurs at Station 1.5 SE. A deepening and wider distribution of low resistivity values to the north and west seems to indicate better water possibilities in this direction which could be caused by an apparent thickening of the gravels. The magnetic picture in this area indicates a lower magnetic zone which could mean deeper valley fill and seems to substantiate the resistivity interpretation.

Line 3, Spreads 5 & 6.

Low resistivity values down to the 4th separation continue on to the north and water possibilities appear quite favorable along the entire length of the line. At station 1.0 N on Spread 6 a slight suggestion of increase in resistivity values might indicate Zone "X" extension--at depth. At station 1.75 S on Spread 5, an increase in the resistivity value at the 3rd depth point may indicate the edge of Zone "V" becoming shallower.

If future well excavation (say deeper than 400 ft.) is contemplated, this zone as well as the broad magnetic high Zone "Z", for example, should be considered as a possibly poorer zone than any zone in a magnetic low gradient area, such as Zones "W" & "Y". For shallow wells (400 ft. or less) this zone "X" appears to be a favorable one with the areas marked "A" & "B" (deeper gravel lenses?), the better areas within Zone "X".

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COPY

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The magnetic picture indicates a general decrease in gradient to the north and east bottoming out at the NE corner of Sec. 32. This magnetic feature is extremely deep and could easily be the deepest point of valley fill in the Sulphur Springs Basin (note U.S.G.S. gravity data comparison).Yield potential seems good all along Line 5 with the possibly better local zones indicated at "H" and "I".

Line 6, Spread 11

This line indicates two distinct resistivity features approximately 1,500 - 2,000 ft. apart. One conformed to the surface topographic high and is probably the extension of Turkey Creek Ridge. Water potential is indicated very poor along the entire line except possibly near zone "J" and to the north from there especially.

The other eastern feature centers at approximately 0.25 E. The zone marked "V" on the plan map is quite shallow on the magnetic records No. 9 & 10 and is deepening to the south as indicated on Magnetic Record No. 1. The main trend parallels Ash Creek Ridge and indicates that the volcanics of Turkey Creek Ridge likely extend through the SW¼ of Sec. 12, T 18 S, R 26 E making for poorer water possibilities in this area. Without electrical coverage here, this interpretation is necessarily based entirely on the magnetic trend indicated.

CONCLUSIONS AND RECOMMENDATIONS

The electrical results suggest bed rock at rather shallow depths 1,500 ft. east of the ¼ corner 3/10 T 17 S, R 26 E. Therefore any drilling for water in that area should be confined to a narrow zone "J" in the NW¼ NW¼ of Sec. 11 and north. Zone "V" should be avoided for the time being. If defining the exact limits of Zone "V" were desired, further magnetics is recommended. The NE¼ of Sec. 11 appears more favorable than to the west.

Sections 2 and 35 appear good. Further magnetic coverage might help determine if the northeast projection of Zone "V" extends further than expected into Sec. 2.

Section 1 appears to have generally good water possibilities. The NW¼, NE¼, SE¼ is underlain by a broad magnetic high. For shallow wells down to 400 ft. this feature is apparently

irrelevant. However, it could eventually have a bearing on deeper wells in the future, in which case those wells off this structure might have the greater yield. The resistivity values indicate two apparently locally more favorable zones near "C" and "D".

Little direct information was obtained on Section 12. However, it would be expected that possibilities would get relatively poorer toward the south depending mainly on the detailed limits of Zone "V". It is possible that Zone "V" extends along the south edge of Sections 7, 8 & 9 at a fairly shallow depth, and if so, would considerably influence lesser production from wells in this area. If it becomes necessary to obtain maximum yield in this area, in addition to more magnetic coverage, a few parallel resistivity lines would be recommended to attempt detection of any possible channeling or zones of deeper valley fill.

Sections 5, 32 and 28 seem to have generally good water possibilities with probably better local zones suggested at "G", "H" and "I". The deepest point of valley fill from the magnetic interpretation appears to be at the NE corner of Section 32.

Since only single resistivity profiles were observed, it is difficult to determine detail trends. In a general way we can use the major regional trends which in this area appear

Magnetic data across Section 32, the north part of Section 33, north along the western side of Sections 27 and 22 and into the northwestern part of Section 22 (magnetic records #6, #7 and #8), when correlated with the apparent geology and results of I. P. line #5, suggests that Sections 14, 15, 21, 22, 23, 27, 29, 30 and 33 also have generally good water potential over all.

COPY

NOTE: Insert on Page 7 before last paragraph.

mostly NW - SE. Local variations will of course be missed. However, if it becomes desirable to make detailed locations in the more marginal areas, such as Sections 10, 11, S½ 12, S½ 7, 8, 9 it is recommended that further resistivity and magnetics be considered, based on additional drilling results and correlation obtained in the meantime.

Respectfully submitted,

HEINRICHS GEOEXPLORATION CO.

E. Grover Heinrichs

Walter E. Heinrichs, Jr.
Registered Engineer

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
WALTER E. HEINRICHS, JR.
DEC. 31, 1962
ARIZONA, U. S. A.

May 4, 1962
P. O. Box 5671
Tucson, Arizona

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CERTIFICATE EXPIRES
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HEINRICHS, JR.
DEC. 31, 1962
ARIZONA, U.S.A.

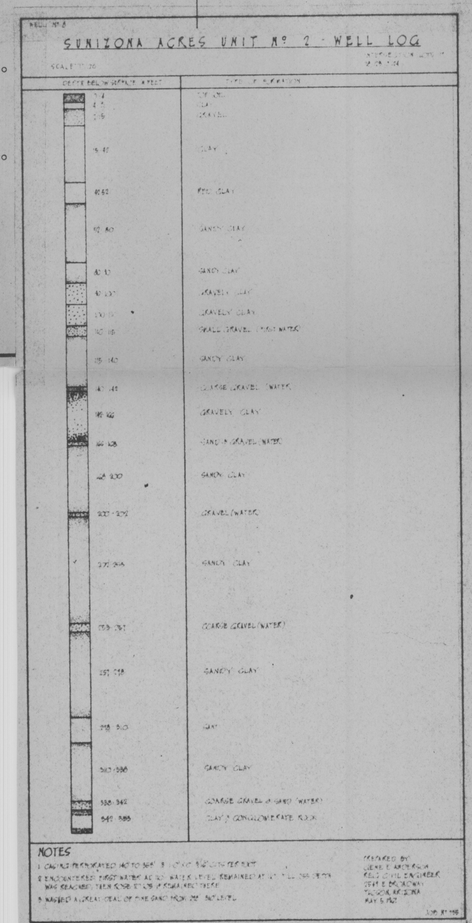
COPY

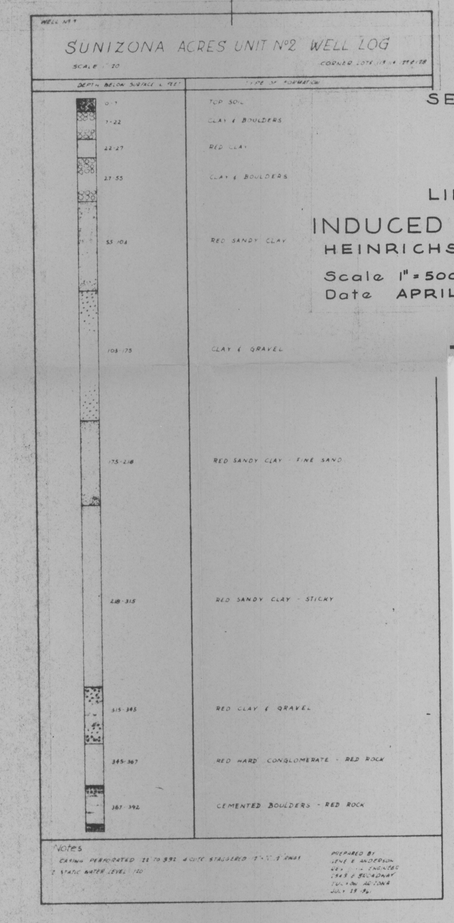
May 4, 1962
P. O. Box 5671
Tucson, Arizona

INTERPRETATION LEGEND

C.I. = Logarithmic

(( )) indicates questionable data





SECTIONAL DATA SHEET

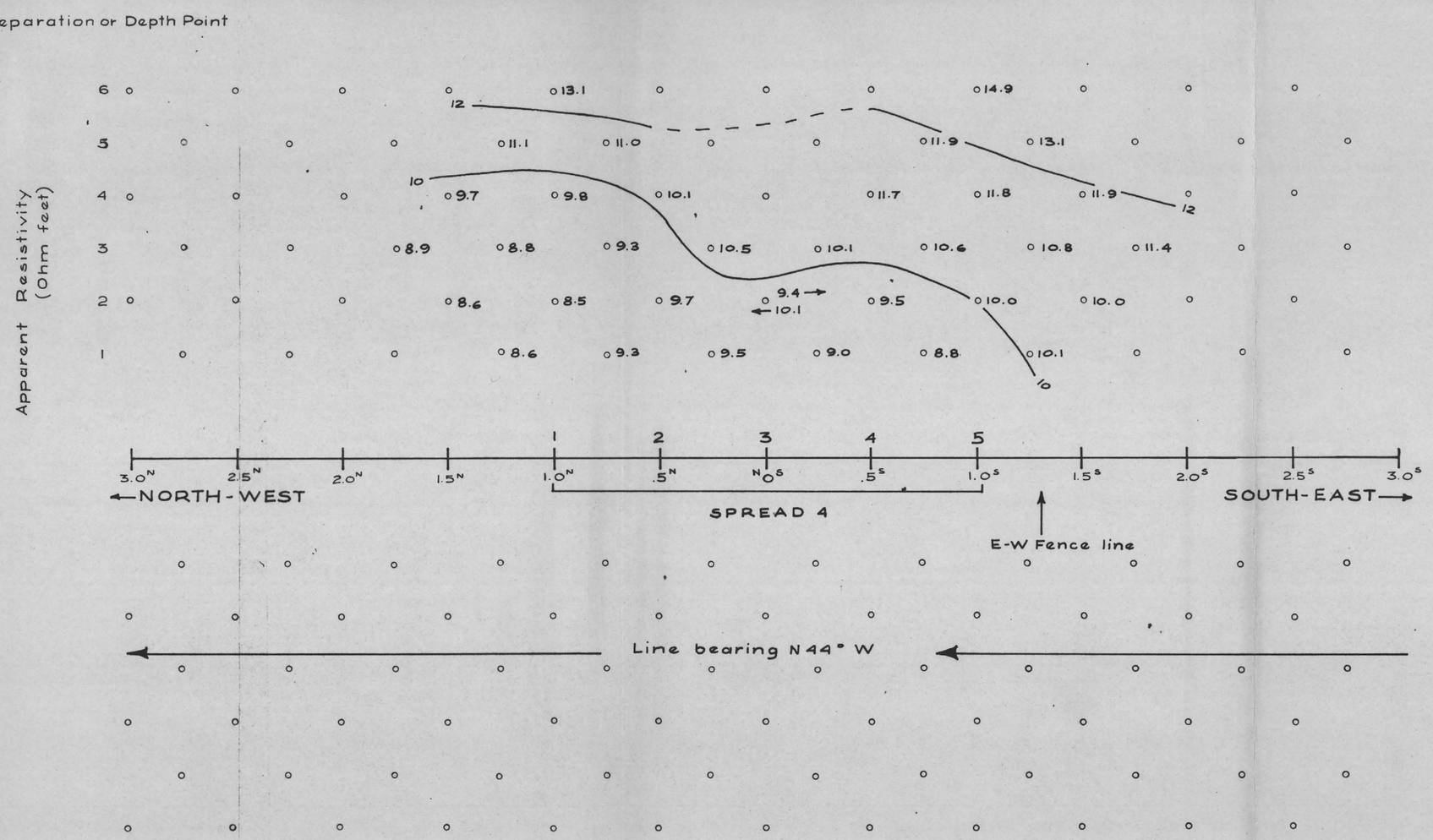
LINE No. 1 Spr. 1-2-3

INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale 1" = 500'

Date APRIL 1962



INTERPRETATION LEGEND

$\rho_{DC}/2\pi$

C.I. = Logarithmic

(( )) indicates questionable data

SECTIONAL DATA SHEET

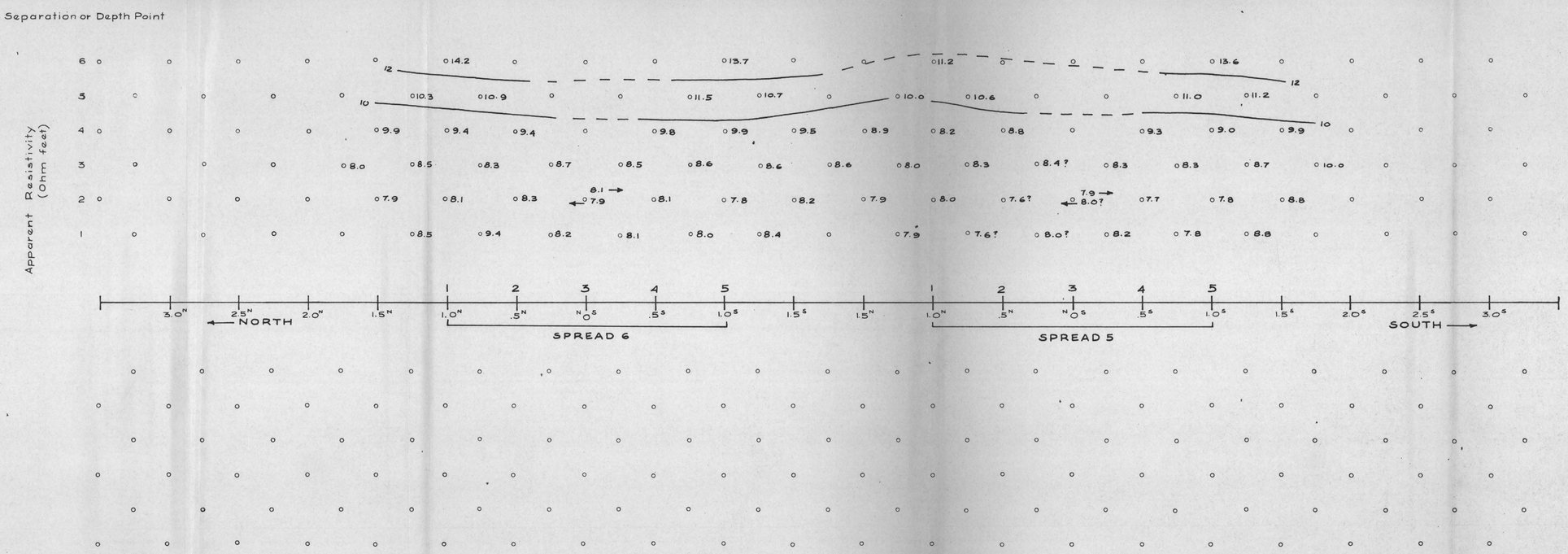
LINE No. 2 Spr. 4

INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale 1" = 500'

Date APRIL 1962



INTERPRETATION LEGEND

$\rho_{DC}/2\pi$

C.I. = Logarithmic

(( )) indicates questionable data

SECTIONAL DATA SHEET

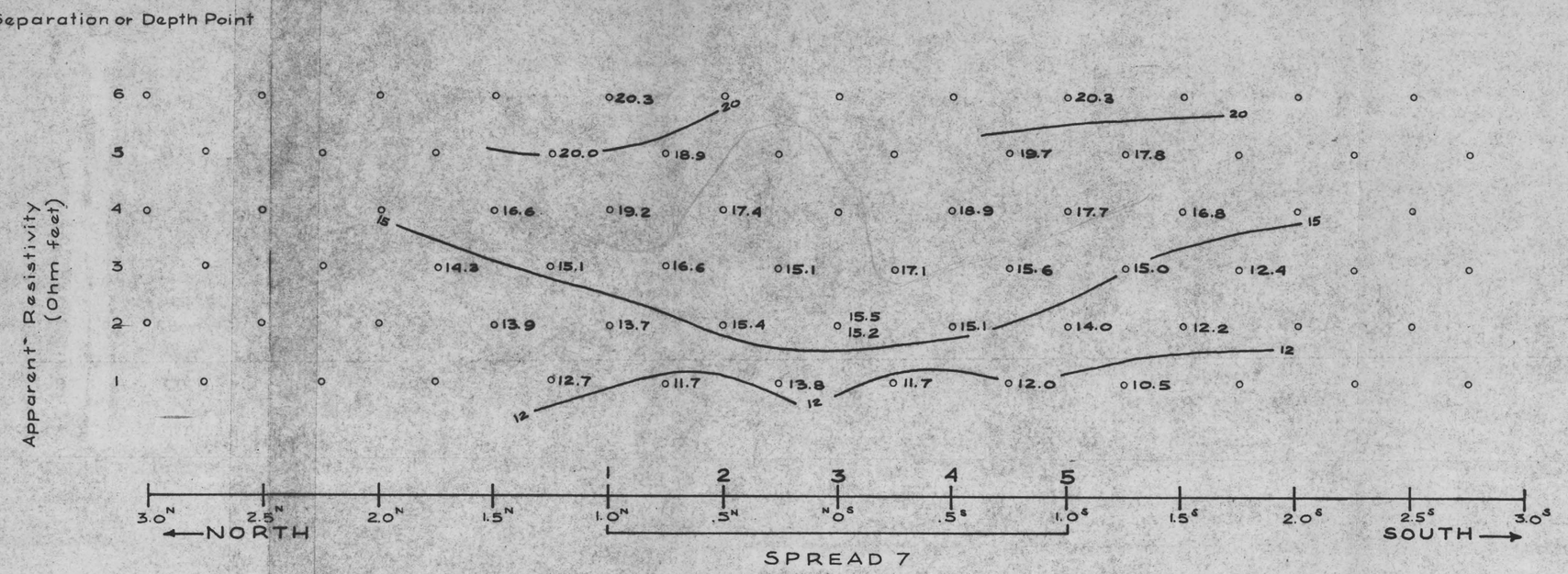
LINE No. 3 Spr. 5-6

INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale 1" = 500'

Date APRIL 1962



INTERPRETATION LEGEND

$\rho_{dc}/2\pi$

C.I. = Logarithmic

(( )) indicates questionable data

SECTIONAL DATA SHEET

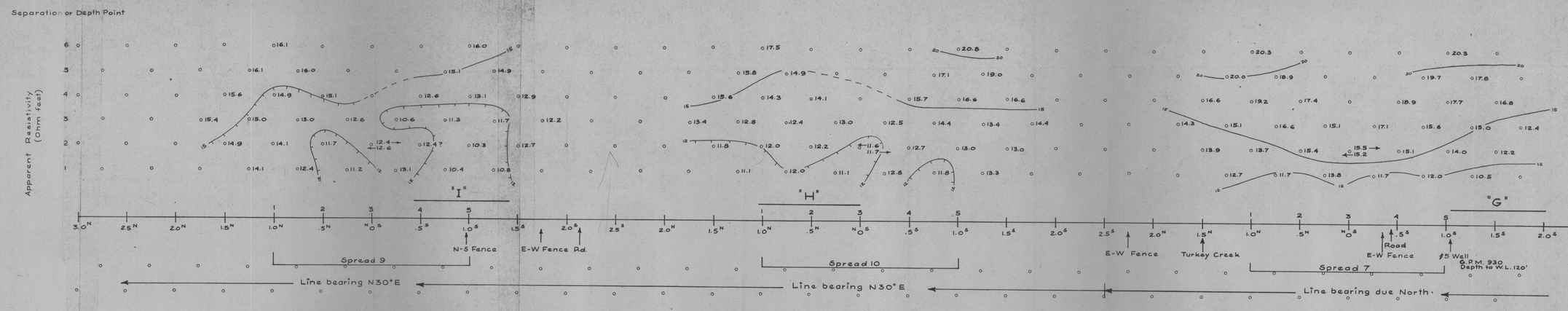
LINE No. 4 Spr. 7

INDUCED POLARIZATION SURVEY

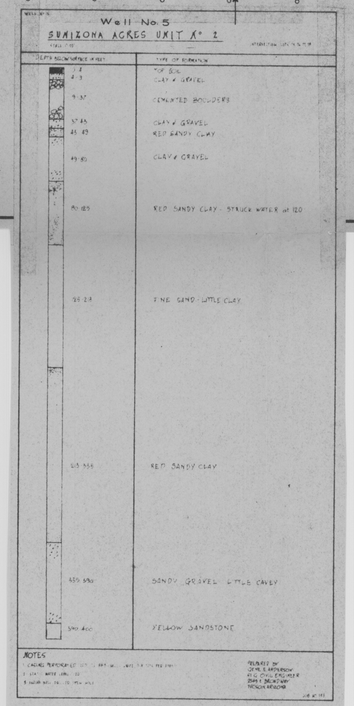
HEINRICHS GEOEXPLORATION CO.

Scale 1" = 500'

Date APRIL 1962



INTERPRETATION LEGEND



SECTIONAL DATA SHEET

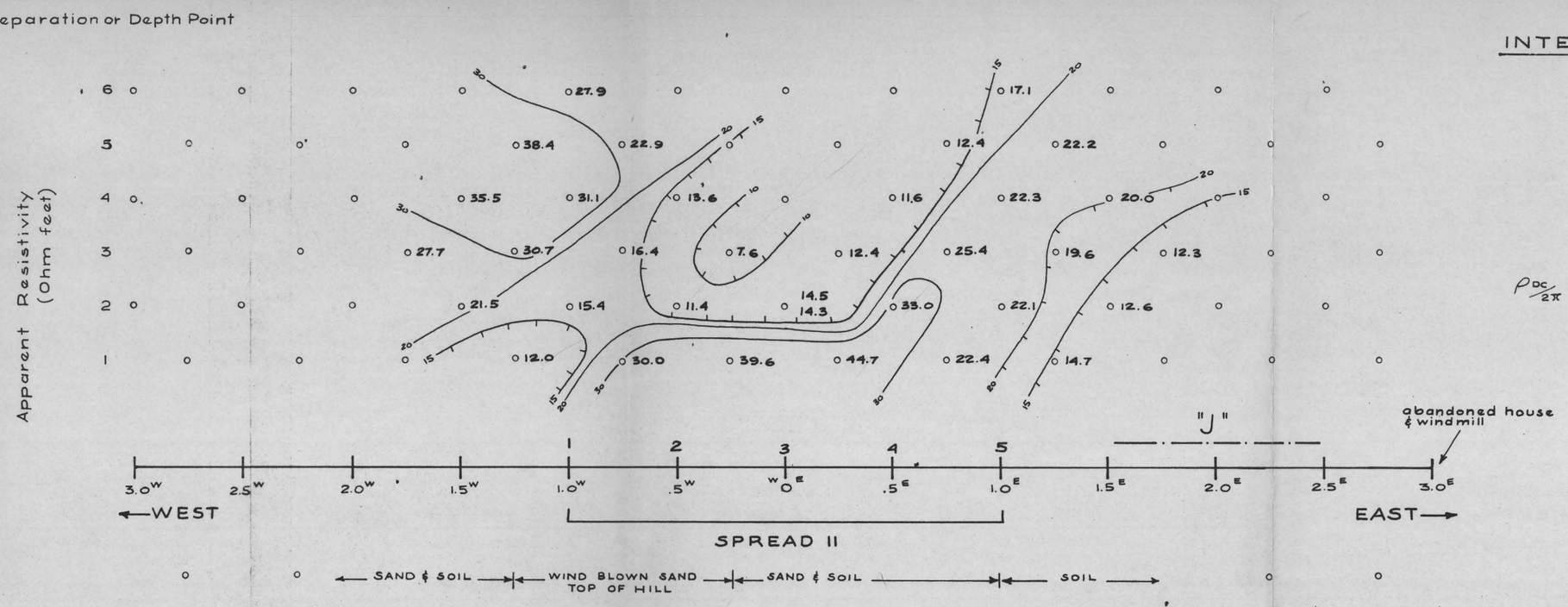
LINE No. 4, Spr. 7 and 5, Spr. 9 & 10

INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale 1" = 500'

Date APRIL 1962



INTERPRETATION LEGEND

$\rho_{DC}/2\pi$

C.I. = Logarithmic

(( )) indicates questionable data

SECTIONAL DATA SHEET

LINE No. 6 Spr. II

INDUCED POLARIZATION SURVEY

HEINRICHS GEOEXPLORATION CO.

Scale 1" = 500'

Date APRIL 1962

Al Erickson
Vi Fisher
provide space @ Motel
2 weeks before commencement
except State lease
11½ Sections
4½ Sections omit
correlate info of present activity

Quantity H_2O Potential
= Best?
= Good
= Questionable
= Poor

Horizontal control by brunton compass & chain on geophysical work

LEGEND

- Power Line
- Fence Line
- Windmill
- Well
- Road
- Mobile Magnetometer Traverse begin, end &/or tie and direction
- I.P resistivity survey location
- indicates I.P resistivity interpretation
- Magnetic interpretation

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

RECONNAISANCE
INDUCED POLARIZATION
ELECTRICAL RESISTIVITY &
MOBILE MAGNETOMETER SURVEY
FOR
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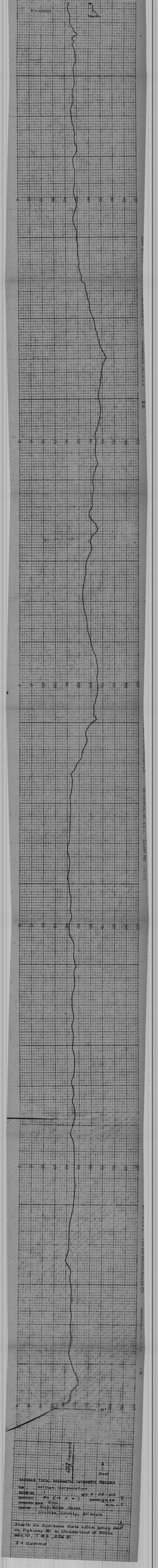
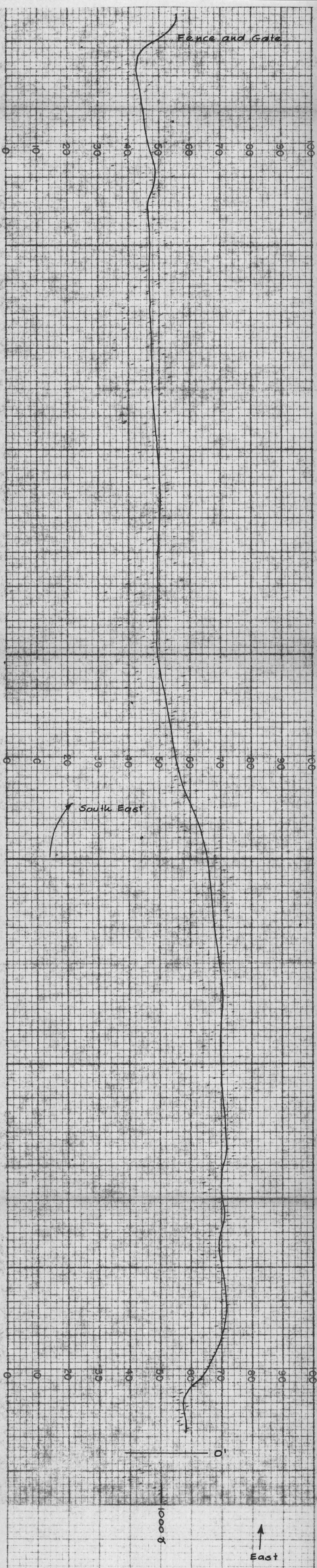
SUNIZONA ACRES PROJECT
Cochise County, Arizona

SCALE: 1" = 3000'	CONTOUR INTERVAL:	REVISIONS
	DATA BY: E. G. H. + W. E. H.	
DATE: APRIL 1962	SHEET OF	
DRAWN BY: I. B.	DRAWING NO.:	FILE:

Office


North
East
MAGNAS TOTAL MAGNETIC INTENSITY RECORD
FOR Willman Corporation
RECORD NO.
DATE 4-26-62
INSTRUMENT
SUPERVISOR
VERTICAL SCALE 200
GAMMAS
Sublaka Oil Co.
Cochise County, Arizona
Starts 2a Kuniform Gate 0.2 of a mile going east on Highway 181 to Douglas and 2 miles south
Sec. 10, T 15 S, R 26 E
2 = Gamma



THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U. S. A. CHART NO. 17491X

MADE IN

Willen Corporation

2 4-26-62

50

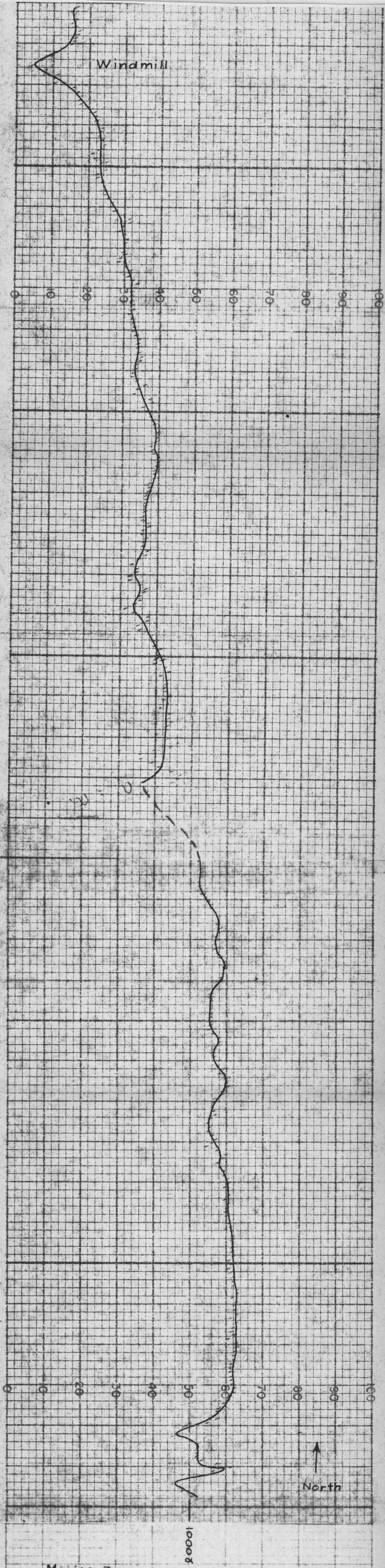
200

Sunizona Acres

Cochise County, Arizona

Starting East from near Windmill Sec. 11

T18S, R26E



MAGNAG TOTAL MAGNETIC INTENSITY RECORD

FOR: Willen Corporation

RECORD NO. 3 DATE 4-26-62

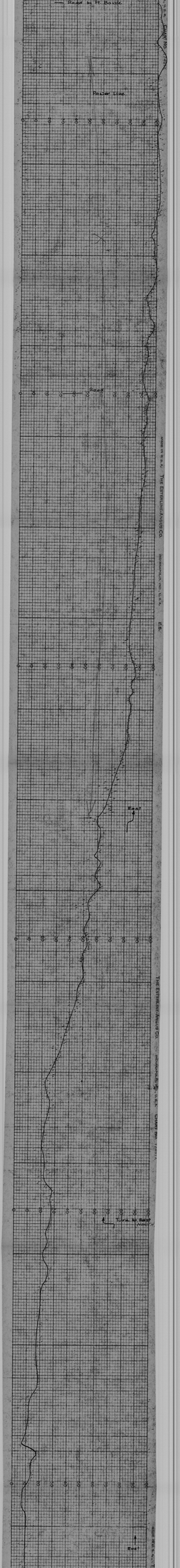
SENSITIVITY 50 GAMMAS 1/2 in S.U.

HORIZONTAL SCALE 200 ft./in.

LOCATION Sunizona Acres
Cochise County, Ariz

Starts at End of Rec. 1 in bend of Highway 181 going North; approx ½ cor. Sec. 11 + 12, T18S, R26E

ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X
E.S.
RT NO. 17491X


Road to Ft. Bowie
Power Line
Road
East
Turn to East
East
Road
E.N.E.
MINING TOTAL MAGNETIC INTENSITY RECORD
Willen Corporation
4
A-26-62
20
1 in = 1 in
200
Sunnyside Acres
Cochise County, Ariz.
Sec. 1 T18S, R26E
Starts at end of Rd. No.3 going NE & East
THE EUGENE DIETZGEN CO.

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X E.S.
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IN

MAGNOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR: Villen Corporation

RECORD NO. 5 DATE 4-26-62

SENSITIVITY 50 GAMMAS/½ in. S.G.

HORIZONTAL SCALE 200 ft./in.

LOCATION Sunizona Acres
Cochise County, Arizona

Starts at end of Rec. No 4 in Road crossing going north on Ft. Bowie Rd.

PROMAG TOTAL MAGNETIC INTENSITY RECORD

Willen Corporation

6 DATE 4-26-62

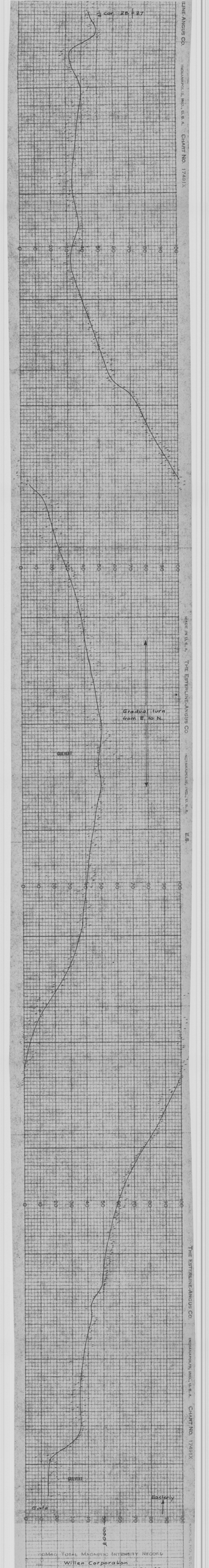
50

200

Sunizona Acres

Cochise County, Arizona

Starts at end of Rec. No. 5 at Gate, going East-North-East. Sec. 32, R27E - ~~R~~T 17S



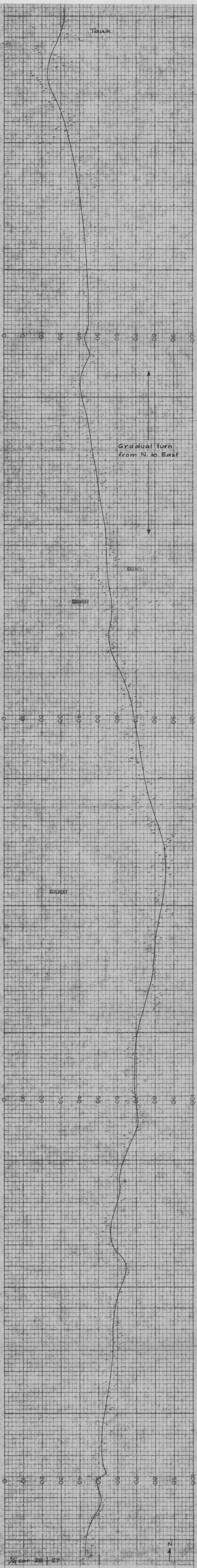
AEROMAG TOTAL MAGNETIC INTENSITY RECORD

Company	Willen Corporation
Flight No.	7
Date	4-26-62
Altitude	50
Speed	200
Operator	
Pilot	
Area	Gunizona Acres
County	Cochise County, Arizona

Starts at end of Rec. No. 6 at Gate of 29 | 28 / 32 | 38

TITE = 427E

Going easterly



MOMAG TOTAL MAGNETIC INTENSITY RECORD

FOR Willen Corporation

RECORDING NO. 8 DATE 4-26-62

SENSITIVITY 50

HORIZONTAL SCALE 200

LOCATION Sunizona Acres

Cochise County, Arizona

Starts at end of Rec. 7 at 1/4 cor. 28 | 27

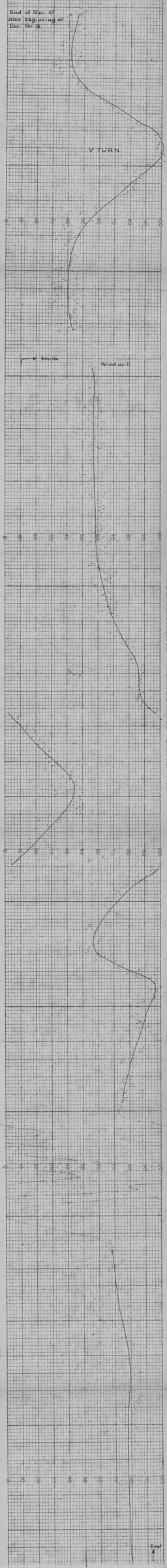
T 17S, R 27E, going north

THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. CHART NO. 17491X E.S.

MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A. E.S.

THE ESTERLINE-ANGUS CO., INC.

East along Sec. Line
Record ends at turn to East
State Highway
¼ mile ± to West
N. along Sec. Line
W
MOMAG TOTAL MAGNETIC INTENSITY RECORD
Willen Corporation
9
4-26-62
50
200
Synizona Acres
Cochise County, Arizona
Starts approx. 750' S. of Sec. 2 & 1200' E. of Sec. 10
T 18 S, R 26 E. Going West
CHART NO. 17491X
E.S.
MADE IN U.S.A. THE ESTERLINE-ANGUS CO. INDIANAPOLIS, IND., U.S.A.



4 | 3
9 | 10

GENERAL TOTAL MAGNETIC INTENSITY RECORD

Willex Corporation

10 4-26-62

50

200

Sunizona Acres

Cochise County, Arizona

Starts at end of Rec 9 at Sec. cor. 4 | 3 9 | 10 T18S, R26E, going East