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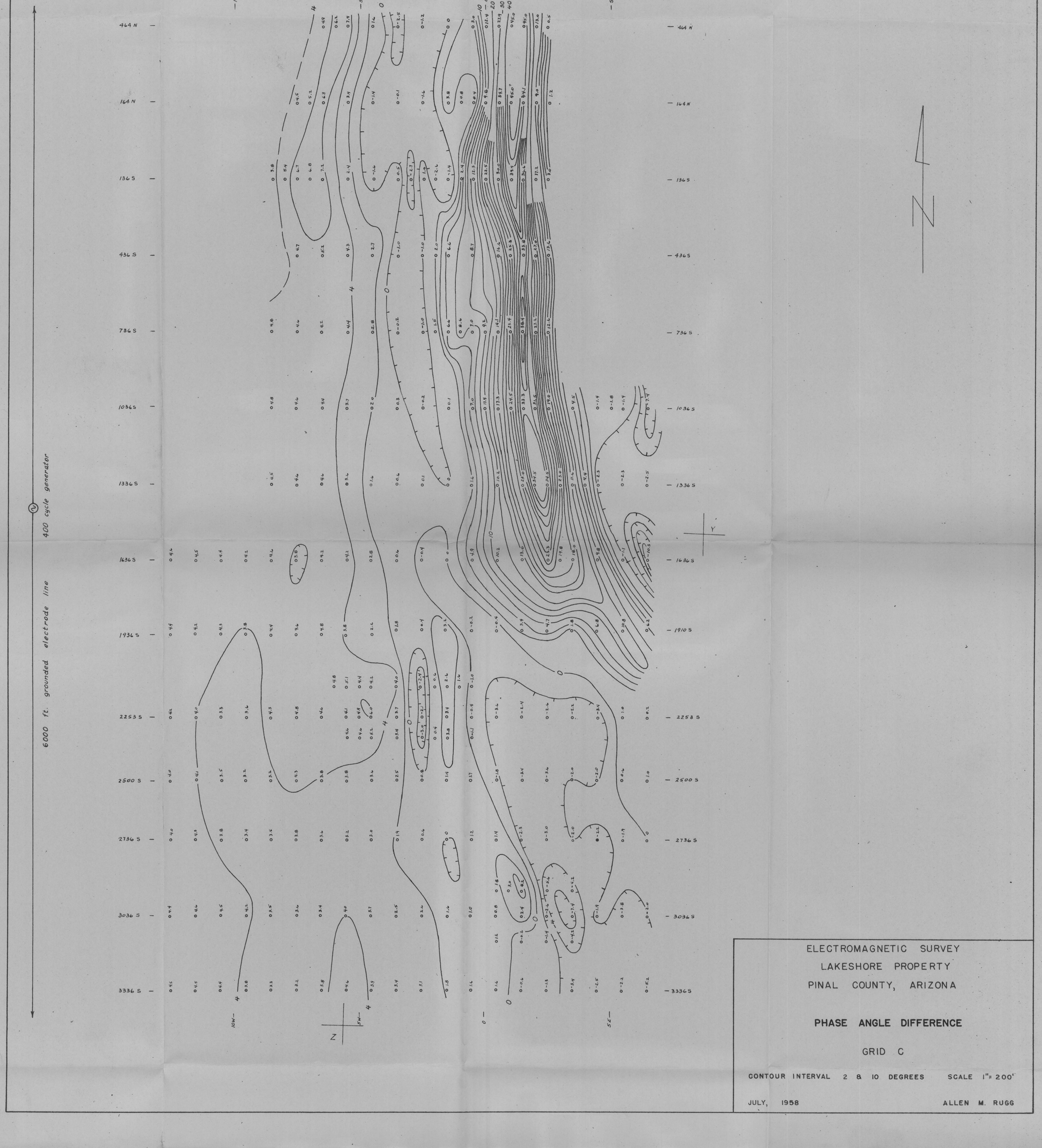


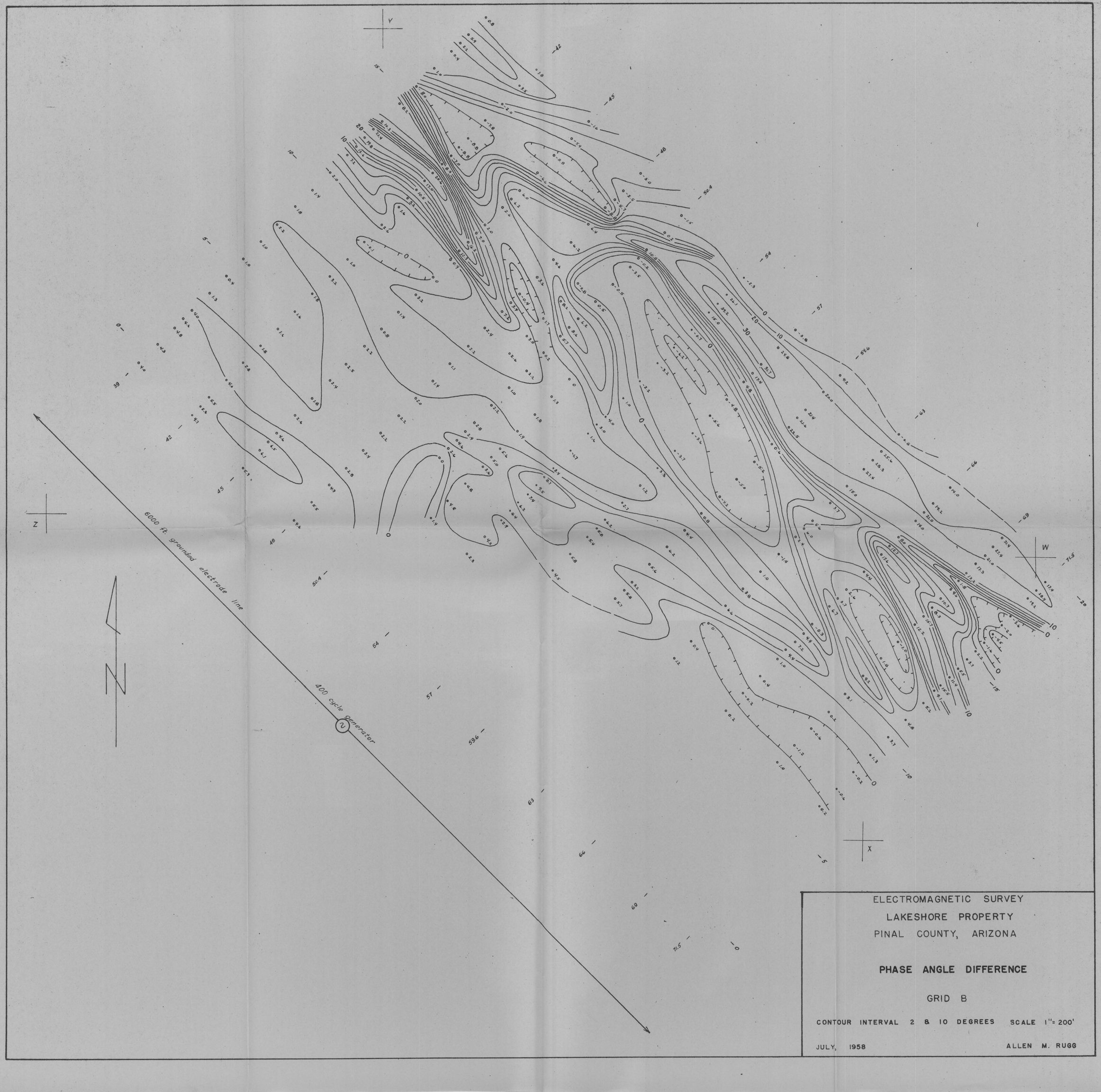
ELECTROMAGNETIC SURVEY
LAKESHORE PROPERTY
PINAL COUNTY, ARIZONA

PHASE ANGLE DIFFERENCE

GRID C

CONTOUR INTERVAL 2 & 10 DEGREES SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG



ELECTROMAGNETIC SURVEY

LAKESHORE PROPERTY

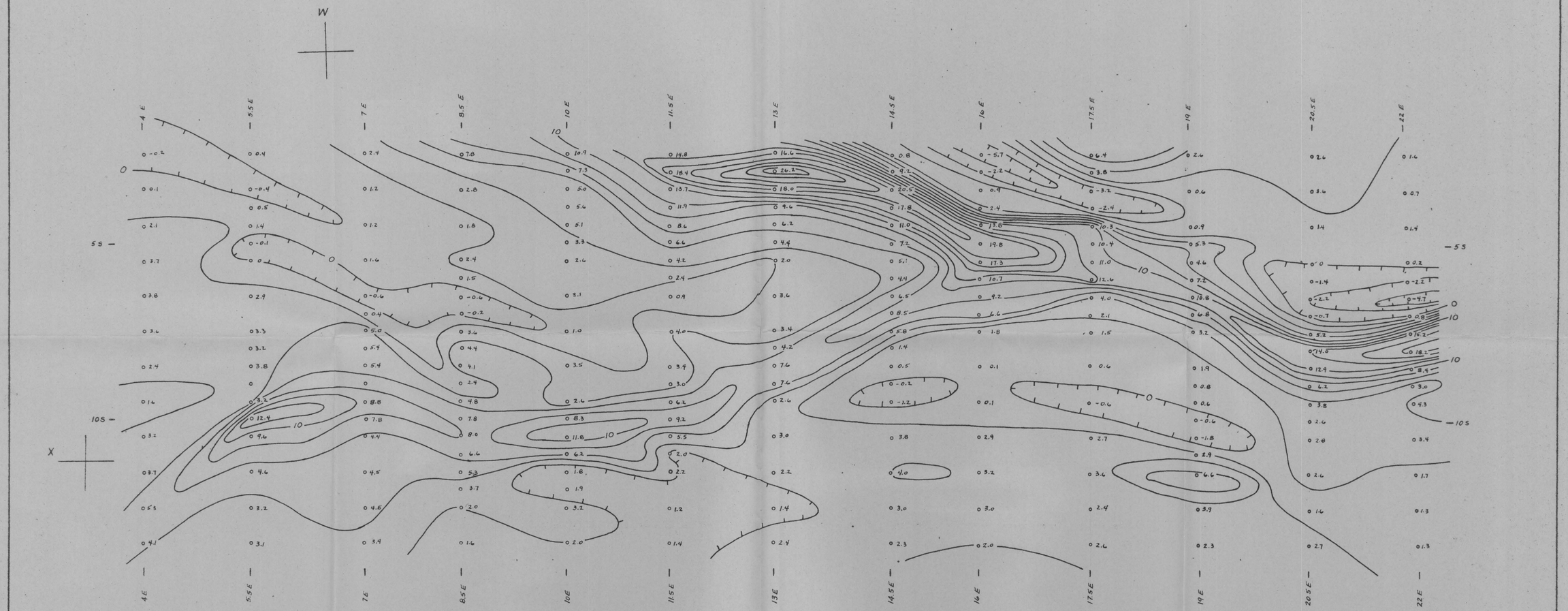
PINAL COUNTY, ARIZONA

PHASE ANGLE DIFFERENCE

GRID B

CONTOUR INTERVAL 2 & 10 DEGREES SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG



ELECTROMAGNETIC SURVEY

LAKESHORE PROPERTY

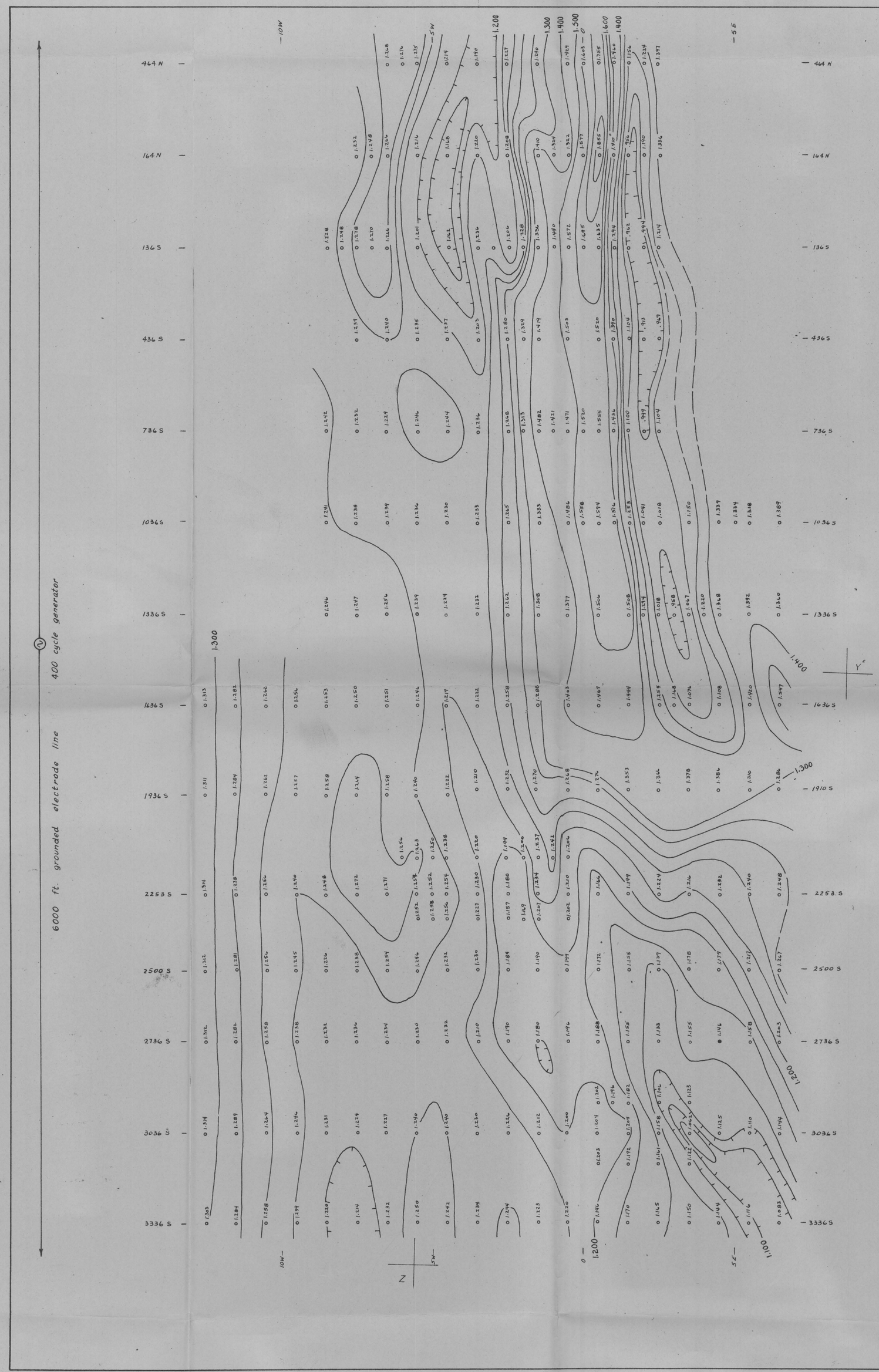
PINAL COUNTY, ARIZONA

PHASE ANGLE DIFFERENCE

GRID A

CONTOUR INTERVAL 2 DEGREES SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG



ELECTROMAGNETIC SURVEY

LAKESHORE PROPERTY

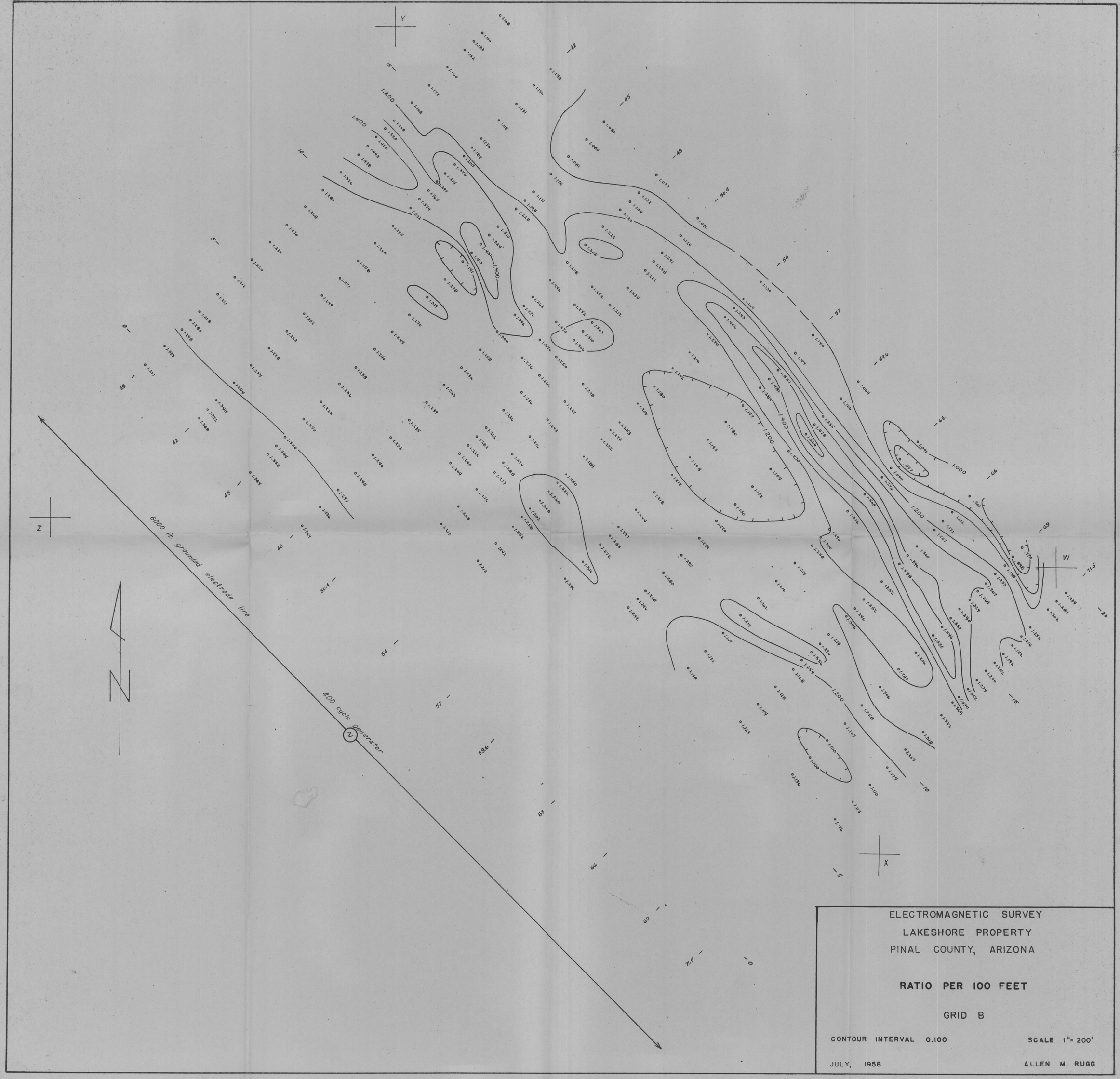
PINAL COUNTY, ARIZONA

RATIO PER 100 FEET

GRID C

CONTOUR INTERVAL 0.100 & 0.020 SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG



ELECTROMAGNETIC SURVEY

LAKESHORE PROPERTY

PINAL COUNTY, ARIZONA

RATIO PER 100 FEET

GRID B

CONTOUR INTERVAL 0.100 SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG

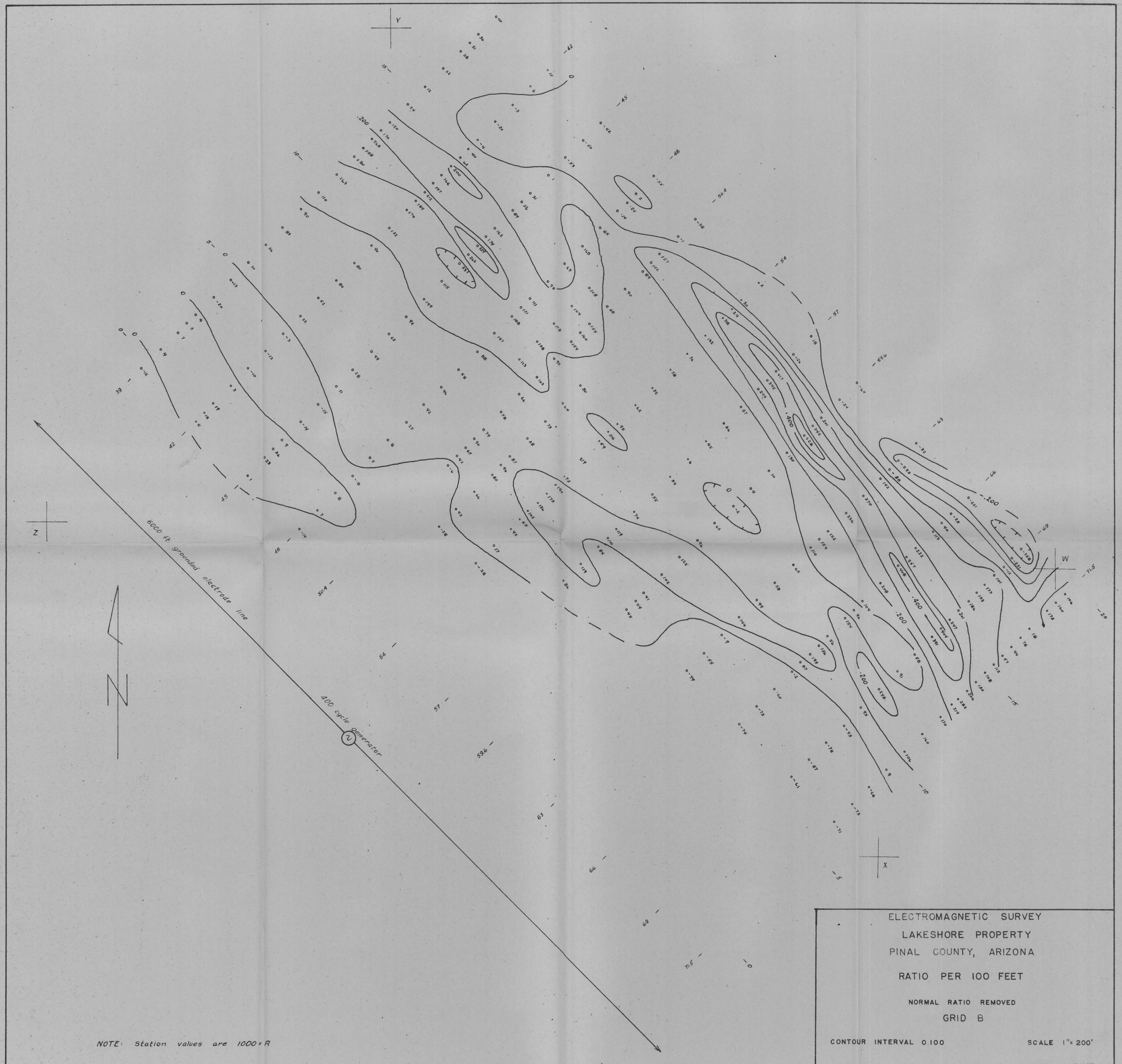
ELECTROMAGNETIC SURVEY
LAKESHORE PROPERTY
PINAL COUNTY, ARIZONA

RATIO PER 100 FEET

GRID A

CONTOUR INTERVAL 0.100 SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG



NOTE: Station values are 1000 x R

ELECTROMAGNETIC SURVEY

LAKESHORE PROPERTY

PINAL COUNTY, ARIZONA

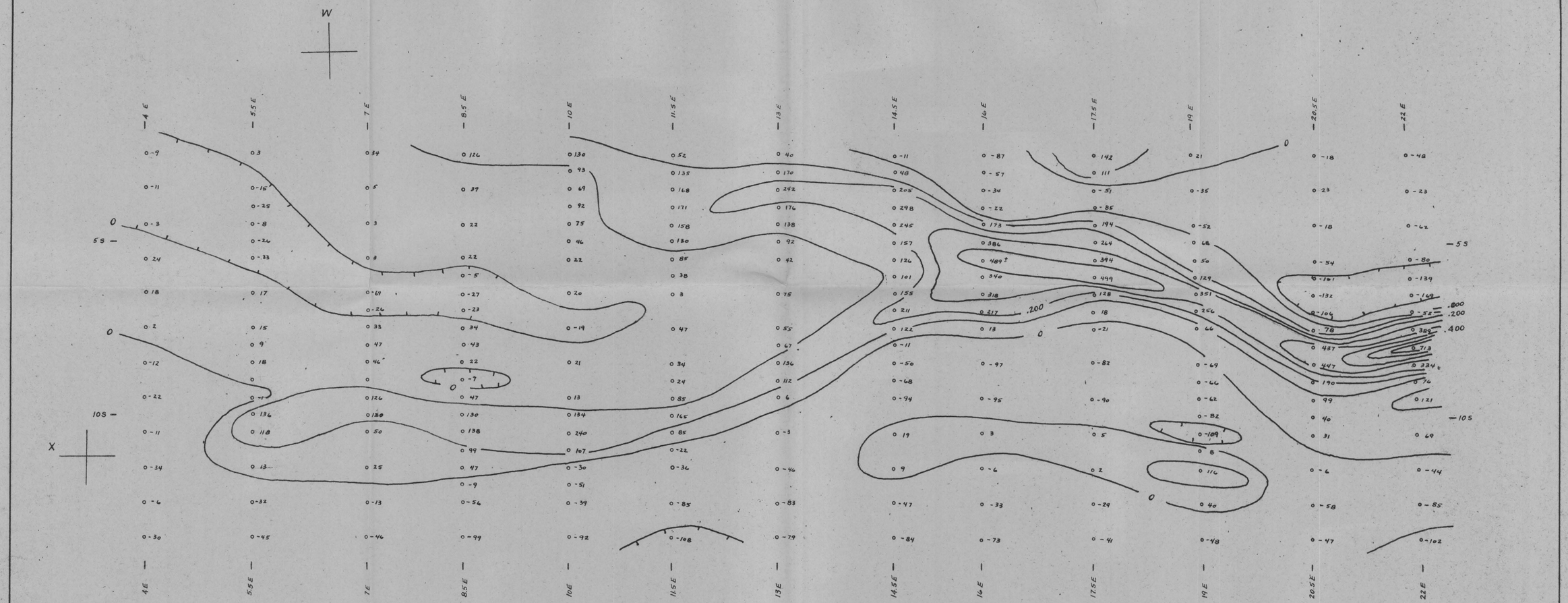
RATIO PER 100 FEET

NORMAL RATIO REMOVED

GRID B

CONTOUR INTERVAL 0.100 SCALE 1" = 200'

JULY, 1958 ALLEN M. RUGG



6000 ft. grounded electrode line — 400 cycle generator

NOTE: Station values are 1000×R

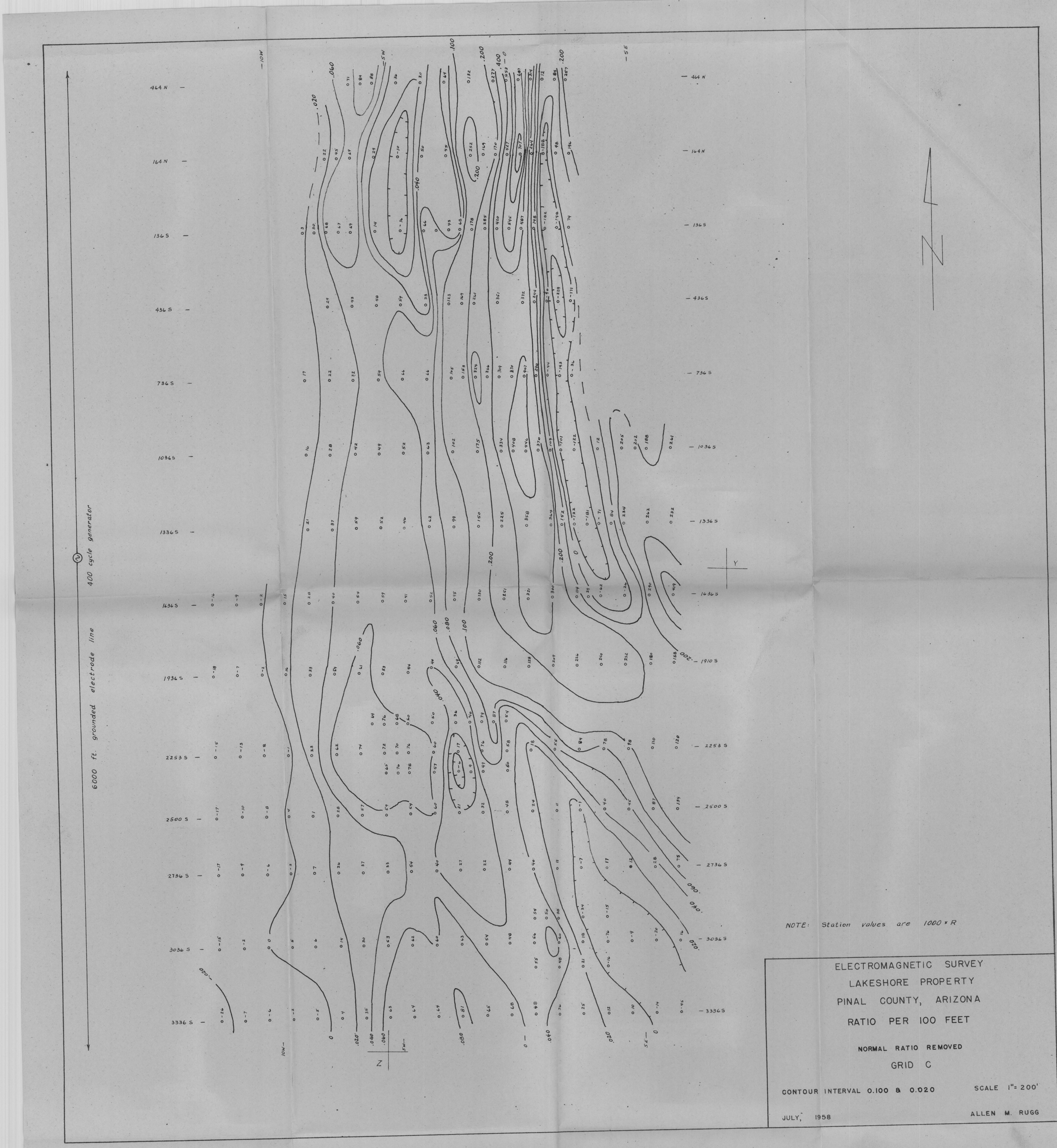
ELECTROMAGNETIC SURVEY
LAKESHORE PROPERTY
PINAL COUNTY, ARIZONA

RATIO PER 100 FEET

NORMAL RATIO REMOVED
GRID A

CONTOUR INTERVAL 0.100 — SCALE 1"= 200'

JULY, 1958 — ALLEN M. RUGG



NOTE: Station values are 1000 x R

ELECTROMAGNETIC SURVEY
LAKESHORE PROPERTY
PINAL COUNTY, ARIZONA
RATIO PER 100 FEET

NORMAL RATIO REMOVED
GRID C

CONTOUR INTERVAL 0.100 & 0.020 SCALE 1"= 200'

JULY, 1958 ALLEN M. RUGG

52,000 E

54,000 E

56,000 E

58,000 E

464 N

164 N

136 S

436 S

50,000 N

736 S

1036 S

1336 S

1636 S

1936 S

2253 S

2500 S

48,000 N

2736 S

3036 S

3336 S

10 W

5 W

5 E

GRID C

GRID B

GRID A

46,000 N

4 E

5.5

7 E

8.5

10 E

11.5

13 E

14.5

16 E

17.5

19 E

20.5

22 E

52,000 E

54,000 E

56,000 E

58,000 E

50,000 N

48,000 N

46,000 N

ELECTROMAGNETIC SURVEY

LAKESHORE PROPERTY

PINAL COUNTY, ARIZONA

PHASE ANGLE DIFFERENCE

GRID A, B, C

CONTOUR INTERVAL 5 DEGREES

SCALE 1" = 400'

JULY, 1958

ALLEN M. RUGG

ELECTROMAGNETIC SURVEY OF THE LAKESHORE PROPERTY,

PINAL COUNTY, ARIZONA

For

Callahan Mining Corp

by

Allen M. Rugg, Jr.

July, 1958

ELECTROMAGNETIC SURVEY OF THE LAKESHORE PROPERTY,

PINAL COUNTY, ARIZONA

An electromagnetic survey was made over portions of the Lakeshore property east of Gu Komelik, Pinal County, Arizona during June and July, 1958. Approximately 450 acres were covered by this survey. Temperatures reached 120 degrees F on several days making it difficult for field crews to work efficiently.

Equipment and Field Procedure

The equipment used is manufactured by United Geophysical Corporation. It consists of an insulated wire used as a grounded electrode line which extends approximately 1000 feet beyond the ends of the grid to be surveyed. This made the total length of the electrode line about 6000 feet for each grid. A 400 cycle, 1400 watt generator is connected to the electrode line as a power source. On this job, about 480 volts at 3.2 amperes was used on the electrode line.

Measurements are made of the resultant electromagnetic field due to current flowing in the electrode line and in the ground. These measurements are made with two horizontal coils 100 feet apart on a line perpendicular to the electrode line. The coils are connected to a bridge which measures two quantities, ratio and phase angle difference between them. Since the coils are horizontal, the vertical component of the electromagnetic field is measured. The ratio measured is strength of the field at the coil nearest to the electrode line compared to the field at the second. The plotting point for the data is a point half way between the two coils.

Since the ratio becomes extremely high close to the electrode line, it has been found that measurements closer than 500 feet to it should be avoided. The position of the electrode line is shown on the 1 inch to 200 foot scale maps.

Three separate areas, grids A, B and C, were surveyed requiring the moving of the electrode line for each one. Lines were run approximately 300 feet apart perpendicular to the electrode line and stations were observed at 50 and 100 foot intervals.

Data

Two maps at a scale of 1 inch to 200 feet for each grid have been plotted, one showing the ratio difference and the other the phase angle difference. In addition, a composite phase angle map at a scale of 1 inch to 400 feet was made. Since the ratio and phase angle maps are quite similar, the ratio was not plotted on the 1 inch to 400 foot scale. The smaller scale map was plotted to conform to the magnetic and geologic maps available at the time. It was found that some of the lines on the magnetic map were not spaced on the ground as shown on the map. This variation in line spacing will cause some distortion in the electromagnetic map at a scale of 1 inch to 400 feet, but it will conform to the magnetic map. The lines are plotted in their correct position on the 1 inch to 200 foot maps.

The rationmaps contain a normal gradient effect due to the increase in field stren[illegible] line. This gradient [illegible]00 feet from the elec[illegible] procedure is used to remove this normal value from the ratio map. However, due to the numerous anomalies, it was decided that it would be a waste of time to attempt to develop a normal curve which would be questionable at best and remove these normal values from the raw data. Anomalies will still be indicated even though the normal curve effect has not been removed. The phase angle data is not affected by any normal gradient curve. The two maps indicate similar results. For this reason, only the phase angle map was plotted at 1 inch to 400 feet.

Results

If an electrical conductor such as a fault or sulfide ore body is present in the area being covered by the electromagnetic survey, there will be an increase in current flowing in this conductor and the resulting electromagnetic field will be changed. The anomaly will be indicated by an increase in ratio and phase angle difference. The axis of the high will usually follow the nearest surface trend of the conductor. It is not possible to differentiate types of conductors, such as faults as compared to metallic ore zones. As a rule, low values will occur on both flanks of the high. If the low has a much larger negative value on one side than the other, there is a possibility of dip being indicated in a direction away from the larger negative value. This is qualitative and the difference in low values could be accounted for by another adjacent high.

Generally, in the area surveyed, there is a lower phase angle difference over the limestone. Part of this is probably due to the high anomalies in the area. Since limestone is usually a very poor conductor, part of this low effect can probably be attributed to it. The phase angle difference over the andesite is somewhat higher than over the limestone varying from 3.5 to 4.5 degrees. This suggests the possibility of roughly following the andesite-limestone contact in areas where no fault caused anomaly is evident. Some of the anomalies discussed later which appear to be of interest may be due to the edge effect of the andesite in contact with the limestone.

The most outstanding electromagnetic high on all three grids is generally correlated with the quartz monzonite contact. However on grid C there is considerable divergence along lines 736 S and 1036 S. This anomaly appears to be due to a very near surface source such as a fault.

As can be seen on the maps, numerous anomalies were found in the area. Many of these appear to correlate with known faults in the vicinity. A fault plane containing moist gouge makes an excellent conductor.

Over the known ore zone which was covered by part of grid C, there is no evident anomaly which indicates a lack of metallic sulfides at depths less than 300 feet. However, the ore zone is very close to a strong anomaly and should there be a weak anomaly due to mineralization close by, it could be masked. The high magnitude of the anomalies indicate that most of them come from near surface conductors which would very likely be faults since most of the near surface mineralization has been oxide copper which is a poor conductor. The main shaft is at O S, O E which will help in orienting the mineralized zone with the electromagnetic data.

The anomaly extending from 464 N 6 W to 436 S, 6.5 W is probably a fault but this should be confirmed if possible.

Some sulfide ore has been drilled in the area between 12 and 14 on lines 42 and 45 on the B grid. A very strong electromagnetic anomaly occurs in this same place. The anomaly appears to be due to a shallow source which may be connected with the mineralization or a fault.

On the same grid, another anomaly extends east from line 45 station 15. This anomaly occurs over quartzite which is cut off on the north side. This anomaly may be caused by a fault, by the electrical conductivity difference between the quartzite and the adjacent formation or some other conductor. Its shape suggests that it could have a deeper source than many of the anomalies.

Other anomalies on grid B appear to be caused by relatively near surface sources with the possible exception of the high trending northwest-southeast between lines 39 and 48 at about station 0.5. This anomaly extends on to grid C to 1910 S, 1.5 W. If no geological reason for this anomaly is available, it may be worth some investigation. Since the anomaly is so close to the electrode line, it could not be completely covered without moving the electrode line. However there is enough detail to locate the high trend.

There is one anomaly on grid A extending from 19 E, 11.5 S to 14.5 E, 11.5 S and probably further into the stronger high. This anomaly is not as sharp or of such magnitude as the others indicating a greater depth of burial. Its considerable length indicates the possibility of a fault but this should be confirmed.

Comparing the magnetic and electromagnetic anomalies, there is not too much correlation. On grid A, there is a slight correlation at 10 S on lines 7 E and 8.5 E. On grid B, another correlation at line 57, station 6 occurs. This has already been drilled with negative results. The rough drilling encountered in some of these holes may indicate a fault source for the electromagnetic anomaly and the andesite could be the source of the magnetic anomaly. The magnetic high at 1636 S, 200 E on grid C has about the same relationship to the electromagnetic high as prevails in the main shaft area. Since this has already been drilled, the combined anomalies may suggest additional drilling is warranted.

Recommendations

All of the anomalies should be checked in the field if there is no known reason for their occurrence. If any of the anomalies appear to be of enough interest to drill, a self potential survey might be warranted. This method is useful under some conditions to locate oxidizing sulfide ore bodies. However, lack of a self potential anomaly over an area does not eliminate it since the sulfide ore body may not be undergoing active oxidation.

If the anomaly between lines 39 and 48 at station 0 on grid B is drilled and proves favorable, another electrode setup could be made in order to cover the area more adequately. Also, the source of most of the low magnitude anomalies which seem to flank the area on the west and south may be the same as this one.

Respectfully submitted,

Allen M. Rugg, Jr.
Geophysicist

CALLAHAN MINING CORPORATION

~~100 PARK AVENUE — NEW YORK 17, N. Y.~~
~~TELEPHONE ORegon 9-1300~~

1105 E. 12th St.
Casa Grande, Arizona
August 18, 1958

RECEIVED SEP 2 1958

Mr. Walter E. Heinrichs, Jr.
Heinrichs Geoexploration Co.
P. O. Box 5671
Tucson, Arizona

Dear Walt:

Enclosed are Al Rugg's ratio maps of the Lakeshore property, with the normal gradient removed.

In a separate package are eleven specimens of magnetic rocks from the Lakeshore. The red markings are the locations for the thin sections I plan to have cut; if you have any suggestions for better locations for any of these sections, please mark them. In playing around with these here in the office, I notice that all of them are polarized, which may be of importance or at least of interest. I happen to have here a specimen of copper-mineralized magnetite, location unknown except that it is from Lakeshore somewhere; it is not polarized, which suggests that polarization or lack of it may serve to differentiate between normal rock constituent magnetite and hydrothermalm magnetite. I'll work over some more of the ore magnetite, to see if any of it is polarized. I'd appreciate it if you would list the magnetic susceptibilities of these specimens for me, to go along with whatever dope I get from the thin sections.

We have started drilling, and now have about 100' of hole on the main EM anomaly at the west edge of the area and somewhat less on the nearby magnetic anomaly. Both holes are still in Gila, and I expect the one on the mag anomaly, at least, will remain in Gila to 200' or more -- instead of the 50' I originally expected. They are getting nearly 100% core recovery in this stuff, and the conglomerate contains rare small pebbles of magnetite. If you would like to work this over to check against the magnetic susceptibility of the Gila cores you already have, I could bring it in sometime later this week. Call me if you want it.

A list of the rock specimens is attached.

Best regards

CALLAHAN MINING CORPORATION
Arthur Baker III

TRANSARIZONA (LAKESHORE) PROPRETY
CASA GRANDE DISTRICT, PINAL CO., ARIZONA
List of rock specimens
collected from areas of magnetic
anomalies in southern part of
property, August, 1958, by ABIII

No.	T 1	N 47140, E 55620	Fine-grained diabase
	T 2	N 47000, E 55850	Coarse diabase
	T 3	N 47000, E 55850	Coarse diabase
	T 4	N 46825, E 54650	Andesite porphyry
	T 5	N 46825, E 54650	Andesite
	T 6	N 46825, E 54650	Andesite porphyry
	T 7	N 44450, E 58950	Agglomerate, abundant red jasper fragments
	T 8	N 44430, E 58950	Reddish welded tuff, 20' stratigraphically below No. T 7
	T 9	N 44450, E 59050	Agglomerate, approximately same bed as No. T 7
	T 10	N 44450, E 59150	Welded tuff, strongly magnetic
	T 11	N 44450, E 59250	Andesite porphyry (?)

19 August 1958

Mr. Arthur Baker, III
1105 East 12th Street
Casa Grande, Arizona

Re: Lakeshore, Pinal County, Arizona Project

Dear Mr. Baker:

At the request of Mr. Dan Kentro of Shattuck Denn, via telephone, consultation was held at this office with you and Mr. Kentro on 12 August 1958. At the time, I was requested to review the geophysical aspects of all the current program and data and results on hand, and to make recommendations, including the possibility of further geophysical work, if any.

Previously, I had gone over some of the data in connection with considerations by Minerals Exploration Company for joint venturing in the project. Also, on 11 August 1958, a brief study was made of the magnetometer survey file of United Geophysical Corporation and other prior magnetic data furnished by Mr. George Freeman. Following the above, further time was spent studying both the magnetic and electromagnetic data in conjunction with Baker's geology and some core from the "North End" area drilling identified by Baker as Gila conglomerate and a suite of rock samples furnished by Mr. Baker.

This will serve as a letter report of my recommendations and conclusions to date, which are as follows:

1. For the most part, I agree with Al Rugg's report and the correlating geology as interpreted by Baker and Rugg. In general, the electromagnetic work mainly traces the fault contact between the quartz monzonite area on the northeast and the sedimentaries or volcanics on the southwest. The same is essentially true for the magnetic data. In addition, the electromagnetic results trace subsidiary faulting. None of the anomalies can be very optimistically the direct result of massive sulfide concentration, nor would it appear there is any indirect relationship. Basically, all of the results seem to reflect response from effects which are remnant following considerable postintrusive movement.

2. Because of a desire to conscientiously appraise the property, it is agreed that the following priority of

proceedure is logical.

a. First are the two magnetic anomalies and one broad EM anomaly in the "X" area - two vertical drill holes approximately 500 feet deep.

b. The Slate Pits area in vicinity of geological section D-D' - one 800 to 1000 foot drill hole on the approximate center of the geographical overlap of the highest magnetic and electromagnetic contours and to bulldoze across the "46,000 Fault" south of EM anomaly "E" in hopes of being able to visually confirm its shallow suboutcrop existence.

3. One shallow drill hole to test the parallel fault about 400 feet east of the Isabella fault which correlates with a small EM high. The question here is the possibility of an echelon offset zone to the Rugg fault which could be mineralized. Geological concepts might require this to be an angle hole.

4. One drill hole on either anomaly "B" or "C" of EM grid "C". The "B" anomaly is preferable because of the magnetic correlation.

5. Originally it appeared likely that drilling on the "North End" area magnetic anomalies had not been deep enough to appraise what was causing the anomalism. However, later examination of the Gila conglomerate core shows at least one fairly thick stratified zone of medium susceptibility. This, coupled with the extremely poor core recovery and possibility of magnetite dilution, now suggests the Gila conglomerate may be responsible. It is hard to understand why more difficulty apparently was not encountered in running hand mag in this area. A low sensitivity instrument may be one answer. It is disappointing that the potentially larger anomalism beginning to appear in the southwest portion of this area was not isolated and developed with further coverage. Even though it may not have proven significant, it would have eliminated one question mark from this area. There seems to be little doubt that a major demarcation exists along the southern margin of this area. This is probably due to both faulting and topography. For the time being, no further work is recommended in this area pending results elsewhere.

Susceptibility checks on rock specimens T-1 through T-11, submitted by Mr. Baker, show from medium to medium-strong

susceptibility with specimens T-3, T-4 and T-11 slightly polarized.

In order to get maximum EM coverage as geologically indicated, a little EM coverage was submitted. In one or two instances, this may have been slightly disadvantageous, such as the question of closure on the "X" area - Grid "C" EM anomaly, which is the broadest, most persistent EM anomaly in the survey, and the Cretaceous volcanic area of EM Grid "B". Odds favor the former being okay, the question of the latter depends strictly on possibilities underlying the volcanics. Admittedly, these possibilities are poor but not impossible.

If time and continued interest permit, self-potential work should be tested along with any further geophysical considerations. A suggested profile or two would be one across area "X" from well on the quartz monzonite to the east to well beyond the anomalous zone, one along geological section D-D' and one across the main ore zone for correlation, however, this is not immediately recommended.

If substantial encouragement is obtained from the drilling presently planned, serious consideration should be given to expanded magnetic coverage in the vicinity of the project, as well as some possible additional detail in areas already covered.

Since I will be out of town for the next week or ten days, I will check with Mr. Baker as to progress and results immediately upon my return, not later than Friday, August 29th. If you have need of either the core, samples or maps and data in my possession, you may call Mrs. Patricia Routt, Main 2-5500, who will let you in our office to obtain them. Should anything urgent materialize, I may be reached during the middle of my absence at Golden, Colorado, c/o M. A. Heath, phone Crestview 9-1673. Messages may also be left 24 hours a day on our recording telephone - Tucson, Main 2-4202.

Respectfully submitted,
Completed in absentia, original dictated or signed by

Walter E. Heinrichs, Jr.
President & General Manager

WEH/pr
cc: Extra enclosed
Dan Kentro (2)