



CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

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TOTAL INTENSITY AERIAL
MAGNETIC SURVEY - AREA 1
(NE OF FLORENCE, ARIZONA)
PINAL COUNTY, ARIZONA

For

Miami Copper Company

March 1967

By

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

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Map - Aerial Magnetic Survey Area 1
Topographic Map Area 1

NOTE: Under separate cover but part of the data accumulated
on this survey:

Magnetic profiles Lines 1 - 26S
35 mm flight path recovery films roll 1 - 26S
Tie line, 4 film strips at 5000' clearance

Original map on mylar and mosaics - Arizona 317,
340 sent in a mailing tube.

INTRODUCTION

At the request of W. W. Simmons, Chief Geologist of Miami Copper Company, Heinrichs Geoexploration Company conducted an airborne magnetic survey of the northeast portion of the Florence Quadrangle, Pinal County, Arizona.

The lines were flown in March 1967. In addition, four flights at 5000' terrain clearance were flown to obtain photographs to facilitate flight line recovery of the data. Additional reflights were flown to fill the larger vacancies in the information after a preliminary compilation was completed.

CONCLUSIONS AND RECOMMENDATIONS

The most interesting feature consists of a general magnetic low centered roughly within an area bounded on the north by Section 24, T2S, R10E and Section 19, T2S, R11E and on the south by Section 24, T3S, R10E, and Section 30, T3S, R11E, and designated Area A on the magnetic contour map.

In the SW corner of the area the magnetics indicate apparent volcanic material present that is probably basalt. The very northern part of the map also indicates volcanics and probably is dacite.

There are two prominent N-S lineations, (I and II) the east and west boundaries of Area A. Another prominent lineation (III) trends eastward along the southern boundary of the dacite area. The third major lineation (IV) is NW trending and may be a contact between the more basic volcanics and the alluvial basin.

Area A

This area is one with several individual magnetic lows of similar character that appear to be related. Anomalies 1 and 3 are well defined aurally, and follow up ground work should probably treat them as separate entities. The area between Anomalies 1 and 2 is also of interest due to the possibility of a fault or contact separating the two areas. Anomaly 1 should be examined with regards to both the low and the small high included within its perimeter.

Anomaly 4 is possibly related to adjacent dikes and plugs.

Anomaly 5 is a very weak low and should be considered for further investigation only if Anomalies 1, 2 and 3 show interesting results.

If geologic investigations and knowledge of the general area are encouraging, then ground magnetics is recommended in Area A to better resolve the vertical magnetic character of the anomalies. This will better define on the ground precise areas where further exploratory work such as induced polarization, gravity, and geochem should be conducted. Induced polarization should be given primary consideration and is recommended to determine if sulfides are related to the magnetic low.

Area A appears to be the magnetic low indicated on the reconnaissance airmagnetic survey made last year.

Area B

This area is of interest because of the intersection of three lineations. These may be structural breaks, or they may be contacts or a combination. This area should be examined geologically very carefully before further geophysical work is considered.

Lineation I, II

These lineations trend north and bound Area A on the east and west sides and are possible faults or contacts. Lineation I is more likely a fault than is Lineation II.

Lineation III, IV

Both appear to be faults or contacts separating volcanic outcrop or near-surface volcanics from deep alluvium. Lineation IV is more definite and separates the basaltic volcanics from the alluvium to the north. Lineation III is less definite and may indicate deepening of the alluvium.

PROCEDURE

A Varian total intensity proton precession magnetometer with a 10" rectilinear chart recorder with a sensitivity of ± 1 gamma was used for the survey. The instruments were mounted in a Cessna 206 and a speed of approximately 120 miles per hour was maintained at a controlled altitude of 500 feet above terrain concomitant with safety procedures. A precise chart recording radar altimeter with a sensitivity of $\pm 1\%$ at 500' was used to indicate terrain clearance.

A total of 276 line miles were flown and the data are presented as a contoured map at a scale of 2" per mile.

Data quality is good considering constant accurate terrain clearance and magnetic record noise level. Navigation of flight lines was adequate and flight path recovery was good.

Flight path recovery was performed by matching strip photos with aerial mosaic purchased from the Soil Conservation Service.

Chart paper is specially designed for Geox and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1000 gammas vertically across the chart. The vertical scale is printed each 6" of record. The horizontal scale is 6" per minute, which equals approximately two miles on the ground when a ground speed of 120 miles ^{per hour} is maintained.

50,000 gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

Compilation and interpretation was by Don Cooley and John Langs under the direction of Chris S. Ludwig, Senior Geophysicist.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B Cooley

Donald B. Cooley
Aerial Project Geologist

APPROVED:

Chris S. Ludwig
Chris S. Ludwig
Senior Geophysicist

E. Grover Heinrichs
Vice President

Tucson, Arizona
March 30, 1967

TOTAL INTENSITY AERIAL MAGNETIC SURVEY

AREA 2

PINAL AND GRAHAM COUNTIES, ARIZONA

For

Miami Copper Company

June 1967

By

Heinrichs Geoexploration Company

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Aerial Magnetic Contour Map - Area 2

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist, Miami Copper Company, on or about February 22, 1967, Heinrichs Geoporation Company conducted and completed an aerial magnetic survey over Area 2 in Pinal and Graham Counties between the San Pedro Valley and Aravaipa Creek during June, 1967.

CONCLUSIONS AND RECOMMENDATIONS

Three zones of different magnetic character are immediately apparent upon observation of the magnetic contour map of the survey results: the deep basin along Aravaipa Creek, the volcanics in the central mountainous regions, and the alluvial covered portion along the western side of the area.

The majority of the exposed rock types in the region being intermediate to basic volcanics with some basic intrusives, a strong variation in the concentration of magnetic materials within the rocks is exhibited by the magnetic records over these rocks. With a few exceptions, the various small magnetic highs and lows that appear on the accompanying map are not economically anomalous, but are mainly characteristic of the more rugged terrain and the rock types sampled. Magnetic values range from a high of 2,550 gammas to a low of 100 gammas. In general the highs are fairly small in extent and the lows quite large by comparison. This is due to the complex resultant of factors, such as size, shape, distance, magnetic susceptibility, polarization, earth's field, etc.

Lineations with three orientations appear with some regularity on the map. The best defined lineations are oriented east-west and northwest-southeast; lineations with a northeast-southwest orientation are less well defined. In several instances the possible dip of structure, stratigraphy, a fault or contact has been indicated. Many of these lineations probably represent fault or fracture zones rather than single discrete fractures.

In the northern part of the center of the area, the magnetics indicate a possible near-surface northwesterly plunging syncline. The county geologic map shows andesite in the area, but some Paleozoic limestones outcrop along the northwestern border of the possible syncline and may exist in such a structure beneath the andesite.

Area of interest "A", as shown on the accompanying map, includes a number of individual highs and lows as well as several lineation intersections. Most of the highest magnetic values lie in this area as do some very extensive magnetic lows and the lowest magnetic value in the whole of survey Area 2. This area should be examined geologically in some detail and the geologic information should be fed back to Geocex for further evaluation and re-appraisal in conjunction with the present results and interpretation. This will also best help formulate further exploration procedures including geophysics, if the geologic results are sufficiently interesting.

Anomalies 1, 2, 3, 4, and 5 are magnetic highs of sufficient magnitude that the trend area of these highs should be carefully reconnoitered geologically to determine possible cause of anomalism. Following this, if not geologically discouraging, spatial position of the anomalies should be confirmed and refined by ground magnetics prior to further exploration and evaluation. Anomaly 1 is the highest magnetic value within Area 2 and is probably about 1,000 feet deep or less indicated. Anomalies 2, 3, 4, and 5 are probably somewhat deeper. Anomaly 6 appears to be about 2,500 feet deep or less indicated, but may actually be a broad shallow subsurface mass of andesite; as andesite outcrops immediately to the east.

Anomaly 7 and 8 are magnetic lows that should be examined geologically. Anomaly 8 may be related to diabase intrusions and Anomaly 7 shows no apparent explanation at this time, but being a low of such magnitude in an area of a general magnetic high is sufficient reason for investigation in this instance.

Anomaly 9 is a magnetic high in an area shown as Quaternary alluvium on the county geologic map. Several Tertiary intrusives are shown in the area, but such a correlation is only conjecture.

The complexity of results of this survey are such that future re-interpretation of the data could involve considerable change, much more than would normally attend re-interpretation of a simpler magnetic picture. For this reason, constant re-evaluation as new information is developed, will be most important.

PROCEDURE

A Model 4937-A Varian Proton Precession total intensity magnetometer, with a 10 inch rectilinear chart recorder with a sensitivity of \pm one gamma mounted in a C45 Twin Beechcraft was used for this survey. A precise chart recording radar altimeter with a \pm 1% accuracy at 500 feet terrain clearance was used and an average of 120 miles per hour ground speed was maintained in accordance with safety practices. The recorder chart paper is specially designed for Geox and is read from right to left with gamma values increasing toward the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches on the record.

A total of 685.3 line miles were flown and the data are presented as a magnetic contour map at a scale of two inches equals one mile and a contour interval of 50 gammas, although in some places the contour interval is variable. Fifty thousand gammas were subtracted from all values for convenience in plotting as all data is based on relative values.

Flight line recovery was performed by matching 35 mm flight line film strips with mosaics obtained from the U. S. Soil Conservation Service. Flight line navigation is thought to be good when the terrain is considered and the line recovery very good except between Lines 13 to 22 which is considered to be only good to fair because of the lack of variation and poor quality of the mosaics.

The data was compiled, reduced or interpreted by J. McDonnell and F. Heinrichs under the supervision of D. B. Cooley, assisted by other members of the Geox, Tucson staff.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Aerial Project Geologist

APPROVED:

Walter E. Heinrichs, Jr.
President & General Manager

July 5, 1967
P. O. Box 5671
Tucson, Arizona

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY AREA 3
(NORTHERN END OF PICACHO MOUNTAINS)
FINAL COUNTY, ARIZONA**

**For
Miami Copper Company**

March 1967

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

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Topographic Map Area 3	

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist of Miami Copper Company, Heinrichs Geoexploration Company conducted an airborne magnetic survey over the north end of the Picacho Mountains in south central Pinal County, Arizona.

The lines were flown in March 1967. In addition, several flights were flown at higher altitudes to facilitate flight line recovery. Two additional flights were made to provide adequate magnetic coverage.

CONCLUSIONS AND RECOMMENDATIONS

The primary magnetic feature present is an elongate major low area. This low is located in Sections 3, 4, 5, and 6, T7S, R10E; Section 31, T6S, R10E; Section 1, T7S, R9E, and is designated Anomaly 1 on the magnetic contour map.

Anomalies 2, 3, 4, and 5 are magnetically high areas but appear to be somewhat different in magnetic character. Anomalies 3 and 4 appear to have similar magnetic characteristics as do Anomalies 2 and 5.

Lineations I, II, and III are a set of NNW trending lineations that may be faults or fractures.

Lineation IV is much less definite and is probably less important but may be a fault or fracture trending NNE.

Anomaly 1 is surrounded on three sides by magnetic highs and cuts across the outcrops, and the area is mapped as Precambrian granite on the county geologic map. This may be a zone of alteration in which the magnetite, apparently present in most of the rest of the outcrop area, has been destroyed. A program of ground magnetics and geologic investigation followed by a reconnaissance induced polarization survey to better define electrical properties in the area of interest and to test for the presence of possible sulfides, is recommended.

Anomalies 2 and 3 are magnetic highs and perhaps related to topography although Anomaly 3 is along the west side of the small range of hills that Anomaly 3 is associated with. These high areas can probably be evaluated geologically by examining the associated topographic features.

Anomaly 4 is magnetically similar to Anomaly 3 but is not visibly associated with a topographically high feature and may represent a similar magnetic material beneath the alluvium. This area is partly mapped as Precambrian granite and partly as Quaternary alluvial sediments. Undoubtedly the granite continues eastward under the alluvium as evidenced by this magnetic feature and is probably at shallow depth.

Anomaly 5 is another magnetic high and is located at the very northernmost part of the Picacho Mountains and is partly related to positive topographic features.

Lineation I, II, and III are apparently a series of parallel faults. Lineation I is of most importance in that it passes through Anomaly 1. These lineations appear very close to the flight line direction and may look like plotting errors. However, they have been rechecked several times, and we are convinced that these lineations are real. Lineation I should be field checked for a surface expression, especially where it crosses Anomaly 1. It is possible that Anomaly 1 is located along a pre-existing fracture which allowed ingress of altering fluids. Later, apparently, this altered area was fractured or faulted. (Note the reduction in width where Lineation I crosses.) This is pure office speculation and should be considered as such. Lineation IV is a possible fault or fracture but is less pronounced than the other lineations.

PROCEDURE

A Model 4937-A Varian total intensity proton precession magnetometer with a 10 inch rectilinear chart recorder and a sensitivity of \pm one gamma was used in the survey. The instruments were mounted in a Cessna 206 and a speed of approximately 120 miles per hour was maintained at a controlled altitude of 500 feet above terrain concomitant with safety

procedures. A precise chart recording radar altimeter with a sensitivity of $\pm 1\%$ at 500 feet was used to indicate terrain clearance.

A total of 154.2 line miles were flown and the data are presented as a contour map at a scale of 2 inches per mile.

Data quality is good considering constant accurate terrain clearance and magnetic record noise level. Navigation of flight lines was adequate and flight path recovery was good though difficult and tedious.

Flight path recovery was performed by matching strip photos with aerial mosaics available from the Soil Conservation Service.

Chart paper is specially designed for Geocex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each 6 inches of record. The horizontal scale is 6 inches per minute, which equals approximately two miles on the ground when a ground speed of 120 miles per hour is maintained, which is the average.

50,000 gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

Compilation and interpretation was by J. McDonnell, P. McDonnell, J. Langs and D. Cooley of the Geocex staff.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Aerial Project Geologist

APPROVED


Walter E. Heinrichs, Jr.
President & General Manager

April 17, 1967

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY AREA 4
(SOUTHEAST OF FLORENCE)
PINAL COUNTY, ARIZONA**

for

Miami Copper Company

March 1967

By

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

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INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist of Miami Copper Company, Heinrichs Geoexploration Company conducted an airborne magnetic survey over Area 4, located in the southern portion of the North Butte Quadrangle, Arizona and portions of adjacent quadrangles, Pinal County, Arizona.

The flights were flown in March, 1967 at 500' terrain clearance. Several flights at higher altitude were flown to facilitate flight line recovery.

CONCLUSIONS AND RECOMMENDATIONS

Area A, located in Sections 27, 28, 33, 34, T4S, R11E and Sections 2 and 3, T5S, R11E, corresponds to an intrusion of Laramide granite and related intrusive rocks as shown on the Pinal County Geologic Map. Anomaly 1 seems to be the intrusive itself and Anomaly 2 is a minor magnetic low that is probably directly associated with the intrusion. In this magnetic latitude, highs and lows are commonly together and caused by the same single geologic feature. There are a number of small mines in this area shown on the U.S.G.S. topographic map.

Area B is a general magnetic high of undetermined rock type, but may be Precambrian granite mostly beneath shallow alluvium. Anomalies 4 and 5 are individual magnetic highs within the general high of Area B.

Anomalies 3 and 6 are individual magnetic low areas in a general low area; relative to this magnetic map.

Lineations I and II are steep magnetic gradients that are possible fault or contact features.

Anomaly 1 is a magnetic high and almost surely the intrusion shown on the Arizona Bureau of Mines County Geologic Map and is significant if the dating is correct. Anomaly 2 is a minor (125 gamma) low that is probably directly related to the high and possibly partly due to alteration associated with the intrusion. To the north and east of Anomaly 1 are indications of other lows, probably similar to Anomaly 2 but they are on the periphery of the surveyed area and the data are too marginal to make a more definite statement. Anomalies 1 and 2 and the possible low areas to the north and east should be carefully checked geologically before additional work is contemplated. Should geologic studies indicate interesting relationships, ground magnetics should be used to locate these anomalous lows due to their small areal extent and small magnetic variation before additional geophysics such as an induced polarization survey is conducted.

Anomalies 4 and 5 in Area B are related to two small hills that outcrop in Sections 28 and 29, T5S, R11E. The geologic character of these outcrops should be examined in order to evaluate Area B magnetically. The small hill appears to fall in one of the minor lows within Area B.

Anomalies 3 and 6 are individual magnetic lows in an area of general magnetic low that appears to be fairly deep. The northern-most part seems to be rising somewhat and is probably at a shallower depth than the rest of Anomaly 3.

Lineation I appears to be a possible fault separating the intrusion at Anomaly 1 from the surrounding Precambrian granite or from an alluvial basin to the west.

Lineation II is an apparent fault that separates Area B from what is possibly an alluvial filled basin to the east.

PROCEDURE

A Varian total intensity proton precession magnetometer, Model No. 4937-A, with a 10" rectilinear chart recorder with a sensitivity of ± 1 gamma was used for the survey. The instruments were mounted in a Cessna 206 and a speed of 120 miles per hour was

maintained as nearly as possible at a terrain clearance of 500 feet in accordance with safety procedures. A precise chart recording radar altimeter with a sensitivity of $\pm 1\%$ at 500 feet was used to indicate terrain clearance.

A total of 65.2 line miles were flown and the data are presented as a contoured map at a scale of 2" per mile and a contour interval of 25 gammas.

Data quality is very good considering constant accurate terrain clearance and magnetic record noise level. Navigation of flight lines was fair and flight path recovery good. No reflights were necessary due to line spacing and character of the magnetic profiles.

Chart paper is specially designed for Geoex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each 6" per minute which equals approximately two miles on the ground when a ground speed of 120 miles per hour is maintained.

50,000 gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

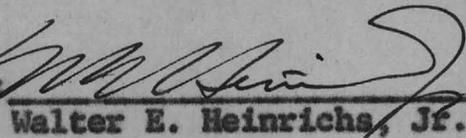
Compilation and interpretation was by J. McDonnell, P. McDonnell, J. W. Langs, and D. B. Cooley of the Geoex staff.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Dan Cooley

Donald B. Cooley
Aerial Projects Geologist

APPROVED: 

Walter E. Heinrichs, Jr.
President & General Manager

April 22, 1967
Tucson, Arizona

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY, AREA 5
COCHISE COUNTY, ARIZONA**

For

Miami Copper Company

June 1967

By

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

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INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist, Miami Copper Company, Heinrichs Geoexploration Company conducted and completed an aerial magnetic survey over Area 5, southeast of Wilcox in Central Cochise County.

CONCLUSIONS AND RECOMMENDATIONS

Anomaly 1 is a magnetic high that is definitely related to the andesite outcrops that make up the majority of the Pat Hills. The highest magnetic values, however, appear to be in the vicinity of the Laramide granitic rocks shown on the Cochise County Geologic Map.

Anomaly 5 is similar to Anomaly 1 in magnetic character and magnitude. The area of anomaly 5 is covered by Quaternary alluvial fill and the feature calculates to be as much as 1,000 feet or more deep, but may actually be somewhat shallower. Geologic examination of the Pat Hills could give further clues to the possible geologic explanation of this geophysical anomaly.

Anomalies 4 and 13 are magnetic highs of less magnitude and areal extent than anomalies 1 and 5, but being in the same proximity may possibly be related to them.

Anomalies 2 and 3 are magnetic lows that are certainly related to one another and associated with Anomaly 4. At first glance the magnetic high that partially separates Anomalies 2 and 3 appears to be the result of compiling errors. Careful checking has shown no discrepancies in data reduction, but the possibility remains that these data may not be exactly as represented by the resultant contouring. However suspicious this may look, the basic feature still is regarded as being real as this trend is present on adjacent flight lines, though to a lesser degree.

Anomaly 6 is a magnetic high in an area of Quaternary and Tertiary sediments as shown on the County Geologic Map. This anomaly is on a trend which consists of a series of contacts between Cambrian sediments and other Paleozoic rocks; Cambrian sediments and Precambrian granites; and Precambrian granites and Precambrian schist. On this same general trend, to the southeast, are a number of Tertiary intrusives. This anomaly could be related to any of these conditions and therefore will require further examination by ground geophysics to determine its economic significance.

Anomaly 7 is a magnetic high related to a northwest trending contact between Precambrian granite and Cambrian rocks. The anomaly seems to be more closely related to the contact than to topography.

Anomaly 8 is a magnetic low over what appears to be Precambrian schist although part of this anomaly is in an area mapped as alluvial cover.

Anomaly 9 is a minor magnetic low that may be a northwestward portion of Anomaly 8 but this interpretation is very tenuous.

Anomaly 10 is an elongate magnetically low area that corresponds to a projection of a northwest trending fault of some magnitude that has been mapped for a considerable distance in the Dos Cabezas Mountains.

Anomaly 11 is a magnetic low area that corresponds to mapped exposures of Precambrian schists and granites.

Anomaly 12 is a magnetic low that encompasses a rather large area. The apparent explanation for this anomaly is deep alluvium and major downfaulting effects off the northeast margin of Pat Hills. Alteration of a large zone of Laramide granite such as outcrops on the west side of the Pat Hills is another possibility, as is a combination of any two or more of these effects.

The center of Area 5 shows little magnetic variation and is probably an area of deep alluvial fill and/or beneath the alluvium at an unknown depth, the bedrock is composed of rocks

with a more uniform magnetic character than is typical of the rocks along the periphery of most of the area.

Anomalies 1, 7, and 8 should be geologically examined for evaluation of possible economic significance before proceeding with additional geophysical work in these areas. If geologic conditions are favorable, then I.P. should be used to check for the presence and distribution of sulfides. Anomaly 10 is a part of a trend that should be examined geologically along its exposed portion in the Dos Cabezas Mountains for additional appraisal of what the geophysical results may mean. Anomalies 2, 3, 4, 5, 6, 10, and 12 should be checked by ground magnetics to better determine the depth to the anomaly and to better define the location on the ground. However, Anomalies 2, 3, 4, 6, and 13 are probably close enough to the surface to directly check for sulfides with induced polarization surveys on 1,000 foot dipole spreads. Anomaly 5 may be shallow enough, but for better evaluation, ground magnetics are recommended first. Anomalies 10 and 12 appear too deep for standard routine I.P. but this should be checked with ground magnetics in order to be more certain of depth as well as for added appraisal.

Lineation I is apparent for a considerable distance, across several flight lines and between Anomalies 1 and 12, at least, is probably a fault.

The steep magnetic gradient in Sections 15 and 23, T16S, R28E appears to be near surface fault or contact. At first glance this appears to involve spurious effects although it has been checked several times. This gradient may be of slightly lesser significance because of its marginal location, but it should definitely be checked by ground magnetics before attempting to appraise it further.

This survey appears to correlate well with the Line 11, Area C profile flown in 1966. The present Anomaly 6 appears to be the same as that noticed originally between checkpoints 4 and 5 on Line 11.

PROCEDURE

A Model 4937-A, Varian proton precession total intensity magnetometer, with a 10 inch rectilinear chart recorder with a sensitivity of ± 1 gamma mounted in a Cessna 206, was used for this survey. Apprecise chart recording radar altimeter with a $\pm 1\%$ accuracy at 500 feet was used to maintain a 500 foot terrain clearance at an average of 120 miles per hour concomitant with safety of aircraft and crew. The recorder chart paper is specially designed for Geox and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches per minute which equals approximately two miles on the ground at the average speed of 120 miles per hour.

A total of 569.5 line miles were flown and the data are presented as a magnetic contour map at a scale of two inches equals one mile and with a contour interval of 50 gammas. For plotting convenience, 50,000 gammas were subtracted from all mapped values as the localized interpretation of magnetic data is based essentially on relative values.

Flight line recovery was made by using visual checkpoints on the U.S.G.S., Square Top Hills, Willcox, Luzena, Cochise, Dos Cabezas, and Cochise Head Quadrangles. Flight path recovery using the 35 mm film strips was from the same maps with the aid of higher altitude film strips over parts of the area. Control was excellent along Highways 86, 186 and the Kansas Settlement Road and in areas of topographic relief. In general, the navigation is considered to be quite good and the line recovery good except on the very western edge of the area, which is only fair because of uniformity or lack of photo contrast of the surface.

The data was compiled, reduced, or interpreted by J. McDonnell, P. McDonnell, J. Bush, and J. Bauersachs under the direct supervision of D. B. Cooley, assisted by all or part of the rest of Geox, Tucson technical staff.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B Cooley

Donald B. Cooley
Aerial Project Geologist

APPROVED:

W. E. Heinrichs, Jr.
Walter E. Heinrichs, Jr.
President & General Manager

June 8, 1967
Tucson, Arizona

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY, AREA 6
COCHISE COUNTY, ARIZONA**

For

Miami Copper Company

April 1967

By

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

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Aerial Magnetic Survey, Area 6

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist for Miami Copper Company, Heinrichs Geoexploration Company conducted an airborne magnetic survey along the eastern mountain front of the Chiricahua Mountains in Cochise County, Arizona. This survey is designated Area 6 and is located in the U.S.G.S. Cochise Head, Vanar and Portal Quadrangles.

CONCLUSIONS AND RECOMMENDATIONS

In general, the survey results indicate the subsurface relief beneath a varying thickness of Quaternary sediments. No major anomalies are noted, and there is a rapid deepening of the bedrock toward the east.

Anomaly 1 is a magnetic high under shallow alluvium that is an apparent eastward extension of the mountains. There is minor mineralization noted in the Precambrian granite shown on the Cochise County Geologic map, just to the west of Anomaly 1. This should be carefully checked on the ground, geologically, before additional work of any type is considered.

The eastward subsurface extension of Harris Mountain is magnetically expressed as a low, and probably represents buried Paleozoic sediments.

The rest of the area shows no anomalism that is not related to topography or probable subsurface extensions of the topography.

PROCEDURE

A Varian total intensity proton precession magnetometer, Model 4937-A with a 10 inch rectilinear chart recorder with a sensitivity of \pm one gamma was used for this survey. The

instruments were mounted in a Cessna 206 and a speed of 120 miles per hour was maintained as closely as possible at an altitude of 500 feet above terrain in accordance with safety practices. A precise chart recording altimeter with a sensitivity of $\pm 1\%$ at 500 feet was used to indicate terrain clearance.

A total of 171.9 line miles were flown and the data are presented as a contour map at a scale of two inches per mile.

Flight line recovery was good and navigation fair in this area, and the overall results are acceptable.

The recorder chart paper is specially designed for Geoex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches of record. The horizontal scale is 6 inches per minute, which equals approximately two miles on the ground when a ground speed of 120 miles per hour is maintained.

50,000 gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

The data was compiled and prepared by J. W. Langs, P. McDonnell, J. McDonnell, and D. Cooley.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Don Cooley

Donald B. Cooley
Aerial Project Geologist

APPROVED: _____

Walter E. Heinrichs, Jr.
President & General Manager

Tucson, Arizona
May 11, 1967

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY, AREA 7
COCHISE COUNTY, ARIZONA**

For

Miami Copper Company

April 1967

By

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

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Aerial Magnetic Survey, Area 7	

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist, Miami Copper Company, Heinrichs Geoexploration Company completed an airborne magnetic survey along the western edge of the Swisshelm Mountains in central Cochise County, Arizona. This area, Area 7, is primarily within the eastern portion of the U.S.G.S. Swisshelm Mountains Quadrangle and the southeast portion of the Square Top Hills Quadrangle.

CONCLUSIONS AND RECOMMENDATIONS

The main feature of interest is Anomaly 1 located in Sections 1, 11, 12, 13 and 14, T21S, R27E.

Anomalies 2, 3, and 4 are magnetic highs most likely related to subsurface volcanics that appear as scattered surface outcrops on the Cochise County Geologic Map. This relationship also is indicated in the northeast corner of the contour map.

Lineations I and II may be faults or contacts. Lineation I is associated with the low axis of Anomaly 1, and II is in part a steep magnetic gradient that may represent a fault or contact.

Anomaly 1 is an elongate magnetic low in which Lineation I represents the magnetic low axis. Immediately to the east of Anomaly 1, the Cochise County Geologic Map shows Carboniferous and Cretaceous sediments at the surface. Because some of these sediments are limestones, there is a distinct possibility that this magnetic low may be due to contact metamorphism. This is especially interesting because of the presence of the rhyolite and andesite outcrops in the vicinity and to the north, a small

outcrop of Laramide granitic rock. This low may also be due to a fairly deep burial of sedimentary rocks beneath the alluvium shown on the County Geologic Map. This magnetic low is a sufficiently significant disturbance of the magnetic contour pattern that it warrants careful geophysical confirmation and geologic study on the ground and also in the vicinity of the intersection of Lineations I and II. Anomaly 5 may be related to the conditions that produced Anomaly 1 or vice versa; of course, the over all explanation could also be the result of any combination of above possibilities, therefore, this entire area is of interest and should be examined further in some detail. If further detailed geologic evaluation of the area on the ground is favorable, ground magnetics and induced polarization should be used to better define the areas of interest, and determine if sulfide mineralization is present.

Several more lines of coverage to the east would have been most helpful in obtaining character background over known formations for correlation purposes out under the alluvial cover. Also, we could have better verified the several known trends in the area. In the future, we recommend such added coverage be specified if at all possible.

PROCEDURE

A Varian total intensity proton precession magnetometer, Model 4937-A, with a 10 inch rectilinear chart recorder and a sensitivity of \pm one gamma mounted in a Cessna 206, was used for this survey. A speed of 120 miles per hour was maintained as closely as possible, at 500 feet above the ground, concomitant with safety procedures. A precise chart recording altimeter with a sensitivity of \pm 1% at 500 feet was used to indicate terrain clearance.

A total of 110.4 line miles were flown and the data are presented as a magnetic contour map at a scale of 2 inches equals one mile and with a contour interval of 100 gammas.

Flight line recovery was good and navigation very good. The flight lines were recovered from the previously mentioned U.S.G.S. Quadrangles in conjunction with higher altitude flights at approximately 7,500 feet.

The recorder chart paper is specially designed for Geoex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches on the record. The horizontal scale is six inches per minute which equals approximately two miles on the ground at an average speed of 120 miles per hour.

Forty-nine thousand gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

The data was compiled and reduced by D. Cooley, J. McDonnell, and J. W. Langs.

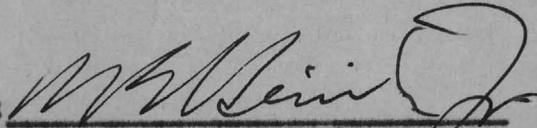
Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B Cooley

Donald B. Cooley
Aerial Project Geologist

APPROVED:


Walter E. Heinrichs, Jr.
President & General Manager

May 15, 1967
Tucson, Arizona

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY, AREA 8
COCHISE COUNTY, ARIZONA**

For

Miami Copper Company

April 1967

By

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

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Aerial Magnetic Survey, Area 8

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist of Miami Copper Company, Heinrichs Geoexploration Company conducted and completed an airborne magnetic survey of Area 8 located in the U.S.G.S. Bisbee NE Quadrangle, north of Paul Spur, Arizona, Cochise County, Arizona.

CONCLUSIONS AND RECOMMENDATIONS

The entire area of this survey shows only Quaternary sediments on the Cochise County Geologic Map.

Area A which is composed of Anomalies 1 and 2 is the most apparent feature on this magnetic contour map. Anomaly 1 is a high and Anomaly 2 is a low, and the two are definitely directly related. These anomalies which show strongly on Line 1 and 2 and less strongly on Line 3 are possibly related to factors associated with an eastward extension of the fault which runs through Bisbee. This aspect and the type of anomaly should be confirmed by tracing the feature and especially closing it off to the west. This might be done best on the ground but could also be done in the air. The feature may have a surface expression in the Cretaceous rocks to the west, or be buried beneath them and traceable only by geophysics. The anomaly is located in Sections 9, 10, 15, and 16, T23S, R25E, and either terminates in this area or is more deeply buried to the east, or it may be offset north or south. The maximum magnetic relief across the feature is 166 gammas.

Anomaly 3 is a somewhat weaker and possibly more isolated magnetic high centered in Section 3, T22S, R25E.

Possible causes of these anomalies are difficult to appraise because of lack of geology and sparsity of coverage. The vaguely suggested lineal aspects of Anomaly 1 may be due to a dike, contact metamorphic effects, or just faulting.

PROCEDURE

A Varian, Model 4937-A, total intensity proton precession magnetometer with a 10 inch rectilinear chart recorder with a sensitivity of \pm one gamma was used in this survey. A precise chart recording altimeter with a sensitivity of \pm 1% at 500 feet was used to indicate terrain clearance. The instruments were mounted in a Cessna 206 and a speed of 120 miles per hour was maintained with a terrain clearance of 500' concomitant with safety practices.

A total of 35.2 line miles were flown and the data are presented as a magnetic contour map. The navigation is considered to be good and the flight line recovery very good.

The chart recorder paper is specially made for Geoex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches on the record and the horizontal scale is six inches per minute which is approximately two miles on the ground at 120 miles per hour.

Fifty thousand gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

The data was compiled and prepared by J. W. Langs, P. McDonnell, J. McDonnell and D. B. Cooley.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Aerial Project Geologist

APPROVED: _____

Walter E. Heinrichs, Jr.
President & General Manager

May 18, 1967
Tucson, Arizona

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY, AREA 9
COCHISE COUNTY, ARIZONA**

For

Miami Copper Company

April 1967

By

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

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INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist for Miami Copper Company, Heinrichs Geoexploration Company conducted and completed an airborne magnetic survey in Area 9, located in the southwest portion of the U.S.G.S. Tombstone SE Quadrangle, Cochise County, Arizona.

CONCLUSIONS AND RECOMMENDATIONS

The information gathered from this area confirms the results seen on Line 24, Area C of the earlier (1966) single flight profile. The Five new lines, however, were insufficient to develop or accentuate possible ties with a zone of weakness economically related to Bisbee. If such exists, additional coverage to the southeast will evidently be required for adequate magnetic correlation.

The magnetic contour map indicates, most likely, a fairly thick Carboniferous sequence and some associated deep subsurface structure, or rock type changes, or combinations of both. Due to the relatively small area of the survey and lack of magnetic relief, nothing more definitive can be said at this time. All gradients are minor and the records are very smooth and subdued, all of which reflects some depth to bedrock through the alluvium. This may also indicate a rock type of uniform magnetic character that is nearer to the surface at the magnetic highs, and deeper at the lows. Maximum indicated depth of the shallowest anomalism could be from near surface to as much as 2,500 feet and the broader effects even deeper. However, actual depths appear in the 1,000 foot to 1,500 foot range. In general, there is a magnetic high in the southeast corner of the area with low gradients away in all directions and indications of another high out of the area, off the northwest corner.

Solely because of the proximity to Bisbee, extending these data south and east would be useful provided related geologic concepts are otherwise considered sufficiently favorable to do so.

PROCEDURE

A Varian Model 4937-A, total intensity proton precession magnetometer with a 10 inch rectilinear chart recorder with a sensitivity of \pm one gamma, and a precise chart recording altimeter with a sensitivity of \pm 1% at 500 feet to indicate terrain clearance, mounted in a Cessna 206, was used in this survey. A speed of 120 miles per hour and a ground clearance

of 500 feet was maintained concomitant with safety practices.

A total of 25.6 line miles were flown and the data are presented as a magnetic contour map. The navigation was fair and the flight path recovery good.

The chart recorder paper is specially made for Geoex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches on the record and the horizontal scale is six inches per minute which is approximately two miles on the ground at an average speed of 120 miles per hour.

Fifty thousand gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

The data was compiled and prepared by J. W. Langs, P. McDonnell, J. McDonnell, and D. B. Cooley.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley
Aerial Project Geologist

APPROVED: _____

Walter E. Heinrichs, Jr.
President & General Manager

May 24, 1967
Tucson, Arizona

TOTAL INTENSITY AERIAL MAGNETIC SURVEY

AREA 2

PINAL AND GRAHAM COUNTIES, ARIZONA

For

Miami Copper Company

June 1967

By

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

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Aerial Magnetic Contour Map - Area 2	

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist, Miami Copper Company, on or about February 22, 1967, Heinrichs Geoexploration Company conducted and completed an aerial magnetic survey over Area 2 in Final and Graham Counties between the San Pedro Valley and Aravaipa Creek during June, 1967.

CONCLUSIONS AND RECOMMENDATIONS

Three zones of different magnetic character are immediately apparent upon observation of the magnetic contour map of the survey results: the deep basin along Aravaipa Creek, the volcanics in the central mountainous regions, and the alluvial covered portion along the western side of the area.

The majority of the exposed rock types in the region being intermediate to basic volcanics with some basic intrusives, a strong variation in the concentration of magnetic materials within the rocks is exhibited by the magnetic records over these rocks. With a few exceptions, the various small magnetic highs and lows that appear on the accompanying map are not economically anomalous, but are mainly characteristic of the more rugged terrain and the rock types sampled. Magnetic values range from a high of 2,550 gammas to a low of 100 gammas. In general the highs are fairly small in extent and the lows quite large by comparison. This is due to the complex resultant of factors, such as size, shape, distance, magnetic susceptibility, polarization, earth's field, etc.

Lineations with three orientations appear with some regularity on the map. The best defined lineations are oriented east-west and northwest-southeast; lineations with a northeast-southwest orientation are less well defined. In several instances the possible dip of structure, stratigraphy, a fault or contact has been indicated. Many of these lineations probably represent fault or fracture zones rather than single discrete fractures.

In the northern part of the center of the area, the magnetics indicate a possible near-surface northwesterly plunging syncline. The county geologic map shows andesite in the area, but some Paleozoic limestones outcrop along the northwestern border of the possible syncline and may exist in such a structure beneath the andesite.

Area of interest "A", as shown on the accompanying map, includes a number of individual highs and lows as well as several lineation intersections. Most of the highest magnetic values lie in this area as do some very extensive magnetic lows and the lowest magnetic value in the whole of survey Area 2. This area should be examined geologically in some detail and the geologic information should be fed back to Geoex for further evaluation and re-appraisal in conjunction with the present results and interpretation. This will also best help formulate further exploration procedures including geophysics, if the geologic results are sufficiently interesting.

Anomalies 1, 2, 3, 4, and 5 are magnetic highs of sufficient magnitude that the trend area of these highs should be carefully reconnoitered geologically to determine possible cause of anomalism. Following this, if not geologically discouraging, spatial position of the anomalies should be confirmed and refined by ground magnetics prior to further exploration and evaluation. Anomaly 1 is the highest magnetic value within Area 2 and is probably about 1,000 feet deep or less indicated. Anomalies 2, 3, 4, and 5 are probably somewhat deeper. Anomaly 6 appears to be about 2,500 feet deep or less indicated, but may actually be a broad shallow subsurface mass of andesite; as andesite outcrops immediately to the east.

Anomaly 7 and 8 are magnetic lows that should be examined geologically. Anomaly 8 may be related to diabase intrusions and Anomaly 7 shows no apparent explanation at this time, but being a low of such magnitude in an area of a general magnetic high is sufficient reason for investigation in this instance.

Anomaly 9 is a magnetic high in an area shown as Quaternary alluvium on the county geologic map. Several Tertiary intrusives are shown in the area, but such a correlation is only conjecture.

The complexity of results of this survey are such that future re-interpretation of the data could involve considerable change, much more than would normally attend re-interpretation of a simpler magnetic picture. For this reason, constant re-evaluation as new information is developed, will be most important.

PROCEDURE

A Model 4937-A Varian Proton Precession total intensity magnetometer, with a 10 inch rectilinear chart recorder with a sensitivity of \pm one gamma mounted in a C45 Twin Beechcraft was used for this survey. A precise chart recording radar altimeter with a \pm 1% accuracy at 500 feet terrain clearance was used and an average of 120 miles per hour ground speed was maintained in accordance with safety practices. The recorder chart paper is specially designed for Geoex and is read from right to left with gamma values increasing toward the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each six inches on the record.

A total of 685.3 line miles were flown and the data are presented as a magnetic contour map at a scale of two inches equals one mile and a contour interval of 50 gammas, although in some places the contour interval is variable. Fifty thousand gammas were subtracted from all values for convenience in plotting as all data is based on relative values.

Flight line recovery was performed by matching 35 mm flight line film strips with mosaics obtained from the U. S. Soil Conservation Service. Flight line navigation is thought to be good when the terrain is considered and the line recovery very good except between Lines 13 to 22 which is considered to be only good to fair because of the lack of variation and poor quality of the mosaics.

The data was compiled, reduced or interpreted by J. McDonnell and F. Heinrichs under the supervision of D. B. Cooley, assisted by other members of the Geox, Tucson staff.

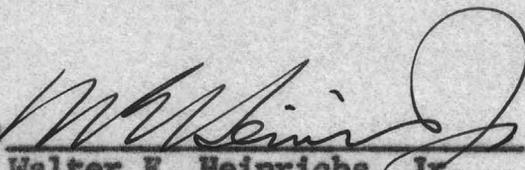
Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

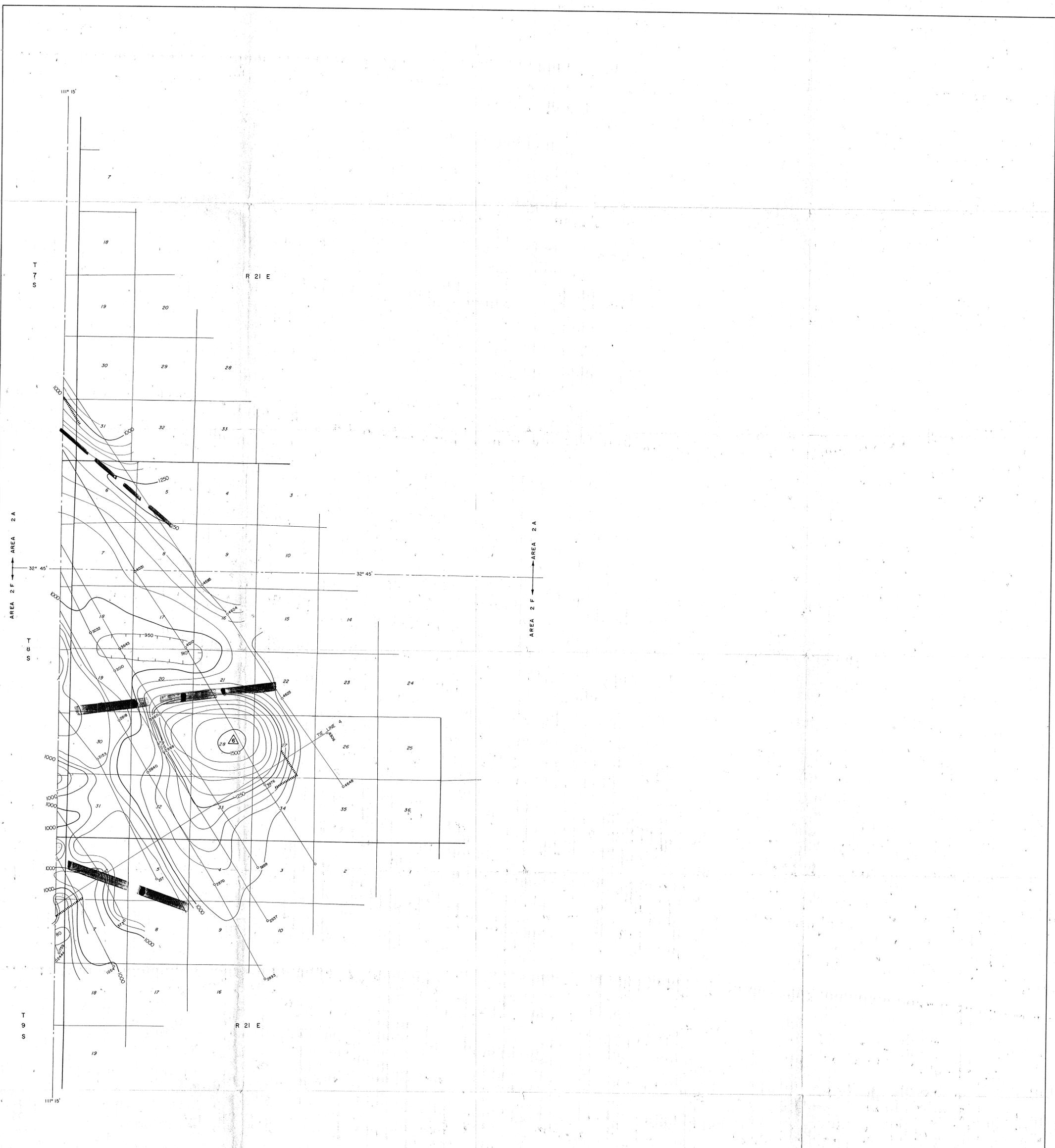
Donald B Cooley

Donald B. Cooley
Aerial Project Geologist

APPROVED:


Walter E. Heinrichs, Jr.
President & General Manager

July 5, 1967
P. O. Box 5671
Tucson, Arizona



APPROXIMATE
MEAN DECLINATION

QUADRANGLE
ARIZONA
PHOENIX
TUCSON
LOCATION

INCLINATION

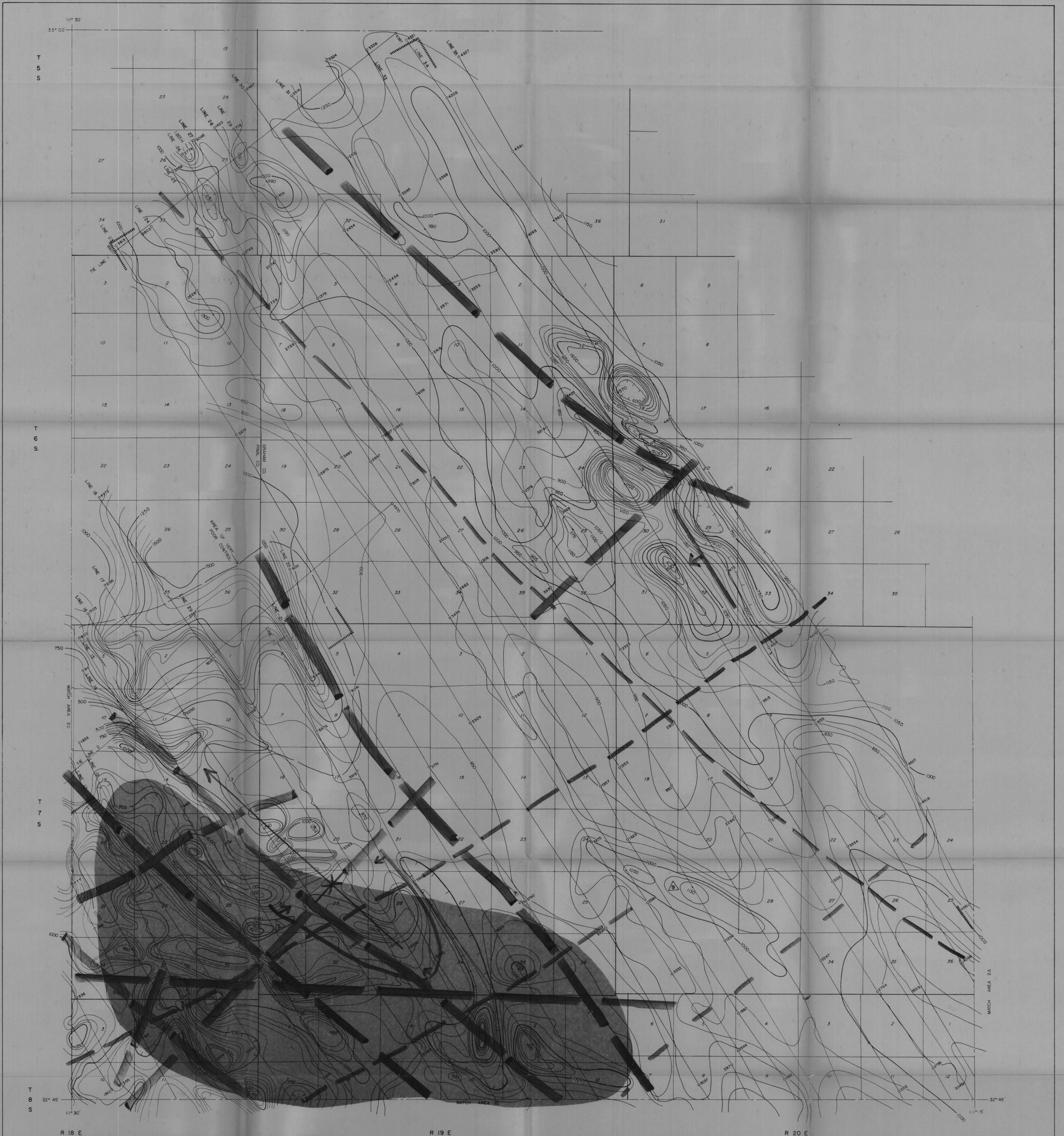
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- LINEATION
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AERIAL MAGNETIC SURVEY
AREAS 2A & 2F
ARIZONA
 for
MIAMI COPPER COMPANY
 by
HEINRICHS GEOEXPLORATION CO.
 CONTOUR INTERVAL = 50 GAMMAS TERRAIN CLEARANCE = 500 FT.
 FLIGHT INTERVAL = 0.50 MILES
 PROTON PRECESSION TOTAL MAGNETIC INTENSITY

SCALE 1:50,000
 0 1/4 1/2 3/4 1 MILE 2 MILES
 COMPILED — JUNE 1967



QUADRANGLE
ARIZONA
PHOENIX
TUCSON
LOCATION

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- MAGNETIC DATUM — 50,000 GAMMAS
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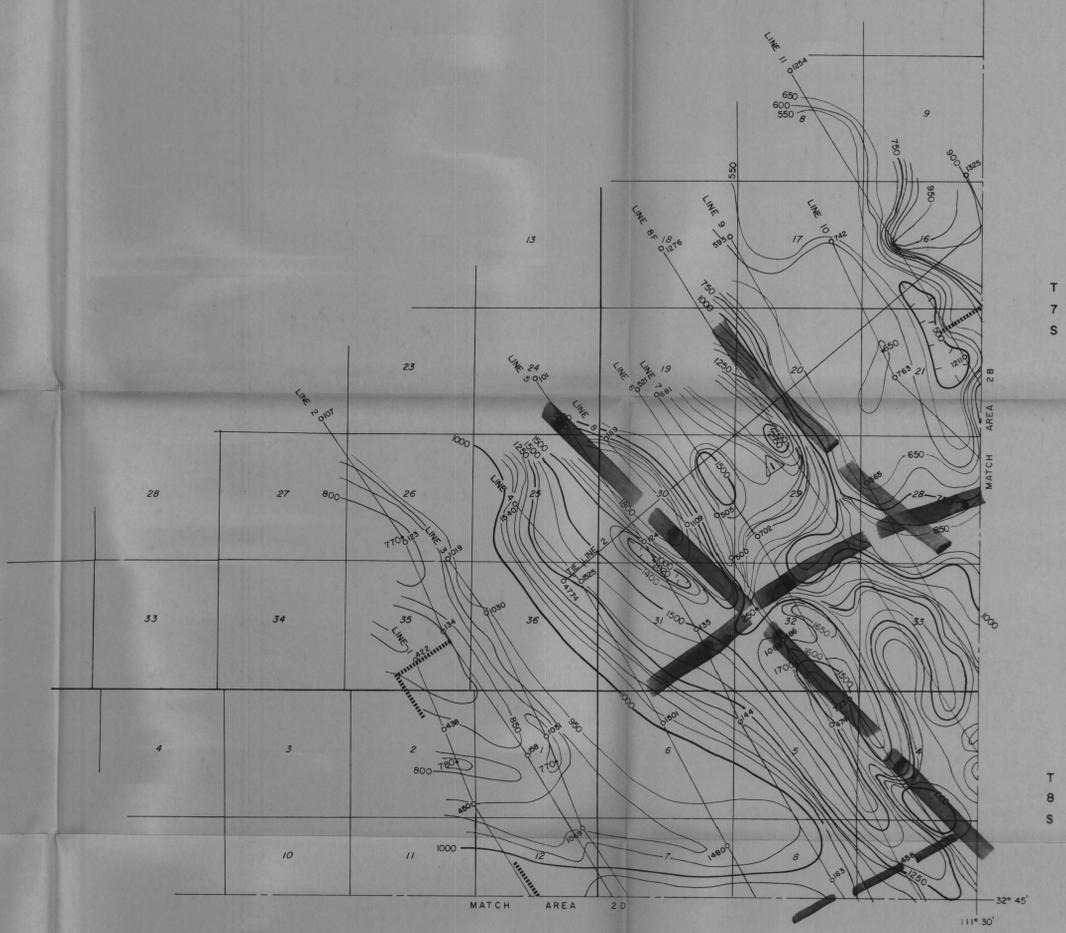
AERIAL MAGNETIC SURVEY
AREA 2B
ARIZONA
for
MIAMI COPPER COMPANY
by
HEINRICHS GEOEXPLORATION CO.
CONTOUR INTERVAL = 50 GAMMAS TERRAIN CLEARANCE = 500 FT
FLIGHT INTERVAL = 0.50 MILES
PROTON PRESSION TOTAL MAGNETIC INTENSITY

SCALE 1:31680
0 1/4 1/2 3/4 MILE 1 MILE 2 MILES
COMPLET — JUNE 1967

APPROXIMATE MEAN DECLINATION: MN 14°

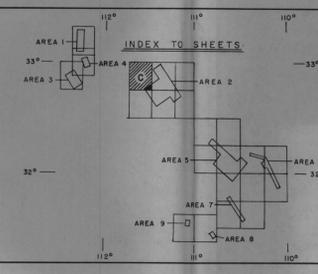
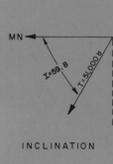
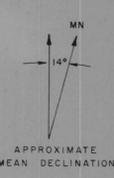
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LAND NET BASE DATA FROM U.S.G.S.



T 7 S
T 8 S

R 17 E R 18 E

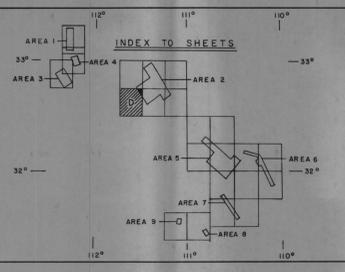
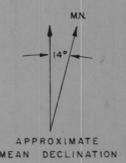
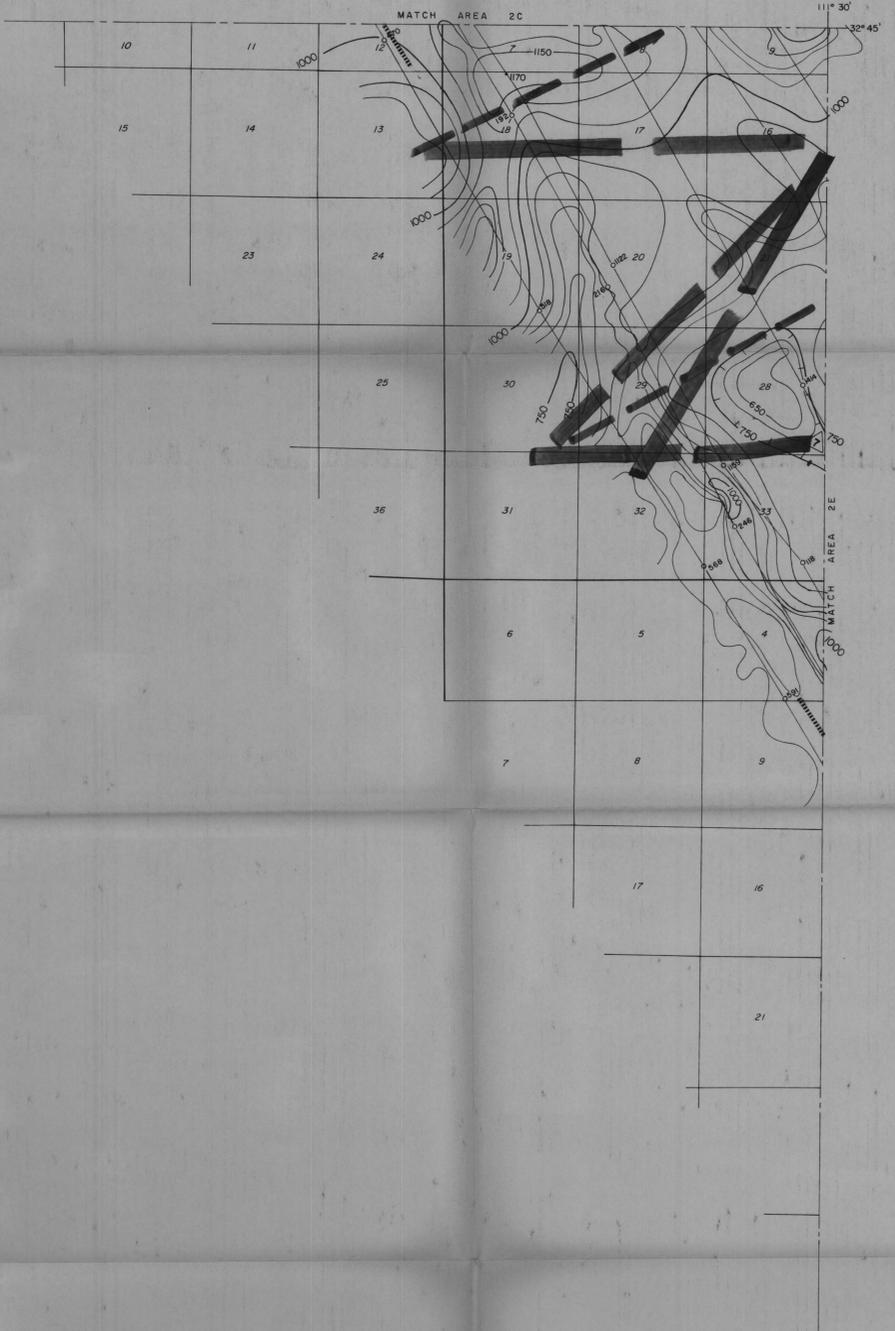


EXPLANATION
 ○ FLIGHT LINE WITH FIDUCIALS
 — MAGNETIC DATUM — 50,000 GAMMAS
 — LIMITS OF CONTRACTED SURVEY
 ▲ ANOMALY
 ■ LINEATION
 ● AREA OF INTEREST

AERIAL MAGNETIC SURVEY
AREA 2C
ARIZONA
 for
MIAMI COPPER COMPANY
 by
HEINRICHS GEOEXPLORATION CO.
 CONTOUR INTERVAL = 100 GAMMAS TERRAIN CLEARANCE = 500 FT.
 FLIGHT INTERVAL = 0.50 MILES
 PROTON PRECESSION TOTAL MAGNETIC INTENSITY
 SCALE 1:31680
 0 1/4 1/2 3/4 1 MILE 2 MILES
 COMPILED — JUNE 1967

R 17 E

R 18 E

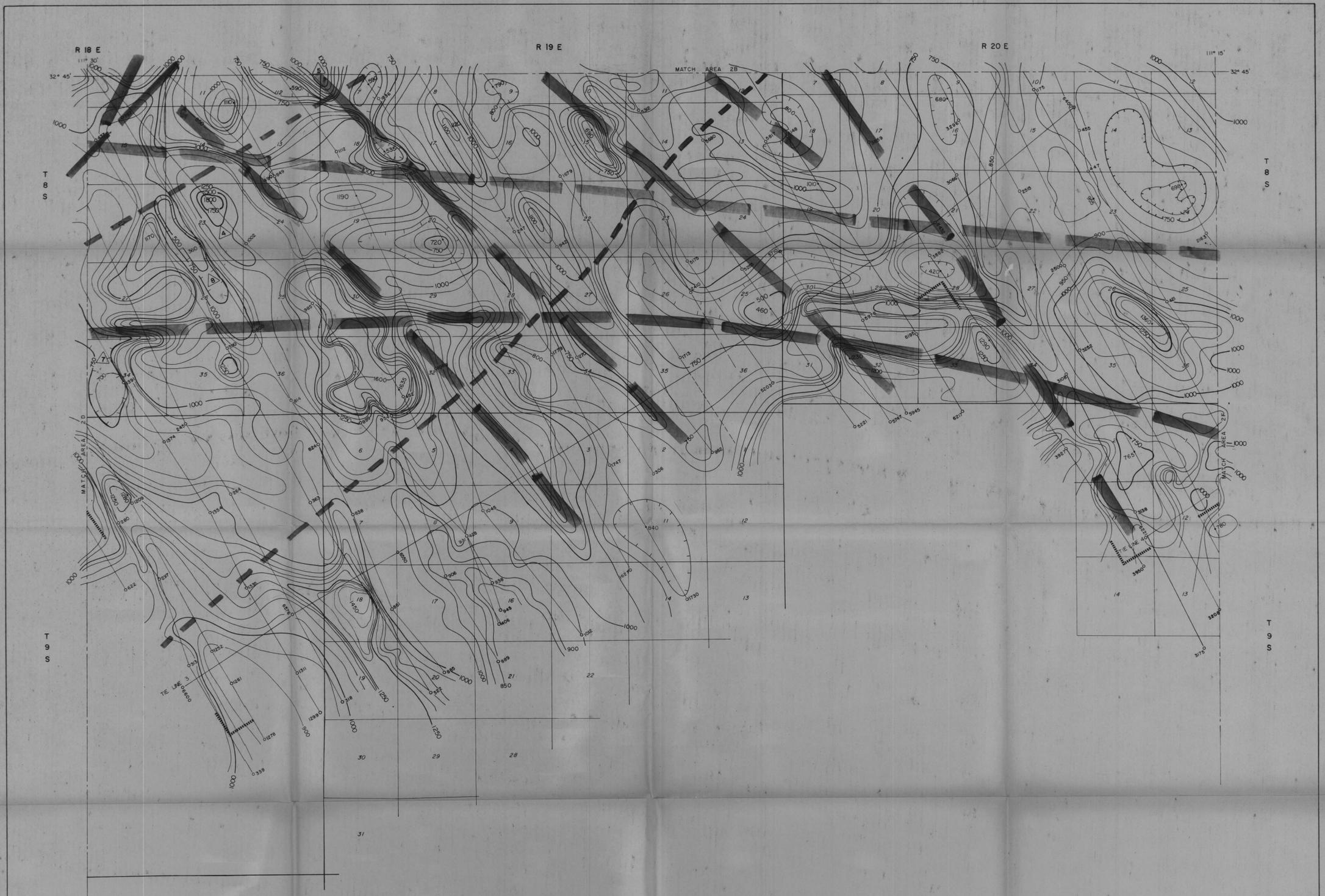


- EXPLANATION**
- FLIGHT LINE WITH FIDUCIALS
 - MAGNETIC DATUM — 50,000 GAMMAS
 - ▬ LIMITS OF CONTRACTED SURVEY
 - △ ANOMALY
 - ▬ LINEATION
 - AREA OF INTEREST

AERIAL MAGNETIC SURVEY
AREA 2D
ARIZONA
for
MIAMI COPPER COMPANY
by
HEINRICHS GEOEXPLORATION CO.
CONTOUR INTERVAL = 50 GAMMAS TERRAIN CLEARANCE = 500 FT.
FLIGHT INTERVAL = 0.50 MILES
PROTON PRECESSION TOTAL MAGNETIC INTENSITY

SCALE 1:31680
0 1/4 1/2 3/4 MILE 2 MILES
COMPILED - JUNE 1967

Georex Copy



QUADRANGLE
ARIZONA
PHOENIX
TUCSON
LOCATION

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AERIAL MAGNETIC SURVEY
AREA 2E
ARIZONA
for
MIAMI COPPER COMPANY
by
HEINRICHS GEOEXPLORATION CO.
CONTOUR INTERVAL = 50 GAMMAS TERRAIN CLEARANCE = 500 FT.
FLIGHT INTERVAL = 0.50 MILES
PROTON PRESSION TOTAL MAGNETIC INTENSITY

SCALE 1:31680
0 1/4 1/2 3/4 1 MILE 2 MILES
COMPILED - JUNE 1967

Geox Copy

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY AREA 3
(NORTHERN END OF PICACHO MOUNTAINS)
PINAL COUNTY, ARIZONA**

**For
Miami Copper Company**

March 1967

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

MINERALS PALES
ONION SAND
WOLSON CO. MONT.

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INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist of Miami Copper Company, Heinrichs Geoexploration Company conducted an airborne magnetic survey over the north end of the Picacho Mountains in south central Pinal County, Arizona.

The lines were flown in March 1967. In addition, several flights were flown at higher altitudes to facilitate flight line recovery. Two additional flights were made to provide adequate magnetic coverage.

CONCLUSIONS AND RECOMMENDATIONS

The primary magnetic feature present is an elongate major low area. This low is located in Sections 3, 4, 5, and 6, T7S, R10E; Section 31, T6S, R10E; Section 1, T7S, R9E, and is designated Anomaly 1 on the magnetic contour map.

Anomalies 2, 3, 4, and 5 are magnetically high areas but appear to be somewhat different in magnetic character. Anomalies 3 and 4 appear to have similar magnetic characteristics as do Anomalies 2 and 5.

Lineations I, II, and III are a set of NNW trending lineations that may be faults or fractures.

Lination IV is much less definite and is probably less important but may be a fault or fracture trending NNE.

Anomaly 1 is surrounded on three sides by magnetic highs and cuts across the outcrops, and the area is mapped as Precambrian granite on the county geologic map. This may be a zone of alteration in which the magnetite, apparently present in most of the rest of the outcrop area, has been destroyed. A program of ground magnetics and geologic investigation followed by a reconnaissance induced polarization survey to better define electrical properties in the area of interest and to test for the presence of possible sulfides, is recommended.

Anomalies 2 and 3 are magnetic highs and perhaps related to topography although Anomaly 3 is along the west side of the small range of hills that Anomaly 3 is associated with. These high areas can probably be evaluated geologically by examining the associated topographic features.

Anomaly 4 is magnetically similar to Anomaly 3 but is not visibly associated with a topographically high feature and may represent a similar magnetic material beneath the alluvium. This area is partly mapped as Precambrian granite and partly as Quaternary alluvial sediments. Undoubtedly the granite continues eastward under the alluvium as evidenced by this magnetic feature and is probably at shallow depth.

Anomaly 5 is another magnetic high and is located at the very northernmost part of the Picacho Mountains and is partly related to positive topographic features.

Lineation I, II, and III are apparently a series of parallel faults. Lineation I is of most importance in that it passes through Anomaly 1. These lineations appear very close to the flight line direction and may look like plotting errors. However, they have been rechecked several times, and we are convinced that these lineations are real. Lineation I should be field checked for a surface expression, especially where it crosses Anomaly 1. It is possible that Anomaly 1 is located along a pre-existing fracture which allowed ingress of altering fluids. Later, apparently, this altered area was fractured or faulted. (Note the reduction in width where Lineation I crosses.) This is pure office speculation and should be considered as such. Lineation IV is a possible fault or fracture but is less pronounced than the other lineations.

PROCEDURE

A Model 4937-A Varian total intensity proton precession magnetometer with a 10 inch rectilinear chart recorder and a sensitivity of \pm one gamma was used in the survey. The instruments were mounted in a Cessna 206 and a speed of approximately 120 miles per hour was maintained at a controlled altitude of 500 feet above terrain concomitant with safety

procedures. A precise chart recording radar altimeter with a sensitivity of $\pm 1\%$ at 500 feet was used to indicate terrain clearance.

A total of 154.2 line miles were flown and the data are presented as a contour map at a scale of 2 inches per mile.

Data quality is good considering constant accurate terrain clearance and magnetic record noise level. Navigation of flight lines was adequate and flight path recovery was good though difficult and tedious.

Flight path recovery was performed by matching strip photos with aerial mosaics available from the Soil Conservation Service.

Chart paper is specially designed for Geox and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each 6 inches of record. The horizontal scale is 6 inches per minute, which equals approximately two miles on the ground when a ground speed of 120 miles per hour is maintained, which is the average.

50,000 gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

Compilation and interpretation was by J. McDonnell, P. McDonnell, J. Langs and D. Cooley of the Geox staff.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

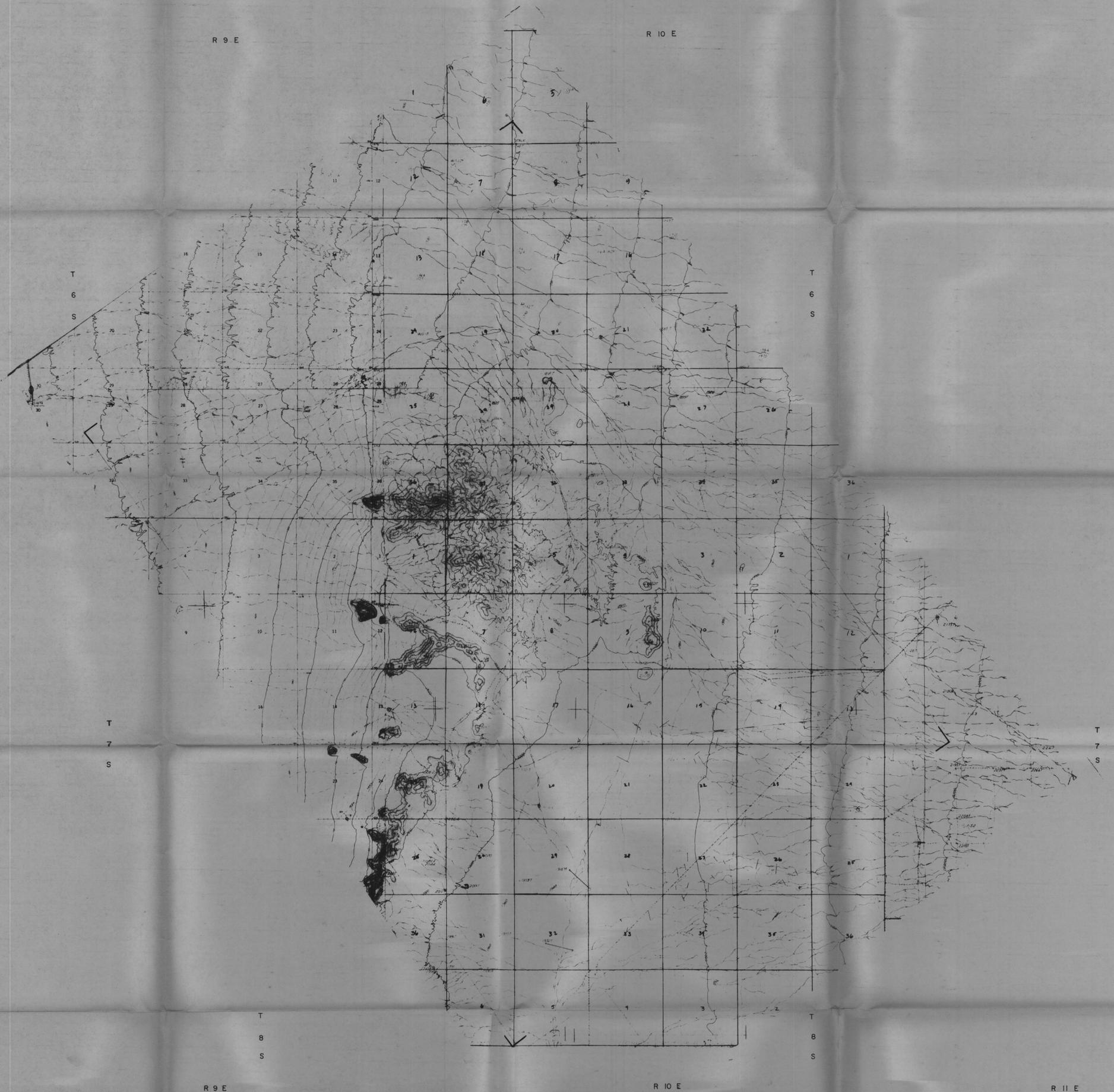
Donald B Cooley

Donald B. Cooley
Aerial Project Geologist

APPROVED


Walter E. Heinrichs, Jr.
President & General Manager

April 17, 1967



TOPOGRAPHY
 AREA 3
 ARIZONA
 for
 MIAMI COPPER COMPANY
 by
 HEINRICH'S GEEXPLORATION CO.

SCALE 1:31680
 0 1/4 1/2 3/4 1 1 1/4 2 1/4
 COMPILED APR 1967

MN
 -1.4
 APPROXIMATE
 MEAN DECLINATION
 LAND NET BASE DATA BY U.S.G.S.

R 9 E

R 10 E

T
6
S

T
6
S

32° 52' 30"

111° 15' 00" 32° 52' 30"

T
7
S

T
7
S

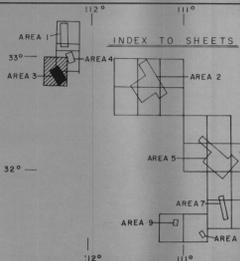
32° 45' 00" 111° 22' 30"

111° 15' 00" 32° 45' 00"

R 9 E

R 10 E

R 11 E



EXPLANATION

- FLIGHT LINE WITH FIDUCIALS
- LIMITS OF CONTRACTED SURVEY
- ▲ ANOMALY
- IV LINATION
- MAGNETIC DATUM = 50,000 GAMMAS

**AERIAL MAGNETIC SURVEY
AREA 3
ARIZONA
for
MIAMI COPPER COMPANY
by
HEINRICHS GEOEXPLORATION CO.**

CONTOUR INTERVAL = 50 GAMMAS TERRAIN CLEARANCE = 500 FT.
FLIGHT INTERVAL = 0.5 MILES
PROTON PRESSION TOTAL
MAGNETIC INTENSITY

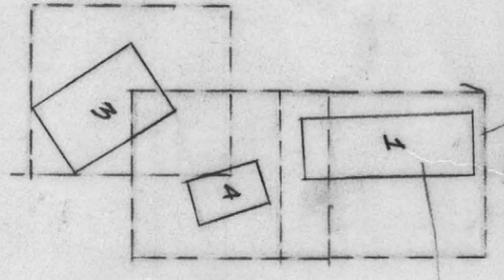


112°

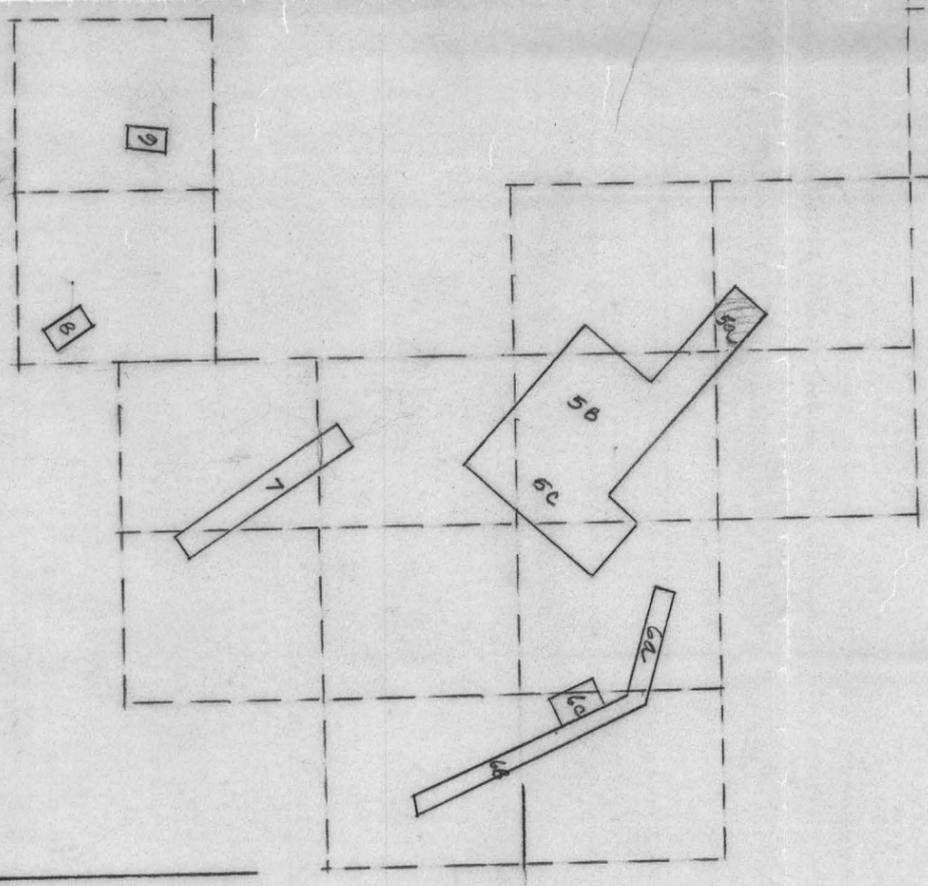
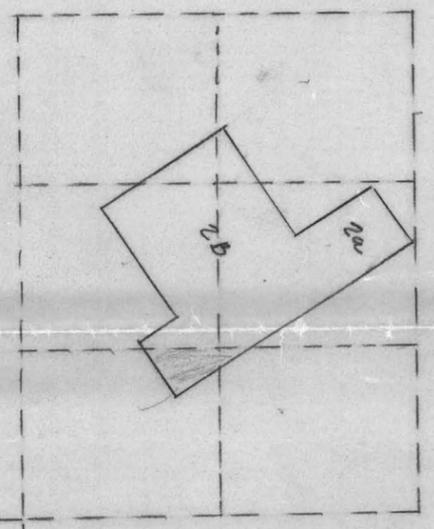
111°

110°

109°



MOY



330

330

**TOTAL INTENSITY AERIAL
MAGNETIC SURVEY AREA 4
(SOUTHEAST OF FLORENCE)
PINAL COUNTY, ARIZONA**

Area 4

for

Miami Copper Company

March 1967

By

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

MILLERS FALLS
CONCORD SECTION
GEOLOGICAL CONTENT

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Topographic Map Area 4	

INTRODUCTION

At the request of Mr. W. W. Simmons, Chief Geologist of Miami Copper Company, Heinrichs Geoexploration Company conducted an airborne magnetic survey over Area 4, located in the southern portion of the North Butte Quadrangle, Arizona and portions of adjacent quadrangles, Pinal County, Arizona.

The flights were flown in March, 1967 at 500' terrain clearance. Several flights at higher altitude were flown to facilitate flight line recovery.

CONCLUSIONS AND RECOMMENDATIONS

Area A, located in Sections 27, 28, 33, 34, T4S, R11E and Sections 2 and 3, T5S, R11E, corresponds to an intrusion of Laramide granite and related intrusive rocks as shown on the Pinal County Geologic Map. Anomaly 1 seems to be the intrusive itself and Anomaly 2 is a minor magnetic low that is probably directly associated with the intrusion. In this magnetic latitude, highs and lows are commonly together and caused by the same single geologic feature. There are a number of small mines in this area shown on the U.S.G.S. topographic map.

Area B is a general magnetic high of undetermined rock type, but may be Precambrian granite mostly beneath shallow alluvium. Anomalies 4 and 5 are individual magnetic highs within the general high of Area B.

Anomalies 3 and 6 are individual magnetic low areas in a general low area; relative to this magnetic map.

Lineations I and II are steep magnetic gradients that are possible fault or contact features.

Anomaly 1 is a magnetic high and almost surely the intrusion shown on the Arizona Bureau of Mines County Geologic Map and is significant if the dating is correct. Anomaly 2 is a minor (125 gamma) low that is probably directly related to the high and possibly partly due to alteration associated with the intrusion. To the north and east of Anomaly 1 are indications of other lows, probably similar to Anomaly 2 but they are on the periphery of the surveyed area and the data are too marginal to make a more definite statement. Anomalies 1 and 2 and the possible low areas to the north and east should be carefully checked geologically before additional work is contemplated. Should geologic studies indicate interesting relationships, ground magnetics should be used to locate these anomalous lows due to their small areal extent and small magnetic variation before additional geophysics such as an induced polarization survey is conducted.

Anomalies 4 and 5 in Area B are related to two small hills that outcrop in Sections 28 and 29, T5S, R11E. The geologic character of these outcrops should be examined in order to evaluate Area B magnetically. The small hill appears to fall in one of the minor lows within Area B.

Anomalies 3 and 6 are individual magnetic lows in an area of general magnetic low that appears to be fairly deep. The northern-most part seems to be rising somewhat and is probably at a shallower depth than the rest of Anomaly 3.

Lineation I appears to be a possible fault separating the intrusion at Anomaly 1 from the surrounding Precambrian granite or from an alluvial basin to the west.

Lineation II is an apparent fault that separates Area B from what is possibly an alluvial filled basin to the east.

PROCEDURE

A Varian total intensity proton precession magnetometer, Model No. 4937-A, with a 10" rectilinear chart recorder with a sensitivity of ± 1 gamma was used for the survey. The instruments were mounted in a Cessna 206 and a speed of 120 miles per hour was

maintained as nearly as possible at a terrain clearance of 500 feet in accordance with safety procedures. A precise chart recording radar altimeter with a sensitivity of $\pm 1\%$ at 500 feet was used to indicate terrain clearance.

A total of 65.2 line miles were flown and the data are presented as a contoured map at a scale of 2" per mile and a contour interval of 25 gammas.

Data quality is very good considering constant accurate terrain clearance and magnetic record noise level. Navigation of flight lines was fair and flight path recovery good. No reflights were necessary due to line spacing and character of the magnetic profiles.

Chart paper is specially designed for Georex and is read from right to left with gamma values increasing towards the 10 on the vertical scale which is 1,000 gammas vertically across the chart. The vertical scale is printed each 6" per minute which equals approximately two miles on the ground when a ground speed of 120 miles per hour is maintained.

50,000 gammas were subtracted from all values as interpretation of magnetic data is based solely on an arbitrary datum level.

Compilation and interpretation was by J. McDonnell, P. McDonnell, J. W. Langs, and D. B. Cooley of the Georex staff.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

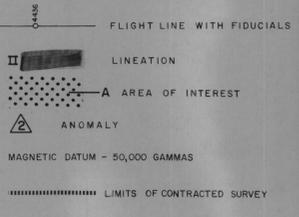
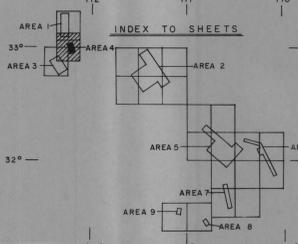
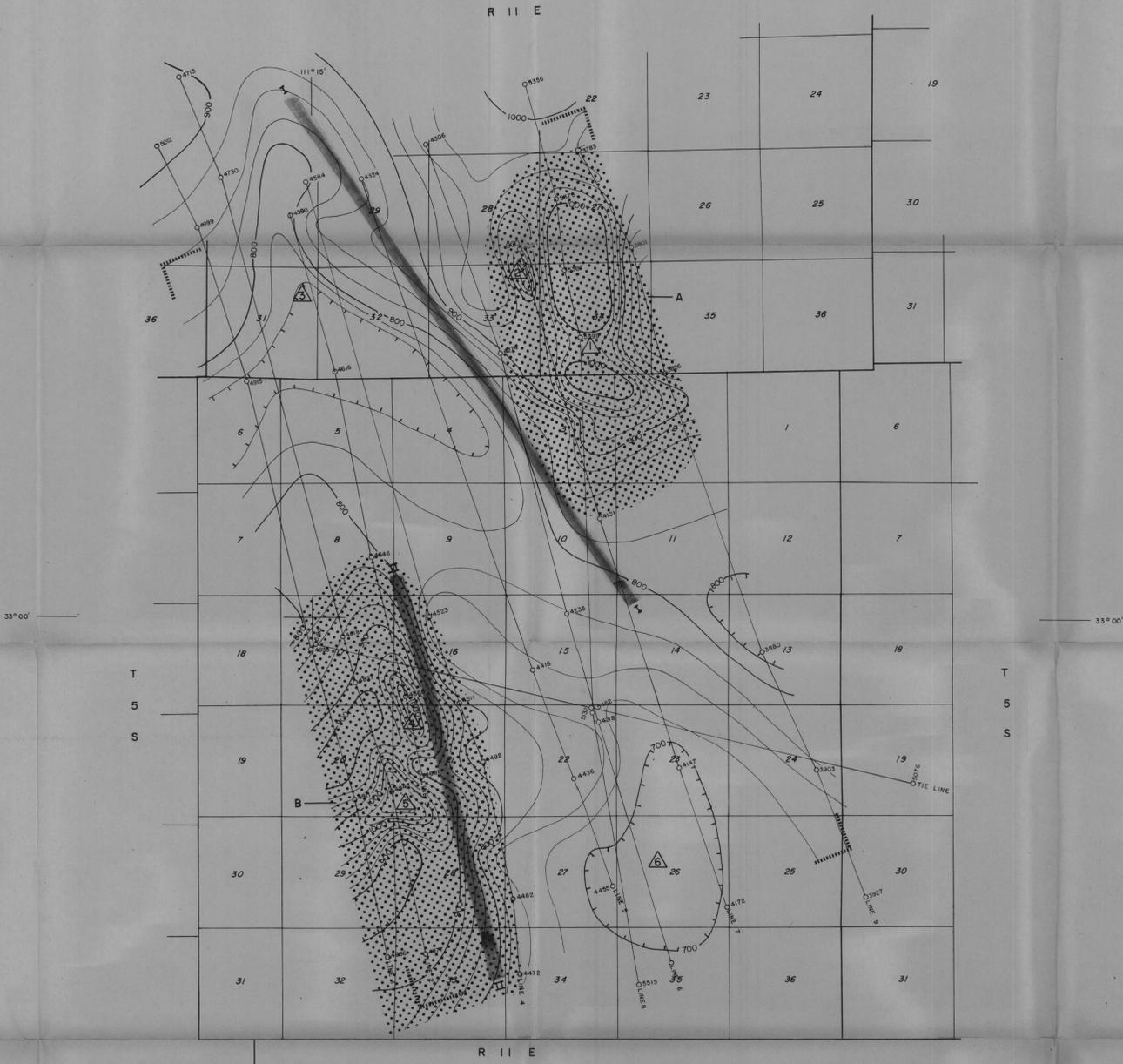
Don Cooley

Donald B. Cooley
Aerial Projects Geologist

APPROVED:

W. E. Heinrichs, Jr.
Walter E. Heinrichs, Jr.
President & General Manager

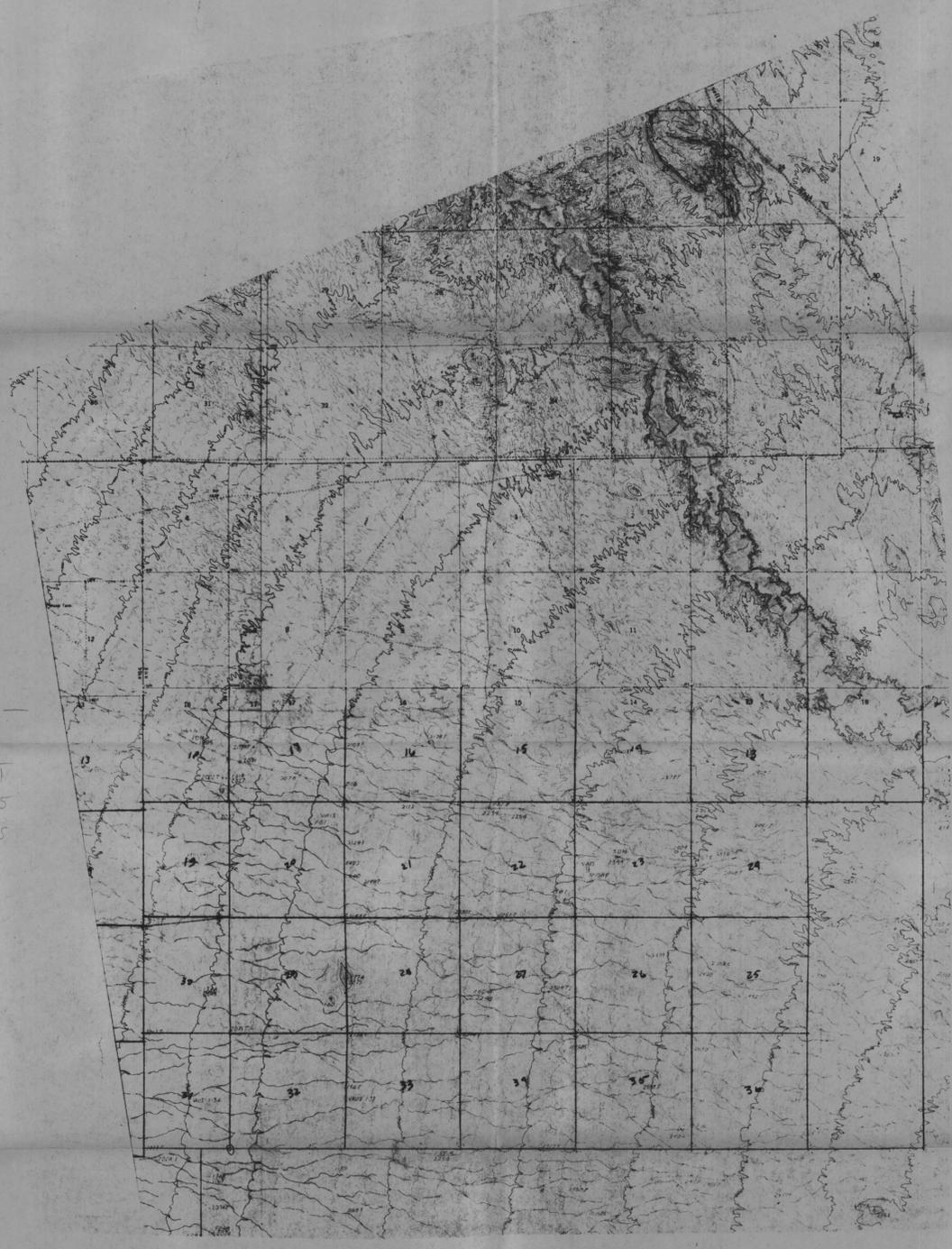
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Tucson, Arizona



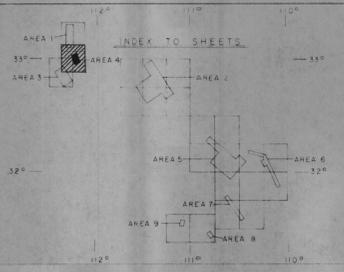
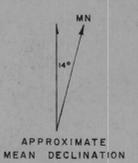
AERIAL MAGNETIC SURVEY
AREA 4
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 for
MIAMI COPPER COMPANY
 by
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 CONTOUR INTERVAL = 25 GAMMAS TERRAIN CLEARANCE = 500 FT.
 FLIGHT INTERVAL = 0.5 MILES
 PROTON PRECESSION TOTAL
 MAGNETIC INTENSITY

SCALE 1:31680
 0 1/4 1/2 3/4 1 mile 2 1/4
 SURVEYED & COMPILED MAR 1967





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TOPOGRAPHY
 AREA 4
 ARIZONA
 for
 MIAMI COPPER COMPANY
 by
 HEINRICHS GEOEXPLORATION CO.

SCALE 1:5180
 COMPILED MAR 1967

