

REPORT NO. 3
INTERPRETATION OF AEROMAGNETIC SURVEY
OF
BLOCK I, NORTHWEST TERRITORIES, CANADA
FOR
AEROMAGNETIC SURVEYS, LIMITED
AND ASSOCIATES
JULY 30, 1953

GRAVITY METER EXPLORATION COMPANY

Houston, Texas

SUMMARY

Report No. 3 covers the interpretation of the aeromagnetic survey of that portion of Block I, Northwest Territories, included within longitudes 121° W- 122° W; latitudes 60° - $20'$ N and 61° - $40'$ N. This includes Sheets 9 through 12 of the 16 individual sheets.

A structural map of the basement surface is included which is a continuation of the map previously drawn, Sheets 1 through 12 for Reports 1 and 2. This map is contoured at an interval of 2000 ft from estimates of the basement (preCambrian?) calculated from the magnetic data. The local areas of interest, indicative of local relief of the basement surface, are also included on the basement map which is at a scale of 1 in = 3 mi. The regional basement configuration has an abrupt change in strike from north south, in Sheets 10 through 12, to east west in Sheet 9 and the northern portion of Sheet 10. The single regional disturbance to this configuration is a broad domal area in the eastern central portion of Sheet 11.

Again the observed magnetic data are very much disturbed by near-surface effects which are attributed to the heterogeneous composition and configuration of surface glacial material. These disturbances make the resolution of residual anomalies very difficult, and only three anomalies are graded good, namely 66, 68 and 82. Of these three, 82 is considered to have the most merit.

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Maps

- Observed Aeromagnetic Map, with local anomalies superimposed, Sheets 9 through 12, scale 1 in = 1 mi; observed data contoured at interval, 10 gamma; residual anomalies contoured at interval, 5 gamma.
- Second Vertical Derivative Aeromagnetic Map, with outlines of local areas of interest superimposed, Sheets 9 through 12, scale 1 in = 1 mi, contour interval 2×10^{-15} cgs.
- Structural Contour Map on the Basement Surface, preliminary, with structural basement contours (interval, 2000 ft; datum, sea level), individual magnetic depth estimates, and local areas of interest superimposed on a composite of the sixteen observed magnetic maps, scale 1 in = 3 mi.

INTRODUCTION

This report, No. 3, continues the interpretation of the aeromagnetic survey of Block I, Northwest Territories. Report No. 1 was submitted on February 26, 1953, for Sheets 1 through 4. Report No. 2 was submitted on July 24, 1953, for Sheets 5 through 8. This report covers Sheets 9 through 12. Reference should be made to Reports Nos. 1 and 2 for the general concepts of the interpretational methods, for the description of the various maps, and for a discussion of the previous results.

THE OBSERVED AEROMAGNETIC MAPS, Sheets 9 through 12 (scale 1 in = 1 mi.)

The observed magnetic data, contoured at an interval of ten gamma, are dominated by a westward decreasing gradient which becomes a westward decreasing gradient in Sheet 9. This general gradient is disturbed by a north-south negative axis in Sheets 11 and 12 and by an adjacent positive axis along the western boundary of those sheets. A second disturbance is on the extreme northern boundary of Sheet 9 where a broad positive anomaly is developed which, in turn, causes the east-west attitude of the observed contours in Sheet 9. These large observed anomalies are considered to be intrabasement in origin and are not necessarily indicative of either regional or local structure.

Again the observed data are conspicuously disturbed by sharp anomalies distributed at random over the entire area. Examination of these distortions shows that they are relatively sharp and must originate from near surface effects with some minor disturbances also apparently originating from turbulence of the magnetic field or of the aircraft during flying operations. The major near-surface effects are attributed to inhomogeneities of the glacial cover which, in turn, are apparently controlled in large part by the drainage pattern. The presence of these sharp anomalies seriously handicaps the resolution of the residual

magnetic anomalies and the determination of basement depth estimates. This is reflected in the abundance of poorly graded residual magnetic features and by the wide range of magnetic depth estimates with respect to each other which necessitated the contouring of the basement at the relatively large interval of 2000 ft.

SECOND VERTICAL DERIVATIVE AEROMAGNETIC MAPS, Sheets 9 through 12, (scale 1 in = 1 mi.)

These maps are shaded red and yellow with the red indicating positive derivative values and the yellow, negative. These two areas correspond approximately to the positive and negative curvatures of the observed magnetic field. This, in turn, signifies geologically that the red areas are underlain either by more ferromagnetic minerals than the yellow areas or that the ferromagnetic minerals are closer to the plane of observation in the red areas. The first of these is more often the case.

Quite often the derivative calculation develops anomalies which indicate basement relief. Therefore, the outlines of basement relief, which are deduced from both the observed and derivative data, are superimposed on the derivative maps.

THE STRUCTURAL CONTOUR MAP ON THE BASEMENT SURFACE, Sheets 1 through 16, (scale 1 in = 3 mi.)

This report continues the basement contours from Sheets 1 through 8 into Sheets 9 through 12. These results are presented on a composite of the sixteen individual observed magnetic maps with the basement mapped at an interval of 2000 ft, subsea datum. The contours are based entirely on magnetic depth estimates which are shown underlined by three, two and one underlines for good, fair and poor dependability. A fourth category is followed by the letter "S" indicating that the estimate was made with the assumption that a local basement uplift was present. In addition, the local basement features, indicative of local basement

relief, have been added to show their relationship to the regional basement configuration.

In general the basement dips gently westward from -8000 ft on the eastern side of Sheets 10 and 11 to more than -10,000 ft on the western sides. This western gradient turns abruptly to become a southward gradient in the northern portion of Sheet 10. The general east-west strike of the basement in this area is considered to continue through Sheet 9 with the basement at a general level of -7000 ft.

This general configuration is distorted in the eastern central portion of Sheet 11 where a regional domal high is shown with the basement at -7200 ft. Actually this regional feature is probably much more complex as suggested by the local relief shown by the green outlines and fault traces.

RESIDUAL MAGNETIC ANOMALIES (Sheets 9 through 12).

The residual magnetic anomalies are superimposed on the observed magnetic data, contoured at an interval of five gammas. In addition, the outline of the related area of interest, or fault, is shown. This outline is the periphery of a postulated basement uplift that could cause the residual anomaly. Again, the anomalies are graded G, F, and P for good, fair, and poor. The outlines of the local areas of interest are shown on the derivative maps and on the basement map.

Table 1: Residual Anomalies

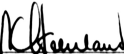
<u>No.*</u>	<u>Location</u>	<u>Remarks</u>
56P	Sheet 9	The anomaly is graded poor because it is on the boundary of the survey. The basement is estimated to be at -6400 ft.
57P	Sheet 9	Anomaly is graded poorly because of its weak amplitude.
58P	Sheet 9	The poor grade results from inconsistent expression on the magnetic data. The basement is estimated to be at -7200 ft.

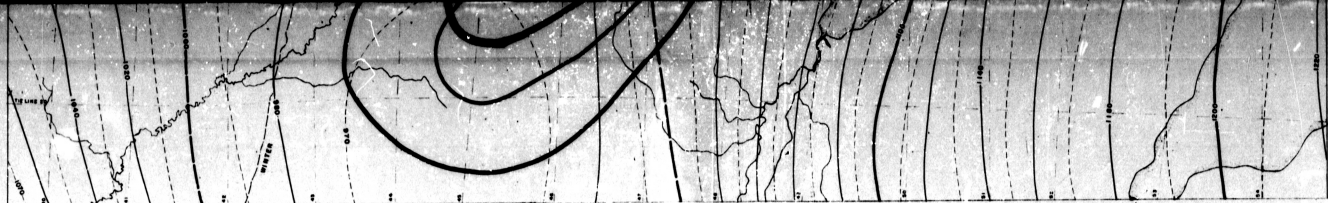
* G, F, and P. Good, Fair and Poor.

<u>No.</u>	<u>Location</u>	<u>Remarks</u>
59F	Sheet 9	This anomaly is more narrow than 58, but is more consistently expressed. This is probably the best of the fair anomalies of this report.
60P	Sheet 10	The basement is estimated to be at approximately -9000 ft along this fault, downdropped to the south.
61P	Sheet 10	A very poor indication of a small fault where the basement is estimated to be at -10,700 ft.
62P	Sheet 10	A poor indication of a small fault, downdropped to the south-west, and conspicuously parallel to local drainage.
63P & 64P	Sheet 10	These two faults, both down-to-the-south, inaugurate a series of anomalies along an east-west trend. This entire group is suspect because of its parallel arrangement to the major rivers in the area.
65P-69F	Sheet 10	This group of anomalies completes the east-west trend just mentioned. Two of the anomalies, 66G and 68G, are highly recommended in spite of their association with this group of anomalies which occurs between two major east-west trending rivers. The basement is estimated to be at -9400 ft at 68G.
70P	Sheet 10	Anomaly is graded poor because of its small amplitude.
71P	Sheet 10	The poor grade results from the east-west trend and the small amplitude.
72P	Sheet 11	This fault, down-to-the-south is indicated by an anomaly of approximately 20 gamma which provides basement depth estimates of approximately -10,600 ft.
73P	Sheet 11	This fault, downdropped to the south, has an anomaly of 37 gamma which provides a depth estimate of approximately -9000 ft.
74F	Sheet 11	This is a rather well developed anomaly which is downgraded because it is parallel to a major river in its southern part. The basement is estimated at -10,400 ft.
75P	Sheet 11	This small anomaly provides a depth estimate of -10,100 ft.
76F	Sheet 11	This fault, downdropped to the south-southeast, is indicated by a magnetic anomaly of 30 gamma and provides a basement depth estimate of -7500 ft.

<u>No.</u>	<u>Location</u>	<u>Remarks</u>
77F	Sheet 11	Note that this anomaly lies on a continuation of the upthrown side of 76F.
78P	Sheet 11	This small fault, downdropped to the north, is indicated by an anomaly of variable amplitude, 8 to 25 gamma.
79P	Sheet 11	This fault, downdropped to the northeast, is indicated by an anomaly of 20 gamma but is parallel to a river located on its downthrown side.
80P	Sheet 11	The poor grade is occasioned by the low relief.
81P	Sheet 11	The poor grade is occasioned by the low relief and by inconsistent expression on the observed data.
82G	Sheet 11	This is the best residual anomaly of this report. The basement is estimated to be at -8700 ft.
83P	Sheet 11	This small fault is downdropped to the southwest and is derived from a magnetic anomaly of approximately 10 gamma.
84P	Sheet 12	This poor anomaly has very low amplitude and is conspicuously parallel to a river on its northwestern side.
85F	Sheet 11	A basement depth of -10,000 ft 's computed from this residual feature.
86P	Sheets 11 & 15	The amplitude of this anomaly is too small for any higher recommendation.
87P	Sheets 10 & 14	This anomaly is also too weakly indicated by the observed data to be recommended any more highly. The excellent derivative indication in the northern part is a result of an observed positive anomaly in the area which is considered to be intrabasement in origin.

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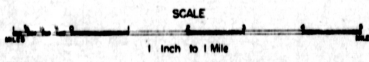

 Nelson C. Steenland



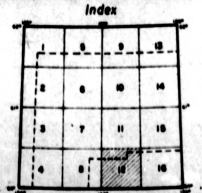
Produced in Canada by AEROMAGNETIC SURVEYS LIMITED

Sheet No. 12

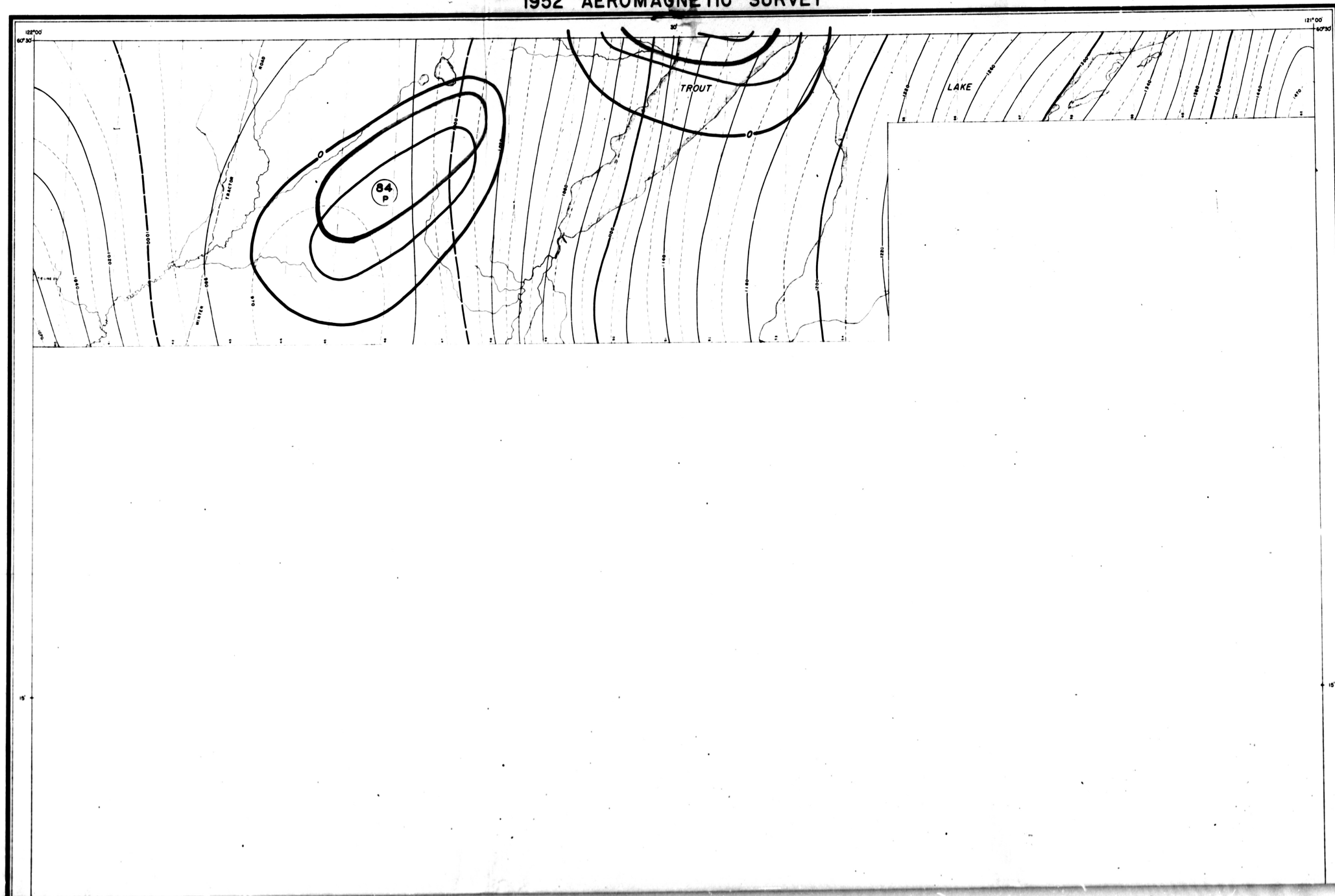
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 ALTITUDE.....2000 FEET ABOVE SEA LEVEL
 500 GAMMA CONTOUR.....
 100 GAMMA CONTOUR.....
 20 GAMMA CONTOUR.....
 10 GAMMA CONTOUR.....
 MAGNETIC LOW.....
 FLIGHT LINES.....



RESIDUAL MAGNETIC ANOMALIES
 CONTOUR INTERVAL 5 GAMMA
 LOCAL AREA OF INTEREST
 FAULT
 INTERPRETATION BY
 GRAVITY METER EXPLORATION COMPANY
 HOUSTON, TEXAS
 REPORT JULY 26, 1955



SIMPSON - LIARD AREA, N.W.T.
1952 AEROMAGNETIC SURVEY



MEAN FLIGHT LINE SPACING.....15 MILES
 ALTITUDE.....5000 FEET ABOVE SEA LEVEL
 500 METER CONTOUR.....
 100 METER CONTOUR.....
 50 METER CONTOUR.....
 25 METER CONTOUR.....
 MAGNETIC LINE.....
 FLIGHT LINES.....

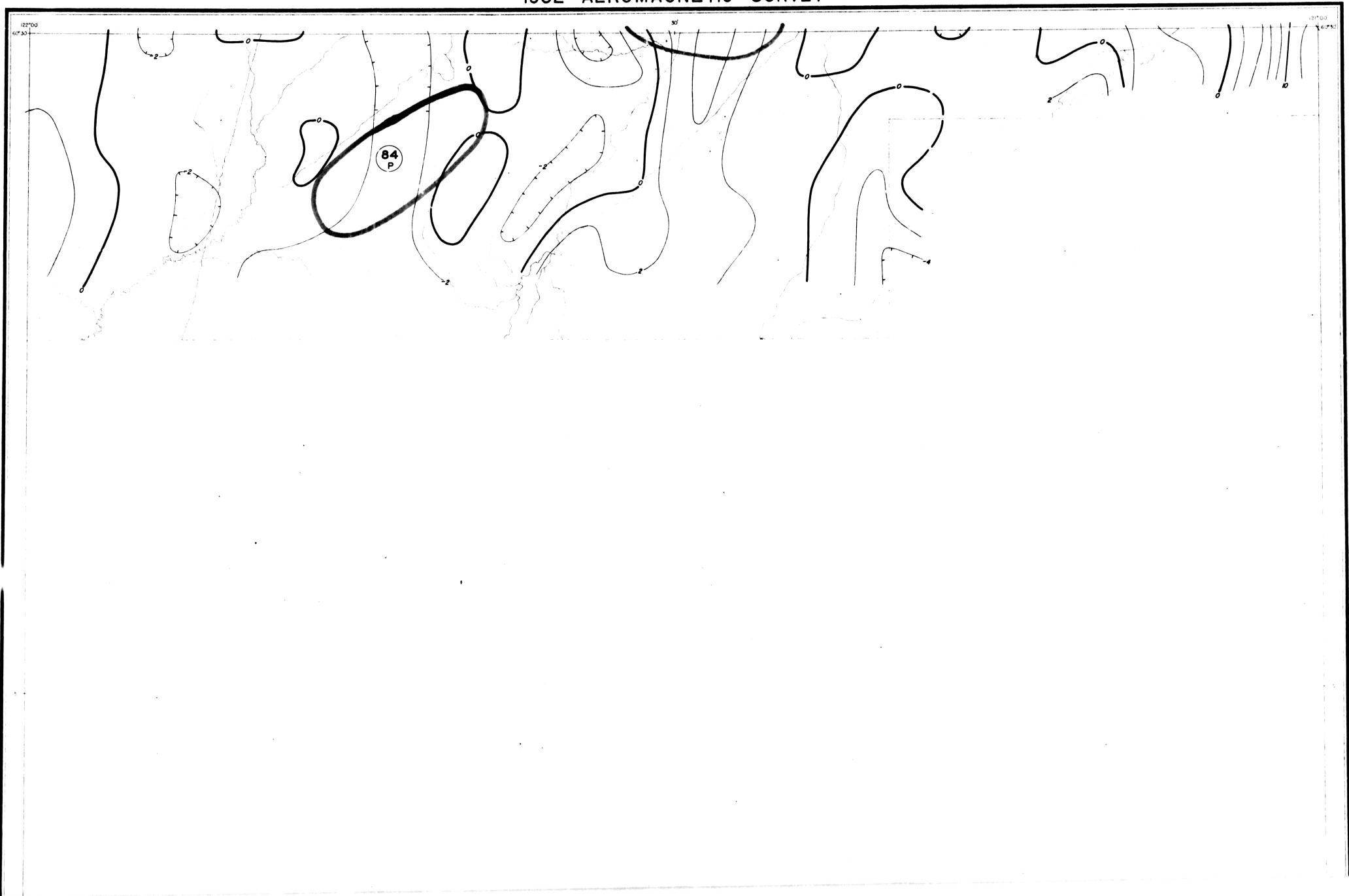
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 1 Inch to 1 Mile

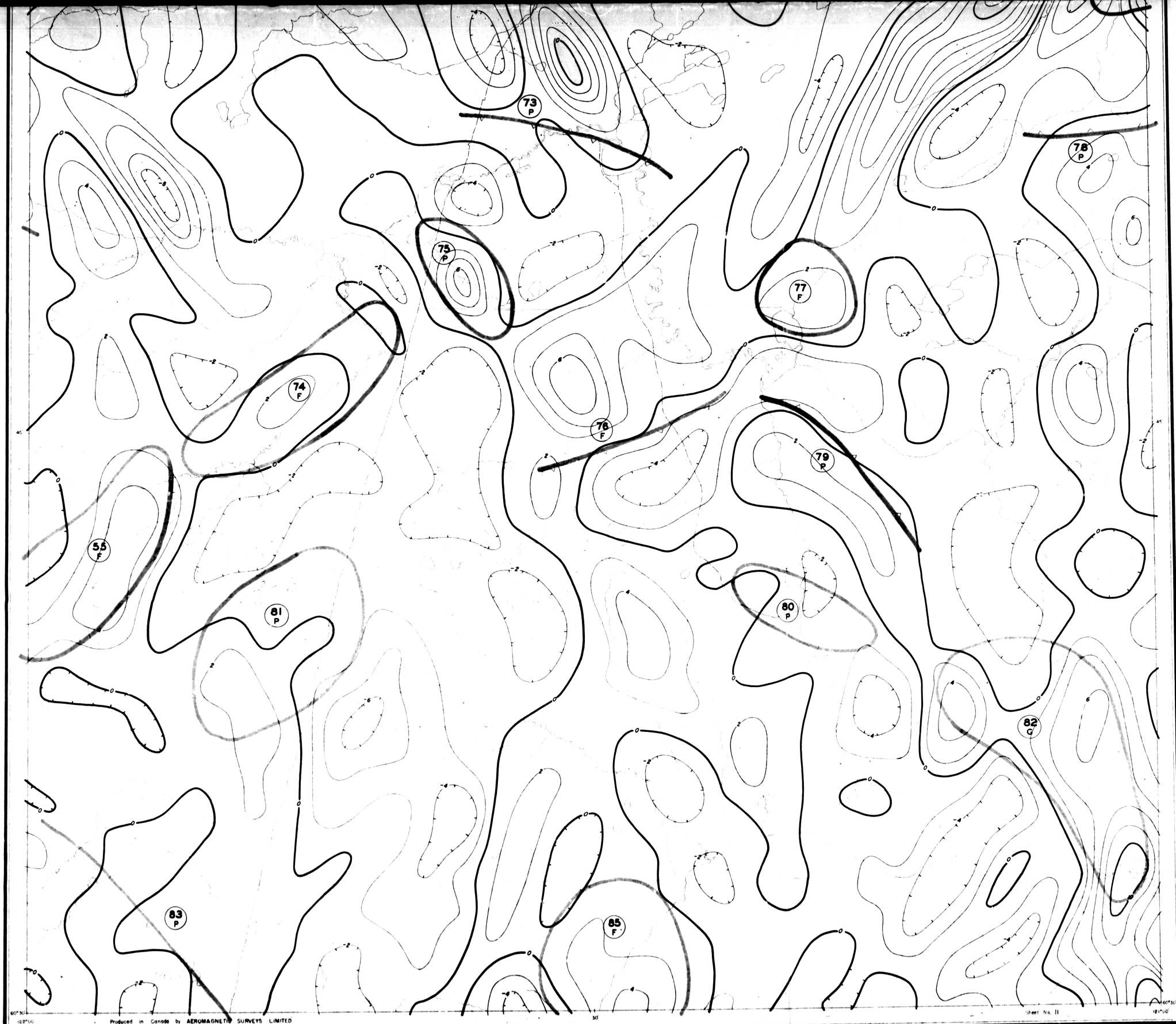
SECOND VERTICAL DERIVATIVE MAP
 CONTOUR INTERVAL 2×10^5 CGS
 CALCULATED BY
GRAVITY METER EXPLORATION COMPANY
 HOUSTON, TEXAS
 REPORT JULY 30, 1953

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SIMPSON - LIARD AREA, N.W.T.
1952 AEROMAGNETIC SURVEY





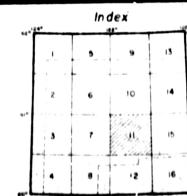
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 ALTITUDE 7500 FEET ABOVE SEA LEVEL
 500 GAMMA CONTOUR
 100 GAMMA CONTOUR
 20 GAMMA CONTOUR
 10 GAMMA CONTOUR
 MAGNETIC LOW
 FLIGHT LINES

SCALE
 1 inch to 1 Mile

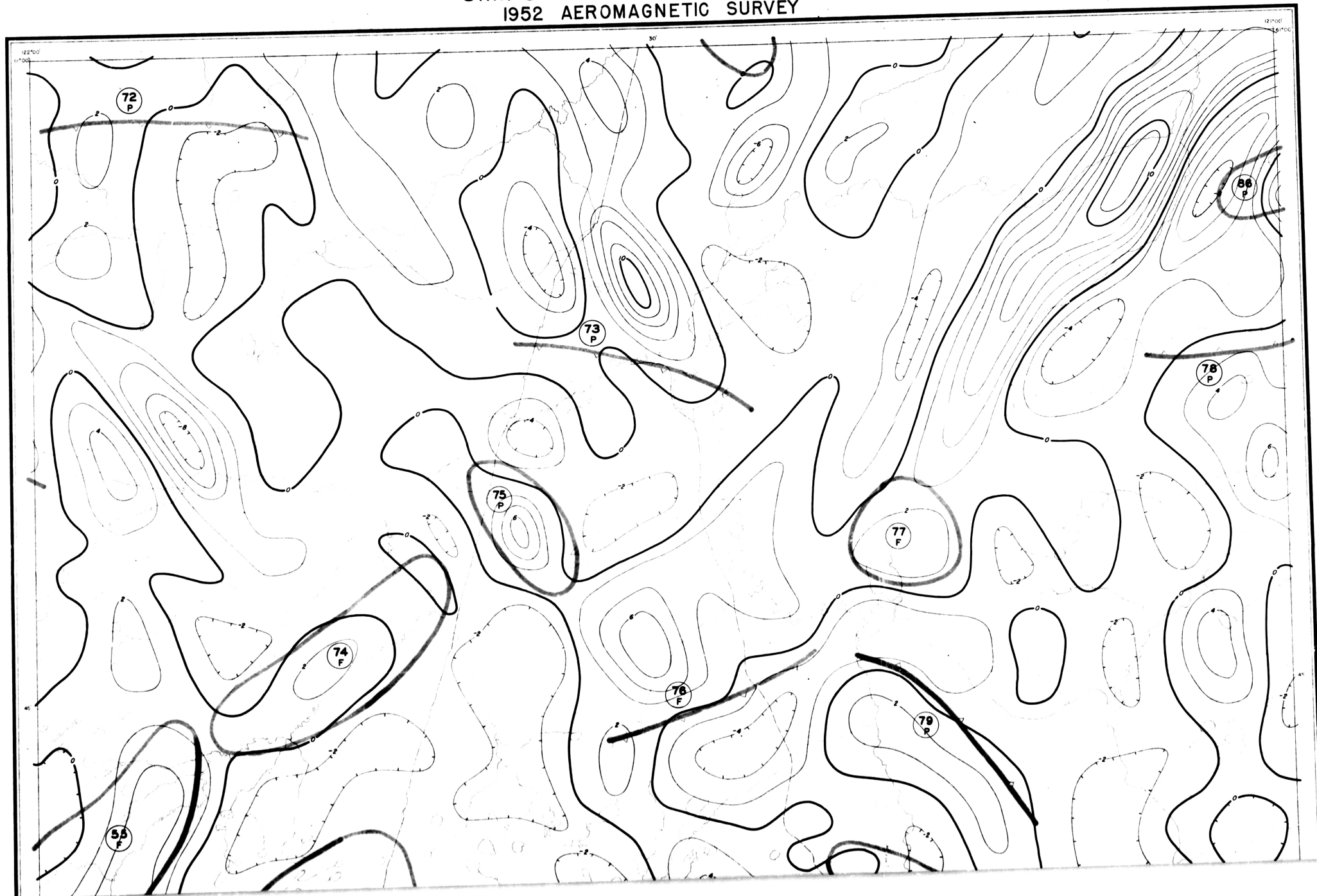
SECOND VERTICAL DERIVATIVE MAP

CONTOUR INTERVAL 2×10^{15} CGS

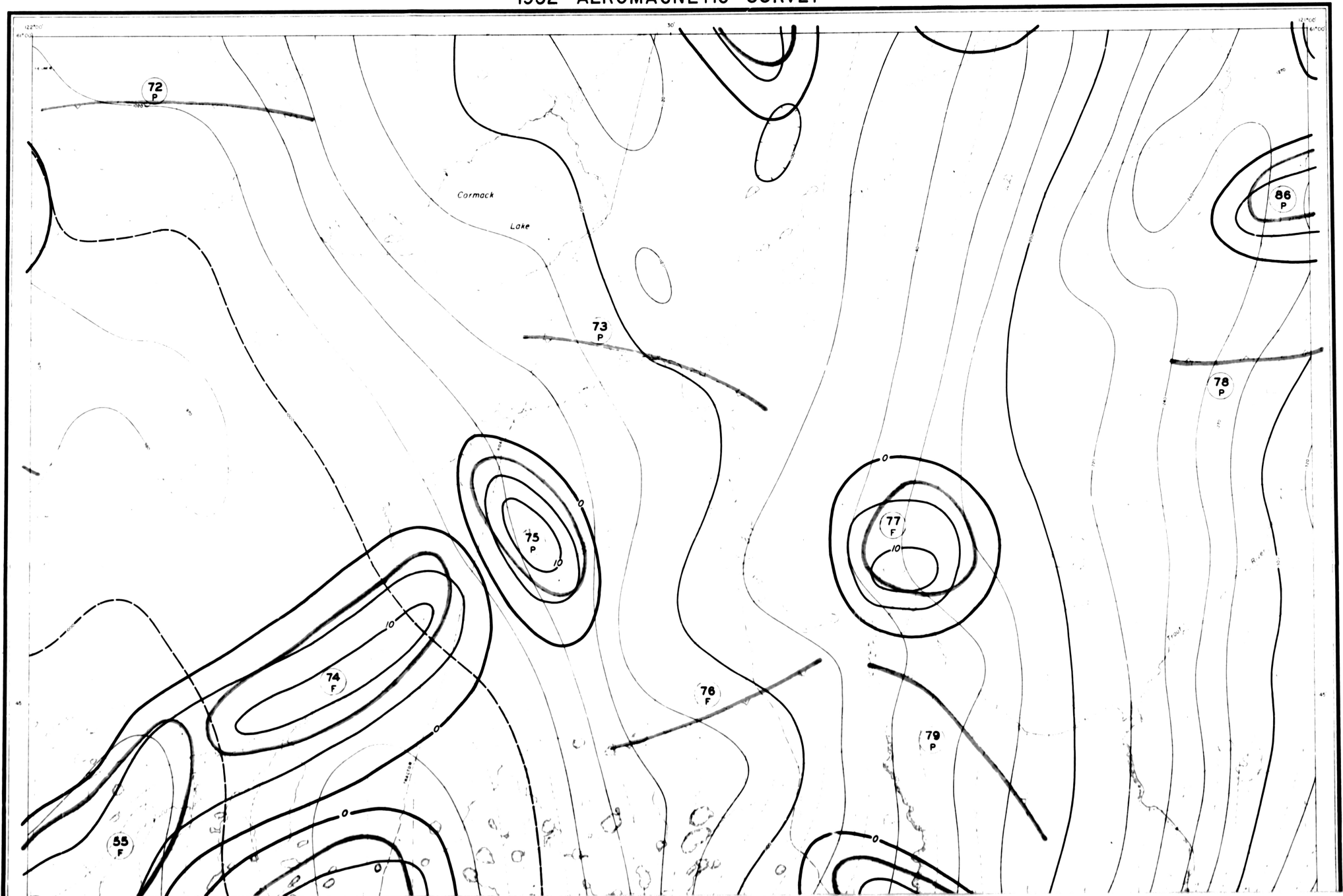
CALCULATED BY
 GRAVITY METER EXPLORATION COMPANY
 HOUSTON, TEXAS
 REPORT JULY 30, 1953



SIMPSON - LIARD AREA, N.W.T.
1952 AEROMAGNETIC SURVEY



SIMPSON - LIARD AREA, N.W.T.
1952 AEROMAGNETIC SURVEY



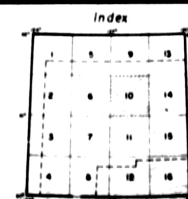


MAG. FLIGHT LINE SPACING 15 MILES
 ALTITUDE 5000 FEET ABOVE SEA LEVEL
 500 GAUSS CONTOUR
 100 GAUSS CONTOUR
 50 GAUSS CONTOUR
 25 GAUSS CONTOUR
 MAGNETIC LINES
 FLIGHT LINES

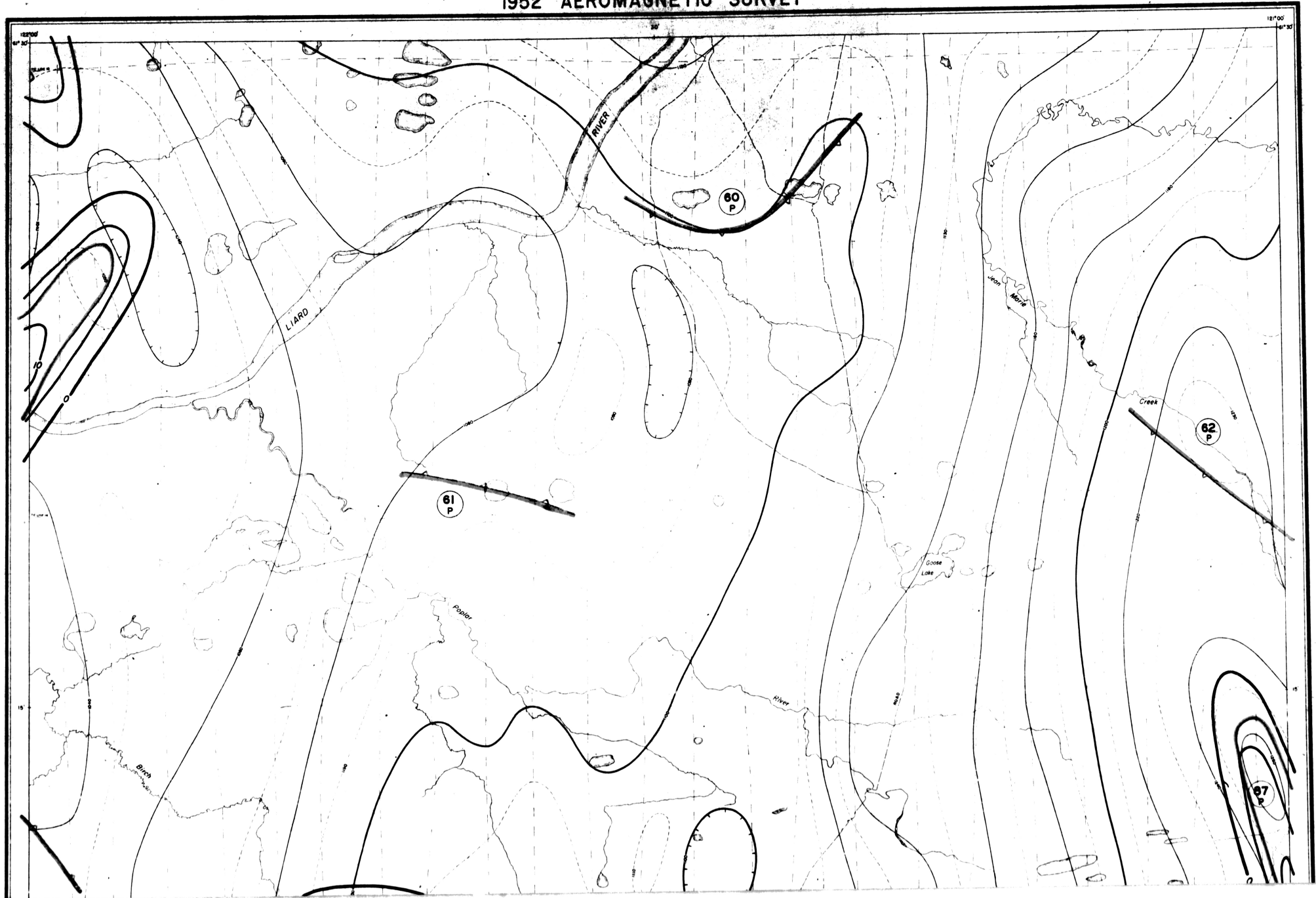
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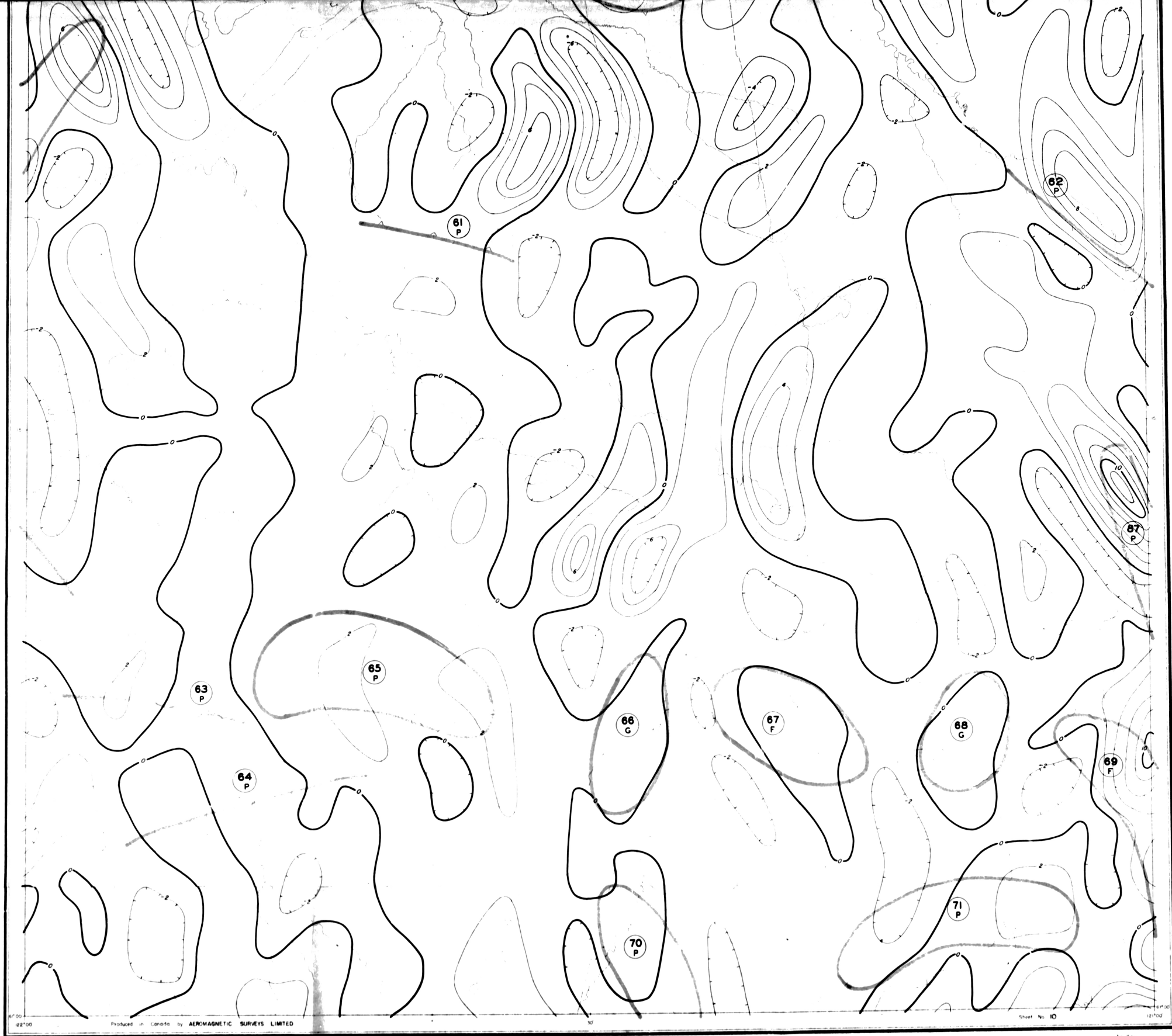
1 inch to 1 Mile

RESIDUAL MAGNETIC ANOMALIES
 CONTOUR INTERVAL 5 GAMMA
 LOCAL AREA OF INTEREST
 FAULT
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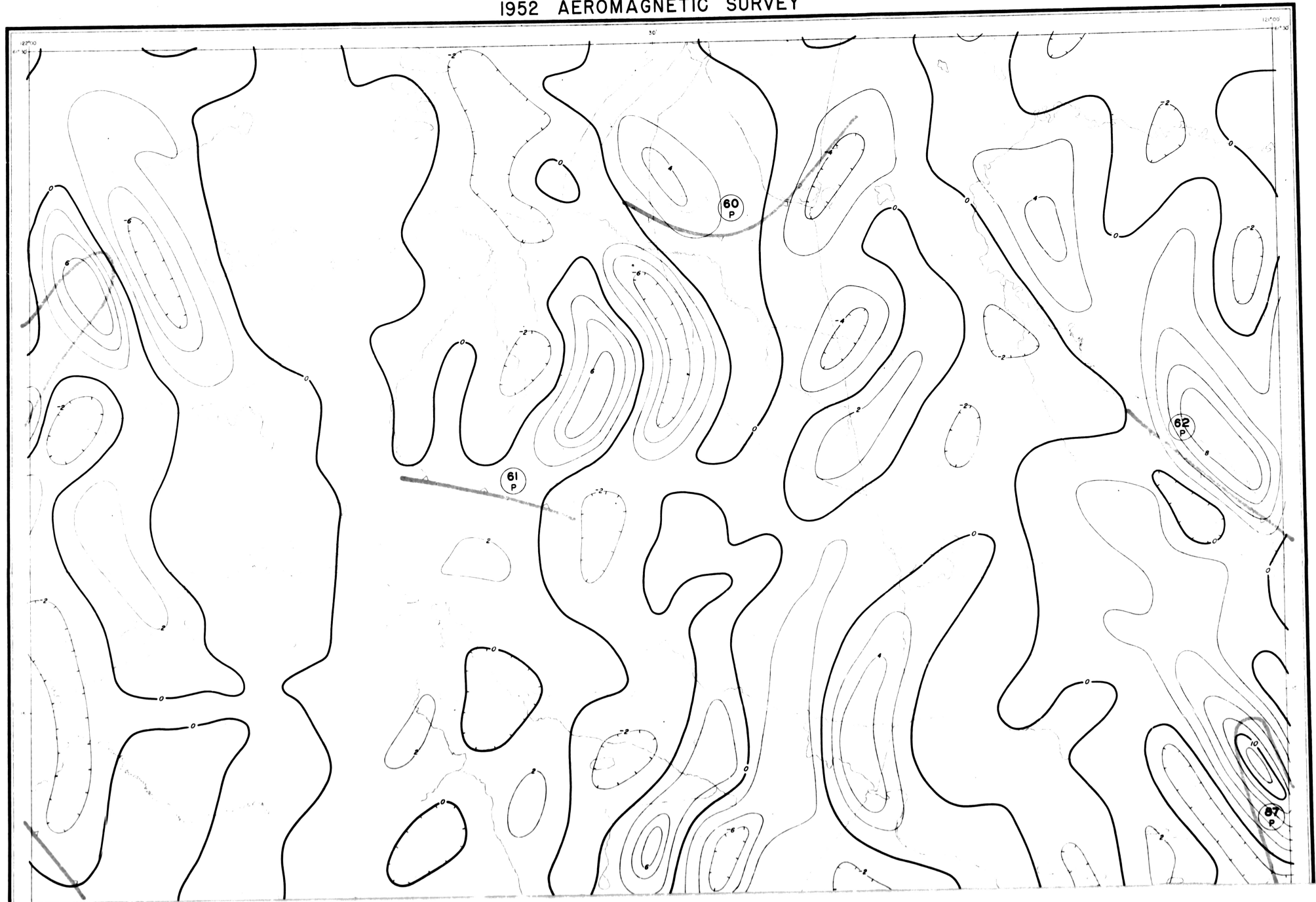


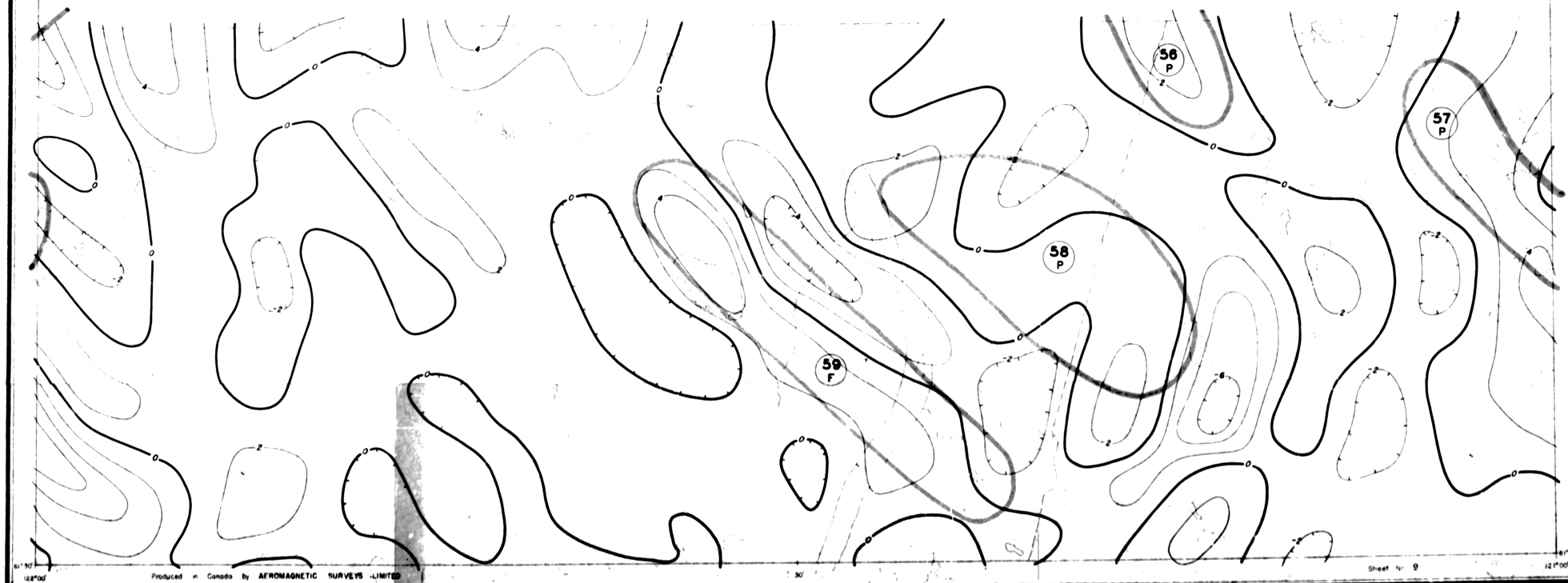
SIMPSON - LIARD AREA, N.W.T.
1952 AEROMAGNETIC SURVEY





SIMPSON - LIARD AREA, N.W.T.
1952 AEROMAGNETIC SURVEY





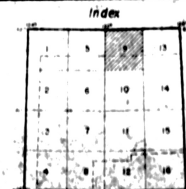
MEAN FLIGHT LINE SPACING 2 1/2 MILES
 ALTITUDE 2500 FEET ABOVE SEA LEVEL
 100 GAMMA CONTOUR
 100 GAMMA CONTOUR
 20 GAMMA CONTOUR
 10 GAMMA CONTOUR
 MAGNETIC LOW
 FLIGHT LINES

SCALE
 1 inch to 1 mile

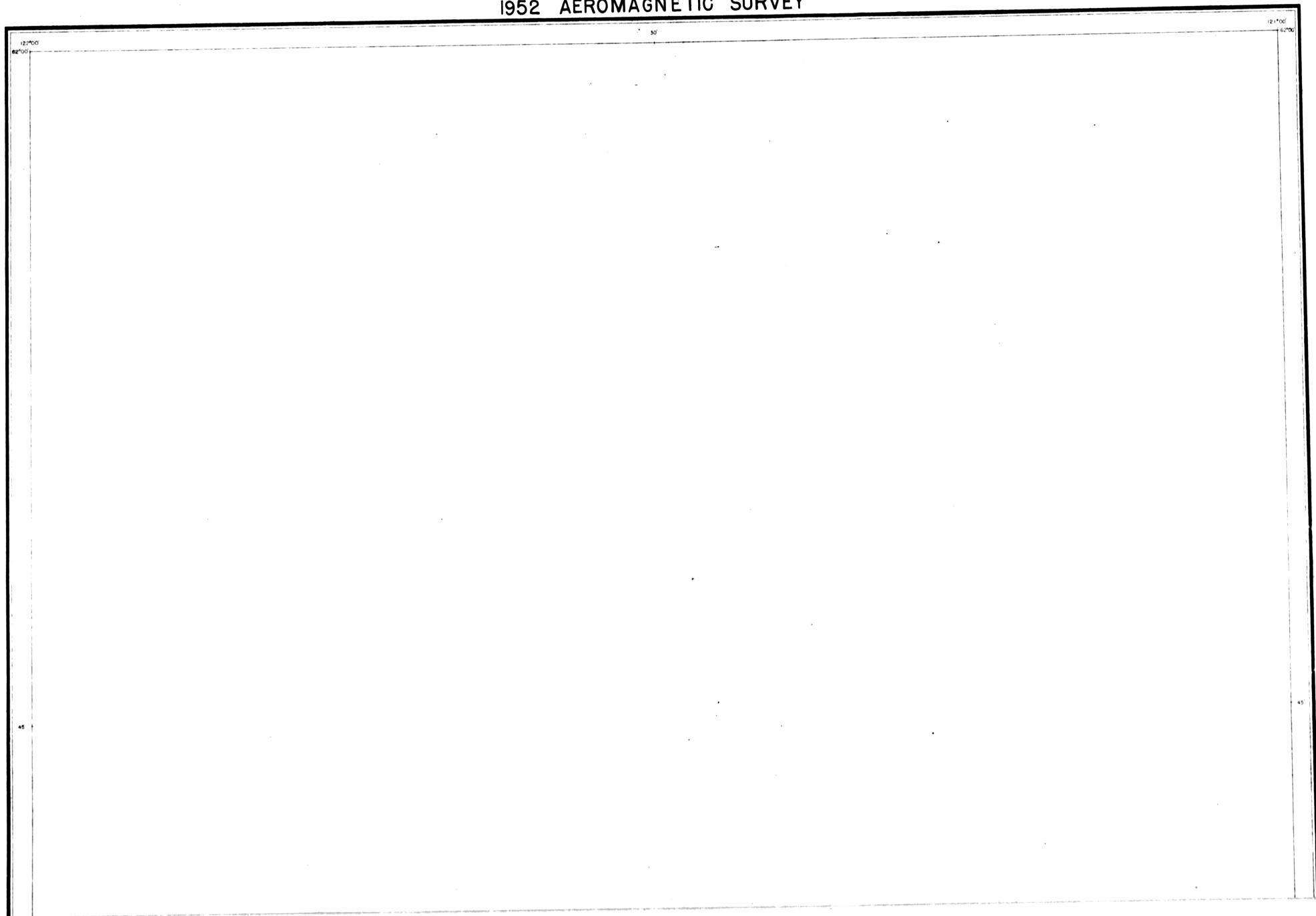
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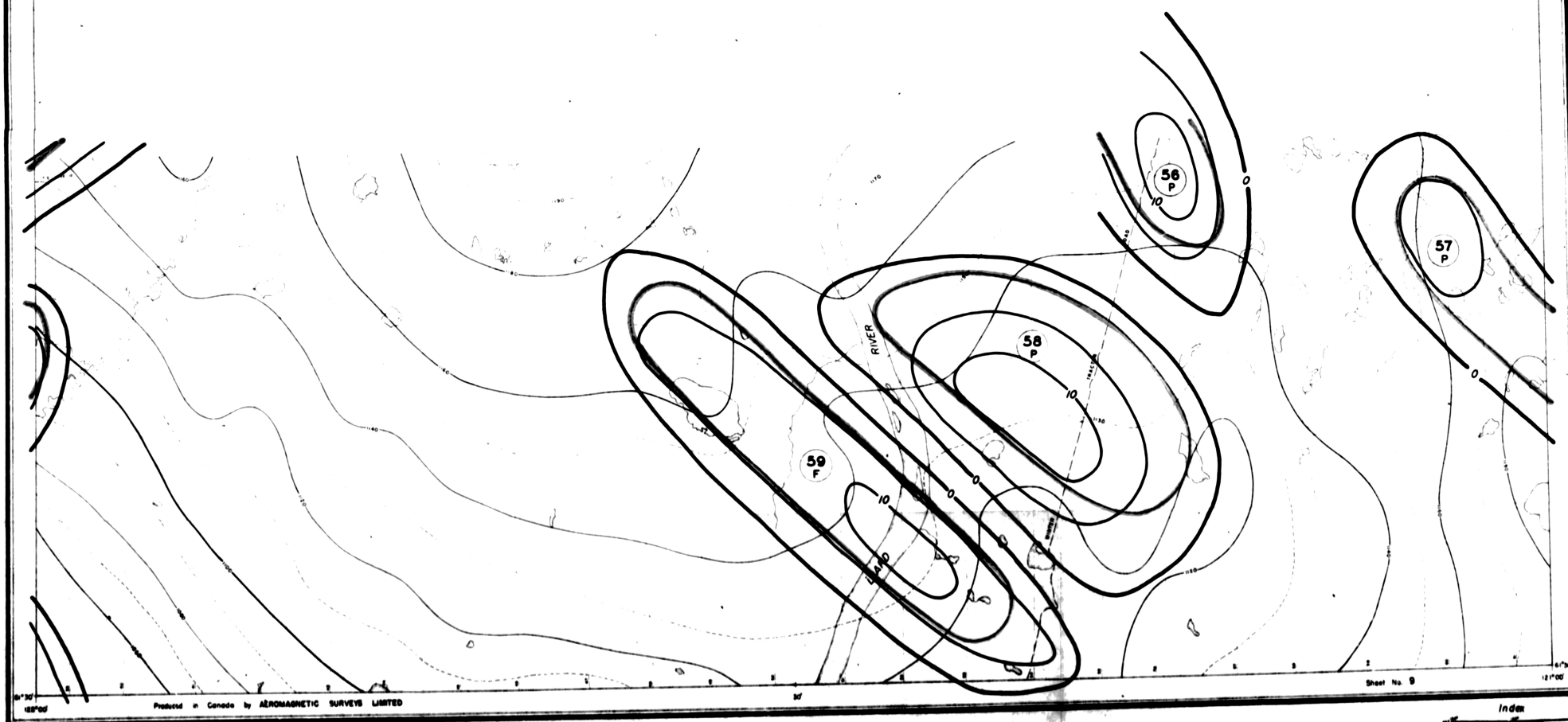
CONTOUR INTERVAL 2×10^{15} CGS

CALCULATED BY
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SIMPSON - LIARD AREA, N.W.T.
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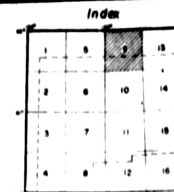




5000' FLIGHT LINE SPACING 1/2 MILES
 ALTITUDE 5000 FEET ABOVE SEA LEVEL
 100 GAMMA CONTOUR
 150 GAMMA CONTOUR
 20 GAMMA CONTOUR
 40 GAMMA CONTOUR
 MAGNETIC LOW
 FLIGHT LINES

SCALE
 1 inch to 1 mile

RESIDUAL MAGNETIC ANOMALIES
 CONTOUR INTERVAL 5 GAMMA
 LOCAL AREA OF INTEREST
 FAULT
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