INTERPRETATION REPORT

for

CONSOLIDATED SYNDICATE

of the

QUEENSTOWN AEROMAGNETIC SURVEY

(JAN - FEB 1971)

1. GEOLOGICAL BACKGROUND

(from "Geology and Mineralization of Tasmania" - M. SOLOMON)

The area under consideration is located in northwestern Tasmania where the principal outcrops are Precambrian. Massive granite intrusives appear along the western coast whereas to the south and southeast, sediments and lavas of Silurian to Tertiary age overlap onto the Precambrian bedrock.

The Precambrian is composed of mica schist containing muscovite, albite and garnet, accompanied by phyllites and amphibolites (pϵw, Whyte schist).

These rocks are believed to have undergone several deformations, as opposed to those of the Upper Precambrian made up of quartzites, schists, conglomerates and volcanic rocks (pϵi, pϵo, pϵb). According to SPRY (1962), the

two series are separated by an orogeny : the Frenchman Orogeny.

The Cambrian (in the surveyed zone) seems to be represented essentially by volcanic rocks (gabbros) outcropping towards the south.

The massive granites were formed (?) during the Tabberabberan and/or Kamimblan orogenies and have been strongly tectonised. It is important to note the presence of subsequent mineralization along the boundaries of the intrusions.

Some sedimentary and some volcanic rocks (dolerites and basalts) overlap the Precambrian in the southern part. They range from Silurian to Tertiary and do not seem to be very thick.

The principal structural directions doubtlessly correspond to orogenies during the end of the Precambrian, and are essentially south-southwest/north-northeast and north/south. Faults trending west-northwest/east-southeast to east/west can be remarked in the granite zones.

II. THE MAGNETIC MARKERS

Among the numerous mineralizations to be found in this region, magnetite-bearing quartzites, associated with amphibolites or not, should give rise to large-amplitude magnetic anomalies.

Veins of pyrrhotite, whether associated with cassiterite or not, should also constitute good markers.

Had the survey been of a more detailed nature, it would have undoubtedly been possible to differentiate between the granites and the Precambrian metamorphic ensembles.

Generally, the dolerites give rise to small anomalies and the veins are recognizable more by the magnetic discontinuities

Faults or mineralized contacts should also produce anomalies, elongated and aligned along well defined directions.

III. GEOPHYSICAL RESULTS

1. General Observations

(a) The survey is located in the southern magnetic hemisphere where the inclination is in the vicinity of 72°. The average intensity of the total magnetic field is approximately 62,000 gammas.

(b) For a vertical-walled magnetic body oriented east/west, the anomaly created by a north/south profile corresponds to that generated by an inclined body of 72° (very largely positive with a small negative undershoot and a slight disparity towards the south between the centre of the body and the axis of the anomaly).

In fact, it would appear that the principal anomalies in this survey (those brought out by the east/west profiles) have a north/south to north-northeast/south-southwest direction . Thus the apparent inclination i', as given by

$$\tan i' = \frac{\tan i}{\cos \varphi}$$

where i' = the apparent inclination
i = the local inclination
φ = the angle between the axis of the body and an east/west line.

is included between 81° and 90°, which is to say that these anomalies are practically symmetrical.

(c) The quantitative interpretation makes it possible to distinguish between two types of anomalies :

- large, positive, and more or less symmetrical anomalies corresponding to infinitely extended downwards compartments, i.e. veins or dykes.

- anomalies either large or small but characterized by a positive and a negative, corresponding to fault or contact models. These can be confused with vertical-walled compartments when the latter are very strongly dipping (or when the remanent magnetism has a relatively important influence).

(d) The quantitative interpretation of the anomalies using the CGG "ITI" and "ITI-gamma" Master Curves enables the definition of the apparent magnetic intensity J' and as a consequence the probable susceptibility of the magnetic marker from $J' = KT$ (where T is the average local total magnetic intensity), and the size of the body $2a = \alpha h$ (α coming from the master curves and h being the depth to the roof of the body beneath the flight- level).

(e) The magnetic discontinuities are brought out into the open by :

- magnetic gradients that correlate over large distances,
- the alignment of ruptures in magnetic axes,
- a succession of characteristic anomalies,
- the interface between two magnetic units having different styles.

These testify as to the existence of either tectonic accidents or contacts between formations of different magnetizations. It is certain that if here and there our outlining of these accidents is not ambiguous, it is nevertheless possible, in other cases, for these to be envisioned as having a different orientation.

2. Possible Significance of the Principal Magnetic Features of the Surveyed Zone

The two 1/48,000 sheets show the quantitative interpretation of the sufficiently well-defined major anomalies and the magnetic discontinuities that are brought to light by the systematic plotting of the maxima and minima of the recorded profiles.

The very first remark that can be made concerns the tight relation that exists between the geological map (furnished by Consolidated Syndicate) and the geophysical trends; that is to say, the principal anomaly axes and/or the principal discontinuities.

Several large amplitude anomaly axes stand out against a relatively calm and homogeneous magnetic background and, in a first appreciation, one can imagine mineralized contacts and dykes in a less magnetic and weakly contrasted metamorphic bedrock.

In the absence of further geological information, the geophysical results and their possible significance can be presented in the following manner :

(a) Sheet 3 (Northern Part)

No geological information whatever was available for this part of the survey. Nevertheless, one can note the remarkable coincidence between the location and the north/south direction of the

magnetic compartments, a_7, a_8 and a_9, and the alignment of the crests of Mts Norfolk, Mabel, Lily and Hazelton.

The quantitative interpretation shows that the marker is located very near to the topographic surface. The anomalies have amplitudes of some 80 to 100 gammas overall, and apparent magnetic intensities between 20 and 50. This contrast indicates the presence of a magnetic mineralization, most probably disseminated magnetite or pyrrhotite in a particular layer.

The same phenomemon seems to repeat itself at the foot of Mt McDougall (where the Leigh River flows) and at the feet of Mts Bolton and Pyramid Hill. The significance of the anomaly groups a_1 and a_1' would thus be similar. To the south of Mt McDougall, the presence of a west-northwest/east-southeast fault, and axes of relatively intense anomalies (a_1) could indicate a zone of mineral interest.

The magnetic structures giving rise to the anomalies at the east of the sheet, a_2, a_3, and a_4, could have a different significance. They could be related to magnetite quartzites associated with lower Precambrian amphibolites. The differences in the magnetic intensities would be indicative of either differences in separation from the flight plane to structure, or to mineralizations with different

richnesses of magnetite. The lack of detailed information as to the topography of the area makes it impossible to situate them with respect to the ground surface.

It is certain that the zone a_2, if it is not already known, presents an undeniable interest.

Two main directions of magnetic discontinuities appear : west-northwest/east-southeast and northeast/southwest, the latter corresponding to the directions of dolerites located in the Upper Precambrian.

(b) Sheet 4 (Southern Part)

Faults F_1 and F_2 are located on the borders of granite intrusives. It was not possible to make a valid quantitative interpretation of F_1, as this is only defined by one flank. Nevertheless, it could appear that this contrast is not located at the surface. It seems to correspond to a marginal type of mineralization such as is spoken of by M. Solomon.

The same is true for F_2 (which seems to be a complex movement) located under an apparently thin cover of Tertiary basalts and connected to the Mt Heemskirk granite intrusion, where pyrrhotite and cassiterite mineralizations are known.

Anomaly a_4 continues towards the south of the survey and coincides with the contact $p \in w$, $p \in o$, indicated on the 1/100,000 geological map. Does this too correspond to magnetite? The magnetization intensities are again important and there is no evident reason for not continuing this structure.

Anomalies a_6 and a_8 would correspond to amphibolites if one compared their location and direction to those noted on the geological map. The intensities are weaker than the preceeding ones but the magnetic behaviour of amphibolites can be quite varied.

There remains the a_5 anomaly, which we would tend to attribute to the presence of volcanic rocks $p \in b$ in (discordant?) contact with $p \in w$. Could it be that this represents serpentinized rocks that would act as hosts to deposits of sulphides?

To the south of F_1 may be noted a magnetic discontinuity having the same direction as the dolerites of this region.

Anomalies a_{10} and a_{11} seem to coincide with a layer of Bernafai volcanics. Anomalies a_{10} and a_{11} are very similar to a_7, a_8 and a_9. The intersection of a_{10} by a transverse discontinuity may be an interesting structural feature in regard to mining exploration.

Finally, the tectonic directions of the different orogenies that have affected the Precambrian are

perfectly defined by the aeromagnetics. The zones of mineralization other than magnetite could be in a_1, a_1', a_5, a_7 through a_9 and the a_{10}-a_{11} magnetic marker.

The magnetic structures are all located at the surface or very close to it.

Accompanying Maps:

1. Isogram contour map
2. ✓ ✓ ✓
3. Interpretation map
4. ✓ ✓

N. Fabre

N. FABRE

Massy, 16 April, 1971.

C. DIKOFF
Australian Branch Manager

CONSOLIDATED SYNDICATE
ZEEHAN — TASMANIA

3412

SHEET Nº 1

71-7614

AIRBORNE MAGNETOMETRIC SURVEY

TASMANIA

ISOGAM CONTOUR MAP

LEGEND

GRID UTM — Meridian of origin 145°00' East of Greenwich 500 Km.
HAYFORD SPHEROID — Latitude of origin 0° Equator 10,000 Km

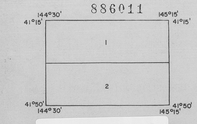
FLIGHT PROGRAM — Line spacing 0.4 Nautical Mile
Flight altitude 2700' Barometric

Flight line with fiducial mark

ISOGAM CONTOURING
Spacing 20 gammas

20
100
500

886011



SCALE : 1/48,000

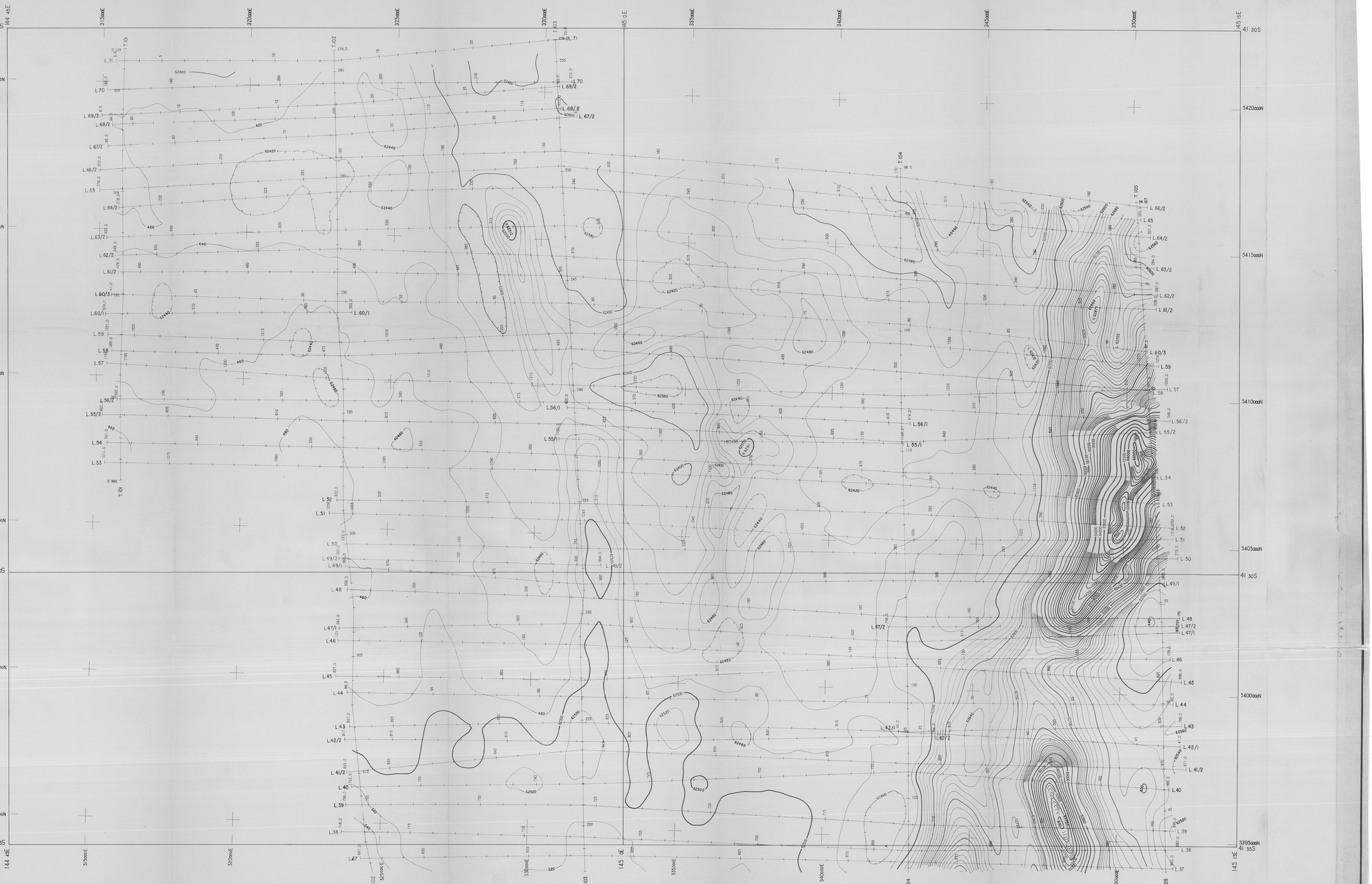
1 0 1 2 miles

Survey and compilation carried out by
COMPAGNIE GENERALE DE GEOPHYSIQUE
26-28 Manning Street, Sth BRISBANE QLD

January 1971

Survey 2665

42/2



CONSOLIDATED SYNDICATE
ZEEHAN — TASMANIA

3413

SHEET Nº 2

71-754

AIRBORNE MAGNETOMETRIC SURVEY

TASMANIA

ISOGAM CONTOUR MAP

LEGEND

GRID: UTM
HAYFORD SPHEROID

Meridian of origin 145°00 East of Greenwich 500 Km.
Latitude of origin 0° Equator 10,000 Km

ISOGAM CONTOURING
Spacing 20 gammas

FLIGHT PROGRAM — Line spacing 0.4 Nautical Mile
Flight altitude 2700' Barometric

Flight line with fiducial mark

Fiducial

20
100
500

886012

144°30' 145°15'
41°15' 41°15'
41°50' 41°50'
144°30' 145°15'

1
2

5 cm

SCALE 1/48,000

1 0 1 2 miles

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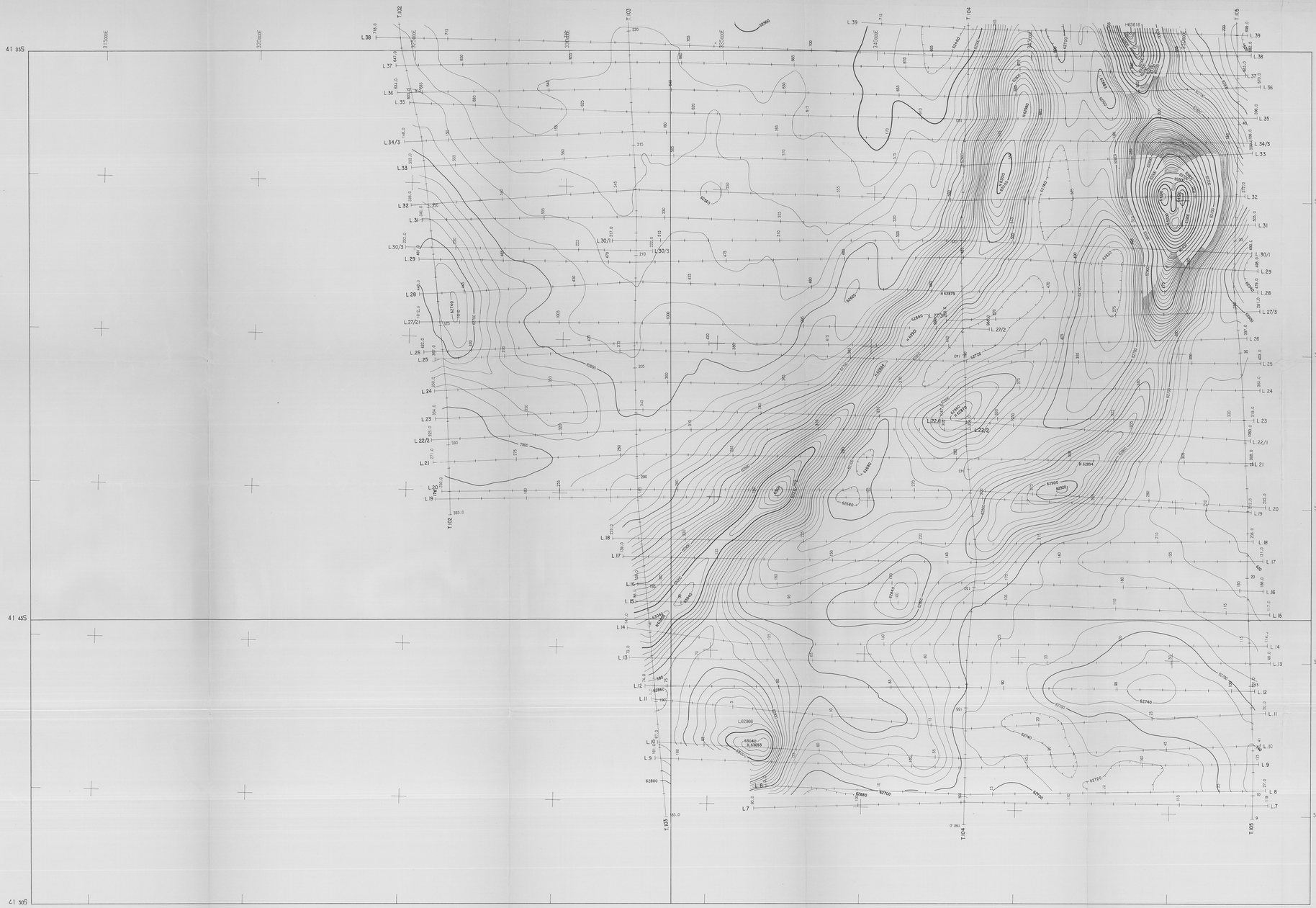
Survey 2665



CONSOLIDATED SYNDICATE
ZEEHAN – TASMANIA

3414 71-754

SHEET No 3

AIRBORNE MAGNETOMETRIC SURVEY

TASMANIA

INTERPRETATION MAP

LEGEND

GRID U.T.M. (HAYFORD SPHEROID)
- Meridian of origin 145°00' East of Greenwich 500 Km
- Latitude of origin 0° Equator 10,000 Km

FLIGHT PROGRAM
- Line spacing 0·4 Nautical Mile
- Flight altitude 2700' Barometric

Flight line with fiducial mark

Depth estimate (in metres above or below sea level) + 450 or – 450

Intensity of magnetization in σ (20)

Anomaly axes

Magnetic discontinuity

Probable contouring of the structure

886013

5 cm

SCALE 1/48,000

1 0 1 2 miles

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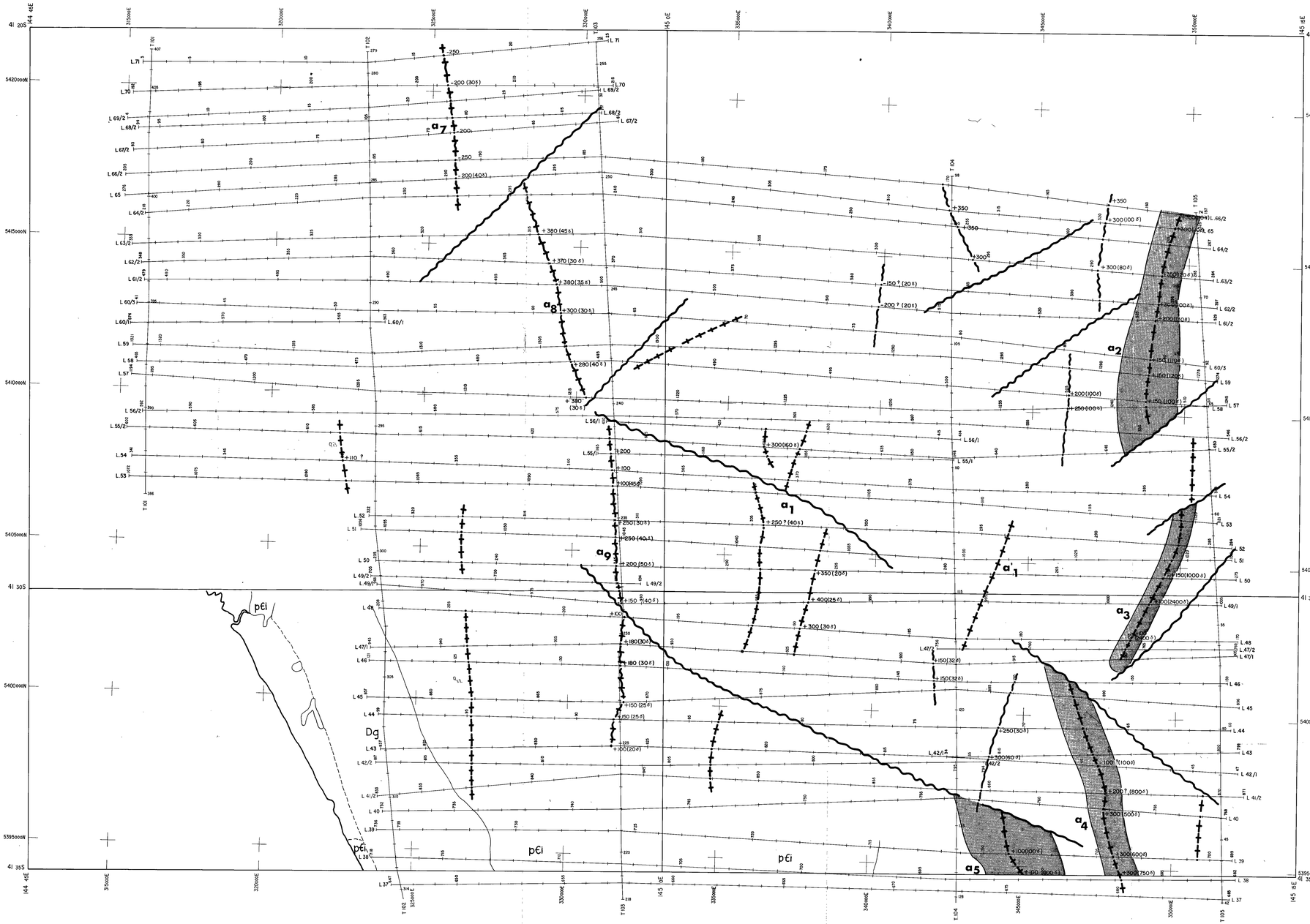
January 1971

42/2

Survey 2665

TERTIARY	Tb	BASALT
JURASSIC	Jd	DOLERITE
PERMIAN	Pz	ZEEHAN TILLITE
DEVONIAN	Dg	GRANITE
ORDOVICIAN TO DEVONIAN	OS	SEDIMENTS
CAMBRIAN	€g	GABBRO
	///	DOLERITE
	p€s	SAVAGE DOLERITE
YOUNGER PRE-CAMBRIAN	p€dl	DELVILLE CHERT
	p€b	BERNAFAI VOLCANICS
	p€c	CORINNA SLATE
	p€d	DONALDSON GROUP – SEDIMENTS
	p€i	INTERVIEW SLATE OR QUARTZITE
	p€o	OONAH QUARTZITE OR SLATE
OLDER PRE-CAMBRIAN	Am	AMPHIBOLITE
	p€w	WHYTE SCHIST
PRE-CAMBRIAN	p€	UNDIFFERENTIATED NORTH OF LAGOON RIVER



CONSOLIDATED SYNDICATE
ZEEHAN – TASMANIA

3415 SHEET No 4
71-754

AIRBORNE MAGNETOMETRIC SURVEY

TASMANIA

INTERPRETATION MAP

LEGEND

GRID U.T.M.
HAYFORD SPHEROID — Meridian of origin 145°00 East of Greenwich 500 Km; Latitude of origin 0° Equator 10,000 Km

FLIGHT PROGRAM — Line spacing 0·4 Nautical Miles; Flight altitude 2700' Barometric

Flight line with fiducial mark

Depth estimate (in metres above or below sea level) + 450 or - 450

Intensity of magnetization in δ (20)

Anomaly axes

Magnetic discontinuity

Probable contouring of the structure

886014

6 cm

SCALE : 1/48,000

1 0 1 2 miles

Survey and compilation carried out by
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26-28 Manning Street, S.th BRISBANE Qld

January 1971

Survey 2665

TERTIARY	Tb	BASALT
JURASSIC	Jd	DOLERITE
PERMIAN	Pz	ZEEHAN TILLITE
DEVONIAN	Dg	GRANITE
ORDOVICIAN TO DEVONIAN	OS	SEDIMENTS
CAMBRIAN	€c	GABBRO
	€g	
	///	DOLERITE
	p€s	SAVAGE DOLERITE
YOUNGER PRE-CAMBRIAN	p€dl	DELVILLE CHERT
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	p€i	INTERVIEW SLATE OR QUARTZITE
	p€o	OONAH QUARTZITE OR SLATE
OLDER PRE-CAMBRIAN	Am	AMPHIBOLITE
	p€w	WHYTE SCHIST
PRE-CAMBRIAN	p€	UNDIFFERENTIATED NORTH OF LAGOON RIVER