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Q29, 30, 37, 38, 45.

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66-0436.

AEROMAGNETIC SURVEY

SHEFFIELD AREA

NORTH CENTRAL TASMANIA

FOR

MICROFILMED

THE BROKEN HILL PROPRIETARY COY. LTD.

GEOPHYSICS

AMEG PTY. LTD.

203002

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SUMMARY

During March and April of 1966, Australasian Mining and Engineering Geophysics Pty. Ltd. (AMEG) conducted an airborne magnetometer survey over the Sheffield Area in North Central Tasmania. The isomagnetic contours and the interpretation are shown on Plate 4.

It is possible to divide the magnetic pattern into eight zones. The most significant are:

1. Zone C which contains a strong positive trend and several large circular anomalies. The sources of these features are most likely steeply dipping dyke-like bodies and vertical cylindrical shaped masses of basic and ultra-basic character.

2. Zone H which is occupied by a 200 gamma plateau-like high. This feature is probably due to a change in the lithology of the basement to a more basic character than the surrounding zones.

In general, the magnetic pattern of a consideral part of the area is complicated by numerous low to medium amplitude anomalies due to thick and widespread basalt flows.

The magnetic picture does not appear to bear any definite relation to the granites, sedimentary lithologies or structural orientations of the area. With the possible exception of Zone H, areas of known mineralisation cannot be related to any recognisable magnetic feature.

INTRODUCTION

In January of 1966, Australasian Mining and Engineering Geophysics Pty. Ltd. (AMEG) contracted with The Broken Hill Proprietary Coy. Limited to perform an airborne magnetometer survey over the Sheffield area in north-central Tasmania (Plate 1). The survey was flown during the months of March and April of 1966 in conjunction with a survey of the Staverton Area for The Mount Lyell Mining and Railway Co. Limited. The following pages and accompanying maps constitute the final report on the survey.

The purpose of the aeromagnetic survey was to aid in the interpretation of the geology of the area. More specifically, this included calculations of the depths to the anomaly sources, their strikes, dips and susceptibilities; and the location of contacts, faults, intrusives and any other structural or lithologic information indicated by the magnetic data. The iso-magnetic maps are presented individually at a scale of 1:31,680, and also as a single composite map at a scale of 1:126,720. The interpretation maps are presented at a scale of 1:63,630.

The survey was planned to be flown at 500 feet above terrain along east-west traverses spaced at either one half or one quarter of a mile apart. The rugged topography of the area, combined with low altitude flying, made navigation difficult during the production phase of the aurvey. As a result some reflights were necessary. It was not possible to maintain 500 feet terrain clearance at all times and the altitude varied from 300 to 900 feet. This altitude variation was taken into account during the quantitative analysis of the anomalies.

All depth estimates referred to in this report are in feet subsurface. Circled numbers on the map refer to anomalies mentioned or discussed in the report. Lettered numbers on the

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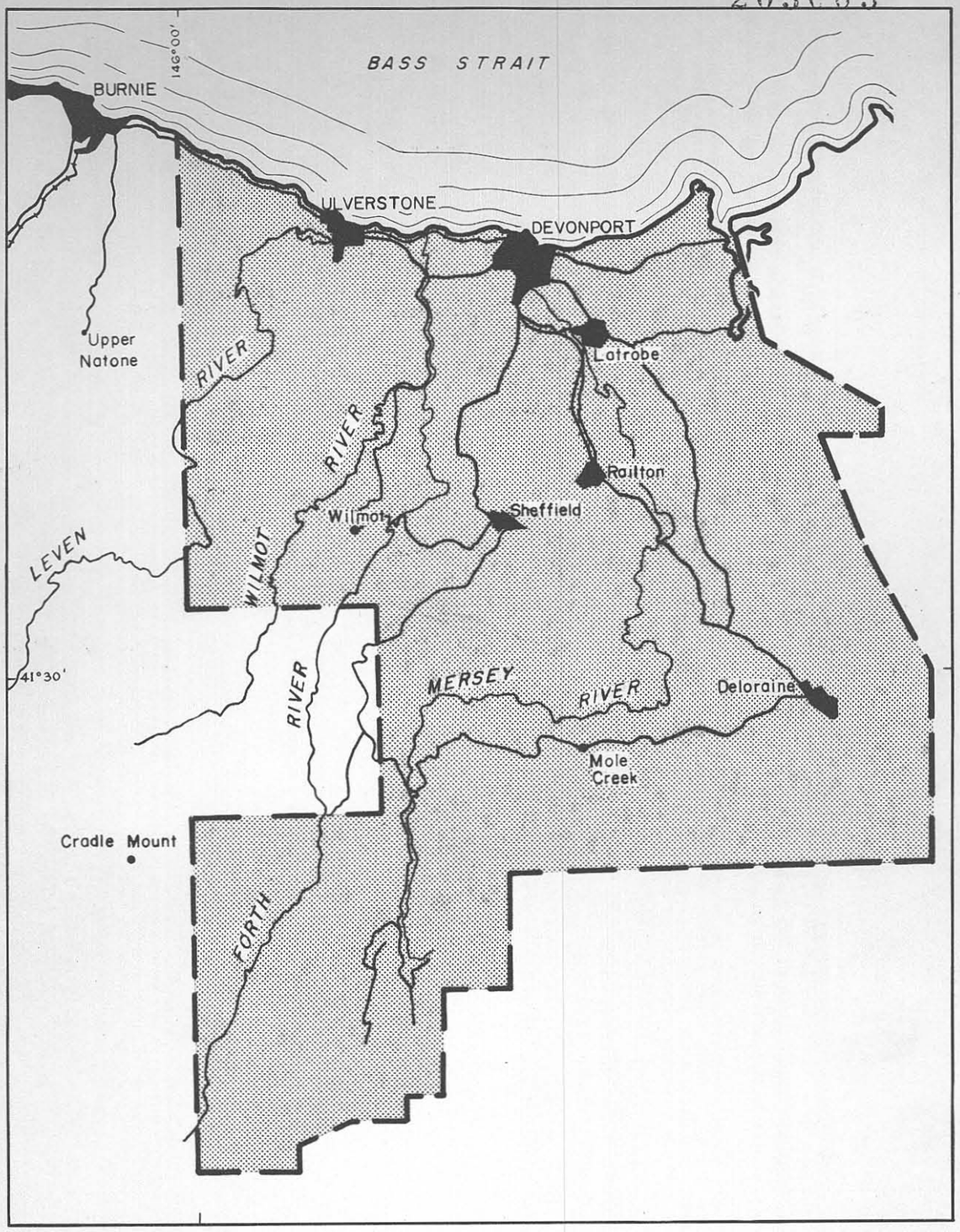

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Scale 1:500,000

5 4 3 2 1 0 5 10 15

MILES

THE BROKEN HILL PROPRIETARY COMPANY LIMITED

LOCALITY MAP

AEROMAGNETIC SURVEY
SHEFFIELD AREA
TASMANIA

AMEG PTY. LTD.

5 cm

PLATE 1

map refer to magnetic and structural features such as magnetic trends, faults and other features of interest. The statistical data relevant to the survey are tabulated in Appendices A and B.

GEOLOGICAL HISTORY

During Precambrian times a north-south trending structural high, the Tyennan Geanticline, occupied the central part of Tasmania. The rocks of the Geanticline were composed of metamorphosed sediments. In late Precambrian time a miogeosynclinal trough developed around the outer edge of the Geanticline. This structural pattern persisted throughout the Cambrian Period. The source of the sediments filling the trough during this time was largely from within the trough itself. These Cambrian sediments are correlated with the Dundas Group. Also during the Cambrian, a sheet-like body of basic or ultrabasic material intruded into the base of the Dundas Group and its correlates, or alternatively, was extruded prior to its deposition. The possible existence of such a sheet-like body in the survey area is suspected on the basis of its occurrence in the neighbouring areas, and also on the basis of small serpentinite exposures within the survey area.

The Jukesian Orogeny in Upper Cambrian time resulted in the general folding of the sediments, including the basic intruded or extruded sheet. The direction of the folding was parallel to the periphery of the Tyennan Geanticline. Thereafter, the Ordovician, Silurian, and early Devonian sediments were deposited in a tectonically uneventful environment until the commencement of the Tabberabberan Orogeny when granite intrusions, uplifts, faulting and folding took place. All the previously folded Cambrian rocks as well as the later undeformed ones were folded along northwest-southeast axes.

The prolonged peneplanation following the Tabberabberan Orogeny was terminated by the deposition of Permian marine and glacial sediments. Toward the end of the Permian the sea gradually retreated and coal measures were formed, followed by thick Triassic freshwater beds. During the Jurassic, the

Permo-Triassic rocks were intruded by huge masses of dolerite. A period of valcanism prevailed in Tertiary time, causing the extrusion of basaltic lavas. Epirogenic movements accompanied both the dolerite intrusion and the basalt extrusion.

INTERPRETATION

The magnetic pattern of the area can be divided into several zones based on the size, shape and magnitude of the anomalies, their trends, and their relationship with each other. In the following discussion these zones are described and discussed in terms of the geology of the area. The geologic maps used in the correlation are:

1. The 1 inch = 1 mile geologic maps of Du Cane, Middlesex, Sheffield and Devonport areas published by the Tasmania Department of Mines. These maps cover the western two-thirds of the area.
2. The geologic maps accompanying a publication on the geology of the Delorine-Golden Valley area by Wells (1957).
3. The 1:506,880 geological map of Tasmania issued by Tasmania Department of Mines, 1961.

The approximate boundaries of most of the basalt outcrops and all the granite and serpentine exposures in the survey area are indicated on the interpretation maps (Plate 4). The locations of mines and mineral workings (excluding coal mines) are also shown on the same plate.

Zone A This zone is dominated by a north-south aligned belt of two parallel negative trends TR1 and TR2 which border a distorted positive trend TR3 of about 200 gammas. The amplitude of the anomalies within this trend varies between 250 and 500 gammas.

Directly north of this anomalous belt there is a large positive feature with associated negative anomalies. Three minor anomalies with intensities between 300 and 500 gammas are superimposed on this feature.

An isolated anomaly 1 with its associated negative is located just inside the eastern boundary of this zone.

Attention is directed to the distinctive character and similar shapes and positions of all the negative anomalies associated with the positive ones. Analysis indicates that the causative bodies are either tabular masses or dykes of finite depth.

The geologic maps reveal that the anomalies of this zone are related to the basalts in the area, which are either exposed or concealed by alluvium.

Zone B This zone covers a very large area and contrasts sharply with the adjoining zones in that it contains very few anomalies. Its general magnetic pattern consists of isolated low intensity anomalies separated by gentle poorly defined gradients.

Two exceptions to this pattern can be recognised. The first exception occurs along the western boundary of the area at the 865 N yard grid line. It consists of two elongate and rather small anomalies 2 and 3 of about 200 gammas amplitude. Their close association with the negative trend TR4 makes them very similar in character to the anomalies of Zone A, suggesting that they may also be the expression of basalt.

Reference to the geological map indicates that the Precambrian Fisher group only is present in the vicinity of the above anomalies. This group outcrops over a very large area within Zone B and its magnetic expression consists of a well defined anomaly 4 and some isolated low amplitude anomalies.

The second exception to the general magnetic pattern of Zone B occurs in the extreme southeastern corner of the

area. Two small partly recorded anomalies (No. 5, 300 gammas, and No. 6, 600 gammas) are situated in an area of dolerite outcrop.

Several partly recorded, medium amplitude, anomalies such as anomalies 7 and 8 are shown in Zone B along the periphery of the areas not covered by the aeromagnetic survey. These areas are covered by thick plateau-forming dolerite, and the traverses end either at the edge of the plateau or slightly inside it.

In contrast, the large dolerite mass between Forth and Arm Rivers (corresponding to the area west of Zone A) has very little or no effect on the magnetic picture.

The magnetic expression of the basalts in Zone B is not consistent. The east-west elongate basalt outcrop in the area of grid 885N and 440E does not appear to have recognisable anomalies associated with it, but the outcrops to the south have a well defined 100 gamma anomaly 9, and trend TR5 associated with them.

Anomalies 10 and 11 are broad, low amplitude features. They do not appear to be related to the surface geology. Depth estimates indicate the source of anomaly 10 to be about 1,300 feet subsurface. The depth to the source of anomaly 11 is of the same order of magnitude.

Anomaly 12 represents a small portion of a much larger anomaly located outside the subject area. It is not defined well enough for discussion.

The cause of anomaly 13 is most likely a horizontal or possibly gentle northward dipping tabular body. Depth

estimates indicate it to be 350 - 400 feet subsurface.

All the exposed Precambrian and Paleozoic rocks, local and regional structures, and mines and mineral shows which occur within the limits of Zone B cannot be related to any recognisable magnetic features.

Zone C. In contrast to Zone B, this zone is characterized by numerous anomalies which range from very small features of about 20 gammas to very large ones well over 2,000 gammas.

Zone C crosses the survey area from its eastern to its western boundary and most likely extends beyond it. In the eastern half of the area it consists of a comparatively narrow belt which separates the non-anomalous Zones B and E. Zone C widens considerably in the western half of the area. Its boundary with Zone F is not as well defined as its boundaries with the other zones.

A pronounced positive trend TR6 of about 200 gammas begins near the eastern end of this zone and extends almost a third of the way across the survey area where it joins the large circular anomaly 14. This trend and circular anomaly can be recognised on the magnetic map by the outline of the 2,500 gamma contour.

Trend TR6 changes direction from east-west at its eastern end to northeast-southwest further west. In the area of anomaly 15 its northeast-southwest strike is interupted by a local and sudden change to north-south. Trend TR6 contains several anomalies. The more pronounced of these are the 400 gamma anomalies 16 and 17, the 700 gamma anomaly 15, and the 500 gamma anomalies 18 and 19.

The character of trend TR6 is emphasized by the closely associated negative trend TR7 which runs immediately south of it. This negative trend terminates against anomaly 15. At this point there is a less pronounced negative trend TR8, which occurs north of trend TR6.

A third, less pronounced U-shaped positive trend TR9 of about 100 gammas partly borders the southern flank of the negative trend TR7. It contains several small anomalies which range up to 200 gammas.

Several minor anomalies are present in the region south of the area where trend TR6 changes strike to north-south. They range from 20 to 100 gammas in amplitude, and do not present a coherent magnetic pattern.

The characteristics of all the trends described above suggest their sources to be steeply dipping dyke-like bodies. Detailed analysis of several anomalies within these trends show the susceptibility values of their causative bodies to range between $4,000 \times 10^{-6}$ and $6,000 \times 10^{-6}$ c.g.s. units, and their depths to be generally in the range 200 to 300 feet and all less than 500 feet subsurface.

The geological maps indicate that the area covered by these trends is overlain almost completely by basalt. The nature of the magnetic pattern and the depth estimates point to a source other than the surface basalt as the cause of the magnetic trends. The susceptibility values obtained from detailed analysis indicate the cause of the anomalies to be a lithology of intermediate or basic character. It may be inferred that the magnetic trends represent a large fissure or a system of fissures through which the basalts were extruded in Tertiary time. However, it is more likely that they indicate a tabular body which was probably intruded into the

sediments and then complexly folded and faulted. The sudden change in the direction of trend TR6 in the area of anomaly 15 may be indicative of large scale faulting which is not exposed.

It is possible that the complex magnetic pattern south of anomaly 15 is due to basalt.

The large circular anomaly 14 has an average intensity of about 300 gammas and is probably the most pronounced feature in the survey area. Several small high intensity anomalies are superimposed on it. Of these, anomaly 20 has an amplitude of 900 gammas and is the largest.

A negative trend TR10 closely bounds the southern and western limits of anomaly 14. The source of these anomalies is a body resembling a vertical cylinder. The susceptibility value and depth of this source is of the same order as the sources of trend TR6. The exposed rocks in the vicinity of anomaly 14 consist mainly of non-magnetic Paleozoic rocks.

Anomaly 21 is located immediately west of anomaly 14 and has an intensity of about 500 gammas. It is directly situated over an exposure of Dove Granite. It may be misleading to consider that the Dove Granite is magnetic on the basis of this example. The geological map shows several small exposures of this rock in the general area, which suggests that they are portions of a much larger buried mass. None of these exposures or the inferred buried mass are represented by anomalies.

An important magnetic feature occurs along the southern boundary of Zone B not far west of trend TR9. It consists of a narrow positive trend TR11 which broadens considerably at its northwestern half. It is well defined by the 2,500 gamma contour.

The significant feature of this trend is the elongate 2,000 gamma anomaly 22. It appears to be caused by a dyke-like body, and detailed analysis indicates its source to be 200 feet subsurface, with a dip of $83^{\circ}S$ and a susceptibility value of $15,000 \times 10^{-6}$ c.g.s. units. Such a susceptibility value most certainly refers to an ultra-basic lithology as the cause of the anomaly, with a content of 6% magnetite by volume.

North of anomaly 14 are several minor anomalies which do not have a definite magnetic pattern. They are thought to be the expression of basalt present in their vicinity.

West of these anomalies is the 600 gamma anomaly 23 with its associated anomalies and trends. Except for its smaller size, it is similar to anomaly 14.

Numerous anomalies of varying amplitudes and sizes are present in the western half of Zone B beyond the negative trend TR10. Most of the small anomalies with amplitudes of up to 300 gammas may be attributed to the basalt in the area. These anomalies complicate the magnetic picture, and help obscure the more significant large ones.

The significant anomalies are:

(a) Anomalies 24 and 25 of about 400 gammas, which may be considered as a single anomaly as outlined by the 2,500 gamma contour, and with which the negative trend TR12 is associated. These anomalies appear to be caused by a horizontal or gently northward dipping tabular mass (sill) about 300 - 600 feet subsurface.

(b) Anomaly 26 (400 gammas) is very similar to anomalies 24 and 25, and may be caused by a similar source. The boundary of anomaly 26 can be approximately traced by the 2,500 gamma contour.

(c) The semi-circular anomaly 27 and the associated negative trend TR13 which are similar to anomaly 14 and trend TR10 discussed earlier. It is probable that they are caused by a mass resembling a vertical cylinder. The 2,500 gamma contour can be considered to outline anomaly 27 which has an average intensity of about 1,000 gammas, with smaller anomalies superimposed on it. Of these, anomaly 28 (2,500 gammas) is the most pronounced.

Several short trends branch out of anomaly 27 and extend southward. It is not certain if these trends, and also anomaly 29, are part of the major anomaly 27 or are the expression of the thick basalts in the area. It should be pointed out that trend TR14 occurs almost directly over a ridge of thick basalt.

Detailed analysis shows the depth to the source of anomaly 28 to be 150 - 250 feet subsurface, and the susceptibility value to be 16,000 x 10^{-6} c.g.s. units. The latter figure is equivalent to 7% magnetite by volume.

(d) It may be possible to consider anomalies 30 and 31 as parts of a larger, semi-circular but poorly-defined anomaly, which is partly bounded by the negative trend TR15 east and south of it. It is not certain if anomalies 30 and 31 and trend TR15 can be compared to the similar but better defined features (anomaly 14 and trend TR10; anomaly 27 and trend TR13).

Detailed analysis of anomalies 30 and 31 indicates a source between 150 and 200 feet subsurface, with a susceptibility value of 2,200 x 10^{-6} to 2,800 x 10^{-6} c.g.s. units.

(e) The positive trend TR16 extends a short distance along the southern boundary of the area directly south of the negative trend TR15. Its amplitude within the survey area is at least 500 gammas. It is not possible to comment on it because only its northern flank falls within the survey area.

None of the trends and anomalies discussed above can be related to the exposed Paleozoic sediments or the local and regional structural orientations as shown by the geological maps. One exception is the coincidence of trend TR16 with a regional anticlinal axis.

Zone D This zone does not contain any distinctive anomalies. The most notable features occur in the northern part and consist of low amplitude northwest-southeast striking positive and negative trends.

The geological map shows the area of Zone D to be overlain completely by Jurassic dolerite. Depth estimates on anomalies 32 and 33 indicate near-surface sources.

Zone E This zone is comparable to Zone B in its non-anomalous character. Three groups of anomalies (Nos. 34, 35 and 36) can be recognised, and they are related to the dolerite and basalt present in their vicinity.

The rest of the area is covered by Precambrian and Paleozoic rocks as shown by the geological maps. Apparently these rocks lack magnetic expression.

Zone F This zone contains a complex anomalous pattern. Most of the anomalies consist of north-south elongate features ranging from 20 to 200 gammas. The negative anomalies are as numerous as the positive ones. They are most likely the effect of widespread basalt and possibly dolerite.

There are two features in this zone worthy of attention. The first feature is the sharp and very distinct boundary of Zone F with Zone E as defined by the long and narrow positive trend TR17. This sharp contrast between Zones E and F may be due to the lack of basalt east of trend TR17, but it is equally possible that it is the expression of large scale faulting associated with the Cainozoic graben system in Northern Tasmania.

The second feature is the pronounced 500 gamma semi-circular anomaly 37 and its northwesterly positive trend TR18. These features with their closely associated negatives have a striking resemblance to trend TR6 and anomaly 14 of Zone C. Detailed analysis shows the depth to the source of anomaly 37 to be 150-200 feet subsurface and the susceptibility value $3,200 \times 10^{-6}$ units.

Zone G. Most of the anomalies of this zone may be attributed to basalt. Those which are considered to have sources other than basalt, are discussed below.

(a) Anomaly 38 and trend 19 have distinctly different characteristics than the anomalies discussed so far. Anomaly 39 should be considered part of trend TR19 since it falls along its southeasterly prolongation, and also has similar characteristics.

The cause of anomaly 38 and trend TR19 may well be a source other than those responsible for the anomalies and trends mentioned so far. It is possible that they are due to a basement (in the regular sense of the word) source, whereas the other anomalies and trends are the expression of sources within the sediments.

Detailed analysis shows the sources of anomaly 38 and trend TR19 to be about 600 feet subsurface and their susceptibility values $1,900 \times 10^{-6}$ c.g.s. units. Attention is directed to the fact that the depth to this source is twice that obtained

for the other anomalies' sources, and the susceptibility value is much less.

The geological map of the area shows a linear system of faults which are considered to be the edge of a Cainozoic graben. These structures cannot be recognized on the magnetic map.

(b) Trend 20 is a pronounced feature with an average amplitude of about 300 gammas, and contains several anomalies. Of these, anomalies 41 (1,000 gammas) and 42 (900 gammas) are the more significant. Trend TR21 is similar to trend 20 but is less pronounced.

Detailed analysis of anomaly 41 indicates a source 300-400 feet subsurface with a susceptibility value of $10{,}000 \times 10^{-6}$ - $11{,}000 \times 10^{-6}$ c.g.s. units, which points to an ultrabasic source. The geological map shows two serpentine outcrops within the area of anomaly 41.

Susceptibility values between $5{,}500 \times 10^{-6}$ and $6{,}000 \times 10^{-6}$ c.g.s. units were obtained for trend TR21 and other parts of trend TR20, indicating a basic source.

Two small serpentine exposures fall within the outline of anomaly 40 (260 gammas). Detailed analysis indicates a susceptibility value of $2{,}100 \times 10^{-6}$ c.g.s. units for the source of this anomaly. This value appears to be too low to be attributed to ultrabasics.

Zone H This zone is occupied by a plateau-like high. Its boundary with Zone G is represented by a poorly-defined gradient of about 200 gammas. This gradient indicates that the basement rocks within Zone H are of a more basic character than those in the surrounding zones.

The geological map does not reveal any exposed lithological or structural features which can be directly related to the plateau-like high. But attention is directed to the coincidence of anomalies 43, 44 and 45 with the Lobster Creek Volcanics of Cambrian age.

The magnetic definition of the plateau-like high in the north-western corner of the zone is obscured by anomalies due to basalt present in the area.

Several anomalies are superimposed on the plateau-like high, the more significant of which are 45 (300 gammas), and anomalies 46 and 47 (400 gammas). Several high intensity trends are partially recorded along the western boundary of the zone. These trends are not defined well enough for discussion.

The geological map in the area of anomaly 46 reveals a rounded hill of basalt about 400 feet high. Anomalies 48 and 49, and the short positive trend TR21 show remarkable coincidence with the outline of the basalt present in this area.

There are several mines in the area of Zone H. None of these are associated with significant magnetic features. It must be pointed out however, that all the iron producing mines in the survey area are located in this zone. The disseminated magnetite deposits mentioned in B.H.P.'s report fall west of Zone H.

DISCUSSION OF RESULTS

Several conclusions can be drawn from the previous discussion. They are listed as follows:

1. The Basalt and dolerite do not have a consistent magnetic pattern.

   In many cases the presence of basalt is expressed by a complex association of positive and negative anomalies with amplitude of up to 500 gammas, but more often, about 200 gammas. In other cases however, the magnetic map does not show any anomalies in areas known to contain basalt.

   Dolerite has similar magnetic expression, but the associated anomalies are less complex and of much lower amplitude.

   Several factors complicate the magnetic patterns of the basalt and affect the intensities of its anomalies. These factors are:

   (a) The variation of the height of helicopter from the magnetic source. The height variation during the survey was 300-900 feet above terrain.

   (b) The degree of weathering, whereby the ferromagnetic minerals lose their magnetic properties partly or completely.

   (c) The variation in the thickness of the basalt.

   These factors apply equally well to the dolerite.

2. The exposed granites in the survey area do not have a characteristic magnetic pattern.

   It is difficult therefore to infer where granites are present, and consequently no recommendations can be made

concerning exploration for cassiterite, tungsten, and other ore minerals genetically related to granite.

3. The exposed lithologies (excluding basalt and dolerite), and structural orientations both local and regional, cannot be related to the magnetic anomalies and trends.

Two local exceptions are:

(a) The partly recorded trend TR16 (Zone C) which coincides with the strike of a regional anticlinal axis.

(b) The probable expression of Lobster Creek Volcanics by anomalies 43, 44 and 45 (Zone H).

It is thus concluded that all the significant anomalies and trends discussed earlier, are caused by an unexposed lithology. This lithology appears to be basic and ultrabasic in character. The few serpentinite exposures in the survey area do not appear to be systematically related to these lithologies.

It also appears that this basic unexposed lithology has no expression in the surface structure.

None of the susceptibilities obtained for the high intensity anomalies indicate large magnetite content in the source rocks. The highest amplitude anomalies in the area have susceptibility values of $15,000 \times 10^{-6}$ c.g.s. units (anomaly 22), and $16,000 \times 10^{-6}$ c.g.s. units (anomaly 28). These figures correspond to 6% and 7% magnetite or approximately 12% and 14% pyrrhotite by volume respectively.

In contrast, the lowest amplitude aeromagnetic anomaly associated with the Savage River deposit indicates a susceptibility of $127,000 \times 10^{-6}$ c.g.s. units, which corresponds to 37% magnetite by volume.

4. The mines and mineral workings shown on the geological map cannot generally be related to recognizable anomalies or anomalous patterns on the magnetic map. An exception may be the known iron occurrence in the area of Zone H.

5. The magnetic map is partially successful in defining the regional structural units (Carey, 1953, fig. 3) of the area. Zone B may be related to the Tyennan Geanticline whose northern end falls within the survey area. Zone C and the major part of Zone G are the expressions of the geosynclinal belt which bounds the geanticline. The significance of Zone H is vague. It may or may not be related to the Rocky Cape Group.

Zones D, E and F cannot be related to any regional structure. The Cainozoic Graben system (Gill, 1962, fig. 39) present in the northeastern part of the area cannot be recognised on the magnetic map.

RECOMMENDATIONS

It is difficult to outline, on the basis of the aeromagnetic survey, follow-up work in an area where the anomalies are not related to the exposed lithology or known mineralisation.

The following anomalies could be significant and it is recommended that geochemical sampling and comprehensive field examination of the geology in the areas of these anomalies be carried out. This may prove difficult in areas covered by basalt.

(a) The anomalies of trend TR6

(b) Anomalies 20, 22, and 28

(c) Possibly anomalies 24, 25, 26 and 37.

It is also recommended that the exposure of Dove Granite with which anomaly 21 is associated, be examined.

Additional field work in the area should include collection of samples for susceptibility measurements. This will enable some sections of the interpretation to be reviewed.

Papken A. Zarzavatjian,
Geophysicist.

December, 1966.

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APPENDIX A

STATISTICS

Client:	The Broken Hill Proprietary Coy. Limited.
Contractor:	Australasian Mining and Engineering Geophysics Pty. Ltd. (AMEG)
Commencement of Flying:	March, 25th, 1966) Flown in conjunction with Staverton Survey for The Mt. Lyell Mining & Railway Co. Ltd.
Termination of Flying:	May, 18th, 1966)
Aircraft:	Bell G3B-1
Aircraft Base:	Mole Creek, Westbury, Beaconsfield, Devonport.
Magnetometer:	Barringer Research (Aust.) Ltd. AM-102 proton magnetometer.
Magnetometer Installation:	Detector head located in a bird towed below and behind the helicopter on 60 feet of cable.
Recorder:	Hagan Optimac
Tape Speed:	3 inches per minute.
Full Scale Deflections:	400 gammas and 4,000 gammas.
Fiducial Interval:	5 seconds
Camera:	Modified Bolex 16 mm movie camera, fitted with a Fairey extreme wide angle "fish-eye" lens.
Terrain Clearance:	500 feet M.T.C. (pre-planned) 300-900 feet (actually flown)
Terrain Clearance Control:	Barringer Research Ltd. (Toronto) portable proton magnetometer type GM-102.
Flight Direction:	East-west
Area:	1,500 square miles (approximately)
Mileage:	2,830 (approximately)
Traverse Spacing:	½ and ¼ mile
Compilation Scale:	1:31,680
Final Map Scale:	1:31,680

Inclination of the earth's magnetic field:	72°
Declination:	12°E
Total Magnetic Field:	62,500 gammas
Regional (not removed):	5.8 gammas per mile (southwesterly direction)
Crew:	Pilot - J. Reilly Magnetometer Operator - J. Dawson Data Technician - K. Miller.

APPENDIX B

INDEX TO PROFILES

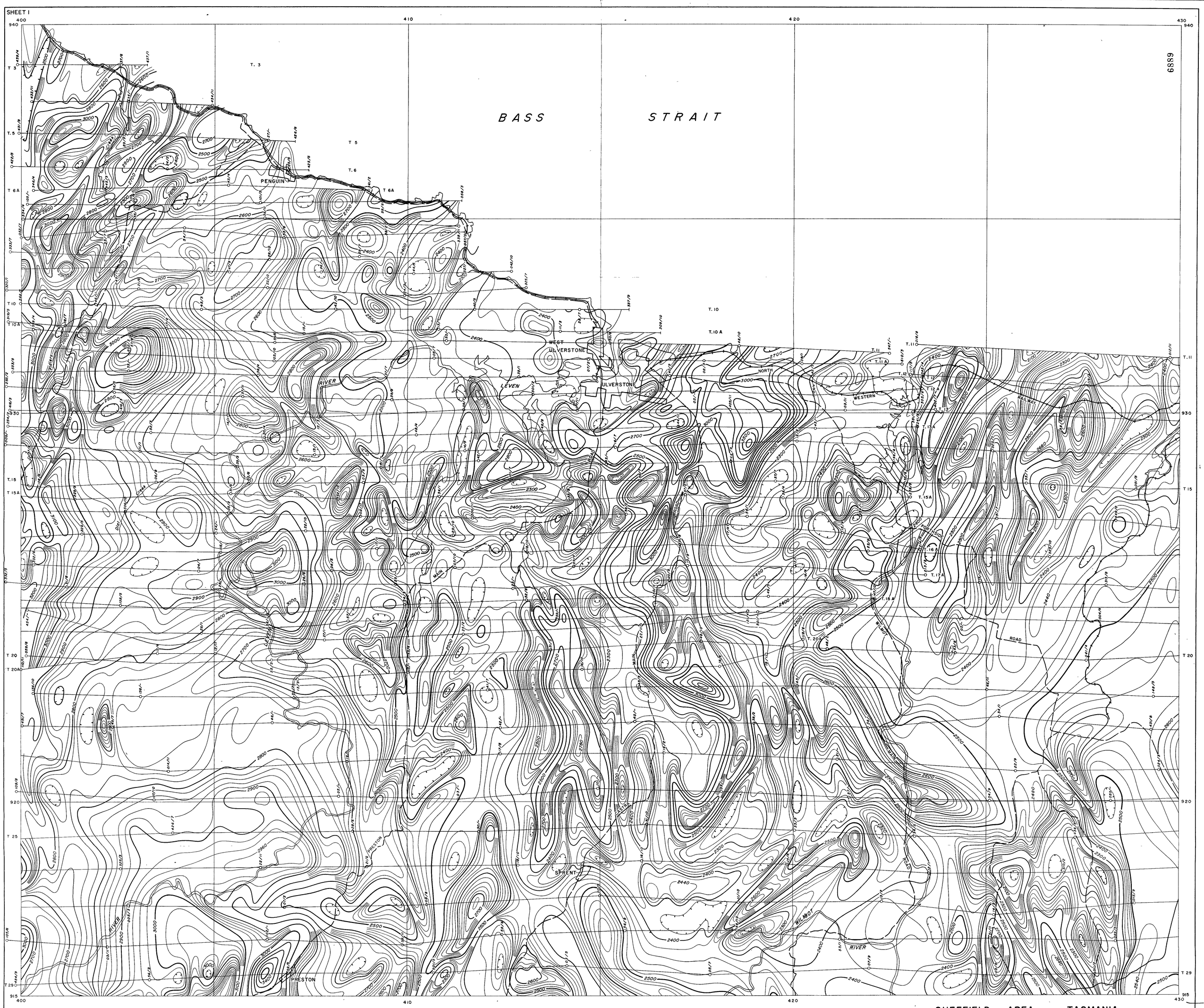
Altitude - 500 feet M.T.C.
Sensitivity - 400 gammas and 4,000 gammas
Job No. - A054

Traverse No.	Start	Finish	Flight	Date Flown
1W	0441	0442	BD7	6.5.66
2E	0440	0440	BD7	6.5.66
3W	0437	0439	BD7	6.5.66
4E	0432	0435	BD7	6.5.66
5W	0426	0431	BD7	6.5.66
6E	0422	0425	BD7	6.5.66
6AW	341	346	DT4	18.5.66
7E (east section)	2330	2330	BD6	6.5.66
7W (west section)	0058	0105	BD6	6.5.66
7AE	0334	339		18.5.66
8W (east section)	2331	2333	BD6	6.5.66
8E (west section)	0052	0057	BD6	6.5.66
8AW	0326	0333	DT4	18.5.66
9E (east section)	2335	2340	BD6	6.5.66
9W (west section)	0042	0051	BD6	6.5.66
9AE	0320	0325	DT4	18.5.66
10W (east section)	2342	2348	BD6	6.5.66
10W	2337	2348	DT2	14.5.66
10AW	0309	0319	DT4	18.5.66
11W	0546	0559	DT1	13.5.66
11W	2358	2416	BD6	6.5.66
12E (west section)	0107	0131	BD6	6.5.66
12E	0533	0534	DT1	13.5.66
13W	0402	0418	DT1	13.5.66
13W	2332	0006	BD8	7.5.66
14E	0009	0032	BD8	7.5.66
15W	0034	0109	BD8	7.5.66
11AE	0601	0610	DT1	13.5.66
12AE	0255	0305	DT4	18.5.66
13AW	0241	0254	DT4	18.5.66
14AE	0137	0146	DT2	14.5.66
15AE	0228	0239	DT4	18.5.66
16W	0430	0509	BD9	7.5.66
17E	0513	0537	BD9	7.5.66
18W	2255	2332	BD2	9.5.66
19E	0454	0515	BD11	8.5.66

Traverse No.	Start	Finish	Flight	Date Flown
20W	0020	0059	BD10	8.5.66
16AW	0214	0227	DJ4	18.5.66
17AE	0201	0213	DJ4	18.5.66
18AW	0147	0200	DT4	18.5.66
19AW	0121	0132	DT2	14.5.66
20A	0110	0119	DT2	14.5.66
21E	0136	0159	BD10	8.5.66
22W	0412	0451	BD11	8.5.66
23E	0012	0034	BD12	9.5.66
24W	0037	0109	BD12	9.5.66
25E	0424	0449	DT1	13.5.66
26W	0450	0527	DT1	13.5.66
27E	0003	0029	DT2	14.5.66
28W	0029	0105	DT2	14.5.66
29E	0454	0530	BD5	4.5.66
30W	0340	0409	BD5	4.5.66
31W	0554	0624	BD3	2.5.66
32E	0523	0554	BD3	2.5.66
33W	0449	0521	BD3	2.5.66
34E	225	251	BD2	2.5.66
35W	2332	0000	BD1	2.5.66
36E	108	140	WY48	1.5.66
37W	041	107	WY48	1.5.66
38E	607	632	WY47	30.4.66
39W	422	455	WY47	30.4.66
40E	057	123	WY45	30.4.66
41W	2314	2346	WY45	30.4.66
42E	152	215	WY44	29.4.66
43W	109	149	WY44	29.4.66
44E	045	108	WY44	29.4.66
45W	2359	043	WY44	29.4.66
46E	135	203	WY42	28.4.66
47E	525	548	WY43	28.4.66
48E	435	523	WY43	28.4.66
49W	0025	0106	WY42	28.4.66
50E	0000	0026	WY39	26.4.66
51W	2332	2355	WY39	26.4.66
52E	622	646	WY38	25.4.66
54W (part line)	154	159	36WY	25.4.66
54W	0128	0149	WY36	25.4.66

Traverse No.	Start	Finish	Flight	Date Flown
55W	335	001	WY36	25.4.66
56W	0504	0527	WY35	24.4.66
56E	027	034	WY36	25.4.66
57E	440	0503	WY35	24.4.66
58W	0345	0417	WY35	24.4.66
59E	204	225	WY34	24.4.66
60W	0024	0104	WY34	24.4.66
61E	151	211	WY30	17.4.66
62W (part)	0119	148	WY30	17.4.66
62			BD1	2.5.66
63W	007	033	WY31	20.4.66
64W	0439	0511	WY29	16.4.66
65E	0418	0437	WY29	16.4.66
66W	0324	355	WY29	16.4.66
67E	0143	0202	WY28	16.4.66
68W	0054	0122	WY28	16.4.66
69W	2337	0006	WY28	16.4.66
70E	030	0052	WY28	16.4.66
71W	422	423	MK26	14.4.66
71W	359	406	MK26	14.4.66
71HW	0301	0327	MK16	30.3.66
72AE (part)	0245	0300	MK16	30.3.66
73AW	0218	0240	MK16	30.3.66
73E (part)	0111	0117	MK19	1.4.66
74W	0041	0055	MK19	1.4.66
74AE (part)	0140	0158	MK16	30.3.66
75AE	0416	0437	MK6	25.3.66
75E	0249	0259	MK14	29.3.66
76AW	0443	0502	MK6	25.3.66
76W	0231	0247	MK14	29.3.66
77W	0016	0031	MK7	26.3.66
77AE	0504	0524	MK6	25.3.66
78E	0032	0047	MK7	26.3.66
78AW	0528	0546	MK6	25.3.66
79AAE	0549	0603	MK6	25.9.66
79ABE	0604	0610	MK6	25.3.66
79W	0049	0102	MK7	26.3.66
80E	0104	0118	MK7	26.3.66
80AW	0611	0628	MK6	25.3.66
81W	0119	0135	MK7	26.3.66
82W	2307	2326	MK9	28.3.66
83E	2327	2341	MK9	28.3.66
84W	2344	0000	MK9	28.3.66
85E	0007	0020	MK9	28.3.66

Traverse No.	Start	Finish	Flight	Date Flown
86E	2334	2348	MK19	1.4.66
87W	2349	0005	MK19	1.4.66
88E	0006	0020	MK19	1.4.66
89W	0331	0346	MK22	11.4.66
90E	0347	0404	MK22	11.4.66
91W (west section)	0503	0517	MK23	11.4.66
91W (east section)	0452	0455	MK23	11.4.66
92E (west section)	0519	0531	MK23	11.4.66
92E (east section)	456	0458	MK23	11.4.66
93W	0533	0544	MK23	11.4.66
93W (east section)	0459	502	MK23	11.4.66
94W	0559	0611	MK23	11.4.66
95	546	0559		
96E	0612	0625	MK23	11.4.66
97W	012	017	MK25	14.4.66
97W	029	035	WY45	30.4.66
98E (part)	018	019	MK25	14.4.66
98W (part)	344	350	MK24	12.4.66
99W (part)	022	024	MK25	14.4.66
99E (part)	356	356	MK24	12.4.66
100E (part)	025	027	MK25	14.4.66
100W (part)	358	001	MK24	12.4.66
101E (part)	004	009	MK24	12.4.66
101W (part)	028	030	MK25	14.4.66
102W (part)	011	016	MK24	12.4.66
102E (part)	031	036	MK25	14.4.66
103E (part)	016	021	MK24	12.4.66
103W (part)	037	044	MK25	14.4.66
104E (part)	045	048	MK25	14.4.66
104W (part)	022	031	MK24	12.4.66
105E	054	102	MK25	14.4.66
106W (part)	111	115	MK25	14.4.66
106W (part)	103	109	MK25	14.4.66
107E	116	121	MK25	14.4.66
108W	122	129	MK25	14.4.66
109E	132	136	MK25	14.4.66
110W	137	141	MK25	14.4.66
111E	143	145	MK25	14.4.66
112E	154	158	MK25	14.4.66
113W	147	153	MK25	14.4.66



LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	1/4 & 1/2 MILE
FLIGHT ALTITUDE	–	500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY
MEASURED BY AIRBORNE PROTON MAGNETOMETER
FOR
BROKEN HILL PROPRIETARY CO. LTD.

203033

6889

SCALE 1 31,680

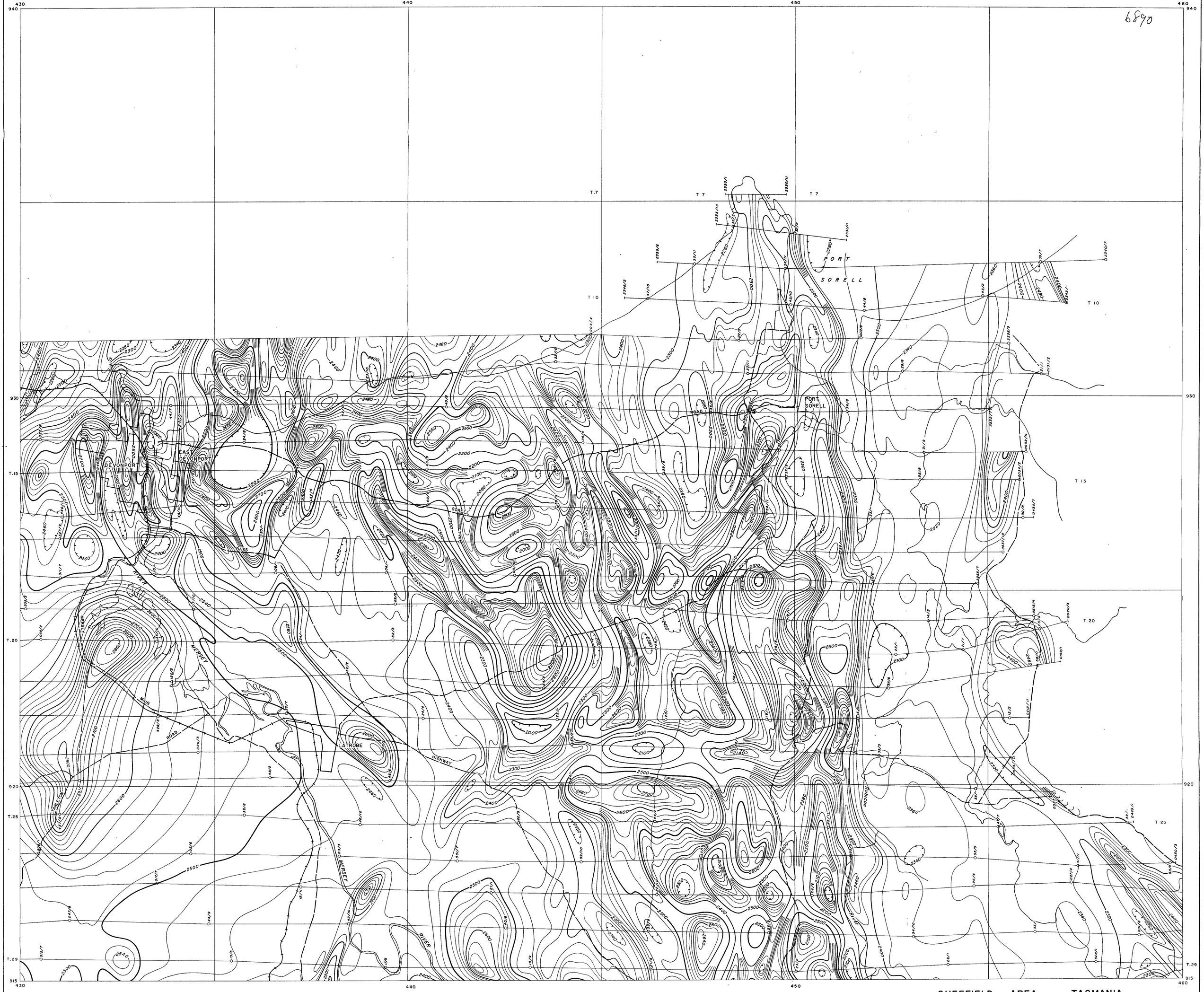
MILES 1 1/2 0 1 2 MILES

5 cm

FLOWN AND COMPILED BY AMEG

TSh 32
G1717A
SHEET 1

SHEET 2



LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	1/2 MILE
FLIGHT ALTITUDE	–	500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY
MEASURED BY AIRBORNE PROTON MAGNETOMETER
FOR
BROKEN HILL PROPRIETARY CO. LTD.

203034

5 cm

SCALE 1:31,680

MILES 1 1/2 0 1 2 MILES

FLOWN AND COMPILED BY A.M.E.G

TSh 33
6890 G1717B

SHEET 2

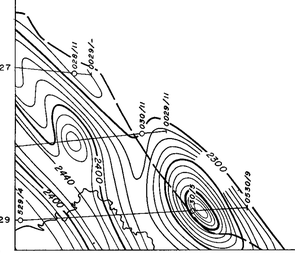
SHEET 3

6891

460 470 480 490

940 930 920 915

T.27 T.29



LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	1/2 MILE
FLIGHT ALTITUDE	–	500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE PROTON MAGNETOMETER

FOR

BROKEN HILL PROPRIETARY CO. LTD.

203025

5 cm

SCALE 1:31,680

MILES 1 1/2 0 1 2 MILES

FLOWN AND COMPILED BY A.M.E.G.

6891

TSh 34
G1717c

SHEET 3

SHEET 4

6892

400 410 420 430

915 910 900 890

T 30 T.35 T.40 T.45 T 50 T.55 T.57

LOWER BARRINGTON

BARRINGTON

SHEFFIELD

WILMOT

ROLAND

LEVEN

RIVER

FORTH

LEGEND

MAGNETIC CONTOURS — 6500

MAGNETIC LOW

MINIMUM CONTOUR INTERVAL – 20 GAMMA

TRAVERSE INTERVAL – ½ MILE

FLIGHT ALTITUDE – 500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE PROTON MAGNETOMETER

FOR

BROKEN HILL PROPRIETARY CO. LTD.

203036

5 cm

SCALE 1·31,680

MILES 1 ½ 0 1 2 MILES

FLOWN AND COMPILED BY A.M.E.G.

TSh 35
G1717D SHEET 4

6892
TSh 35

SHEET 5

6893

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE PROTON MAGNETOMETER 203037

FOR

BROKEN HILL PROPRIETARY CO. LTD.

SCALE 1:31,680

MILES 1 ½ 0 1 2 MILES

5 cm

FLOWN AND COMPILED BY A.M.E.G.

TSh 36

6893 G1717E

SHEET 5

LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	½ MILE
FLIGHT ALTITUDE	–	500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

Sheffield
Railton
Kimberley
Weetah
DASHER RIVER
MERSEY RIVER

SHEET 6

6894

460 470 480 490

915 910 900 890

T.30 T.40 T.45 T.50 T.55 T.58

T 30 T 40 T 45 T 50 T. 55 T. 58

LEGEND

MAGNETIC CONTOURS — 6500

MAGNETIC LOW

MINIMUM CONTOUR INTERVAL — 20 GAMMA

TRAVERSE INTERVAL — 1/2 MILE

FLIGHT ALTITUDE — 500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA — TASMANIA

TOTAL MAGNETIC INTENSITY 203038

MEASURED BY AIRBORNE PROTON MAGNETOMETER

FOR

BROKEN HILL PROPRIETARY CO. LTD.

5 cm

SCALE 1:31,680

MILES 1 1/2 0 1 2 MILES

FLOWN AND COMPILED BY A.M.E.G.

TSh 37
G1717F

SHEET 6

6894

SHEET 7

6895

400 410 420 430

890 880 870 865

T 59 T 60 T 65 T 70 T 75 T 80 T 85 T 86

FORTH RIVER

LEGEND

MAGNETIC CONTOURS — 6500

MAGNETIC LOW

MINIMUM CONTOUR INTERVAL – 20 GAMMA

TRAVERSE INTERVAL 1/2 MILE

FLIGHT ALTITUDE – 500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY 203039

MEASURED BY AIRBORNE PROTON MAGNETOMETER

FOR

BROKEN HILL PROPRIETARY CO. LTD.

5 cm

SCALE 1 31,680

MILES 1 1/2 0 1 2 MILES

FLOWN AND COMPILED BY AMEG

TSh 38

6895 G1717 SHEET 7

SHEET 8

6896

430 440 450 460

890 T.59 T.60 T.65 880 T.70 T.75 T. 80 870 T.82 T.83 865

MERSEY RIVER

MOLE CREEK

CHUDLEIGH

DELORAINE

MEANDER RIVER

LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	½ MILE
FLIGHT ALTITUDE	–	500 FEET M.T.C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE PROTON MAGNETOMETER 203040

FOR

BROKEN HILL PROPRIETARY CO. LTD.

SCALE 1: 31,680

5 cm

MILES 1 ½ 0 1 2 MILES

FLOWN AND COMPILED BY A.M.E.G.

TSh 39
6896 G1717H SHEET 8

SHEET 9

6897

460 470 480 490

890 880 870 865

T 59 T 60 T 65 T 70 T 75 T 80 T.59 T.60 T.65 T.80

MEANDER RIVER

DELORAINE

LAKE

HIGHWAY

LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	½ MILE
FLIGHT ALTITUDE	–	500 FEET M T C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE PROTON MAGNETOMETER 203041

FOR

BROKEN HILL PROPRIETARY CO. LTD.

5 cm

SCALE 1 31,680

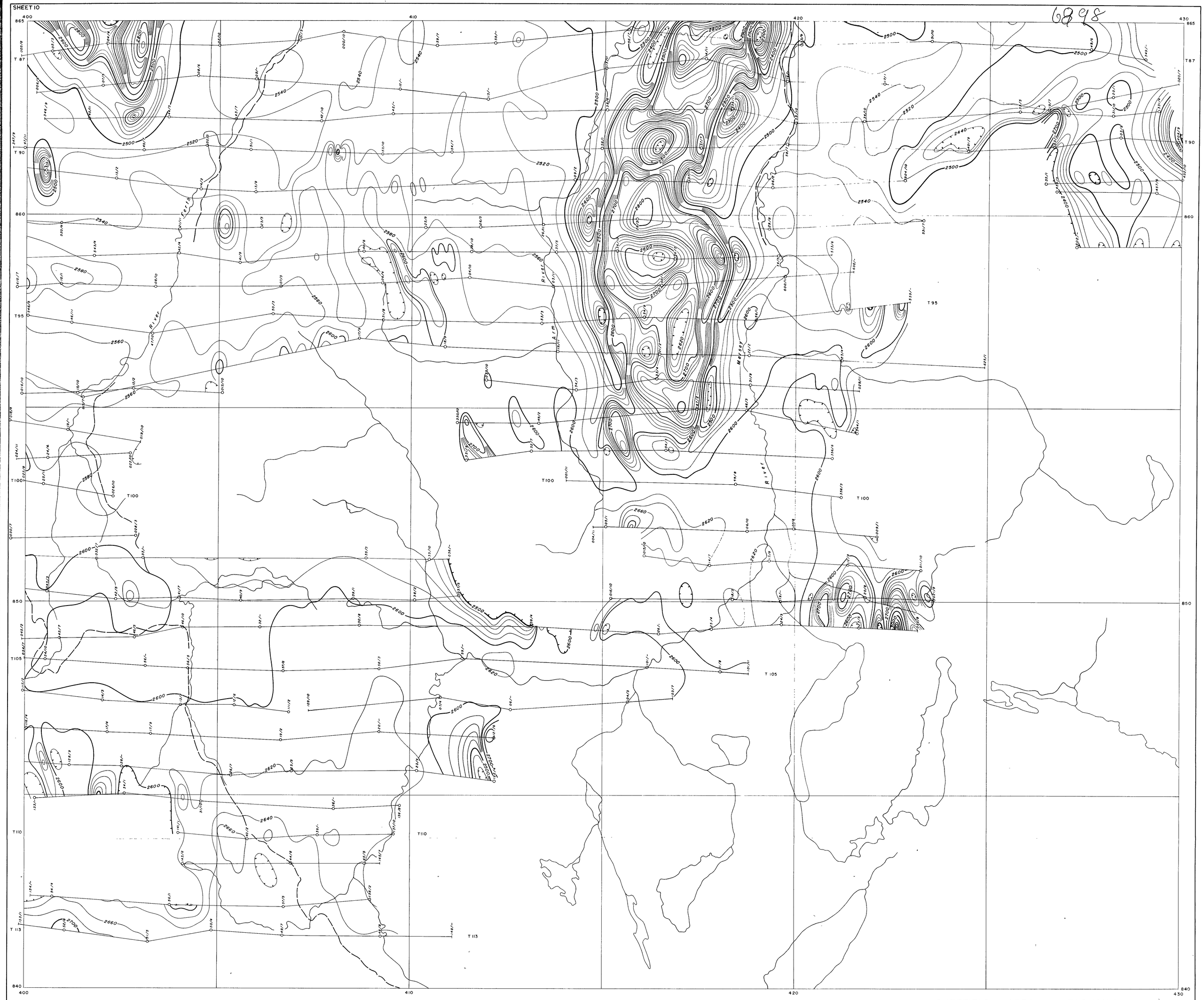
MILES 1 ½ 0 1 2 MILES

FLOWN AND COMPILED BY AMEG.

6897 G1717' TSh 40 SHEET 9

SHEET 10

6898



LEGEND

MAGNETIC CONTOURS		6500
MAGNETIC LOW		
MINIMUM CONTOUR INTERVAL	–	20 GAMMA
TRAVERSE INTERVAL	–	1/2 MILE
FLIGHT ALTITUDE	–	500 FEET M T C

SHEET INDEX

1	2	3
4	5	6
7	8	9
10		

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE PROTON MAGNETOMETER

FOR

BROKEN HILL PROPRIETARY CO. LTD.

203042

5 cm

SCALE 1 31,680

MILES 1 0 1 2 MILES

FLOWN AND COMPILED BY AMEG

6898 TSh 41 G1717J SHEET 10

BASS STRAIT

PENGUIN

ULVERSTONE

DEVONPORT

PORT SORELL

SHEFFIELD

DELORAINE

MOLE CREEK

940 930 920 910 900 890 880 870 865

400 410 420 430 440 450 460 470 480 490

2400 MAGNETIC LOW BELOW 2400 GAMMA

2500 MAGNETIC LOW ABOVE 2400 GAMMA

FLOWN BY AMEG

COMPILED BY B.K. LENON AND ASSOC.

SHEFFIELD AREA — TASMANIA

TOTAL MAGNETIC INTENSITY

FOR

BROKEN HILL PROPRIETARY CO. LTD.

203043

SCALE 1:126,720

MILES 2 1 0 2 4 6 8 MILES

5 cm

6899 TSh 29 G1719

PLATE 3.

SHEFFIELD AREA – TASMANIA

TOTAL MAGNETIC INTENSITY
MEASURED BY AIRBORNE PROTON MAGNETOMETER
FOR
BROKEN HILL PROPRIETARY CO. LTD.

SCALE 1 : 63,360
1 MILE 1 KILOMETRE

FLOWN AND COMPILED BY AAEA

GI7/18A

PLATE 4

6900

TSh 30

203614

NORTH SHEET

SHEET INDEX

LEGEND

MAGNETIC CONTOURS
MAGNETIC LOW
MINIMUM CONTOUR INTERVAL – 20 GAMMA
THICKENED INTERVAL – 1/4 & 1/2 MILE
FLIGHT ALTITUDE – 500 FEET M.S.L.

5 cm

INTERPRETATION BY PAPKEN A. ZARZAVATJIAN

ANOMALY NUMBER (2)
ANOMALOUS TREND TR 3
ANOMALOUS ZONE BOUNDARIES ZONE A / ZONE B
BASALT OUTCROP
GRANITE OUTCROP
SERPENTINE OUTCROP
SURFACE STRUCTURAL FEATURES
FAULTS
FOLDS
MINES AND MINERAL HOLDINGS

ZONE A
ZONE B
ZONE C
ZONE D
ZONE E
ZONE F
ZONE G
ZONE H
TR 5
TR 6
TR 7
TR 8
TR 9
TR 10
TR 11
TR 12
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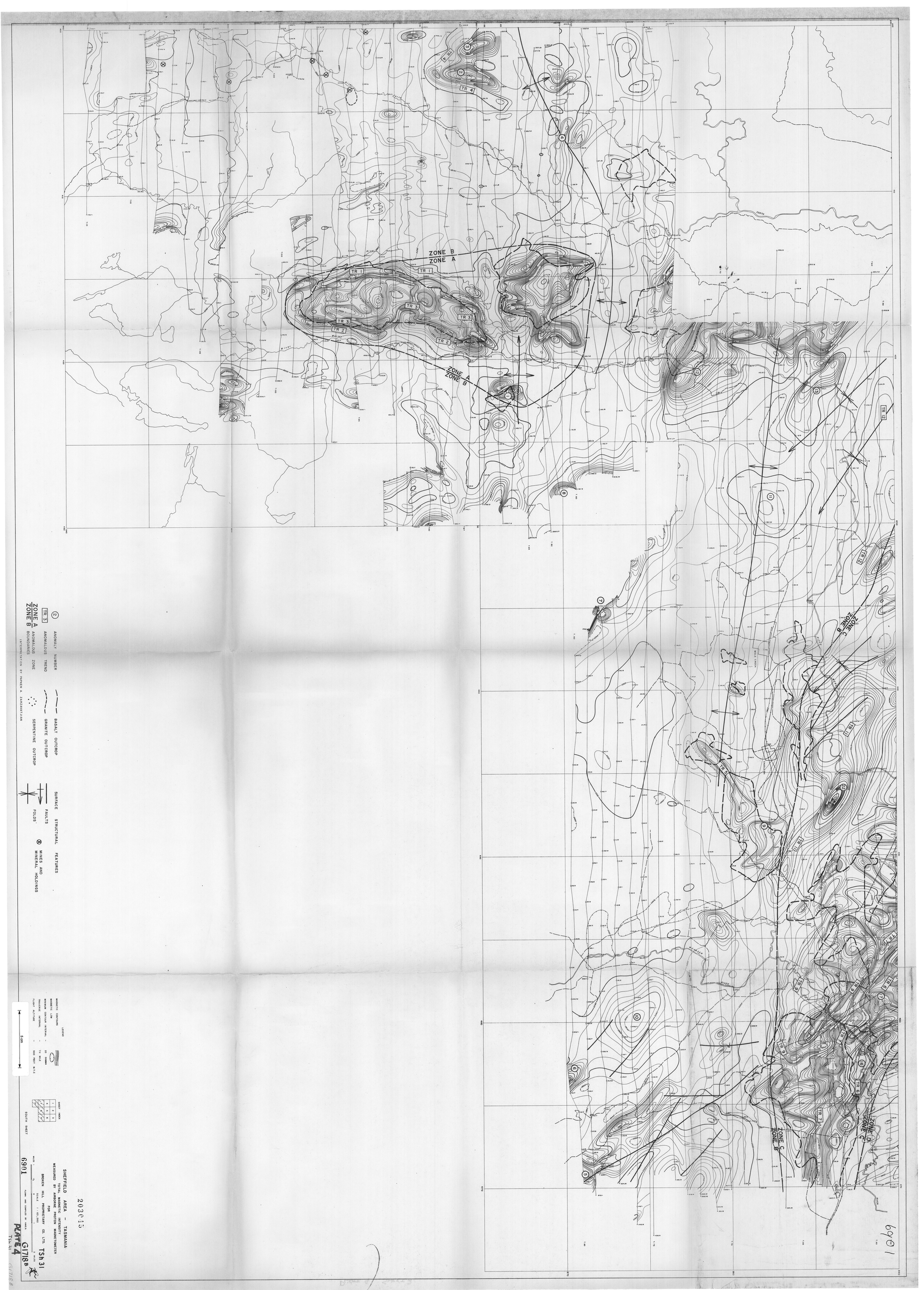

ZONE B
ZONE A
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ZONE C
ZONE D
ANOMALY NUMBER
ANOMALOUS TREND
ANOMALOUS ZONE
ANOMALOUS BOUNDARIES
INTERPRETATION BY PARKEN A. ZARZAVATJIAN
BASALT OUTCROP
GRANITE OUTCROP
SERPENTINE OUTCROP
SURFACE STRUCTURAL FEATURES
FAULTS
FOLDS
MINES AND MINERAL HOLDINGS
LEGEND
MAGNETIC CONTOURS
MAGNETIC LOW
MINIMUM CONTOUR INTERVAL - 20 GAMMAS
TRAVERSE INTERVAL - 1/2 MILE
FLIGHT ALTITUDE - 500 FEET M.T.C.
5 cm
SHEET INDEX
SOUTH SHEET
203045
SHEFFIELD AREA - TASMANIA
TOTAL MAGNETIC INTENSITY
MEASURED BY AIRBORNE PROTON MAGNETOMETER
FOR
BROKEN HILL PROPRIETARY CO. LTD.
TSh 31
SCALE 1:63,360
MILES
PLOTS AND COMPILED BY AREA
6901
G1718B
PLATE 4
TSh 31