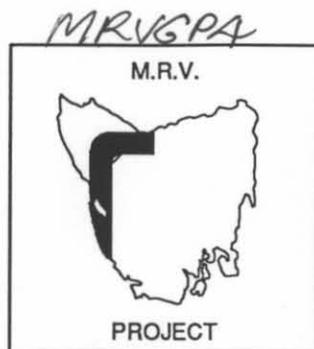


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Mt Read Volcanics Project Geophysical Report 4

1986

Interpretation of the North-West Tasmania Aeromagnetic Survey

by J. R. Bishop



TASMANIA DEPARTMENT OF RESOURCES & ENERGY
DIVISION OF MINES & MINERAL RESOURCES

INTERPRETATION OF THE NORTH-WEST TASMANIA

AEROMAGNETIC SURVEY

for

The Tasmanian Department of Mines

by

Dr J.R. Bishop

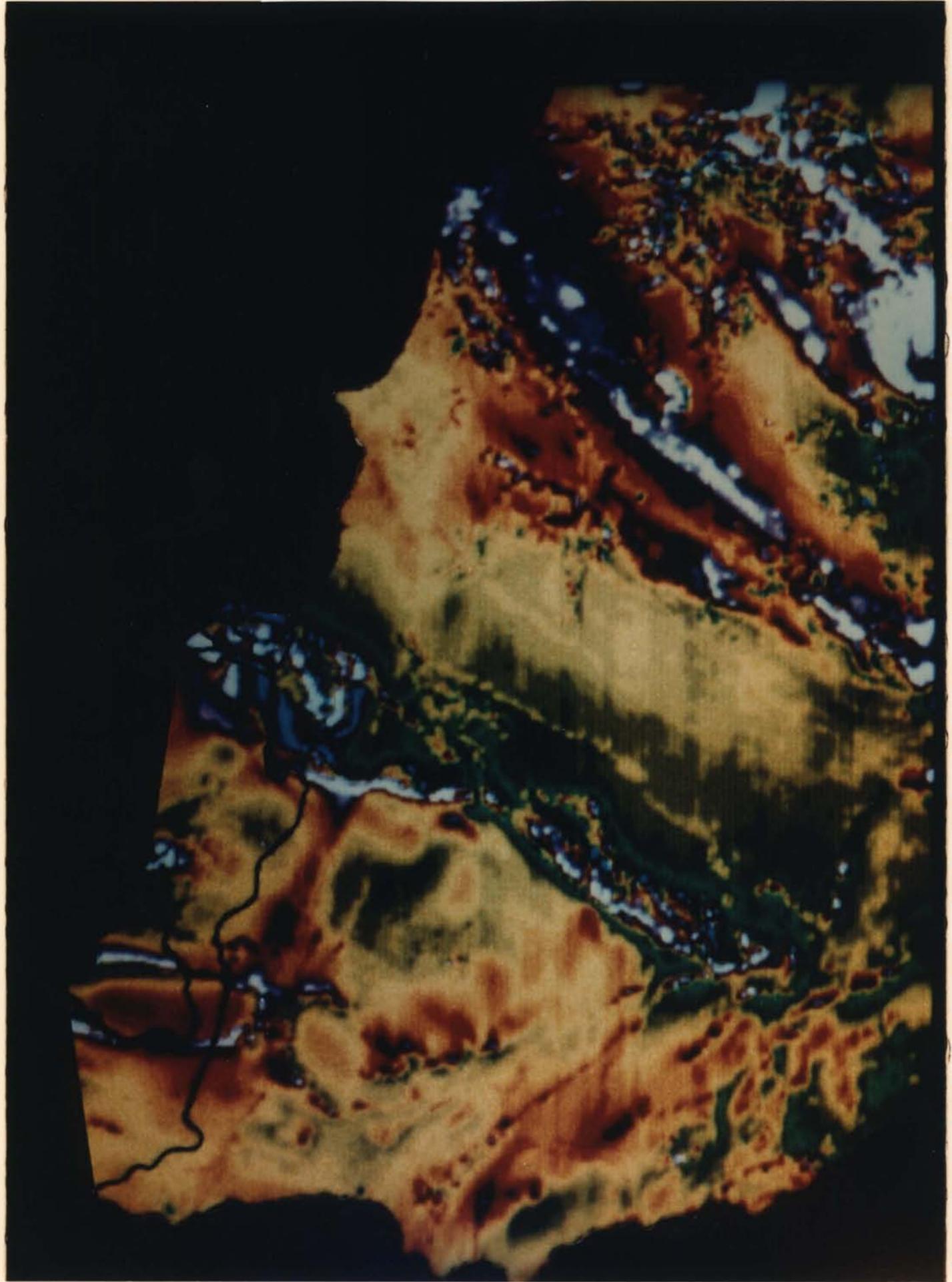
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* These images have a slight distortion (about 5%) in the projection and thus are not true to scale.

INTRODUCTION

The north-west corner of Tasmania is a prospective area where the geology in general and the structure in particular are poorly known. The Geological Survey's 1:250,000 Burns sheet shows a large proportion of the area as undifferentiated Precambrian sediments, with much of the remainder covered by Tertiary basalt or recent alluvium.

The land to the north of 5,430,000m and to the west of 340,000m was covered with an aeromagnetic/radiometric survey in 1984. The results show a good correlation with the published geology and other aeromagnetic data from that survey with the main aim of assisting the geological mapping, however the economic potential of the area has also been considered. A regional approach has been taken insofar as no particular anomalies have been identified as being prospective, nor has any attempt been made at trying, for example, to correlate other magnetic bodies beneath a basalt cover.

SUMMARY

An aeromagnetic/radiometric survey has been flown over the north-west corner of Tasmania. This region, most of which has not been mapped in any detail, contains large areas of Cambrian and Precambrian sediments which are prospective for sediment-hosted base metal deposits and for replacement tin bodies within the calcareous sequences. Gold has been won from several streams draining the surveyed area. A number of companies have carried out exploration for these commodities, however access is difficult and most of the region can be regarded as under-explored.

Several structures are evident in the magnetic data. These include the margins of the Smithton Trough with two anticlines inside the trough. The Arthur Lineament and a proposed parallel second structure are both partially obscured by responses from Tertiary basalt. A number of faults and magnetic trends have also been defined. Although the radiometrics and regional gravity coverage have not been integrated with the magnetic data, a brief examination suggests that the former should be useful for structure and/or lithological definition within the non-magnetic sediments and the latter for improving the quantitative interpretation of the regional structure.

Unmetamorphosed Precambrian sediments are the dominant lithologies in the central and western regions, with the metamorphosed and magnetic sequences of the Arthur Lineament trending north-eastwards through these rocks. In the north-west, magnetic Cambrian basalts define the eastern edge of the Smithton Trough, which consists largely of Cambrian sediments, both the

INTRODUCTION

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The land to the north of 5,420,000mN and to the West of 340,000mE was covered with an aeromagnetic/radiometric survey in 1984. The results show a good correlation with the published geology and other sub-cropping magnetic units have been clearly defined. This report interprets the aeromagnetic data from that survey with the main aim of assisting the geological mapping, however the economic potential of the area has also been considered. A regional approach has been taken insofar as no particular anomalies have been identified as being prospective, nor has any attempt been made at trying, for example, to define skarns or other magnetic bodies beneath a basalt cover. Rather the emphasis has been to define the gross structures of the region and to offer likely explanations for the causes of magnetic anomalies in any particular area.

GEOLOGY AND EXPLORATION TARGETS

The surveyed area overlaps ten of the Mines Dept's 1:50,000 scale or 1 mile geological maps (indicated below). Only four of these have been published and thus the geology over much of the surveyed area is not well known and has been labelled as undifferentiated on the Dept's 1:250,000 'Burnie' geological map.

CAPE GRIM

WOOLNORTH

BLUFF POINT

BALFOUR

SMITHTON*

TROWUTTA

MAGNET

TABLE CAPE*

BURNIE*

ST VALENTINES*

* published map

Unmetamorphosed Precambrian sediments are the dominant lithologies in the central and western regions, with the metamorphosed and magnetic sequences of the Arthur Lineament trending north-eastwards through these rocks. In the north-west, magnetic Cambrian basalts define the eastern edge of the Smithton Trough, which consists largely of Cambrian sediments; both the

sediments and basalts are partially covered by alluvium. Tertiary basalt occurs throughout the surveyed area, but only forms a significant proportion of the cover near the eastern boundary of the survey, where it overlies Permian and Ordovician sediments, Devonian granite and a small area of Cambrian volcanics.

The area has attracted consistent attention from exploration companies. The targets have included shale hosted base-metals and Renison or King Island style tin-tungsten deposits within the Cambrian and Precambrian dolomite sequences. Around the granite margins in the south-east corner of the survey, exploration has concentrated on finding skarns similar to those being mined at the Kara deposit. Gold occurs in several streams (eg, the Arthur, Inglis and Cam Rivers) and has been sought throughout the area. There has also been some evaluation of the plentiful coastal sand dunes for heavy minerals. Kara is the only metalliferous mine now operating within the surveyed area (see Figure 3), but the region contains a number of old workings and prospects, the largest of which is probably at Balfour where copper was mined and where some alluvial tin is still being won. Immediately to the south of the survey, lie the now closed Mt Bischoff and Cleveland tin mines, the Magnet silver-lead mine and the operating Savage River magnetite mine. The area also contains a number of non-metalliferous deposits; these include gravels, magnesite, high-grade silica sands, coal and oil-shales.

Any skarn or replacement tin deposits may be expected to be strongly magnetic and a number of promising anomalies have been drilled in the north-west, so far with disappointing results. There are no 'type' sediment hosted base-metal deposits within Tasmania to act as a guide to exploration and no comment is made as to the likely magnetic properties of such a body. However a number of magnetic anomalies with associated 'gossans' and anomalous base-metal geochemistry have been investigated by exploration companies. The exploration for these deposits has often been based on follow up of detailed aeromagnetic surveys. The location and extent of (?)most of these is indicated in Figure 3. While it may be unlikely that this survey will define many new prospective anomalies, it is hoped that exploration of the area may be assisted by a better understanding of the geologic structure evident in this data.

SURVEY DETAILS

The aeromagnetic/radiometric survey of north-west Tasmania was carried out by the BMR in February, 1984 using a fixed wing aircraft. A three component fluxgate magnetometer was used which has a stated sensitivity of 1.0nt. The lines were flown east-west and visual positioning was assisted with a doppler navigation system. The nominal line spacing was 500m with tie lines every 20kms. The nominal terrain clearance was 150m with a sampling interval of 60m. Thus the survey has similar specifications to the 'West Coast' survey flown for the Mines Dept by Georex in 1981 and which abuts this survey immediately to the south (see Corbett et al, 1982; Leaman, 1986). Radiometric data was also obtained.

A 16.78 litre detector was used and the usual four channels (total count (TC), potassium (K), uranium (U) and thorium (Th)), were recorded.

The magnetic data was processed by subtracting the international geomagnetic reference field (1980) and adding 5000nt. To produce a contour map, the data was gridded using a 5"* cell. No filtering was applied. Examination of some processed images which are particularly sensitive to variations in adjacent flight-lines (eg, Figures 6 & 7) shows that the data is not entirely free of positioning errors or altitude discrepancies. Nevertheless it is considered to be 'good' data. The radiometric data was corrected for height, background subtracted and energy stripped for the K, U & Th channels. The survey data has been produced by the BMR in the following form at 1:100,000 scale:-

- * flight path lines
- * altimeter profiles
- * total magnetic intensity profiles
- * TC, K, U & Th profiles
- * magnetic contours

Contours of total count will also be produced at this scale and the BMR intends to make all of the above available at 1:250,000 scale. Located data tapes for all five parameters are available from the Tasmanian Mines Dept who will carry out further data processing if requested, including producing gridded data tapes. The magnetic contours at 1:100,000 scale are included with this report (Figure 1). Also relevant to this area is the BMR's map of Bouguer gravity (at 1:250,000 scale). This is regional data with a station separation of around 7kms. The magnetics has not been integrated with this data, but it is briefly referred to in the Conclusions.

INTERPRETATION

An interpretation map has been produced to overlay the 1:100,000 scale magnetic contours (Figure 2). This map outlines the more magnetic units, magnetic lineaments and interpreted faults as well as showing the dominant faults from the published geology. This data is repeated, together with the location of prospects, old workings, areas of detailed surveys, etc. in Figure 3, which has been designed as an overlay to the 1:250,000 geology. This figure also shows the areas of Tertiary basalt from the Burnie

* This results in a rectangular shaped grid cell. In the area of this survey, 5" of longitude is approximately 115m and 5" of latitude is approximately 140m. Note that non-square cell shapes will produce distorted plans when image processing. The images included in this report have been 95% corrected.

1:250,000 geological sheet, to compare with the extent interpreted from the magnetics. The interpretation was largely carried out by examination of a number of different pictures produced by running the data through an image processor and by working from the 1:100,000 and 1:250,000 scale magnetic contours; the latter overlaying the 'Burnie' geology sheet. Some of the processed images have been reproduced here; all have been retained as photographic slides at the Mines Dept and are listed in Table 1. Note that the processed images have had the off-shore areas blanked out. This has removed data from the north-western arms of both the Montagu and Stanley Anticlines. The answers to many of the questions posed by the interpretation were found within the open file reports of the exploration companies who have held licences within the surveyed area.

Very few magnetic rock types have been differentiated in this interpretation. Those that have include:-

- * Tertiary basalt
- * Cambrian basalt
- * Precambrian amphibolites
- * Precambrian 'ironstones'

The sedimentary rocks of all ages are comparatively non-magnetic and the Jurassic dolerite has not been differentiated from the Tertiary basalt. Thus except for outlining the extent of the basalt, the magnetic data is generally not useful for defining lithological boundaries nor for defining structure within the sediments. I believe that some of the radiometric data may be more useful for this purpose and this is further mentioned below.

Cross-sections taken from the 1:100,000 scale magnetic contour map have been included to show the gross interpreted structure in the area. Magnetic modelling has been included to give, in some cases, the dip direction and possible size of the source of the anomaly. It is emphasised that these models, although quantitatively produced, are essentially diagrammatic and do not represent unique solutions.

A number of structures, individual anomalies and geographic areas are mentioned in this report. These are labelled in Figure 3 and discussed below under these headings. Some of the names have been taken from the open file literature and used here without attribution since the original sources have not been determined. This report is deficient insofar as no magnetic property measurements have been made to aid and confirm the interpretations. A few values are quoted in Table 2. However, Hudspeth (1986) will contain petrophysical values for most of the rock types in western and north-western Tasmania. Clark (1985) lists the magnetic properties of several rocks located on the Burnie 1:250,000 sheet and some of these are included in Table 2.

TERTIARY BASALT

Tertiary basalt occurs throughout the surveyed area, but is concentrated in the eastern third. The basalt has occurred as a number of flows. Each flow having quite different remanence properties and a range of susceptibilities. In a number of areas, the basalt has a dominant reversed remanence giving rise to negative anomalies. These are mostly spot lows, although some elongate anomalies are evident. The features are best observed as blue or green coloured points or lines on the colour image or as dark spots in Figure 4. They are most common in the south-east corner of the survey. These variations in the magnetic properties make any attempt at a quantitative interpretation of the basalt a rather suspect procedure.

There is a considerable variation in the level of magnetic response over the Tertiary basalts. The highest levels were recorded in the south east corner (shown as white on the coloured imagery). A north-eastern trend here parallels the Arthur Lineament and AL2 (both described later) and may indicate a sub-basalt magnetic zone. Drilling in this area has revealed non-magnetic Precambrian sediments (see the St Valentines geological sheet), but buried magnetic sources could be metamorphosed Precambrian rocks similar to those in the Arthur Lineament or possibly mafic Cambrian volcanics. One could also speculate on a north-easterly extension of the Bald Hill ultramafics. Other isolated highs within the basalt have been investigated for possible pyrrhotite-cassiterite replacement deposits.

SMITHTON TROUGH

The Smithton Trough is a 'V' shaped structure located in the far north-west corner of Tasmania. The 1:250,000 Burnie geological map shows the base of the 'V' immediately north of Balfour, with the two faulted margins of the trough partially defined. These boundaries are evident in the magnetic contour data and are better outlined and extended in some of the processed images. The western margin is defined by a trend of discrete elongate anomalies. Although the north-western end of the trend is covered by Tertiary basalt, its continuation can be seen in, for example, Figure 6. This margin is labelled the Marrawah Fault in Figure 3. Several of these anomalies, some of which are associated with sulphides and/or anomalous geochemistry, have been investigated as part of an exploration program which had as its model lead-zinc mineralisation along the margin of a sedimentary trough. Weir (1985a) describes the western margin of the Smithton Trough

as a steep 70° - 80° easterly dipping and facing "sequence of Precambrian quartzite, chert-silicified dolomite, dolomite and dolomite breccia, Cambrian siltstones and mafic volcanics." The magnetic responses along the margin have been ascribed to the discontinuous volcanics and to magnetite within the fault zone (Weir, 1985a). Two other zones, parallel to the western margin, can be seen in Figure 4; one 'inside' the trough, the other 'outside'. These agree with the structures interpreted by Carey

(1981) and perhaps suggest that the margin is defined by a number of faults.

A cross-section through the western margin is given in Figure 8. Approximate modelling of the anomalies shows that a steeply dipping source will cause the anomaly adjacent to the Marrawah Fault, while east dipping bodies fit the responses within the trough. The westernmost response is along strike from the Frankland River anomaly, which has been ascribed to magnetite within Precambrian siltstones (Weir, 1985a). A similar source may be the cause of the 'Richardson's Bend' anomaly.

The eastern edge of the Smithton Trough is truncated by a broad zone of strongly magnetic Cambrian basalts. The western edge of this zone is sharply defined and is coincident with a fault in the published geology (labelled the Duck River Fault in Figure 3). As with the trough's western margin, the northern extension of this fault beneath Tertiary basalt can be seen in the processed images (eg, Figure 7). The images also show some residual trends within the Cambrian basalts. These may reflect thicker sequences of basalt, or possibly the older basalt beneath a cover of Tertiary basalt. Weir (1982) has noted that the eastern edge of the Cambrian basalts are faulted, at least in places; eg, the Julius River Fault in Figure 3. Carey (1981) has suggested a second persistent fault and a number of magnetic trends parallel to the Duck River Fault can be seen in the processed images (eg, Figures 5 and 7) to the east of the Smithton Trough in the Precambrian sediments. Some of these may be due to Precambrian dolerite dykes, several of which are shown on the 'Burnie' 1:250,000 sheet. An interpretive cross-section of the eastern margin is shown in Figure 9.

STANLEY ANTICLINE

Some of the processed images (eg, Figure 7) show well defined magnetic zones beneath Tertiary basalt to the south of Stanley; ie, at the northern end of the Duck River Fault. These zones, which have been transferred to Figures 2 and 3, show two separate limbs of Cambrian basalt, with the more easterly one strongly folded. Precambrian sediments have been mapped between the zones and a dome or anticlinal structure similar to the Montagu Anticline (see below) is suggested. This structure has been labelled the Stanley Anticline in Figure 3.

MONTAGU ANTICLINE

The anticline defined by the Cambrian basalts within the Smithton Trough was first interpreted by Large (1982) following a detailed aeromagnetic survey over E.L. 25/80. The outline of the anticline is clearly seen in the original magnetic contours (Figure 1), but not so clearly in the processed images which have had the offshore data masked out. Large (1982) considerably simplified the existing interpreted geology of this area by suggesting the presence of two dolomitic horizons: a lower horizon beneath the Cambrian basalt and an upper horizon (the Smithton Dolomite)

above the basalt (see Figure 3). The southern section of the anticline is shown in Figures 2 & 3 with a multi-faulted eastern arm of the fold, which is interpreted to dip shallowly to the east. The magnetic modelling (Figure 10) confirms the expected dip directions of the basalts in the limbs of the fold and the central high can also be explained by an anticlinal structure, perhaps of the hematitic siltstone referred to by Large (1982).

There are a number of interesting magnetic features in this area. They include the anomalies H, DB1 & DB2 in Figure 3*. The cause of the latter two anomalies, which parallel the dominant Mella magnetic trend (see below), has been postulated by Large (1982) to be either basic dykes or magnetite or pyrrhotite within fault zones. Large (1982) has also suggested that the anomalies labelled C1 & C2 in Figure 3 may be due to magnetic tuffs or lavas. An alternative hypothesis is that C2 is a less magnetic continuation of the basalts which define the Montagu anticline and that C1 is a separate body, possibly with a dyke-like source (see Figure 5).

MELLA MAGNETIC TREND

The Mella magnetic trend, named after a small locality through which it passes, is a dominant feature on several of the processed images (eg, figures 5 & 6). The linear passes through both the Montagu and Stanley Anticlines and has been tentatively continued eastwards towards the Arthur Lineament. It has been interpreted as a fault which has little apparent dislocation. A section of the trend had been previously recognised to the west of Smithton in a detailed aeromagnetic survey of that region (Robertson Research in McDonald, 1982). There, the trend had been interpreted as being due to "an ESE-trending coastal dune system". However its magnitude and persistent strike length indicate that this is not so. Two other linears parallel or sub-parallel the Mella Trend: these are DB1 and DB2, both recognised by Large (1982) and interpreted as a possible mafic dyke. However the latter has been extended through the Montagu Anticline and further to the west in this interpretation. Since it truncates trend C1, (which may reappear some 1.5kms to the west), it has been interpreted here as primarily a fault, with some magnetic material partially infilling it.

BALFOUR COPPER TREND

There are a number of old copper prospects defining a linear trend through Balfour; these include the Waratah Adit, Pierpont Morgan, Balfour and The Clump workings. These lode deposits lie along the flanks of a series of north-north-west trending

* Labels given to individual anomalies by previous investigators have been used here.

magnetic anomalies which are a northern extension of the Norfolk range and which have been ascribed to disseminated pyrrhotite with strong remanence within the sediments (Dickson, pers. comm.) Although the northernmost prospect, The Clump, which is along this trend, is adjacent to the north-west trending Frankland River anomaly and has been attributed to magnetite in Precambrian siltstones (Weir, 1985a). The Frankland River anomaly and other similar responses paralleling the Marrawah Fault and defining a trend (see Figure 8) have also been investigated and found to have associated geochemical anomalies in base and other metals (Weir, 1985a).

BALFOUR - TEMMA AREA

This region of Precambrian sediments has a more magnetic character than the other areas of similar (undifferentiated) mapping covered by the survey. A detailed magnetic survey of the Temma area has been carried out and investigation has shown that "the intense magnetic anomalies* relate to narrow, crosscutting dyke or vein like bodies composed of varying assemblages of magnetite, carbonate, iron rich amphibole, chlorite and quartz" (Herrmann and Sumpton, 1982). A number of north-west and north-north-west trending faults have been interpreted from the magnetic contours and processed images. At several localities quartz and disseminated sulphides are associated with the veins and these are commonly anomalous in base and precious metals. Herrmann and Sumpton (1982) consider that these "veins... are of hydrothermal origin probably associated, along with other vein deposits of the Balfour field, with Late Devonian granitic intrusives of the west coast."

THE ARTHUR LINEAMENT

This is a well developed north-east trending zone of intensely folded Precambrian rocks extending from near Granville Harbour on the west coast to Table Cape on the north coast. Solomon (1981) has noted that the lineament separates Precambrian quartzites and siltstones to the west (the Rocky Cape Geanticline) from similarly aged mudstone, quartz-wacke and minor basalt in the east. The southern half of the Arthur Lineament consists of a number of strongly magnetic basic rock types; as well as some pods of magnetite, including those of the Savage River mine. The northern half, covered by this survey, is less well defined, containing a lower proportion of magnetic units. Also, its boundaries are partially obscured by increasing amounts of Tertiary basaltic cover. One long, apparently continuous anomaly, possibly due to amphibolite, is indicated in Figures 2 & 3 and is particularly noticeable on the coloured image at the beginning of this report. Also evident on some of the processed images are

* One response of 23,000nt was recorded.

linear trends sub-parallelizing the Lineament on its north-western side. These are associated with lower intensity magnetic anomalies and may be due to Cambrian basalt or to more magnetic sediments. Anomaly WY3 at the northern end of the lineament (see Figure 3) has been drilled and is due to amphibolite (Anon., 1984). Another anomaly, further to the north-east has had a similar source interpreted. An interpretive cross-section through the Arthur Lineament (Figure 11) suggests that the anomaly to the north-west may be a section of Precambrian metamorphics separate from the Arthur Lineament.

AL2

15 km
A similar anomaly with a similar trend underlies Permian sediments some 1.5 kms to the south-east of the Arthur Lineament. This has been labelled AL2 in Figures 3 and 11. This also may be due to metamorphosed Precambrian rocks and may indicate a second major structure of comparable intensity to the northern end of the Arthur Lineament. Alternative interpretations might include an extension of the ultramafics at Bald Hill, some 20kms to the south-west. Another large and apparently discrete anomaly lies to the south of AL2 also underlying the Permian (shown as a separate anomaly in Figures 2 and 3). With the sub-basalt trend postulated in the 'Tertiary Basalt' section, there are possibly a number of magnetic trends sub-parallelizing the Arthur Lineament.

SKARNS

The Kara tungsten mine is one of a number of skarn deposits associated with the Husetop Granite in the south-east corner of the surveyed area (Figure 3). The skarns have strong magnetic signatures, but much of the area is overlain by basalt. No attempt has been made in this report to outline any of the skarns or to 'look' beneath the basalt, but at least in some cases "the high susceptibility... and high remanent component of the basalt" made modelling of the basalt and underlying skarn difficult (Lawton, 1982).

MISCELLANEOUS

There are a number of other features distinguishable in the processed images and/or contour data which are worthy of comment.

(1) The 'Leigh River Hook' to the east of Balfour is a hook shaped trend, clearly defined on some of the images. This area has been investigated (Weir, 1985b) and the sources identified as Cambrian basalts. Weir (1985b) identified a fault running through the southern anomaly and it is possible that the 'Hook' reflects the junction of two oblique trends, rather than the folding suggested in the processed images.

(2) The 'Richardson's Bend' to the west of Balfour is another possible interference effect in the processed images.

However the northern section, bending to the south east, is believed to be real. The two sections have been differentiated in Figures 2 & 3.

(3) A very small area of the prospective Mt Read Volcanics outcrops in the extreme south eastern corner of the survey and it is possible that a much larger area lies under basalt cover. The volcanics are likely to have variable magnetic properties and no attempt has been made to try and determine their extent.

CONCLUSIONS

The aim of this report has been to provide a broad structural interpretation of the north-west corner of Tasmania. The data has helped to define a number of features not previously shown on the published maps. The dominating features in the magnetic contour map of north-west Tasmania are the responses of the Tertiary and Cambrian basalts, however the effect of the former can be minimised by data processing. The boundaries of the Smithton Trough have been defined by Cambrian basalt and other magnetic bodies along the faulted western margin and by larger volumes of basalt on the eastern side. Within the trough, similar basalts have outlined two large structures, the Montagu and Stanley Anticlines. A number of cross-cutting faults have also been interpreted. Further to the east, magnetic bodies within the Arthur Lineament have been outlined, but the extent and boundaries of this structure have not been well defined. Not at all defined are the folds and other structures that apparently exist within the Precambrian sediments of the Rocky Cape Geanticline and to the south-west of the Smithton Trough.

Not examined here in any detail, but relevant to the geological and structural interpretation of the area, are the radiometric and gravimetric data. A brief examination was made of both sets of data. Overlying a preliminary 1:250,000 scale copy of the radiometric total count contours (ie, unlabelled; highs and lows not identified) on the geology, suggests that the Permian sediments can be recognised where not covered by the basalt; as can the Cambrian and Precambrian sediments in the north-west corner, where not covered by alluvium. There may be some discrepancies here with the published geology. The boundaries of the Smithton Trough are evident and strong differences are noted within the undifferentiated Precambrian sediments to the west and east of the Smithton Trough. Some structure might also be interpreted within the Trough. Image processing would be most useful. Superposition of the gravity data with the magnetics shows a positive ridge coincident with the Arthur Lineament. The Rocky Cape Geanticline is a flat area of low Bouguer attraction. The northern part of the Smithton Trough is poorly defined by an area of higher values with a strong positive gradient to the west (ie, off shore).

This aeromagnetic survey is sufficiently detailed to enable data from specific areas such as the Arthur Lineament with its potential for gold and other metals, to be processed at a smaller scale. The data could also be usefully combined with the larger scale gravity to obtain a better three dimensional interpretation, giving dip directions and lithological thicknesses.

ACKNOWLEDGEMENTS

The interpretation of this survey was greatly helped by discussions with A.V. Brown and D.B. Seymour of the Mines Department; T.W. Dickson of CRA and R.R. Large of the University of Tasmania.

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J.R. Bishop
Dec., 1986.

REFERENCES

- Anon., 1984. E.L. 23/79 (Wynyard). Report for year ended 1/12/86. BHP Company report to Mines Dept; ref. no. 85/5305.
- Carey, S.W., 1981. Notes to accompany the photo-interpretation of the country between the Arthur and Pieman Rivers, Tas. Report to Geopeko.
- Clark, D.A., 1985. Catalogue of magnetic properties of Australian Rocks (2). CSIRO report (Division of Mineral Physics and Mineralogy).
- Corbett, K.D., Richardson, R.G., Collins, P.L.F., Green, G.R. and Brown, A.V., 1982. The 1981 West Coast aeromagnetic survey: summary of information and results. Tas. Mines Dept unpublished report 1982/39.
- Herrmann, W. and Sumpton, J., 1982. Progress report E.L. 1/77, Tenma area, 1981. Geopeko report to Mines Dept; ref. no. 82/2454.
- Hudspeth, J., 1986. Summary of rock properties for Mt Read project. Mines Dept report.
- Large, R.R., 1982. Annual report, E.L. 25/80 (Montagu), 1981 season. Geopeko report to Mines Dept; ref. no. 82/5747.
- Lawton, J.J., 1982. E.L. 4/77 (Highclere). Progress report on exploration during the period March 1980 - August 1982. Shell Company report to Mines Dept; ref. no. 82/1878.
- Leaman, D.E., 1986. Interpretation and evaluation report, 1981 west Tasmania aeromagnetic survey, for Mt Read Volcanics project.
- McDonald, I.R., 1982. E.L. 52/80 (Smithton). Final report on exploration activity November 1981 to November 1982. EZ report to Mines Dept; ref. no. 82/8967.
- Oakes, G., 1981. Geophysical response of the Kara scheelite deposit. Shell company report.

Solomon, M., 1981. An introduction to the geology and metallic ore deposits of Tasmania. Econ. Geol. 76, 194-208.

Wright, D.J., 1984. E.L. 23/79 (Wynard). Report for year ended 1983.

Weir, D.J., 1982. E.L. 1/77 (Rocky Cape). Progress report, July, 1981 - June 30th, 1982. CRA report to Mines Dept; ref. no. 82/2098.

Wright, D.J., 1985. E.L. 23/79 (Wynard). Report for year ended 1984.

Weir, D.J., 1985a. E.L. 1/77 (Rocky Cape). Progress report for period February 1984 to January 1985. CRA report to Mines Dept; ref. no. 85/2112.

Clark, D.A., 1985. Catalogue of magnetic properties of Australian rocks. Geophys. Surv. 12, 1-10.

Weir, D.J., 1985b. E.L. 12/80 (Leigh River). Progress report for period July 1984 to January 1985. CRA report to Mines Dept; ref. no. 85/8443.

Contract, K.D., Richardson, R.G., Collins, P.L.F., Green, E.R. and Brown, A.V., 1982. The 1981 West Coast aeromagnetic survey: summary of information and results. Tas. Mines Dept unpublished report 1982/32.

Hermann, W. and Supton, J., 1982. Progress report E.L. 1/77. Tas. Mines Dept, 1981. Geophys. report to Mines Dept; ref. no. 82/2484.

Hutchings, J., 1986. Summary of rock properties for Mt Read project. Mines Dept report.

Judge, R.R., 1982. Annual report, E.L. 25/80 (Montagu), 1981 season. Geophys. report to Mines Dept; ref. no. 82/2747.

Lawton, J.J., 1982. E.L. 4/77 (Highland). Progress report on exploration during the period March 1980 - August 1982. Shell Company report to Mines Dept; ref. no. 82/1878.

Leaman, D.E., 1986. Interpretation and evaluation report, 1981 west Tasmania aeromagnetic survey, for the Read Volcanics project.

McDonald, I.R., 1982. E.L. 22/80 (Saitheon). Final report on exploration activity November 1981 to November 1982. EE report to Mines Dept; ref. no. 82/3957.

Olson, G., 1981. Geophysical response of the Kara schistose deposit. Shell company report.

Table 1

LIST OF PROCESSED IMAGES

North-west Tasmania aeromagnetic survey
Data held as photographic slides at the Department of Mines.

- TASMAG 1. Raw data (Figure 4 of this report).
- TASMAG 2. Raw data with pseudocolour added (Frontispiece of this report).
- TASMAG 3. Shaded relief: azimuth = 0°.
- TASMAG 4. Shaded relief: azimuth = 45° (Figure 6 of this report).
- TASMAG 5. Shaded relief: azimuth = 90°.
- TASMAG 6. Shaded relief: azimuth = 135° (Figure 7 of this report).
- TASMAG 7. East-west gradient (Figure 5 of this report).
- TASMAG 8. North-south gradient.

Table 2

MAGNETIC PROPERTIES

No specific measurements were made for this report, but the following values have been obtained from open file reports, etc. Estimates used for modelling have been given where no other values have been found. The magnetic properties of most of the major rock types in western Tasmania will be given in Hudspeth (1986).

ROCK TYPE	SUSCEPTIBILITY x 10 ⁻⁶ cgs	COMMENT	REFERENCE
Tertiary basalt	15000- 20000 200- 300 110- 4300	Q=71 Q=1-71 (often reversed)	Lawton, 1982. Oakes, 1981. Clark, 1985.
Devonian granite	less than 100 7	Q<.01	Oakes, 1981. Clark, 1985.
Skarns	18000-100000 27000-303000	Q=0.4-14	Oakes, 1981. Clark, 1985.
Cambrian basalts	2000- 3500	values used for modelling only, no measurements made.	
Cambrian sediments	500 20- 270	" "	Q=0.1-2.3 Clark, 1985.
PreCambrian metamorphics	500- 3000	values used for modelling only, no measurements made.	

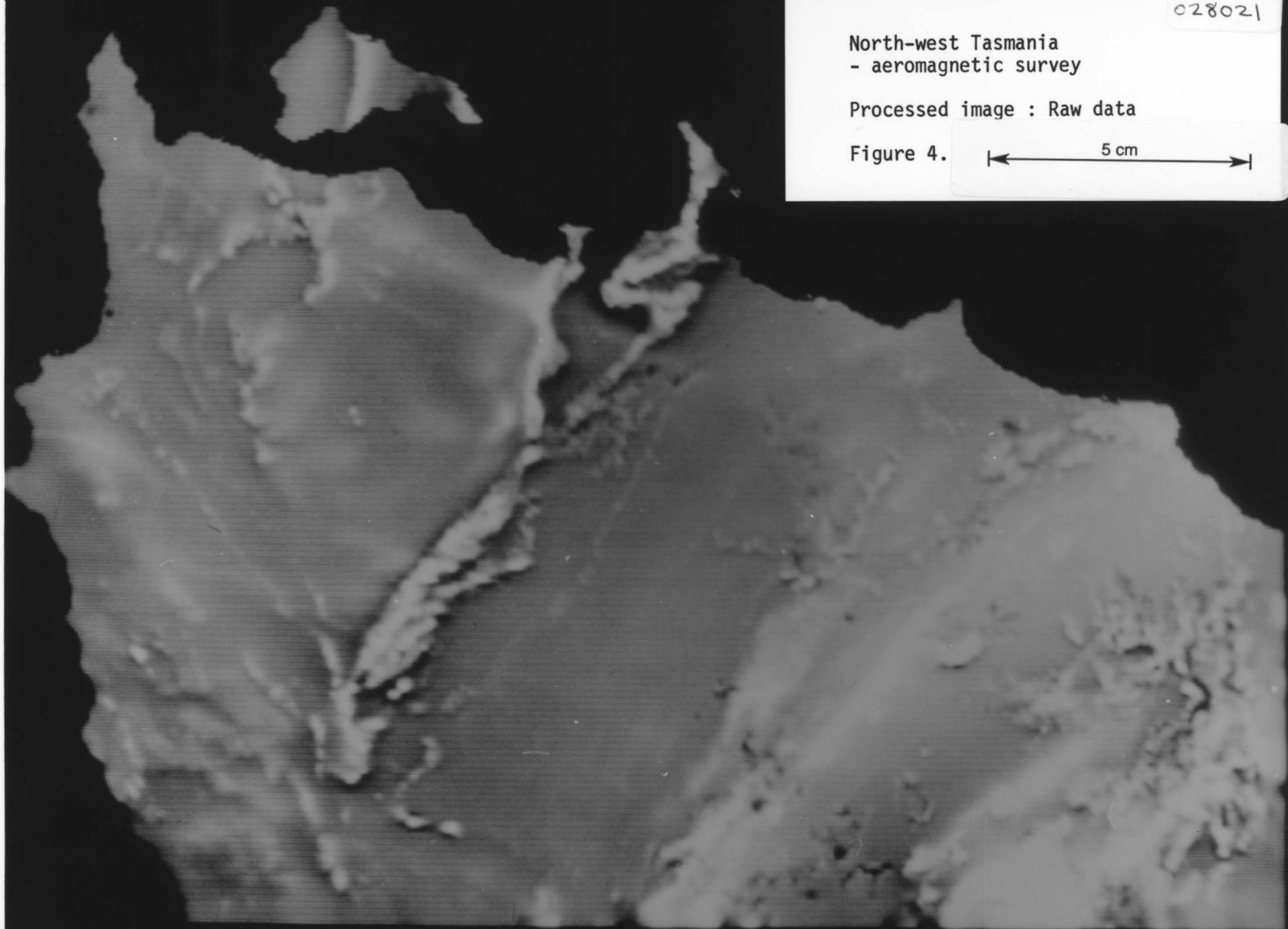
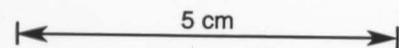
028021

North-west Tasmania
- aeromagnetic survey

Processed image : Raw data

Figure 4.

5 cm



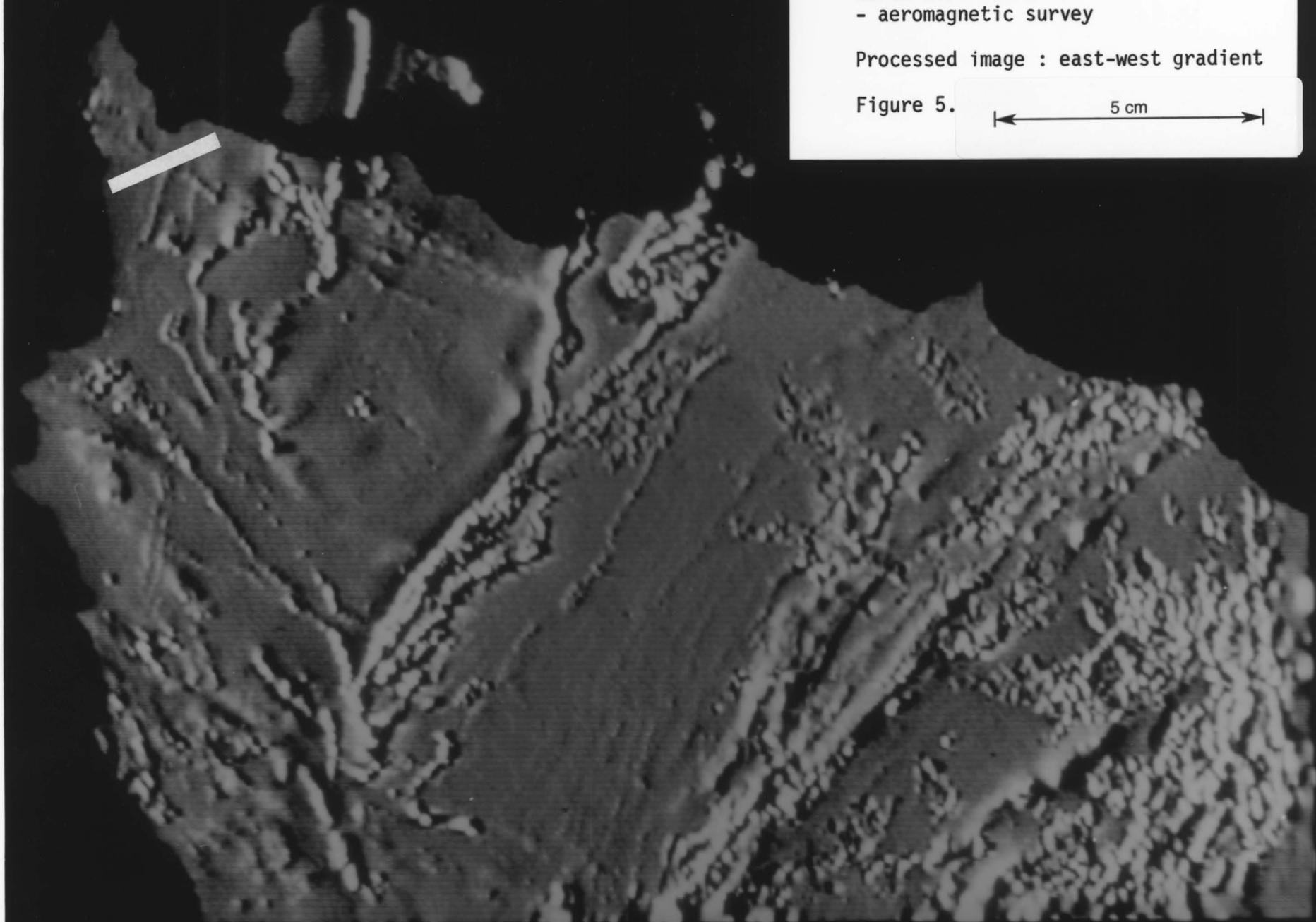
028022

North-west Tasmania
- aeromagnetic survey

Processed image : east-west gradient

Figure 5.

5 cm

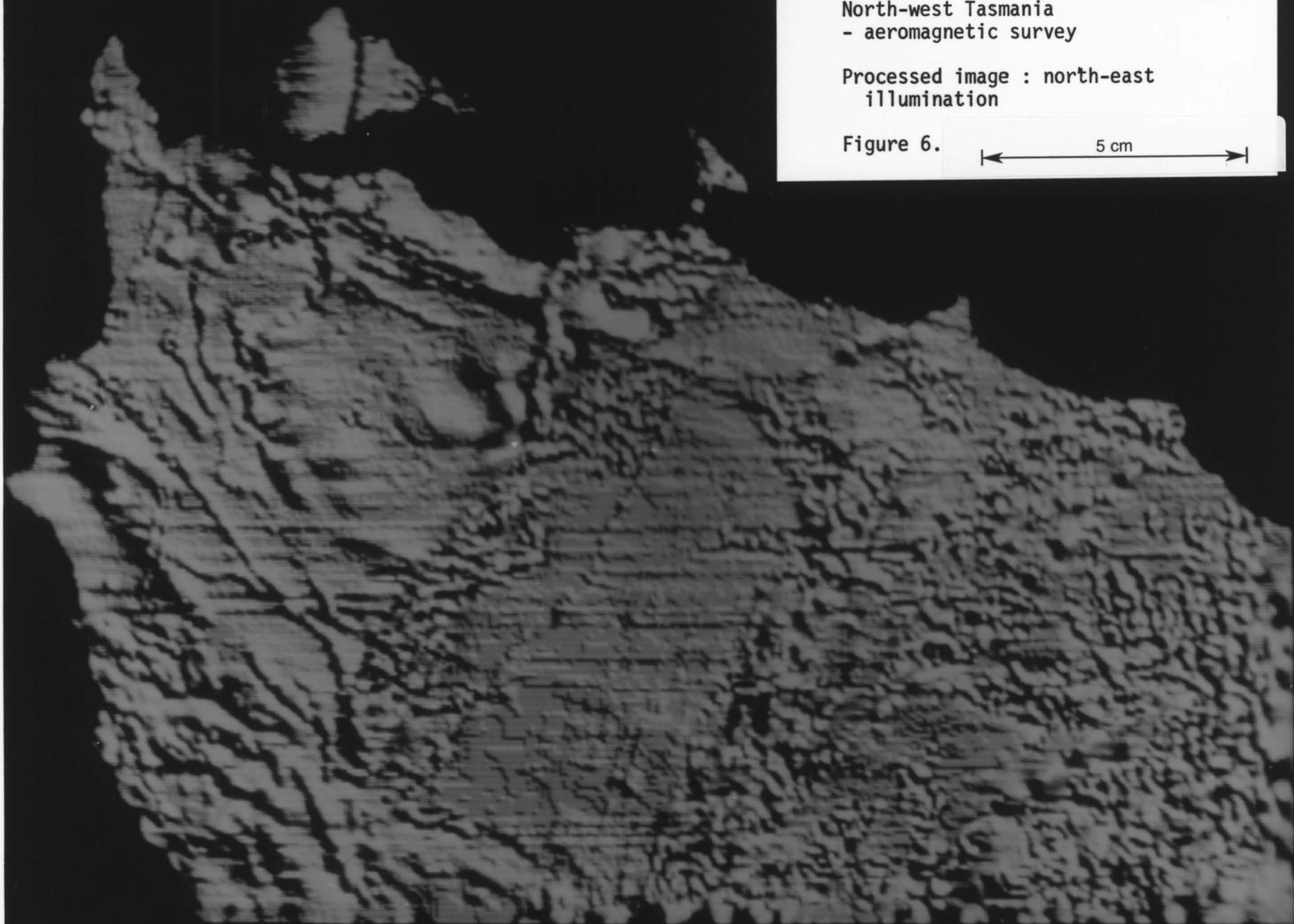


028023

North-west Tasmania
- aeromagnetic survey

Processed image : north-east
illumination

Figure 6.

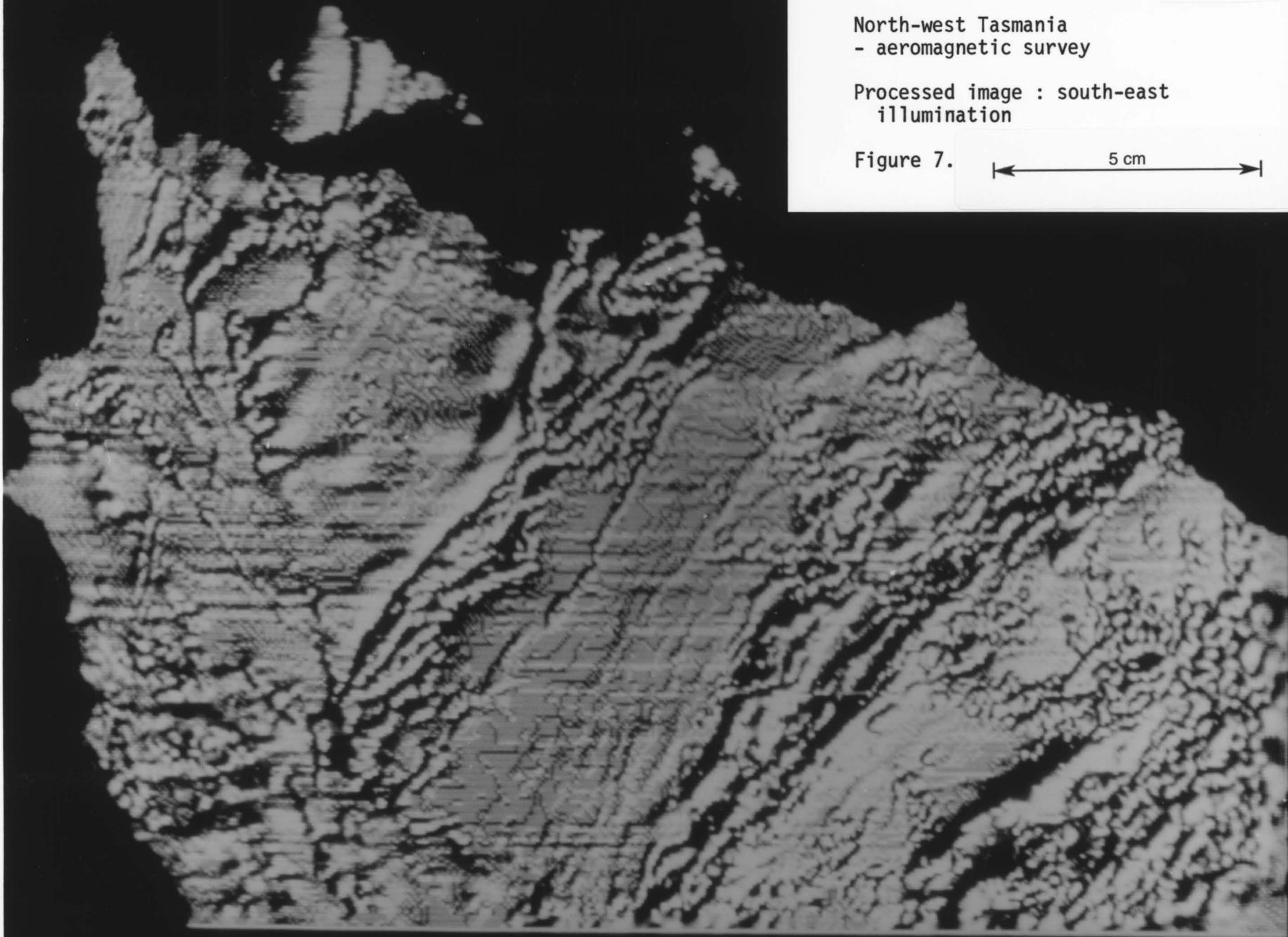


028024

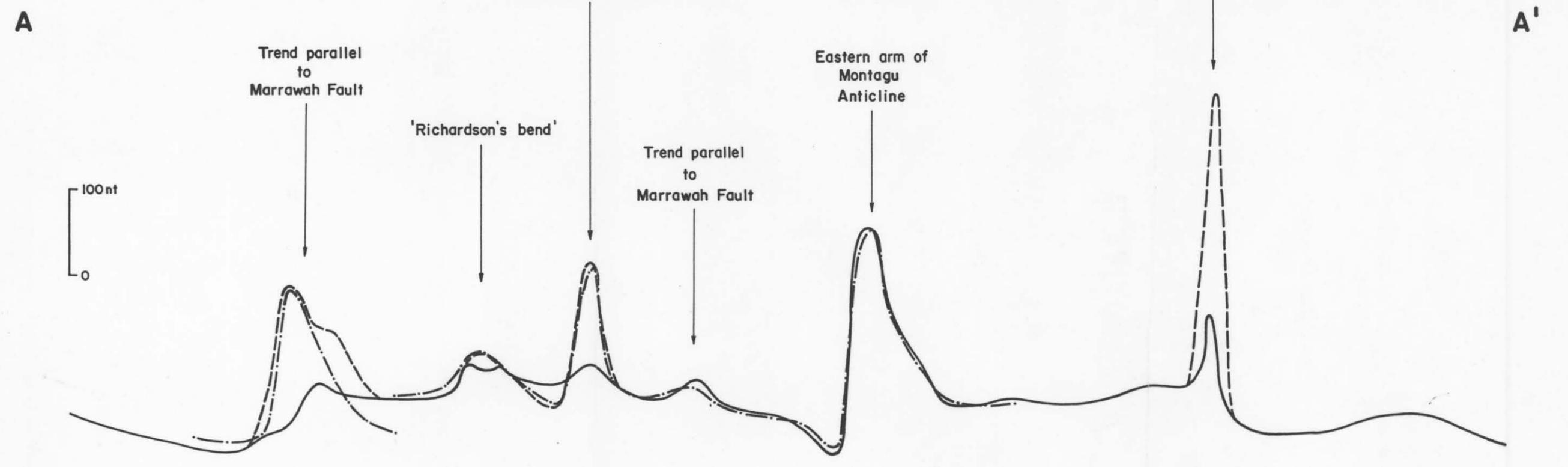
North-west Tasmania
- aeromagnetic survey

Processed image : south-east
illumination

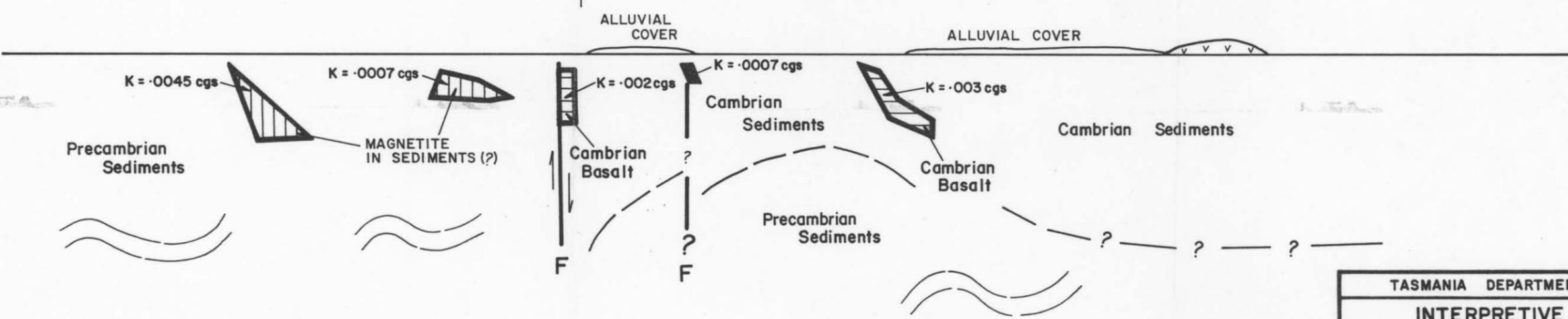
Figure 7.



KEY
 ——— PROFILE FROM CONTOURS
 - - - - - PROJECTED ANOMALIES
 - · - · - · CALCULATED RESPONSES



SW Smithton Trough NE



0 1 2 3 4 5
 KILOMETRES

5 cm

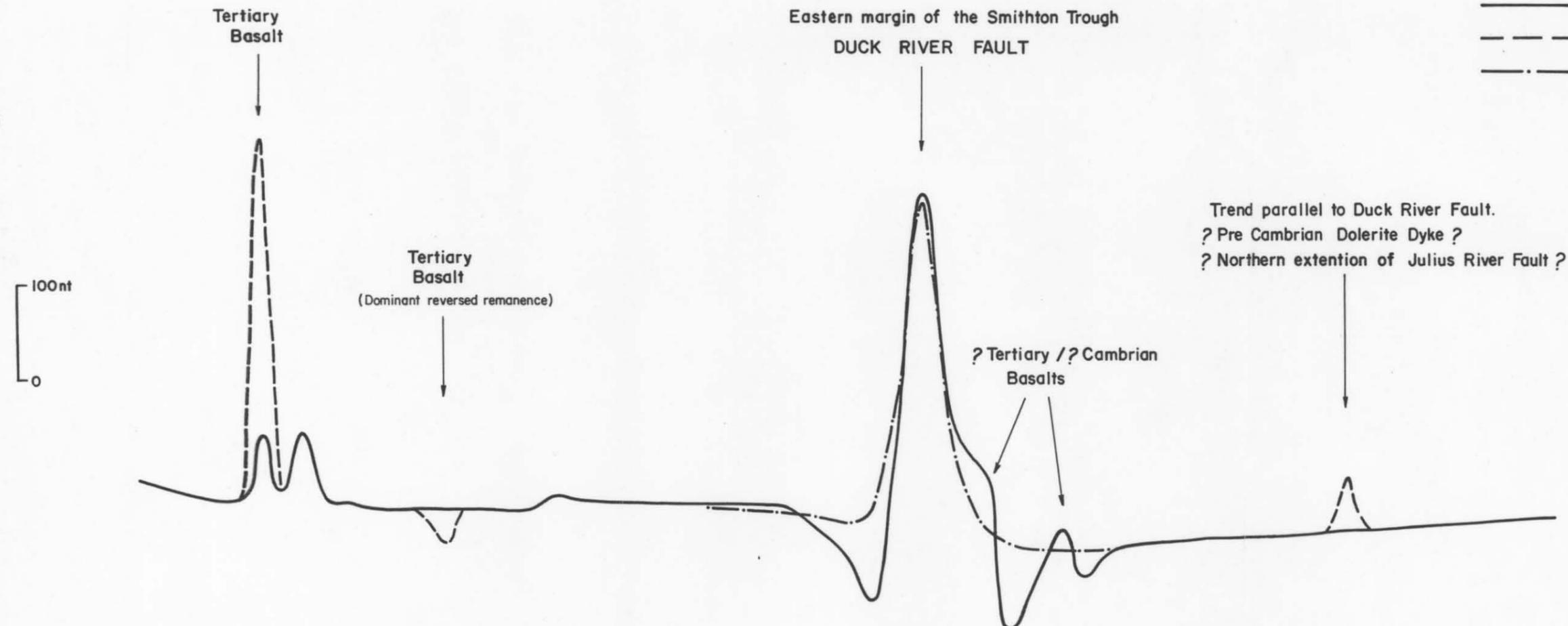
Reference MD / MGB6 / 11

TASMANIA DEPARTMENT OF MINES	
INTERPRETIVE CROSS-SECTION OF THE WESTERN MARGIN OF THE SMITHTON TROUGH	
DRAWN BY J.B.	DRAFTSMAN T.D.G.S.
DATE Jan. '87	REVISIONS
FILE NO.	FIG. 8
SCALE 1:100,000	
KILOMETRES	

KEY
 ——— PROFILE FROM CONTOURS
 - - - - - PROJECTED ANOMALIES
 - · - · - · CALCULATED RESPONSES

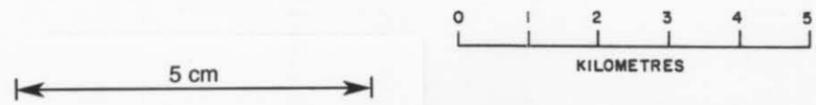
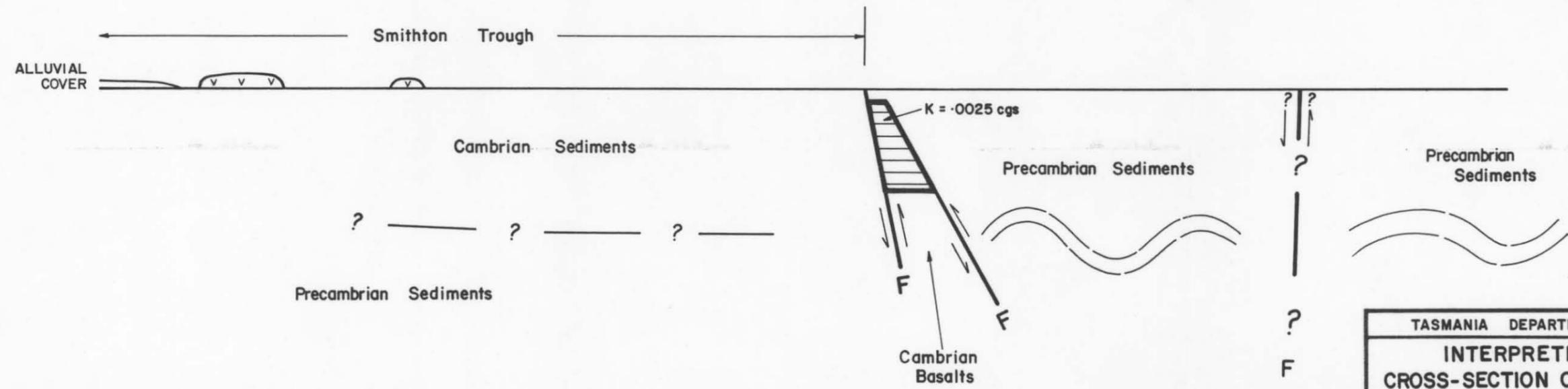
B

B'



NW

SE

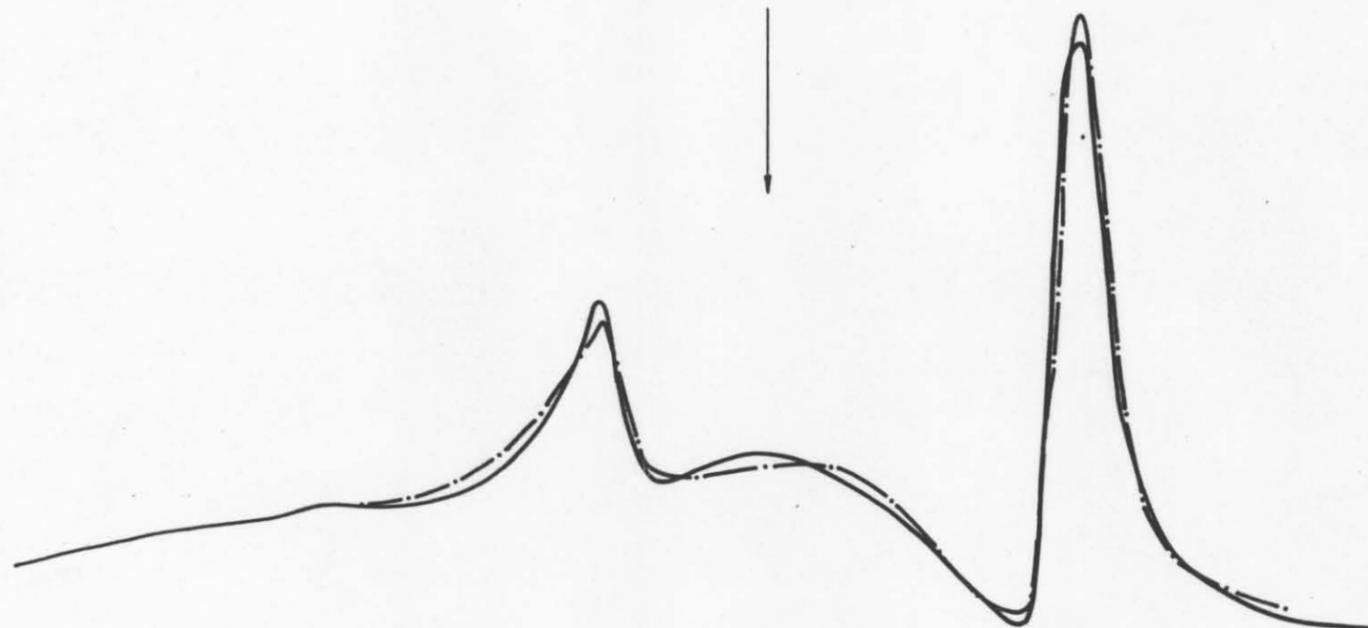


TASMANIA DEPARTMENT OF MINES	
INTERPRETIVE CROSS-SECTION OF THE EASTERN MARGIN OF THE SMITHTON TROUGH	
DRAWN BY : J.B.	DRAFTSMAN : T.G.D.S.
DATE : Jan. '87	REVISIONS
FILE NO.	FIG. 9

C

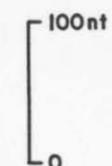
C'

Montagu Anticline



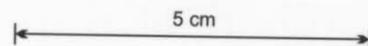
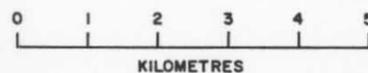
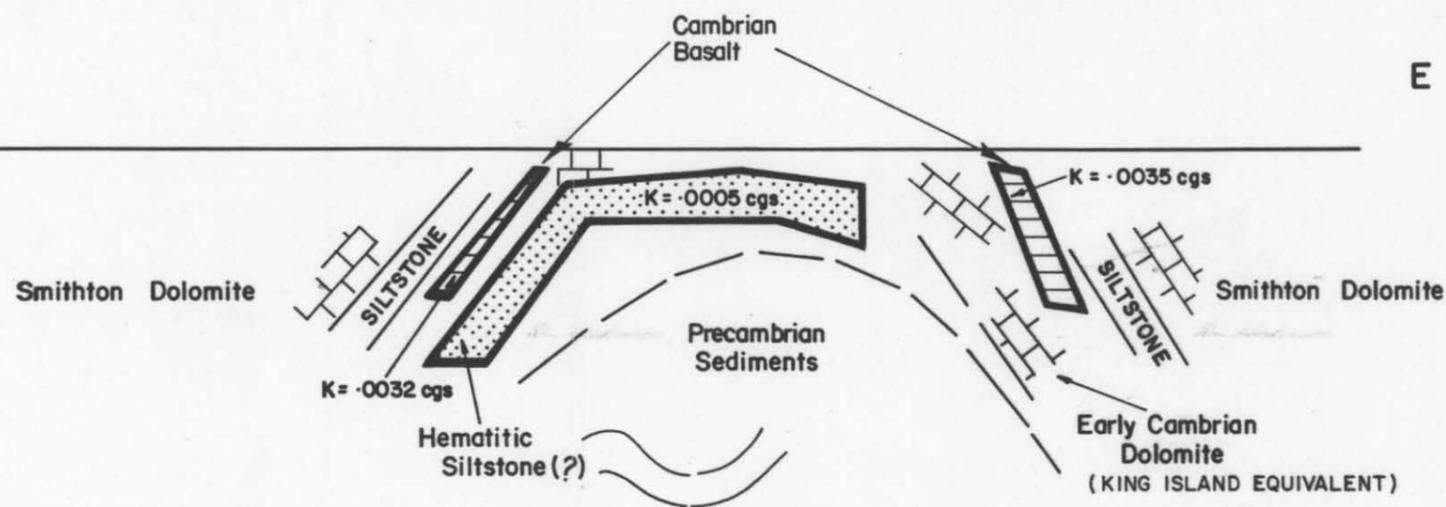
KEY

- PROFILE FROM CONTOURS
- - - PROJECTED ANOMALIES
- · - CALCULATED RESPONSES



W

E



(after Large, 1982)

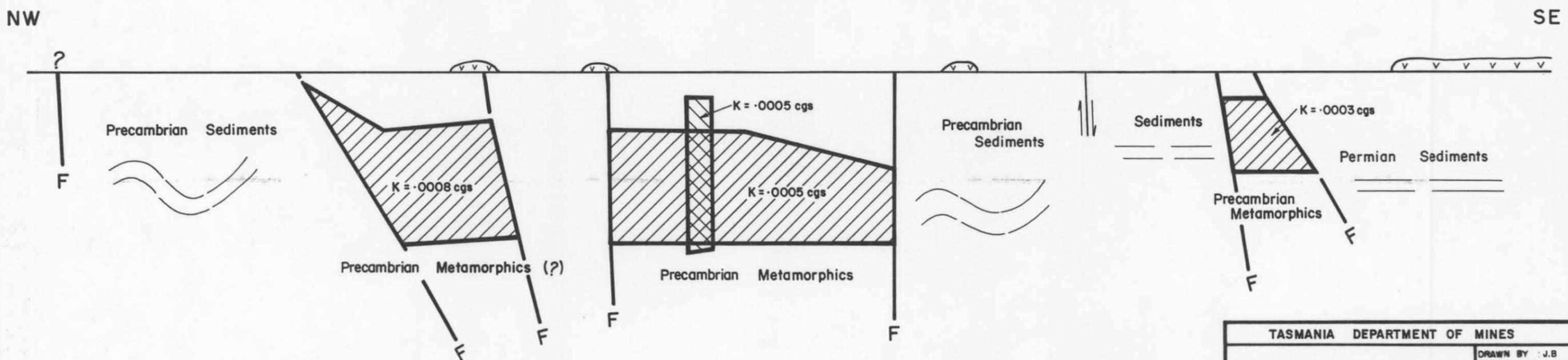
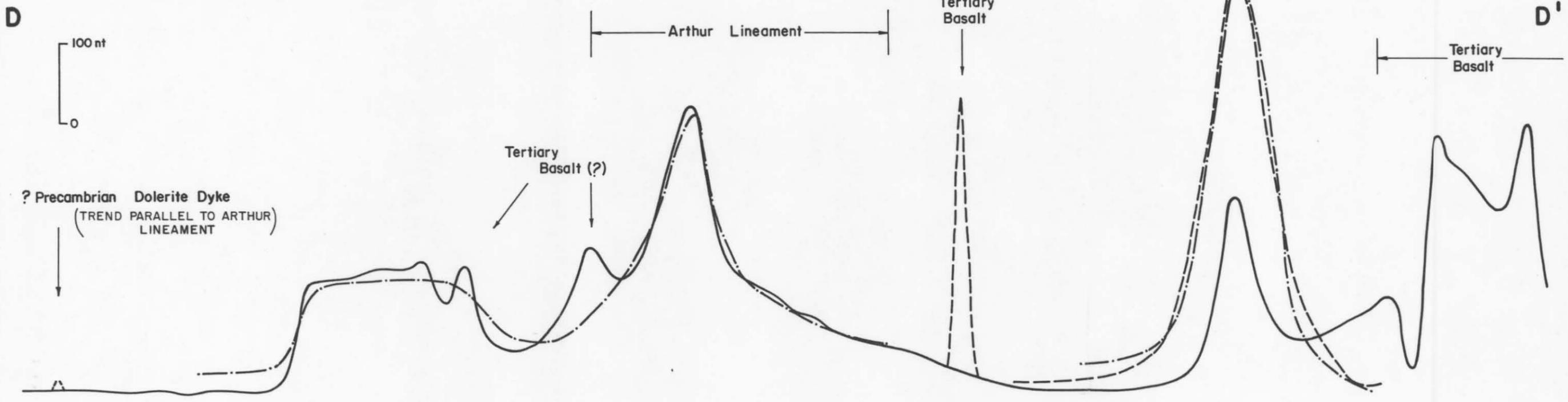
Reference MD/MGB6/11

TASMANIA DEPARTMENT OF MINES	
INTERPRETIVE CROSS - SECTION OF THE MONTAGUE ANTICLINE	
DRAWN BY : J.B.	DATE : Jan. '87
DRAFTSMAN : T.G.D.S.	REVISIONS :
FILE NO.	FIG. 10
SCALE 1:100,000	KILOMETRES

KEY

- PROFILE FROM CONTOURS
- - - PROJECTED ANOMALIES
- · - · - CALCULATED RESPONSES

AL 2
(SECOND MAJOR LINEAMENT)
SUGGESTED



TASMANIA DEPARTMENT OF MINES	
INTERPRETIVE CROSS - SECTION OF THE ARTHUR LINEAMENT	
DRAWN BY : J.B.	DRAFTSMAN T.G.D.S.
DATE : Jan. '87	REVISIONS
FILE NO.	FIG. 11

SCALE 1:100,000

KILOMETRES

Reference MD / MG86 / 11



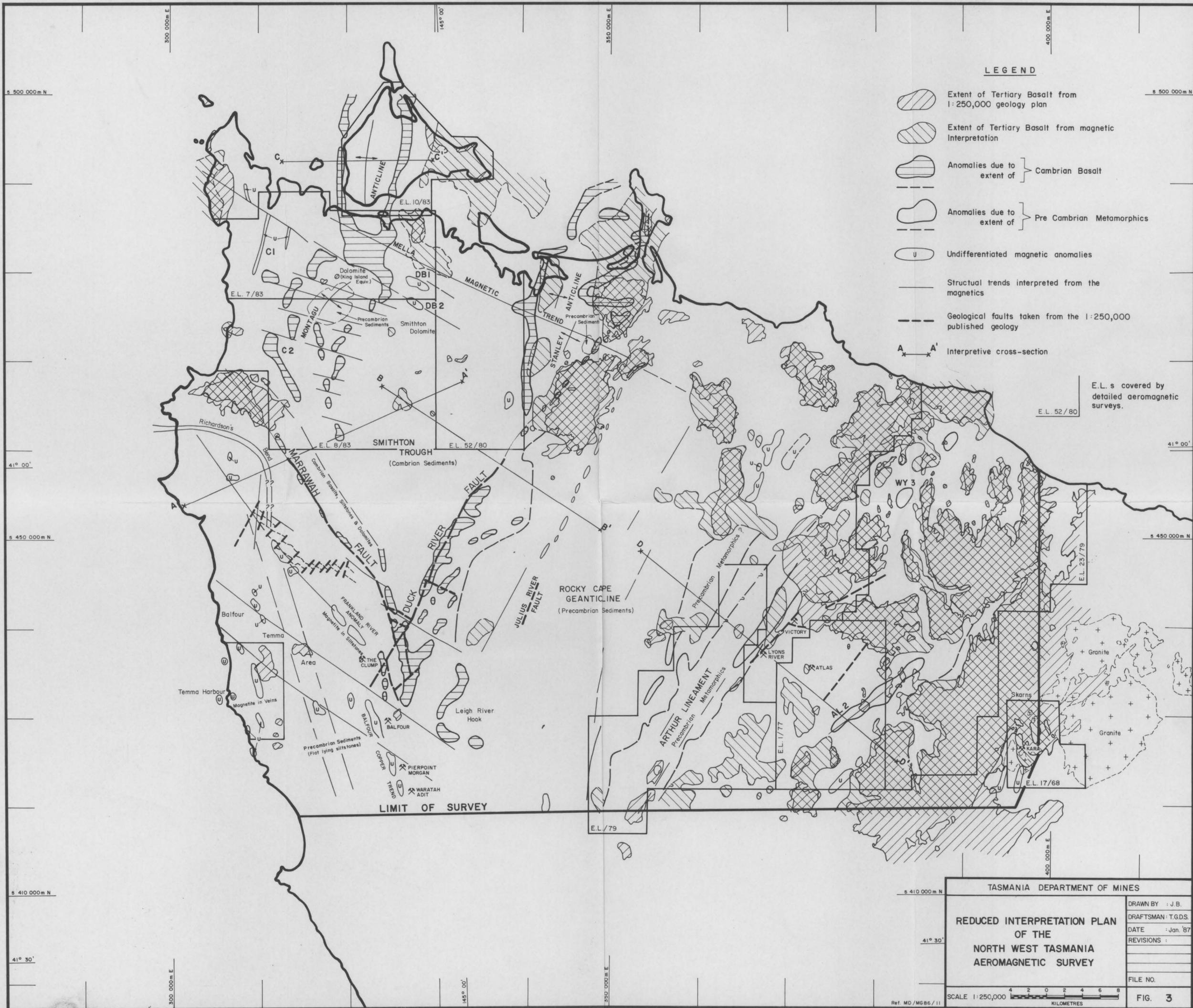
- LEGEND**
- Extent of Tertiary Basalt
 - Anomalies due to Cambrian Basalt
 - Extent of
 - Anomalies due to Precambrian Metamorphics
 - Extent of
 - Undifferentiated magnetic anomalies
 - Structural trends
 - Interpretive cross-section with distance to projected anomaly

TASMANIA DEPARTMENT OF MINES
 NORTH WEST TASMANIA
 Interpretation of the Aeromagnetic Survey

SCALE 1:100,000

5 km

FILE NO.
 FIG. 2

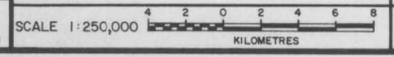


LEGEND

- Extent of Tertiary Basalt from 1:250,000 geology plan
- Extent of Tertiary Basalt from magnetic interpretation
- Anomalies due to extent of } Cambrian Basalt
- Anomalies due to extent of } Pre Cambrian Metamorphics
- Undifferentiated magnetic anomalies
- Structural trends interpreted from the magnetics
- Geological faults taken from the 1:250,000 published geology
- Interpretive cross-section

E.L. s covered by detailed aeromagnetic surveys.

TASMANIA DEPARTMENT OF MINES	
REDUCED INTERPRETATION PLAN OF THE NORTH WEST TASMANIA AEROMAGNETIC SURVEY	
DRAWN BY : J.B.	DATE : Jan '87
DRAFTSMAN : T.G.D.S.	REVISIONS :
FILE NO.	FIG. 3



028031