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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1964/33

MOUNT CLEVELAND MINE
GEOPHYSICAL SURVEY
NEAR WARATAH, TASMANIA 1963

by

J.P. WILLIAMS

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ILLUSTRATIONS

SUMMARY

Self-potential and magnetic surveys at the Mount Cleveland mine, near Waratah, Tasmania in 1953 and 1954 demonstrated that areas of mineralisation could be located by these methods. In 1963, at the request of Aberfoyle Tin Development Partnership supported by the Tasmanian Mines Department, the same methods were used to investigate an additional area at Mount Cleveland.

No significant self-potential anomalies were obtained. Magnetic anomalies appear to coincide with outcrops of volcanic rocks and shale. Magnetic susceptibility tests made on a suite of specimens suggest that the presence of volcanic rocks explains the magnetic results satisfactorily. No drilling sites have been recommended.

1. INTRODUCTION

The Mount Cleveland tin-mining area near Waratah, Tasmania, has been known for over 50 years. Renewed interest in the deposit by a local syndicate prompted the Bureau of Mineral Resources, Geology and Geophysics to carry out geophysical surveys in 1953 and 1954 (Keunecke and Tate, 1954). For descriptions of the mine area and the geophysical methods and results the reader is referred to this report. The geophysical work consisted of magnetic and self-potential (S-P) surveys. Subsequent drilling over anomalies indicated that these methods could be used to indicate the presence of orebodies in the area.

In 1963, Aberfoyle Tin Development Partnership, through the Department of Mines, Tasmania, requested the Bureau of Mineral Resources to make an additional geophysical survey based on recent geological work. The area selected measured 1200-feet square and its relation to the area of the earlier surveys is shown in Plate 1.

The area surveyed was in rough country covered by dense forest. Surveying of the traverses was done with an Abney level by the company; slopes of up to 40 degrees were measured.

The geophysical work, which consisted of magnetic and S-P surveys, was done during April and May 1963 by geophysicists J.P. Williams and A. Howland-Rose.

2. GEOLOGY

The country rocks in the vicinity of the mine area are Cambrian (Dundas Series) and are mainly slate, tuff, and lava (Hughes, 1953). There is a north-east structural trend; Crescent Hill and Deep Creek both coincide with fold axes. Important mineralisation is limited to a favourable bed in shales, although structural weaknesses are also important. The tin (cassiterite) is accompanied by sulphides such as pyrrhotite and pyrite with small amounts of chalcopyrite and arsenopyrite. Detailed geological information on this area is given by Reid (1923) and Hughes (1953).

Later geological work by Glasson (1962) directed attention to the north-east of the original area. Recurrence of the 'chocolate shales', which he considered the favourable bed for mineralisation, led him to recommend a site for further geophysical work.

A more-recent geological survey was made by G.R. Dale, (Geologist of Aberfoyle Tin Development Partnership) when access was available along the geophysical traverses. Owing to scree material on the steep slopes it is hard to tell if the outcrop is actually in situ. Also, because of the thick soil cover outcrops are scarce. Thus it is difficult to recognise anything other than general trends in the structure and no attempt has been made to construct a complete geological map.

The lithological types distinguished are volcanic rocks, chocolate shale, chert, and sandstone (felspathic micaceous). There appear to be at least two major types of volcanic rocks - probably one type is extrusive and the other intrusive. Moreover, the distinction between some cherts and the shale often appears to be a degree of silicification, i.e. one grades into the other. No attempt has been made to relate these rock types to those described by Hughes (1953). Also, no study of thin sections appears to have been done in the area surveyed in 1963.

The sandstone, chert, and shale are interbedded and the strike seems to swing from north-east to east. Not enough information is available to recognise folding. In some outcrops, the volcanic rocks, which appear to be several discrete flows, would seem comformable, but it is not known whether this is general. No evidence of mineralisation is apparent to the naked eye, but microscopic work may reveal the presence of disseminated minerals.

3. SELF-POTENTIAL SURVEY

Field work

A baseline 1200 ft in length was laid out from 4000N/6000E (mine grid) on a grid bearing of 132 degrees (see Plates 1 and 2). Thirteen traverses, viz. 40N, 41N, ... 52N, were laid at right angles to this baseline at 100-ft intervals. The traverses were pegged at 25-ft intervals from 0 to 12E, the baseline being at 5E (Plate 2). Traverse 41N was extended to 22E, and the reconnaissance Traverse S surveyed in by compass and tape. A total of 18,800 ft of traverse was covered with stations from 25 to 50 ft apart.

One station was taken as a fixed reference station and at every point on the grid a reading was taken of the potential difference relative to the fixed station.

Results

No significant anomalies were detected in the area, the maximum amplitude being -20 to -30 mv. In the previously surveyed area, the anomalies due to the known mineralisation were of the order of -250 to -500 mv. For this reason, it was not considered necessary to include the S-P profiles and no attempt has been made to contour the results.

The absence of anomalies similar to those over the known lodes in the mine area lessens the possibility of an orebody being present, but does not entirely exclude it. No S-P effects would be expected, for example, from a sulphide body lying completely below the water table.

4. MAGNETIC SURVEY

Field work

The traverses and observation points used for the S-P survey were also used for the magnetic survey together with the additional reconnaissance Traverses D and R. A total of 19,800 ft of traverse was surveyed with stations intervals ranging from 10 to 50 ft. The magnetic profiles are shown in Plate 3; the contour map constructed from the profiles is shown in Plate 4. The magnetic values have been referred to the arbitrary datum of the earlier surveys.

Results

The contour map exhibits a fairly consistent east-west trend with anomalies of the order of 2500 gammas. However, the north-western corner of the grid and also Traverse D are relatively undisturbed. From geological information available, this area appears to consist largely of sandstone and chert. In the anomalous areas, there seemsto be more shale and volcanic rocks.

The magnetic anomalies may be due to one or more of the following types of body:

(a) small, massive orebodies containing magnetic minerals such as pyrrhotite,

(b) larger disseminated bodies with similar magnetic minerals to (a),

(c) a lithological unit containing magnetic minerals. These minerals may either be of primary origin, e.g. a volcanic rock containing magnetite, or of secondary origin, e.g. a mineralised shale bed.

Type (a) would be expected to give S-P anomalies similar to those near the mine. The possibility of the bodies being unoxidised or too deep to produce S-P effects can be ruled out as the magnetic anomalies clearly arise from bodies at shallow depths.

Type (b) is really a graduation from (a) to (c); S-P anomalies would also be expected from type (b). A disseminated body could perhaps explain the broad magnetic anomaly on Traverse 41N between 9E and 13E.

Type (c) is considered to be the most likely cause of the magnetic anomalies as the volcanic rocks that occur in the area could give rise to the anomalies. During the survey it was noted that the occurrences of volcanic rocks coincided with several of the positive magnetic anomalies. Magnetic susceptibility tests were made on a suite of specimens from the area. The results, tabulated in the Appendix, show that some of the volcanic rocks have high susceptibility and that some, but not all, shales have an appreciable, but much lower, susceptibility (shales here include silicified shale and some chert). The magnetic properties of the shales are due to accessory pyrrhotite or magnetite. The susceptibility values of the more-magnetic volcanic rocks are such that these rocks would be expected to produce anomalies similar to those observed. The volcanic rocks are therefore considered to be the most-likely cause of the anomalies. It should be pointed out, however, that specimens were not collected from the vicinity of every anomaly so that there is no direct evidence as to the cause of some of the anomalies.

5. CONCLUSIONS AND RECOMMENDATIONS

The sparse geological information available suggests a general change in strike from north-east to east and this is borne out by the trend of the magnetic anomalies. The absence of S-P anomalies seriously lessens the possibility of an orebody being present. The magnetic susceptibility tests further discount the existence of an orebody by showing that the volcanic rocks are sufficiently magnetic to cause the anomalies.

No test drilling can be recommenced on the basis of the geophysical results. In order to verify the interpretation given above it is recommended that trenches should be dug to obtain more information on the distribution of the different rock types in the area. It is also considered that petrological studies and a closer examination of the structural geology should be made.

6. REFERENCES

GLASSON, K.R.	1963	Mount Cleveland, Tasmania. Aberfoyle Tin Development Partnership (unpubl. rep.)
HUGHES, T.D.	1953	The Mount Cleveland mine. Department of Mines, Tasmania (unpubl. rep.)
KEUNECKE, O. and TATE, K.H.	1954	Geophysical survey at Mount Cleveland mine, Waratah, Tasmania. Bur. Min. Resour. Aust. Rec. 1954/7 (unpubl.)
REID, A.M.	1923	The Mount Bischoff tin field. Bul. geol. Surv. Tas., 34.

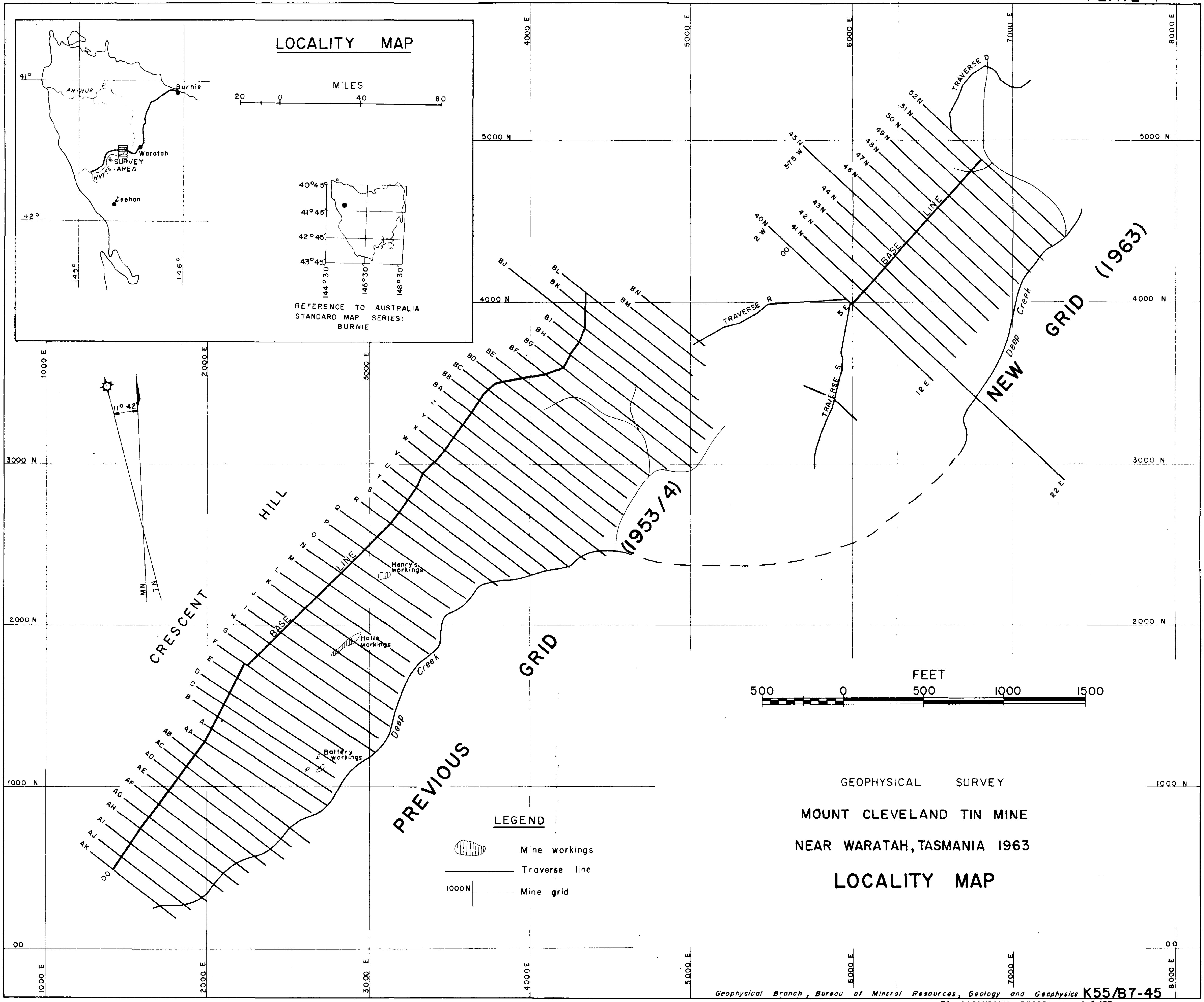
APPENDIX

Susceptibility Determinations

Specimen number	Location	K x 10^{-3}	Bried field description
578	41N/53E	8.45	Grey-green volcanic rock
597	42.15N/11.25E	8.60	Grey-green volcanic rock (less weathered)
580	42.1N/11.25E	8.20	Fine-grained grey volcanic rock
581	45N/6.75E	9.60	Fine-grained grey volcanic rock
582	R2.65	1.41	Fine-grained grey volcanic rock
583	R 2.5	0.172	Dark green volcanic rock
584	41.3N/3.75E	0	Chocolate shale
585	41.75N/3.5E	0.110	Sandstone (felspathic and micaceous)
586	42.3N/3.25E	0.173	Red chert
587	43.5N/3E	0.104	Red silicified shale
588	Henry workings	0.113	Tuffaceous shale
589	Halls workings	0.118	Chert (weakly mineralised)

The magnetic susceptibility of the specimens was determined in the Geophysical Laboratory of the Bureau of Mineral Resources.

The difference in colour of volcanic rocks No. 578 to 582 may be due only to weathering, but cannot be resolved in the hand specimen. However, No. 583 is distinctly different and may be intrusive.



GEOPHYSICAL SURVEY

MOUNT CLEVELAND TIN MINE

NEAR WARATAH, TASMANIA 1963

LOCALITY MAP

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics K55/B7-45

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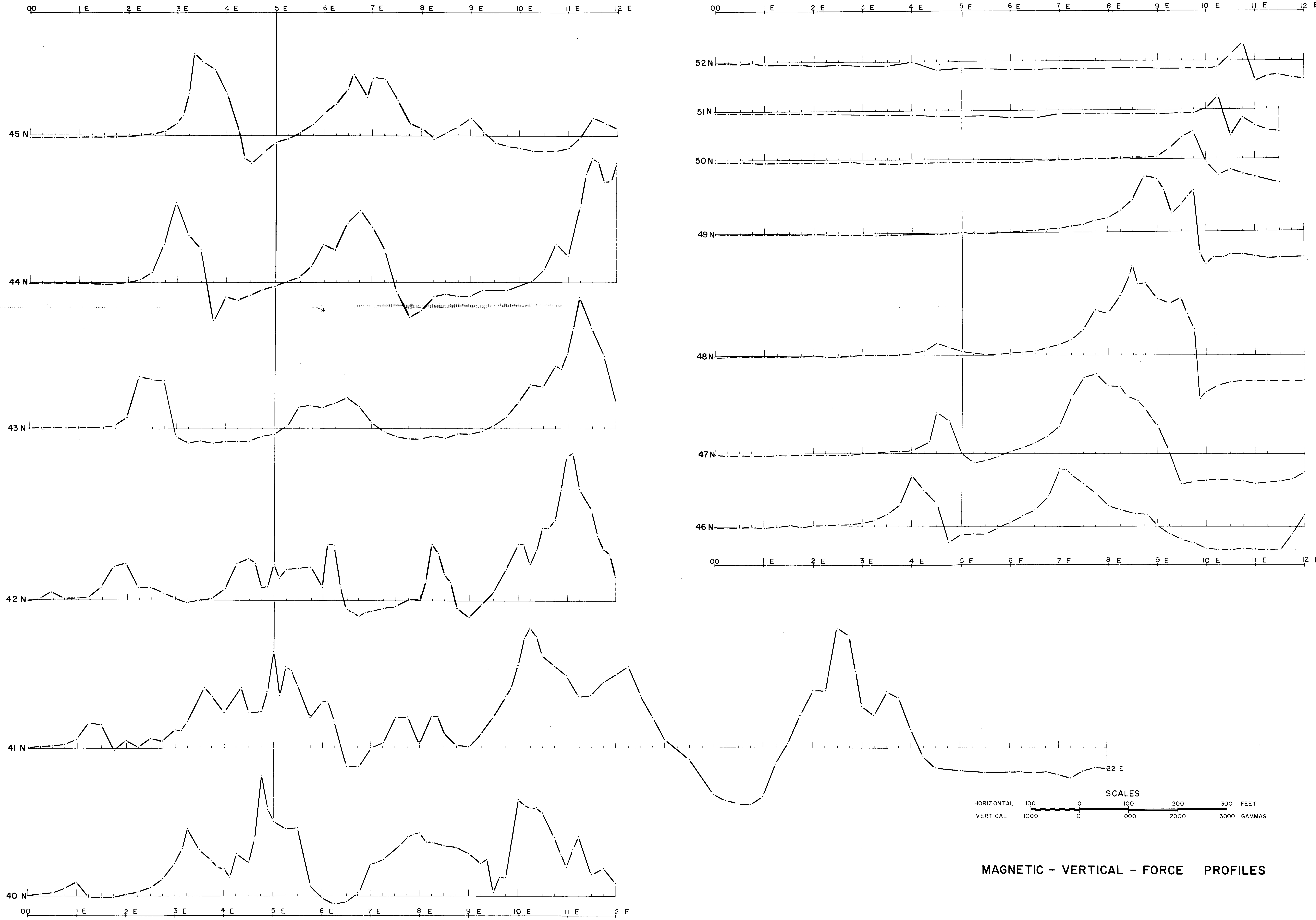
PLATE 3



MT CLEVELAND MINE WARATAH, TAS 1963

MAGNETIC - VERTICAL - FORCE PROFILES

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PLATE 4

MT CLEVELAND MINE, WARATAH, TASMANIA 1963

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