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COMMONWEALTH OF AUSTRALIA
MINISTRY OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1951 No. 42

SECOND PROGRESS REPORT OF THE GEOPHYSICAL SURVEY OF RENISON BELL TIN FIELD, TASMANIA.

by

R. P. LOH

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C O N T E N T S

P L A T E S

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1. INTRODUCTION

In an earlier report, Williams (1950) has described the geophysical survey carried out early in 1950 on the Renison Bell tin field. The present report deals with the work of a second field season which commenced in November 1950 and continued until June 1951.

The methods used were again the magnetic and self-potential. The 1950 survey was extended to the south and east by continuing the Renison Bell Hill base-line a further 1000 feet south and reading stations on both sides of this base-line along traverses extending from the main quartz-porphyry dyke to the headwaters of the Montana Creek. In addition, some of the traverses were extended over the saddle between Dreadnought and Stebbins Hills as far as the Boulder tramway.

The area covered by the Imperial Geophysical Experimental Survey (I.G.E.S.) in 1929 (Edge and Laby, 1931) lies immediately to the south of the present survey. The I.G.E.S. layout has been located by tying in with the present survey two of the beacons left by the I.G.E.S. The locality plan (Plate I) shows the extent of the coverage so far completed by the Bureau with the self-potential and magnetic methods, and the location of the I.G.E.S. layout.

The Zeehan staff of the Tasmanian Mines Department again undertook the surveying of the traverse lines and their assistance in this and many other matters expedited the progress of the survey. Renison Associated Tin Mines N.L. provided a field assistant during the wet months and willingly co-operated with the geophysical party.

In starting the survey, the writer was assisted by Mr. L.W. Williams, geophysicist, who spent the first three weeks with the party, which also included Mr. R. Green, cadet geophysicist and four university students on vacation. After the departure of the students, the party was joined by Mr. J.H. Quilty, geophysicist, and Mr. R.J. O'Neill, field assistant.

II. GEOLOGY

A summary of the geology of the Renison Bell tin field has been given in the first Progress Report (Williams, 1950) and reference has been made to the work of Ward (1909), Conder (1918), Reid (1925) and Fisher (1943). These writers give a general description of the geology of the field and detailed descriptions of the individual mine workings but it has apparently been difficult to plot the boundaries of and determine the relationship between the different sedimentary beds which constitute the Dundas series. A detailed geological surface plan of a section of the field was prepared by the I.G.E.S. The northern part of this plan includes part of the area covered by the present geophysical survey and has been reproduced without alteration in Plate 2.

The eastern side of the Renison Bell Hill is a region of faulting and fracturing accompanied by silicification. The sedimentary bed in which most of this fracturing occurs is locally termed "red rock", which is considered to have been originally a fine-grained ferruginous sandstone now converted to quartzite by siliceous solutions. The "red rock" is resistant to weathering and appears to overly the normal slates and sandstones; it has been taken to mark the upper limit of the sedimentary beds favourable for the formation of mineralised floors. The I.G.E.S. plan shows portion of the red beds in detail and indicates where the rock has been highly silicified and mineralised. A tuffaceous horizon is shown west of the "red rock" on the I.G.E.S. plan and has also been mapped by Conder in his plan of the Montana South workings.

The Dreadnought and Stebbins hills lying to the east of the "red rock" region are composed of grits and massive shales which appear to become more massive and felspathic in character going eastward and are of slightly tuffaceous aspect. (Fisher, 1943, p.6, p.19). A dolerite dyke considered to be of Mesozoic age has been mapped on the western slopes of the Dreadnought-Stebbins ridg

Plate 2 shows the location of the principal open-cut workin in the area of the present survey. In the Montana South workings, situated on a steep slope on the west bank of the Montana Creek, oxidised ore has been removed by systematic sluicing over a fairly extensive area. The Montana South lode system consists of three pyritic floors intersected by at least two pyrrhotite lodes of the fissure type. The pyritic floor of the Montana North workings has been sluiced in two cuts joined by a deep costean.

The Federal ore-body on the eastern slopes of Stebbins Hill is a double fissure lode in which replacement by massive pyrrhotit has taken place. The oxidised ore has been removed by open cuttin to a depth of 100 feet but there is probably still a large body of sulphide ore left unworked. Traces of copper can beseen in the walls of the open cut. In Evenden's workings, which lie on the Dreadnought line of lode, a narrow vein has been mined for oxidise ore.

III. RESULTS AND INTERPRETATION

The results of the magnetic and self-potential surveys are shown in the form of contours in Plates 3 (magnetic) and 4 (self-potential). As in the work of the previous season, a number of magnetic and self-potential anomalies, some of them very intense, were observed and it has been possible to recognise additional "anomalous areas" which are indicated on the plans by numbers XIV to XXIII. These will be discussed under two main headings, namely Renison Bell-Montana Section and Dreadnought Section.

Owing to the use of large contour intervals required in orde to represent the more intense anomalies, the contour plans do not adequately represent the weaker anomalies and more moderate gradie which nevertheless are important as they could be caused by deep-seated ore-bodies. Hence the results obtained in some parts of th area have been represented also in the form of profiles (Plates 5, 6 and 7).

(a) Renison Bell - Montana Section.

XIV. This "anomalous area" is situated near the top of the Reniso Bell Hill and extends approximately from traverse 1690 S to traver 3010 S and from 100 E to 600 W. It includes the area referred to IV in the first Progress Report. The anomalies associated with th Upper Blow lode and the No.5 workings have been traced south and have developed into complex pattern shown by both the magnetic and self-potential contours. The strike of the body or bodies produci the anomalies is roughly parallel to the direction of the base-lin

The magnetic anomalies are particularly intense with very steep gradients. An outstanding feature of the magnetic results i the large number of intense negative values particularly about traverse 2200 S, where, over a distance of 200 feet (150 W to 350 the vertical component of the magnetic field is at least 5,000 gam below the normal undisturbed value. There is a corresponding regi of abnormally high positive values to the east of the negative reg These extreme positive and negative magnetic values indicate a strongly magnetic body at a shallow depth. No theoretical analysi of the anomaly is possible however, owing to its irregular form an the fact that it appears to be mainly due to abnormal polarisation rather than to magnetisation by induction in the earth's field.

Considering the whole of area XIV, it may be seen that there is in general a good agreement between the magnetic and self-potential results. An exception is the self-potential low centred at 2600S/425W, which is not accompanied by any marked magnetic anomaly. Analysis of this self-potential anomaly indicates that it is probably due to a sulphide body about 150 feet below the surface and dipping to the north or north-east at 40° to 50°.

The intense localised negative centres at 500 W on traverses 2100 S and 2300 S suggest shallow mineralisation. In the central part of the area, although the pronounced magnetic anomalies appear to originate from shallow depths, the more moderate self-potential gradients indicate deeper mineralisation.

The magnetic anomaly, whose axis roughly follows the baseline between 2600 S and 2900 S practically coincides with a well defined self-potential anomaly, and both methods give evidence of an almost vertical lode approaching close to the surface. The magnetic anomaly appears to terminate at the southernmost traverse read, but it is clear that the self-potential anomaly will continue still further south.

To sum up the discussion of area XIV, it may be stated that both methods appear to indicate a strongly mineralised zone about 1300 feet long and several hundred feet wide. It is obvious that there are strongly magnetic bodies close to the surface but there is also evidence that in parts of the area the mineralisation must continue to considerable depth. It is probable that a fissure lode, forming a continuation of the Upper Blow lode, extends south beyond the summit of the Renison Bell Hill and has associated with it subsidiary ore-bodies causing the individual anomaly centres shown by the geophysical results.

On the basis of the above interpretation, this area represents a very promising one for detailed testing. Diamond drilling would be preferred for locating deeper bodies and following up known lodes but the terrain favours trenching for testing the nature of shallow bodies.

The testing recommended for the purpose of making a preliminary check on the significance of the geophysical anomalies is indicated in Plates 3 and 4 and is set out in detail in Section IV. Trenches would be useful in the following places:- at 2050 S from 475W to 550W, along traverse 2300 S from 400 W to 500 W and along traverse 2200 S from the base-line to 500 W. Should the last show good values it could well be deepened, so as to obtain a cross-section of the lode structure while obtaining economic ore. A long inclined drill hole G16 directed into the hillside in the line of traverse 2200 S would test the depth extent of the mineralisation. A vertical hole G15 at 2550 S/400 W should intersect the body responsible for the self-potential anomaly here at a depth of 150 to 200 feet. The hole G17 at 2900 S/50 E would test for a vertical lode thought to be indicated by the well-defined self-potential and magnetic anomalies in this locality.

XV. A self-potential anomaly with two subsidiary negative centres extends from 2200 S to 2550 S. The corresponding magnetic anomaly is of smaller magnitude than those on Renison Bell Hill. A fairly deep-seated body is indicated by both methods and should be intersected at a depth between 60 and 100 feet by the recommended drill hole G18 collared at 2300 S / 425 E.

XVI. This "anomalous area" is a continuation of IX referred to in the first Progress Report. An elongated magnetic anomaly traced as far south as traverse 2600 S shows three distinct magnetic highs.

Two separate self-potential negative centres roughly correspond to the magnetic anomaly. There appears to be no relation between the magnetic anomaly and the tuffaceous horizon which has been plotted on the I.G.E.S. geological plan between 800 E and 900 E and shown by Conder (1918) to occur immediately west of the Montana South workings.

Analysis of the self-potential anomaly centred at 2500 S/950 E indicates an oxidising body at a depth of about 30 feet. The old adit at 2400 S/ 1000 E may have intersected this body and a geological examination of this adit and its dump material may therefore yield useful information. The more pronounced anomalies in this area could be tested by inclined drill hole G20 at 2050 S/ 725 E and trench along 2100 S near 650 E.

XI. (already referred to in first Progress Report). Extension of the survey to the south and east has shown the full.extent of the anomalies in the vicinity of the Montana North workings. A continuation westwards of the known pyritic floor exposed in the workings would explain the character of the self-potential results. The high magnetic readings near 1890 S/ 1050 E may be related to the vertical fissure lode suggested by Williams (1950, p.5) and are considered worthy of testing by a drill hole such as G21 collared at 1890 S/ 1000 E.

XVII. A Weather-resistant outcrop of "red rock" striking N 30°W can be traced through 2200 S / 1400 E and appears to be related to the elongated magnetic anomaly which has been traced from 1600 S to 2500 S and may continue further south. No self-potential anomaly is present and a comparison may be made with the "anomalous area" X (first Progress Report), which also showed an elongated magnetic anomaly with no appreciable self-potentials occurring in an area of "red rock". Samples of the "red rock" taken from area XVII show intense magnetism due to included magnetite. The absence of self-potential effects is probably due to a high water table in the vicinity of the Montana Creek which would prevent oxidation of the sulphides. The test hole G9 recommended in the previous report should prove whether this type of magnetic anomaly is likely to indicate the presence of useful ore.

XVIII. Another magnetic anomaly occurs with no associated self-potential anomaly over an outcrop of magnetic "red rock".

XIX. The Montana South workings constitute the most extensive workings in the area of the present survey. A series of three floors is intersected by two fissure lodes and the complex structure has been systematically sluiced over the eastern face of the spur that projects from the main Renison Bell Hill. The six traverses, 2500 S to 3010 S cross this spur and terminate at the edge of the sluiced workings. The magnetic results obtained along these traverses between the base-line and the workings are shown separately in the form of profiles in Plate 5. The profiles show an anomaly which, although much weaker than those on the Renison Bell Hill, indicates a deep-seated magnetic body striking roughly parallel to the base-line and lying between 500 E and 600 E. The anomaly is such as would be caused by a tabular body with vertical or near-vertical dip and could therefore indicate a fissure lode. With certain limitations, the depth below the surface of such a magnetic body is equal to the horizontal distance over which the magnetic anomaly falls from the maximum value to half that value. Application of this principle to the six profiles (Plate 5) gives an average result that the top of the body is near the 1000 feet level. This is the same level as the middle of the floor system of the Montana South workings. The self-potential contours show a negative anomaly, which indicates an extension of the floor system into the hill at least as far as 700 E. Hence considering the results of both methods, the most probable interpretation seems to be that of "floor" associated with a fissure lode. An inclined hole such as G22 collared at 2800 S / 800 E should be sufficient to test the validity of this interpretation.

(b) Dreadnought Section.

As a result of adverse weather in April and May, only a limited number of traverses could be extended eastwards to cross the Dreadnought - Stebbins ridge. These traverses were chosen so as to give a general idea of the trend of the self-potential and magnetic values on an east-west cross section of the Dreadnought-Federal lode system. It was necessary to terminate the field work with gaps remaining in the coverage of the area and some of the anomalies detected only partly delineated.

In the Dreadnought section the results are in general of a different character from those in the Renison Bell section. Both self-potential and magnetic anomalies have gentler gradients. It is also noted that the average level of the magnetic values is about 1000 gammas higher than in the Renison Bell section, an effect which may be related to a change in the type of sedimentary rocks, which, along the Dreadnought-Federal line of lode, are quite distinct from the more westerly outcrops. As has been pointed out, the rocks on the Dreadnought Stebbins ridge appear to become more massive and felspathic in character going eastward from the "red rock" beds and are slightly tuffaceous in aspect.

The magnetic and self-potential contour plans (Plates 3 and 4) show "anomalous areas" XX to XXIII. The results are shown in greater detail in the form of profiles in Plates 6 and 7.

XX, XXI. Situated on the ridge leading up to the summit of Dreadnought Hill, both these areas show magnetic and self-potential anomalies. XXI has not been fully delineated. Profiles 1000 S to 1500 S show the presence of a broad self-potential trough, which could be due to a sulphide body extending through both areas and with its upper limit at a depth of about 200 feet. However, a single body of this type does not explain the magnetic anomalies, which appear to be mainly due to mineralisation at shallow depths.

XXII. Four traverses, 1000 S to 1300 S were extended over the eastern slopes of Dreadnought Hill in order to investigate the Dreadnought line of lode south of Evenden's workings. The self-potential results reveal the presence of a sulphide body east of Evenden's cut, dipping to the east at a steep angle (60° - 80°) with the limit of the unoxidised zone at 150 to 200 feet below 2500 E. The continuation upwards of this body would cause it to outcrop at the position of Evenden's cut. The body appears to strike south and may therefore link up with the Federal lode. The existence of such a body would be consistent with the views of earlier writers (Ward, 1909, p.158; Conder, 1918, p.73), who considered that the Federal lode formed part of the Dreadnought lode system. Completion of the geophysical survey between traverses 1300 S and 1800 S should clarify this point.

XXIII. The three traverses which cross the Federal open cut have revealed a well defined anomaly with each method. Considerable information is available about the Federal ore-body and is illustrated in sections accompanying the report by Fisher (1943). In the northern part of the workings, the oxidised ore has been removed by open cut and stoping, and a sulphide body, about 40 feet wide dips to the east at about 67°. The theoretical magnetic profile calculated for such a body, assuming the susceptibility to be of the order of 0.I, agrees very closely with the observed profile. The self-potential results indicate that active oxidation is taking place, but the readings should be continued further to the east to give sufficient data to enable a quantitative determination of the depth extent of the body to be made. However, on the basis of the magnetic and self-potential profiles as they stand at present it is estimated that the body extends for at least 200 feet, that is, down to the level of the Boulder tramline.

As the Federal ore-body gives rise to strong well-defined anomalies, which give very satisfactory correlation with the known body, additional geophysical work should determine with considerable certainty the length of the ore-body along its strike and in particular should show whether the ore-body is pinched out or faulted out underneath the Dreadnought Creek as the geological evidence tends to suggest.

The self-potential profiles indicate the possibility of another lode system parallel to and about 200 feet west of the main Federal lode. The outcrop of rock in this locality has been investigated by three small trenches located, by coincidence, on each of the three traverses.

A more complete picture of the Dreadnought - Federal lode system could be obtained by extending the geophysical survey to fill in the gaps in the existing layout and by investigating the areas to the north, south and east. Drilling recommendations in the Dreadnought section can well wait until additional geophysical work has been completed.

IV. SUMMARY OF TESTING RECOMMENDATIONS

Drill holes and trenching recommended in the general text of the report are summarised in the following table:-

Hole/Trench No.	Co-ordinates of Collar/Trench ends		Area Tested	True bearing of hole/trench	Depression of hole.
G12T	2050S	475W-550W	XIV	67°	-
G13T	2300S	400W-500W	XIV	67°	-
G14T	2200S	B.L.-500W	XIV	67°	-
G15	2550S	400W	XIV	Vertical	90°
G16	2200S	B.L.	XIV	247°	20°
G17	2900S	50E	XIV	270°	20°
G18	2300S	425E	XV	247°	45°
G19T	2100S	700E-625E	XVI	67°	-
G20	2050S	725E	XVI	210°	45°
G21	1890S	1000E	XI	50°	45°
G22	2800S	800E	XIX	247°	45°

V. SUMMARY AND CONCLUSIONS

The geophysical survey has been extended to the south and south-east of the area covered during the previous field season, and indications of several new and promising ore occurrences have been outlined by both magnetic and self-potential methods. Difficulties which existed previously, of lease boundaries and unfavourable water supplies probably prevented the mining of the ore-bodies indicated, but as these difficulties can now be surmounted, further prospecting by trenching and drilling should be undertaken.

Near the top of the Renison Bell Hill, an area of very intense anomalies has been outlined, giving evidence of a strongly mineralised zone about 1300 feet long and several hundred feet wide. The mineralisation is probably a continuation of the Upper Blow lode and the area appears to be a very promising one for detailed testing. The results in the vicinity of the Montana South and Montana North workings point to the probability of substantial extensions of these two lode systems towards the west into the Renison Bell Hill. In these, and several other localities, the results are of considerable interest and provide definite targets for testing.

Trial traverses across the Dreadnought - Stebbins saddle have given evidence of a deep-seated lode system. Additional geophysical work designed to trace out this system in full and to determine its relation to the Boulder workings should be of considerable assistance to the operating company.

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31/1/52.

DISTRIBUTION:

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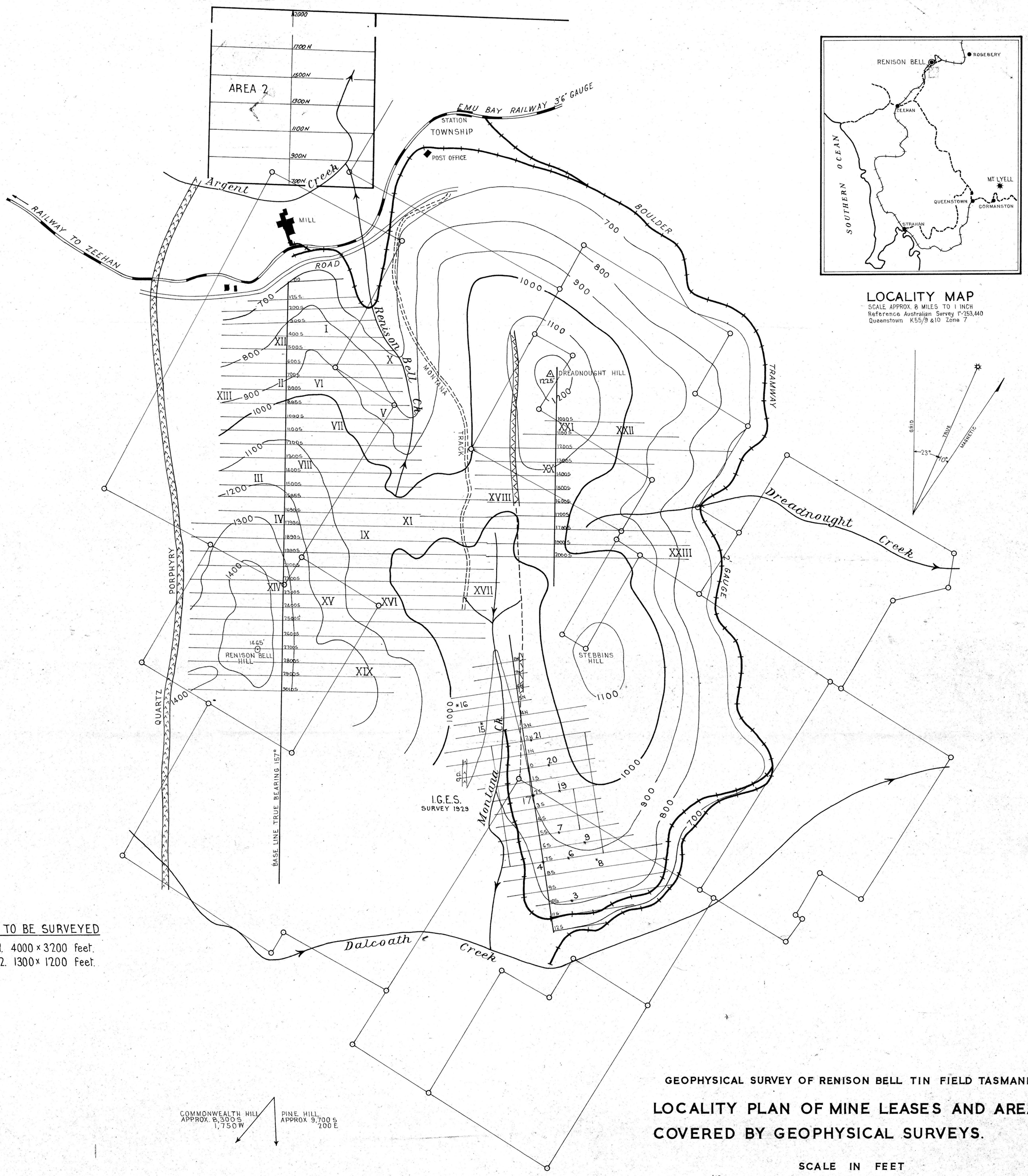
7. " " "

PLATE I



LOCALITY MAP

SCALE APPROX. 8 MILES TO 1 INCH
Reference Australian Survey 1°-253,440
Queenstown K55/9 &10 Zone 7

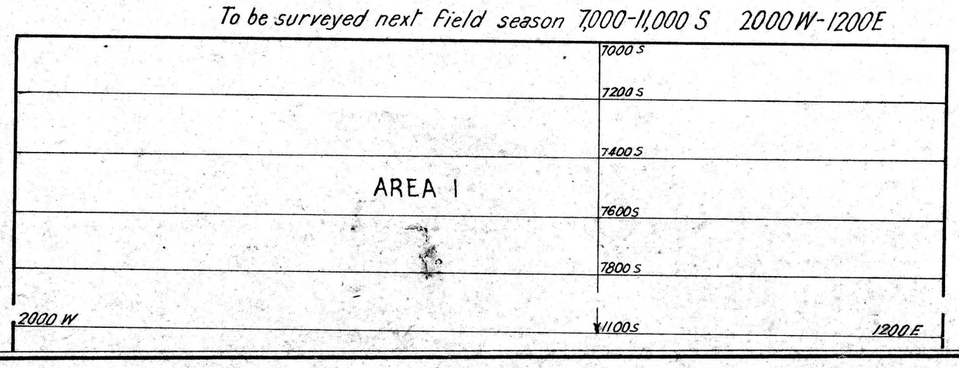
AREAS TO BE SURVEYED

AREA 1. 4000 × 3200 feet.
AREA 2. 1300 × 1200 feet.

COMMONWEALTH HILL
APPROX. 8,300 S
1,750 W

PINE HILL
APPROX 9,700 S
200 E

To be surveyed next Field season 7,000-11,000 S 2000 W-1200 E



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GEOPHYSICAL SURVEY OF RENISON BELL TIN FIELD TASMANIA

LOCALITY PLAN OF MINE LEASES AND AREAS COVERED BY GEOPHYSICAL SURVEYS.

SCALE IN FEET

400 0 400 800 1200 1600

LEGEND

- QUARTZ PORPHYRY q.p.
- DOLERITE d.l.
- XX — ANOMALOUS AREAS 1950, 1951
- *7 — I.G.E.S. BEACONS 1929
- 1100 — TOPOGRAPHY CONTOURS BASED ON TASMANIAN MINES DEPARTMENT SURVEY DATUM: DREADNOUGHT TRIG 1224·7'
- LEASE BOUNDARIES FROM FISHER 1943 PLATE 1.

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G86-4


PLATE
DREADNOUGHT HILL
EVENDEN'S CUT
MONTANA NORTH WORKINGS
UPPER BLOW LODE
No. 5 WORKINGS
SILICIFIED SEDIMENTS
RED ROCK
ADIT DUMP
DAM
RENISON BELL HILL 1465'
MONTANA SOUTH WORKINGS
GRITS AND SHALES
FEDERAL CUT
STEBBINS HILL
DUNN'S WORKINGS
Dreadnought Creek
Tramway
Boulder
BASE LINE
BASELINE
I.G.E.S.
SCALE IN FEET
100 0 100 200 300 400 500 600
LEGEND
Alluvium
Grits and Shales
Quartzite (Red Rock)
Tuff
Dolerite
Geophysicist
GEOPHYSICAL SURVEY AT RENISON BELL TIN FIELD, TASMANIA
SURFACE PLAN SHOWING
GEOPHYSICAL GRID, SURFACE CONTOURS, SURFACE GEOLOGY AND OPEN CUT WORKINGS
G 86-5
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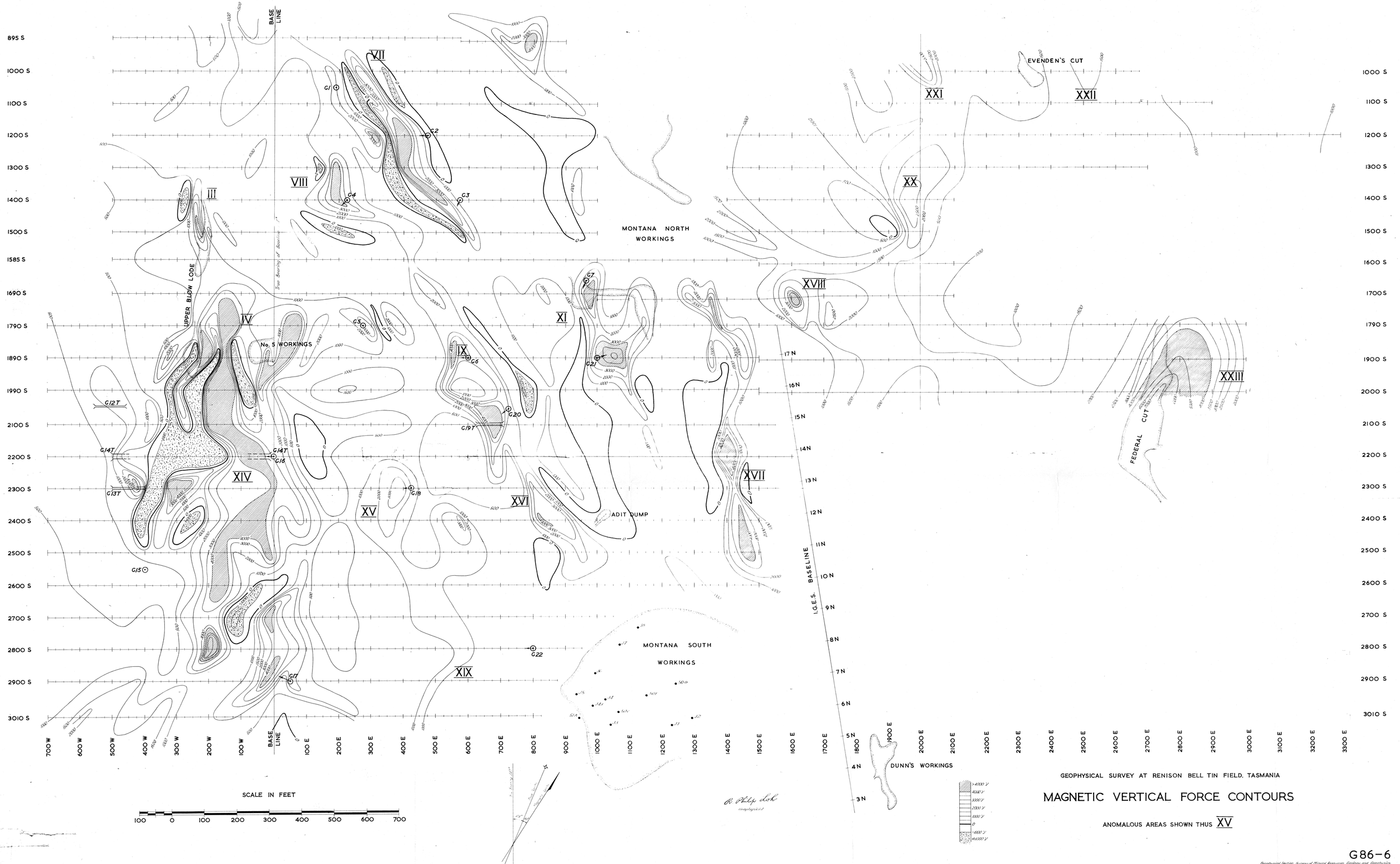

GEOPHYSICAL SURVEY AT RENISON BELL TIN FIELD, TASMANIA

MAGNETIC VERTICAL FORCE CONTOURS

ANOMALOUS AREAS SHOWN THUS XV

G86-6

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PLATE 4

GEOPHYSICAL SURVEY AT RENISON BELL TIN FIELD, TASMANIA

SELF-POTENTIAL CONTOURS

ANOMALOUS AREAS SHOWN THUS XV
CONTOUR INTERVAL 50 MILLIVOLTS

G86-7

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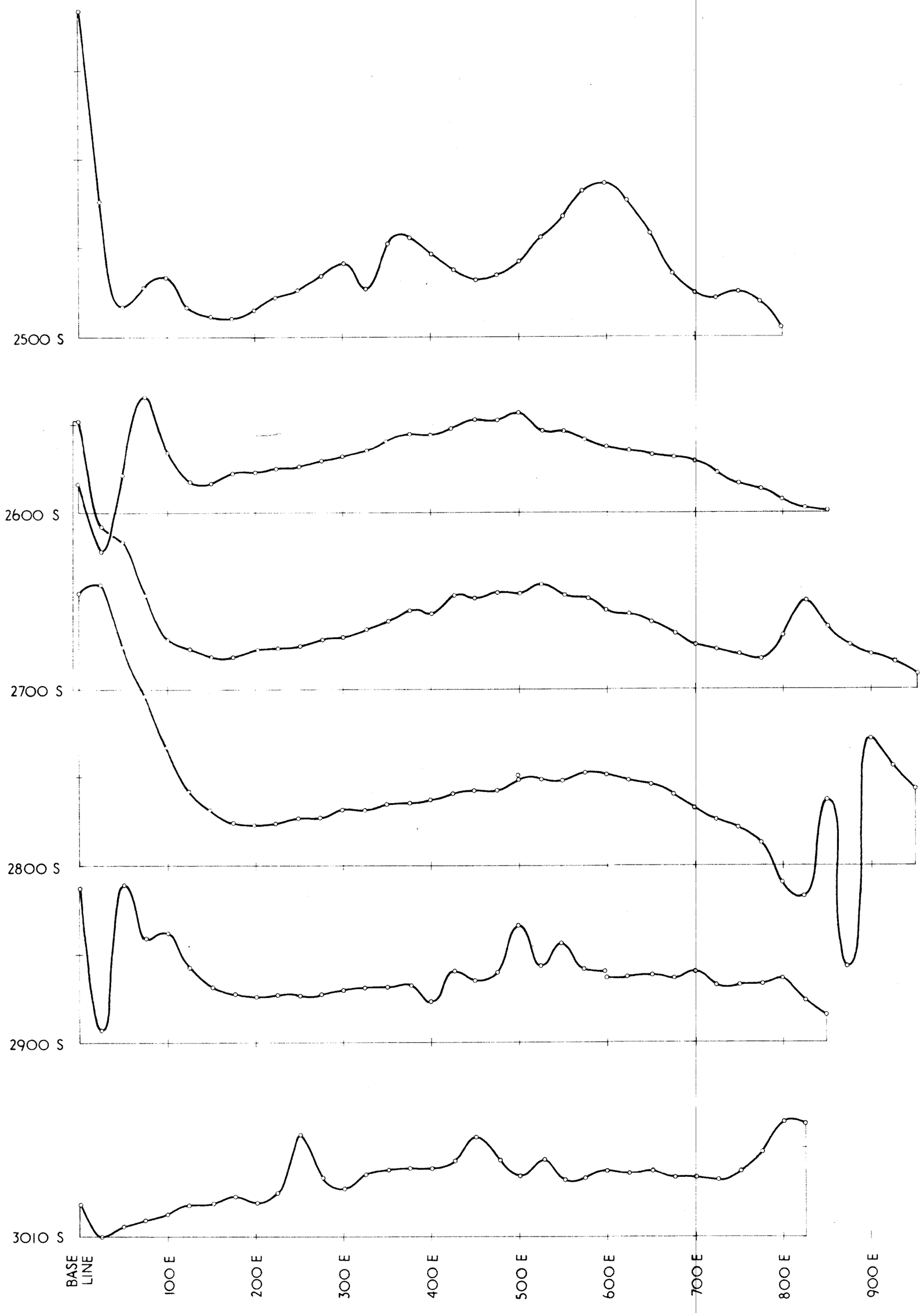
PLATE 5



SCALES

HORIZONTAL 100 0 100 200 300 400 FEET

VERTICAL 100 0 100 200 300 400 GAMMAS

GEOPHYSICAL SURVEY AT RENISON BELL TIN FIELD, TASMANIA

MAGNETIC VERTICAL FORCE PROFILES

MONTANA SECTION

K. Philip Loh
Geophysicisi

G86-8

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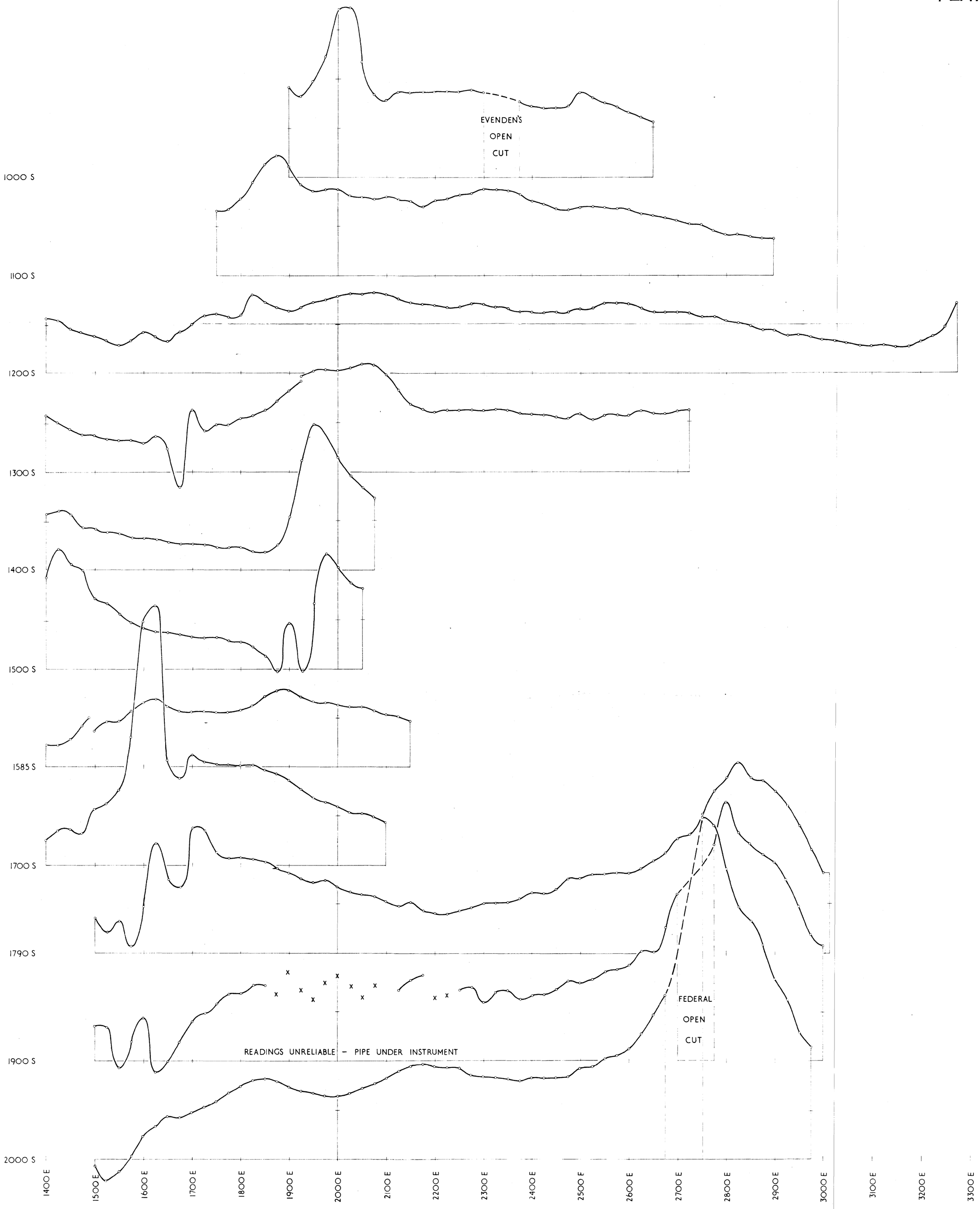
PLATE 6



SCALES

VERTICAL 1000 0 1000 2000 3000 4000 5000 GAMMAS

HORIZONTAL 100 0 100 200 300 400 500 FEET

GEOPHYSICAL SURVEY AT RENISON BELL TIN FIELD, TASMANIA

MAGNETIC VERTICAL FORCE PROFILES

DREADNOUGHT SECTION

G86-9

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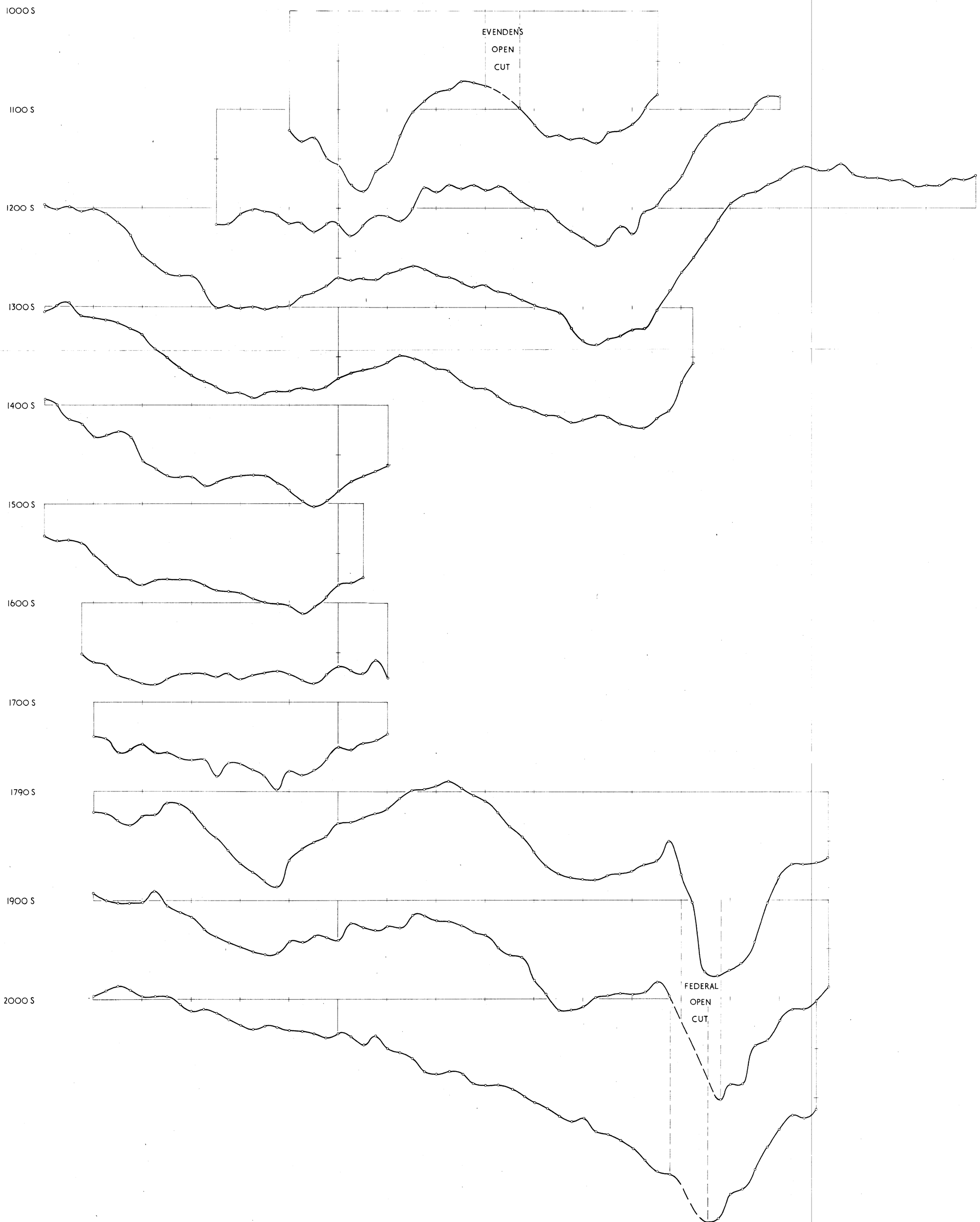
PLATE 7



SCALES

HORIZONTAL 100 0 100 200 300 400 500 FEET

VERTICAL 100 0 100 200 300 400 500 MILLIVOLTS

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GEOPHYSICAL SURVEY AT RENISON BELL TIN FIELD, TASMANIA

SELF-POTENTIAL PROFILES

DREADNOUGHT SECTION

G86-10

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