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ANNUAL REPORT

MOINA AREA

E.L. 8/65

1969 - 70

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BY: B. C. DANDY

AMG REFERENCE POINTS ADDED

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1. INTRODUCTION

This report covers the work performed in the Moina lease area (E.L. 8/65) from March 1969 to April 1970. The bulk of the geological work was carried out by the writer and one field assistant between February and April 1970. The work was directed toward the continued appraisal of selected areas of interest delimited by the aeromagnetic survey carried out by A.M.E.G. in 1966 (with a reinterpretation of the same data by J. Webb in 1968) and previous geological investigations by K.O. Reid and M. Foster whose Progress Reports were issued in 1967 and 1969 respectively. Follow up investigations were also commenced over the area of geochemical response on Olivers Hill outlined by the Tasmanian Department of Mines in May and June of 1969.

The areas selected for further work were Fletchers Adit, Olivers Hill, Shepherd and Murphy Mine, Iris River area to the south of the Iris River bridge, and the area covered by aeromagnetic anomaly 'F'.

A geophysical survey was carried out by the Compagnie Generale de Geophysique in February and March 1970 in the above mentioned areas with the exception of aeromagnetic anomaly 'F'. The survey was performed under the guidance and consultation of G. Ganes (Chief Geophysicist with C.G.G.). The relevant sections of his report on the interpretation of results and recommendations have been included within the appropriate sections of this report.

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The various areas in which work was conducted are dealt with separately. Recommendations for further work are included for each area and recommendations are also given for future work in other areas within the lease.

The author is indebted to Messrs. K.O. Reid and L.A. Newham for their helpful guidance during the preparation of this report and Mr. R. Wilson for draughting the appended maps.

2. FLETCHERS ADIT

2.1 Previous Work

Work in the region around Mt. Stormont by members of the Tasmanian Geological Survey and New Consolidated Goldfields (A/sia) Ltd. indicated that a large tonnage of skarn occurs as a product of the metamorphism of the basal portion of the Gorien Limestone within the area of Fletcher's Adit. A possible maximum tonnage of 5,500,000 tons was tentatively estimated by G.I. Wilson in 1962. The skarn which is known to contain disseminated bismuth as bismuthinite and bisbite, is underlain by Moine Sandstone and partially obscured by a basalt and basaltic scree cover.

N.C.G.F. decided to concentrate work on the Fletcher's Adit area as it appeared to contain a larger tonnage of skarn than the Stormont Mine area. Limited rock sampling by G.I. Wilson of N.C.G.F. (ten samples were collected) gave a maximum value of 2000 p.p.m. bismuth immediately adjacent to Fletcher's Adit. Elsewhere values were considerably lower at less than 500 p.p.m. bismuth. Soil sampling by K. Reid in 1965 revealed a soil anomaly for bismuth north west of Fletcher's Adit (maximum 230 p.p.m.) However no bismuth anomaly was detected from soil sampling over Fletcher's Adit.

2.2 Site Preparation

The widely scattered traces of sulphides (mainly bismuthinite) in the skarn throughout the area and the previously indicated bismuth

soil anomalies led to the cutting of a more extensive grid over the area. The grid consists of 10 traverse lines, spaced at 200 ft. intervals, and a baseline of 1800 ft. length. The orientation of the grid was altered from the previously existing grid on the recommendation of the geophysical consultants (C.G.G.) who subsequently conducted a gradient array geophysical survey over the grid. Because of the geophysical technique used it was necessary to construct approximately 2500 ft. of vehicular access road along the baseline.

2.3 Geochemistry

(i) Soil Sampling (Maps 3, 4, 5)

Sampling of the "B" horizon at 100 ft. intervals obtained results agreeing in general with previous soil sampling. Two anomalies for bismuth were outlined. The larger anomaly to the north west of Fletcher's Adit has a maximum value of 680 p.p.m. bismuth. It is approximately oval in shape, 400 ft. by 300 ft. trending north-west to south-east and is approximately coincident with I.P. anomalies A1 and A3. The second anomaly lies adjacent to the baseline from 1400'N to 800'N and does not coincide with any recognisable geophysical feature. In agreement with previous work, no anomaly was detected over Fletcher's Adit along the grid lines, but two soil samples (averaging 340 p.p.m. bismuth) were taken adjacent to two coreteens to the south of the adit. Extensive basaltic scree considerably reduced the effectiveness of the soil sampling.

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(ii) Chip Sampling (Maps 3, 4, 5)

Sampling of the two costeans to the south of Fletcher's Adit was undertaken to check the results obtained by G.I. Wilson. Sampling was at 4 ft. intervals and the values for bismuth were significantly less than those obtained by Wilson in the same area. The maximum value obtained was 1100 p.p.m. bismuth with a mean of the 12 samples of 250 p.p.m. bismuth as opposed to a maximum of 2000 p.p.m. bismuth and mean 850 p.p.m. bismuth obtained by Wilson from 3 samples. The differences in the results may be due to patchy mineralisation within the costeans or possibly differences in analytical technique between the two laboratories. It must be noted that the background values obtained by grab sampling over the grid were no greater than 30 p.p.m. bismuth whereas a background of 100 p.p.m. bismuth was obtained by Wilson. In the region of the larger oval bismuth soil geochemical anomaly, two bulldozed areas were chip sampled. Both Moins Sandstone and skarn are exposed but are not 'in situ'. Sampling was at 20 ft. intervals and 26 samples were obtained. The mean concentration of bismuth was 187 p.p.m. and maximum concentration 1200 p.p.m. It was suspected that rocks sampled in the surface bedrock were not representative of the unleached bedrock and in order to test this theory, samples in known bismuth mineralisation were taken at the Stormont Bismuth Mine. A sample from the unleached rock from the walls of the adit in weak mineralisation contained 870 p.p.m. bismuth in contrast to a sample from the surface bedrock adjacent to the adit above the previous mentioned sample containing 160 p.p.m. bismuth.

It is possible that shallow sampling of the bedrock provides sampling data significantly different from sampling data obtained from deeper mineralised rock.

2.4 Geophysics (Map 6)

(1) Contract Geophysical Survey (by C.G.G.) From report

"Geophysical Survey at Moina E.L. 8/65" by G. Onnes of C.G.G.

"(1) Magnetometry

(See fig. 9 in the 'Progress Report on Activities in E.L. 8/65 (Moina Area) to March 1969' by M.J. Foster).

The anomalies located in the southern part of the area are due to the basaltic overburden.

Another 400 gamma anomaly is parallel to the Lea River and runs south-westward from Fletcher's Adit within a zone mapped as Moina Sandstone.

North-westward from Fletcher's Adit other high magnetic readings coincide with an area mapped as skarn.

(2) Resistivity

The electrical soundings show that the Moina Sandstone behaves as a resistant basement, its resistivity is larger than 500 ohm-m.

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The superficial resistant layer coincides with the basalt. The conductive axes follow a SE-NW trend, and may be due to shear zones in the sandstone.

(3) Induced Polarisation

There are no well defined anomalies but rather anomalous zones where the chargeability is larger than 20 ms. Their general trend is SE-NW, approximately parallel to the conductive axes but there is no apparent correlation between apparent resistivities values and chargeabilities.

The I.P. anomalies do not coincide with the magnetic anomalies. Three main anomalous axes A1, A2 and A3 were detected west from Fletcher's Adit but none of them seem associated with the Fletcher's Adit showings.

A1 coincides with a bismuth geochemical anomaly.

(4) Self Potential

No significant anomaly was detected.

(5) Conclusions and Recommendations

Three main anomalous I.P. axes were detected. All areas within the 20 ms contour may be considered as anomalous.

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A1 coincides with a bismuth geochemical anomaly. There is no apparent correlation between magnetic, resistivity and I.P. measurements.

We would recommend to start with geochemical sampling in trenches across A1 and A2".

(ii) Non-Contract Geophysical Work

(i) Scintillometry

A ground scintillometer survey did not reveal any significant variations over the area. The slightly higher counts recorded adjacent to the Lea River were probably due to thin soil cover and a topographic effect.

2.5 Recommendations

As indicated by G. Omes, geophysical results suggest further work on the prospect is warranted. Present bull-dozing over I.P. axis A1 is insufficient in extent and depth, as it was only possible to sample partially leached loose bedrock. Deeper dozing of A1 and A2 should be effective in exposing unleached bedrock for sampling purposes and it is recommended that this should be attempted first. Approximately 2500 ft. of trenching would be necessary. Should it prove impossible to sample reliably from the surface in this manner, a more expensive vertical percussion drilling programme may prove a necessary alternative.

3. OLIVERS HILL AREA

3.1 Previous Work

A geochemical and geological survey during May and June 1969 by the Tasmanian Department of Mines revealed ferromanganese zones over 1 mile long on the northern slopes of Olivers Hill. Two subparallel ferromanganese bodies outcrop over approximately 1,200 ft. (elsewhere along strike, one body only outcrops). The bodies trend W.N.W. subparallel to the strike of the adjacent Moira Sandstone which dips steeply to the north. Adjacent and subparallel to the ferromanganese bodies, small areas of quartz felspar porphyry (characterised by the occurrence of rounded quartz phenocrysts) occur. The geochemical soil survey conducted by the Department of Mines revealed a zone at least 2500 ft. long containing concentrations of lead in excess of 1700 p.p.m. with associated weak copper and zinc anomalies (in excess of 100 p.p.m. and 300 p.p.m. respectively). Basalt and basaltic talus covers much of the ground along the strike of the ferromanganese zones.

Robinson (unpublished report 1958) did not believe that the ferromanganese mineralisation persisted with depth as indicated in exposures within shallow adits, and postulated that the ferromanganese occurred as surface enriched cappings underlain at shallow depths by leached sandstone. However, his sampling gave erratic values up to 8.8% lead and 20 oz/ton silver, which suggests a source other than leached sandstone.

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3.2 Access

In accordance with the recommendations of K. Reid in an appendix to the "Progress Report of 1969", 3400 ft. of access road were constructed and 10 grid lines spaced at 300 ft. intervals were cut across the area of interest. In all, 44,000 ft. of grid lines were cut. The grid lines were used in carrying out a gradient array geophysical survey, geochemical sampling, and a ground magnetic survey.

3.3 Geochemistry

(i) Soil Sampling (Maps 8, 9, 10)

Sampling of the 'B' horizon at 100 ft. intervals was carried out over the grid. The results were in fairly close agreement with the results obtained by the Department of Mines.

3.4 Geophysics (Map 11)

(i) Contract Geophysical Survey (by C.G.G.) From report "Geophysical Survey at Moins E.L. 8/65" by G. Omes of C.G.G.

"(1) Magnetometry

The measurements of the vertical component of the magnetic field show that all anomalies coincide with the basalt outcrops, elsewhere there is strictly no anomaly.

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(2) Apparent Resistivity

The Electrical Sounding carried out at 00-1450S shows that the true resistivity of the sandstone is about 10,000 ohm-m.

Three narrow NW-SE conductive anomalies run across the area. The asymmetry of the main one, A1, shows that the conductive lode dips steeply northeastward.

Two main resistant axes are parallel to the conductive axes. A transverse fault interrupts and shifts the axes between profiles 32W and 40W.

A1 is the only conductive axis which coincides with gossans.

(3) Induced Polarisation

The chargeability axes are parallel to the northwestward resistivity trends. The shapes of anomalies and the comparison of measurements carried out with two different current line lengths (profile 0) show that the polarizable bodies are narrow lodges dipping steeply northeastward. Eight main anomalies were detected.

A1: A1 is the main anomaly with a maximum amplitude on profile 16W. It coincides with a strong conductive axis. A gossan lies along A1 between profiles 8W and 16W. The total length of the anomaly is 2000 ft.

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A2: A2 coincides with a resistivity low on profile 56W but on profiles 48W and 40W there is no apparent correlation between the chargeability and apparent resistivity values.

A3: A3 runs from profile 48W to profile 56W and probably extends outside the surveyed areas, there is no apparent correlation between the chargeability and apparent resistivity values.

A4: A4 coincides with a conductive axis on profile 56W on the north-eastern limit of the surveyed area.

A5: A5 coincides with a resistant axis on profile 56W. A5 probably extends outside the surveyed area.

A6: A6 is well defined on profile 24W only. It coincides nearly with a resistant axis, a gossan lies 150 ft. southwestward from A6. The gossan may be associated with the mineralisation which gives rise to A6. The position of the gossan may be explained by the complete oxidation of the upper part of the lode and by the northeastward dip.

A7: A7 is well defined on profile 0 only, it is probably due to shallow rooted small mineralisation. It does not show up with the longer current line.

A8: A8 on profile 0 has not a larger lateral extension than A7 but it is rooted deeper. A8 does not coincide with any resistivity anomaly.

(4) Self Potential

A small -25mv anomaly coincides with a gossan near A1 on profile 16W. The amplitude is small but the anomaly appears to be well defined and its position fits with the northeastward dip of the conductive and polarizable lode. The S.P. anomaly is perhaps due to a sulphide mineralisation electrically continuous but some manganese oxides also give rise to S.P. anomalies. The first possibility appears more likely because the amplitude of I.P. anomaly A1 is a maximum on 16W and is not due to the gossan. There is no other significant S.P. anomaly within the surveyed area.

(5) Conclusions and Recommendations

Eight I.P. anomalies were detected, they fit in three different categories.

(A) I.P. anomalies associated with conductive axes:

A1, A4, small part of A2. A1 is also associated with an S.P. anomaly on profile 16W.

The conductive axes have a larger extension than the I.P. axes. This fact could be explained as follows: lower resistivities are due to both sulphides and clay minerals located in a stratum or shear zone, although the extension of the sulphide mineralization is smaller than the extension of the clayey shear zones or strata.

(B) I.P. anomalies associated with resistant axes or zones:
A2, A5, A6.

These anomalies are probably due to disseminated sulphides, perhaps pyrite, in sandstone.

(C) I.P. anomalies which do not seem to be related to any apparent resistivity feature:

A3, A7, A8.

Two anomalies, A1 and A2, inside the surveyed area are more than 2,000 feet long.

We recommend to start drilling anomaly A1 (2 holes) and anomaly A2 (1 hole).

<u>Anomaly</u>	<u>Profile</u>	<u>Position of rig</u>	<u>Dip</u>	<u>Length</u>
A1	16W	600 feet from base line	45° SW	450 feet
A1	8W	350 feet from base line	45° SW	300 feet
A2	48W	650 feet from base line	45° SW	450 feet

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4. SHEPHERD AND MURPHY MINE AND IRIS RIVER AREAS

4.1. Previous Work

These areas lie adjacent to the east-west axis of a regional synclinal structure. Beneath a partially obscuring Tertiary basalt cover, folded Ordovician rocks are represented by Gordon Limestone which outcrops in the core of the syncline. The limestone is underlain by the older Moina Sandstone. Metamorphism of the basal portion of the limestone has produced a magnetiferous and garnetiferous skarn. In the Shepherd and Murphy Mine area tungsten, tin, molybdenum and bismuth mineralisation occurs within vertical to near vertical lodes adjacent to the Bismuth Creek Fault Zone. Movement of the fault resulted in the west block moving down and north. It has been suggested by previous studies that the emplacement of the lodes was concomitant with the intrusion of the nearby Dalcoath Granite.

Williams (1958) noted a low calcic content associated with the tungsten mineralisation and concluded that metasomatism of the limestone pre-dated the tungsten mineralisation. L.A. Hewham (Senior Geologist with Mt. Lyell Mining & Railway Co. Ltd.) in a recent study of the mine suggested that the movement along the Bismuth Creek Fault produced tight, steeply plunging, anticlinal and synclinal structures, the axial zones of which presented favourable zones of weakness for the injection of the mineralised lode fluids. The Bismuth Creek Fault does not necessarily disrupt the eastern extremities of the lodes as had been claimed by most

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early writers. Papers by Blake (1955) and Robinson (1957) of the Tasmanian Department of Mines, describe mapping within the workings whilst the mine was in production. Six major lodes were developed associated with numerous small lodes. The lodes appear to have been tension gash infillings consisting largely of quartz, fluorite, and mica gangue, carrying variable amounts of cassiterite, wolframite, bismuthinite, native bismuth, magnetite, chalcopyrite, galena and several others in minor amounts. The major lodes were mined to a maximum of 300 ft. depth and apparently narrowed with depth. Most of the lodes branched and narrowed to the east and several of the lodes narrowed and/or branched to the west.

A grid over an area extending from the Lea River to the Cradle Mountain Road (adjacent to the Bismuth Creek Fault) composed of traverse lines at 500 ft. spacing. These traverse lines (orientated north-south) were cut and covered in 1968 and 1969 by geological mapping, soil geochemical, ground magnetic, and ground E.M. surveys.

Ground magnetometry essentially revealed three strong magnetic anomalies associated with the outcropping skarn:-

- (1) Anomaly between lines 10W and 8W, 3000'S and 4000'S to the west of the Iris River. The outcropping skarn is mineralised with magnetite, pyrite, bismuthinite, and minor chalcopyrite and was postulated (by M.J. Foster) to be a shallow faulted syncline plunging to the south-east and terminated to the

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south-west by a fault (trending north-west to south-east) and to the south-east by a second fault (trending north-east to south-west). The anomaly is approximately coincident with a bismuth soil geochemical anomaly.

- (ii) Anomaly generally coincident with the Shepherd and Murphy Mine. This anomaly exists over both exposures of skarn and Moins Sandstone. There is little correlation between the magnetic anomaly and soil geochemical anomalies presumably due to contamination from the mine workings.
- (iii) Anomaly (to the north-east of the Bismuth Creek Fault) which is not exactly coincident with the outcropping skarn or a bismuth soil geochemical anomaly.

Geochemistry proved to be of little value over the eastern half of the grid due to contamination near the Shepherd and Murphy Mine area and the fairly widespread distribution of a basaltic cover. The magnetic anomaly to the west of the Iris River due to outcropping magnetiferous skarn is however coincident with a bismuth soil geochemical anomaly. The basalt cover to the west of the grid again limited the usefulness of soil geochemistry.

4.2 Access

In order to provide sufficient access for an induced polarisation survey to be conducted within the area, it was necessary to cord

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portions of the road parallel to the Iris River (extending southwards from the Iris River Bridge). In consultation with the geophysical consultants (C.G.O.), it was decided to cut four additional lines perpendicular to the existing grid (Map 12) in order that a geophysical survey could be carried out over a variety of the outcropping rock types. An induced polarisation and resistivity (combined with self potential) survey using a double pole-dipole array was deemed to be the most suitable arrangement. Two lines were cut in the Iris River area totalling 9000 ft. and two in the Shepherd and Murphy Mine area totalling 10,500 ft. One of the purposes of the I.P. tests was to check if it was possible to distinguish the mineralised skarn from the barren Gordon Limestone.

In accordance with the recommendations of L.A. Newham (Senior Geologist with Mt. Lyell Mining & Railway Co. Ltd.) dated 18th May 1970, site preparation and access was completed in June 1970 in order to drill three diamond drill holes from three sites in the Shepherd and Murphy Mine area. It is anticipated that a start will be made on the drilling in 1970-1971.

4.3 Geochemistry

(i) Soil Sampling

Sampling of the 'B' horizon at 100 ft. intervals along the two lines in the Iris River area (cut for the contract geophysical survey) was undertaken to check previous results

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obtained using the previously cut grid. Only recontouring of previously outlined anomalies was necessary. No other anomalies were detected.

4.4 Geophysics

- (i) Contract Geophysical Survey (by C.G.G.) From report
'Geophysical Survey at Moina E.L. 8/65' by G. Omes of C.G.G.

"(1) Magnetometry

(See figs. 12 and 18 in 'Progress Report on Activities in E.L. 8/65 (Moina Area) to March 1969' by M.J. Foster).

Both magnetic maps show a coincidence of strong magnetic anomalies with known skarn mineralisation. Actually the main mineral of some samples at the Shepherd and Murphy Mine is magnetite.

All anomalies have a very irregular shape. The magnetic bodies are shallow and they are outcropping or at depths of less than 30 ft. At the Iris River and west from the Shepherd and Murphy Mine, part of the saw teeth on the magnetic profiles is due to the outcropping basalt.

Inside the skarn mineralisation, the magnetite higher grade zones seem to follow a north south 'en echelon' pattern.

(2) Resistivity

E.S. at 200W, 1600S was carried out in the Gordon Limestone. The overburden has a resistivity of 150 ohm-m. and a thickness of about 20 ft. The true resistivity of the Gordon Limestone is within the 500-1500 ohm-m. range.

E.S. at 3450E, 1600S was carried out on the Shepherd and Murphy Mine skarn.

The resistivity of bedrock increases gradually downward.

On Shepherd and Murphy line 1 the apparent resistivity is slightly lower on the skarn than on the Gordon Limestone. A well defined resistivity low coincides with a magnetic anomaly near 5000E on line 1, on the eastern side of the Bismuth Creek Fault.

In the Iris River area apparent resistivities rise sharply east of peg 4000W. The resistivity low seems to coincide with the magnetic anomaly.

It seems that as a rule apparent resistivities are lower on the magnetic anomalies of the Shepherd and Murphy Mine and Iris River area.

(3) Induced Polarisation

Surprisingly enough, there is only a weak anomaly above the Shepherd and Murphy Mine zone.

The barren Gordon Limestone does not give rise to any I.P. anomaly. The average level of the chargeability is even lower than on the Moira Sandstone.

The largest I.P. anomaly is located near peg 5000E on line 1 (Shepherd and Murphy Mine) on a resistivity low and a magnetic anomaly. The polarisable body dips westward.

The high level of the chargeability at the eastern end of line 1, Shepherd and Murphy Mine, may be due to disseminated pyrite in the sandstone since some pyritic floats have been found near the road.

Three other polarisable bodies have been detected along line 1 (Shepherd and Murphy Mine). None of them seem to be very important.

The 5000E peg anomaly is perhaps due to a skarn mineralisation where the proportion of sulfides is higher than at the Shepherd and Murphy Mine.

Seven intersections of polarisable bodies are located on lines 1 and 2 in the Iris River area. The most important are

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situated on both sides of peg 4000W on line 1.

(4) Self Potential

There is no significant S.P. anomaly.

(5) Conclusions and Recommendations

The I.P. and resistivity tests showed that the barren Gordon Limestone does not give rise to significant I.P. anomalies in the Shepherd and Murphy Mine and Iris River areas.

Magnetic anomalies due to skarn mineralizations coincide with apparent resistivity lows.

On line 1, the Shepherd and Murphy Mine skarn gives rise to a small I.P. anomaly. On the same line, east from the Bismuth Creek Fault a strong I.P. anomaly coincides with a resistivity low and a magnetic anomaly.

We would recommend drilling a vertical hole on peg 5000E (line 1 - Shepherd and Murphy Mine area)."

(ii) Non-Contract Geophysical Work

(1) Ground Magnetica

Readings at 50 ft. intervals along the four newly cut grid lines using a Sharpe magnetometer were taken to check previous

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results. Only recontouring of previously outlined anomalies was necessary. No other anomalies were detected.

(2) Scintillometry

A ground scintillometer survey over the four newly cut lines did not reveal any anomalous gamma radiation intensities.

4.5 Recommendations

The area adjacent to the magnetic anomaly to the west of the Iris River is of interest. Skarn, rich in magnetite with some pyrite and bismuthinite, is exposed adjacent to lines 8W and 9W. The magnetic anomaly has a maximum amplitude of approximately 60,000 gammas and is coincident with I.P. anomalies adjacent to 4000W on lines 1 and 2 (See Maps 12 & 17).

It is interesting to note that the magnetic anomaly has an east-west trend subparallel to the dominant trend of the mineralised lodes in the Shepherd and Murphy Mine area. In addition, a soil geochemical anomaly for bismuth of maximum 3900 p.p.m. coincides with the magnetic anomaly. It is recommended that one intermediate traverse line be cut at 3750'W from 4500'S to 1500'S and soil sampled together with lines 4250'W and 4750'W. It may be necessary to recut and repeg portions of the lines already cut in the area of interest. More detailed geological mapping of this area of interest is recommended on a scale of 200 ft. to 1 in. together with chip sampling of outcropping skarn. If the results obtained prove

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encouraging, it is suggested that the road close to line 4500'W be extended further into the region of the outcropping skarn in order that vertical percussion drilling at 100 ft. centres could be undertaken.

At 3500'W 1800'S, 1300 p.p.m. bismuth with zinc up to 200 p.p.m. in adjacent areas was recorded in soil sampling and it is recommended that lines 3500'W and 2500'W be extended to 1500'S and soil sampling and measurements of ground magnetics be carried out at 100 ft. intervals over the extensions.

A study of the Shepherd and Murphy Mine was made by L.A. Newham as earlier indicated in this report. As a result of this study he recommended that diamond drilling be undertaken within the mine area. Since the time of the original recommendation, drill-site preparation for the three holes recommended has been completed by one D7 dozer in one week.

The relevant drilling proposals are outlined below as set out by Mr. Newham and hole locations shown on Map 18.

Three diamond drill holes totalling 2,700 ft. are recommended (800', 800', 1100'). Specifications of the three holes are given below.

(1) D.D.H. No. 1

Collar: 22°, 750 ft. from Main Shaft.

Length: 800'

Bearing: 180° (Mag.)

Dip: 50°

Size: BK (Wireline)

Purpose: To test the easterly and depth extensions of No. 6 lode. It will also test the lodes intersected in Godwin's Adit and the lodes intersected by the horizontal drill hole on No. 3 level of No. 6 lode (see Map 18).

Geology

Expected: The hole will collar in skarn but should pass into, and stay in, quartzite at a fairly shallow depth.

(11) D.D.H. No. 2

Collar: 235°, 500' from Main Shaft.

Length: 1100'

Bearing: 180° (Mag.)

Dip: 50°

Size: BK (Wireline)

Purpose: To test the westerly and depth extensions of No. 4 and No. 2 lodes. These lodes appear not to have been worked out to the west.

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Geology

Expected: The hole will collar in Tertiary basalt which is expected to be 50 - 100 ft. thick. A relatively thin deep lead should be intersected before passing into skarn which should continue for most of the hole.

(111) D.D.H. No. 3

Collar: 110°, 1750' from Main Shaft.

Length: 800'

Bearing: 0° (Mag.)

Dip: 50°

Size: BX (Wireline)

Purpose: To test for easterly and depth extensions of No. 4 lode and also to test a coincidental magnetic and I.P. anomaly.

Geology

Expected: Collar and remain within quartzite for its full length. The hole should intersect the Bismuth Creek Fault.

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5. AEROMAGNETIC ANOMALY 'F'

(a) Previous Work

Chalcopyrite was reported in the Moine Sandstone by K. Reid ('Progress Report of 1967') and low order stream sediment anomalies obtained in the area of Mr. Webb's aeromagnetic anomaly 'F' (flown by A.M.E.G. in 1966).

In 1968-69, a grid of 3 lines (of average length 2,200 ft. orientated north-south) was cut over the aeromagnetic anomaly, and limited E.M. and soil sampling carried out over portions of the grid. The data obtained was insufficient for any conclusions to be drawn from the results.

(b) Non-Contract Geophysics

(i) Ground Magnetometer Survey (Map 19)

A ground magnetometer survey over six of the eight lines disclosed a regular broad magnetic anomaly trending at approximately 050° . The regular broad nature of the anomaly suggests that the source of the anomaly occurs at depth.

(ii) Ground Scintillometer Survey

No response was obtained in a survey along the baseline and no further readings were taken over the grid.

(c) Recommendations

Further work in this area should take low priority. As the

031

941033

23.

source of the magnetic anomaly appears to occur at depth and as much of the area is basalt covered, it is doubtful whether soil geochemistry would prove an effective method of exploration in the area.

032

6. RECOMMENDATIONS FOR AREAS NOT WORKED IN 1969-70

6.1 Mt. Stormont Mine Area

(i) Summary of Geology

Bismuth mineralisation as bismuthinite and bismite occurs disseminated through skarn derived by the metasomatism of the basal portion of the Gordon Limestone. The skarn is underlain by magnetiferous and garnetiferous rocks (apparently without bismuth mineralisation). The skarn outcrops in three areas adjacent to Mt. Stormont.

(1) Mt. Stormont Mine. Situated on the Mt. Stormont fault which trends at 330 deg., the skarn is faulted against Moins Sandstone.

(2) Mt. Stormont West, and

(3) Mt. Stormont East. The skarn is exposed in the axes of shallow synclines.

(ii) Recommendations

To date, the area adjacent to the Mt. Stormont Bismuth Mine has only been partially covered by a grid and the present grid does not cover adequately Mt. Stormont West and East. Accordingly, it is recommended that the following traverse lines be cut or extended (on the western extension of the grid covering the Iris River).

033

- 10,250'W from 4500'S to 6500'S
- 10,500'W " 4500'S " 5500'S
- 10,750'W " 4500'S " 6500'S
- 11,000'W " 4500'S " 6500'S
- 11,250'W " 4500'S " 6500'S

The total footage to be cut would be 9,000 ft. The traverse lines should be soil sampled at 100 ft. intervals and a ground magnetometer survey carried out along the lines.

6.2 Delcoath Hill

(i) Summary of Geology

A granite stock of Tabberabberan age, intruding the Cambrian Bull Creek Formation and Moina Sandstone, contains disseminated tin, molybdenum, and tungsten on the margins of the granite.

At the Hidden Treasure on the eastern margin of the granite, molybdenite occurs associated with wolframite and some cassiterite. Traces of bismuthinite were detected on the site of the Squib Mine which was mined for tungsten bismuth and molybdenum. Sayers Mine nearby was mined for tungsten. The underground workings of both these mines are at present inaccessible.

034

(11) Recommendations

It is recommended that, in order to evaluate the economic potential of the granite, reconnaissance geological mapping be carried out over the exposures made by the H.E.C. in its development in the area.

Before any geochemical sampling is undertaken over the area, it is suggested that an orientation survey be carried out over areas of known mineralisation. The use of a P.I.F. analyser is suggested in the orientation survey. A P.I.F. analyser should allow whole rock analyses for molybdenum to be made in the field and if successful should be less expensive than chip sampling along the grid lines. The orientation survey should investigate the concentration of niobium and tantalum within the granite as they may prove to be useful pathfinders in reconnaissance soil or colluvial sampling surveys. Niobium and tantalum are readily hydrolysed and deposited in hydrolysate sediments. They are also present in resistates and become enriched within placer deposits. Both niobium and tantalum often occur in association with tungsten, tin, and molybdenum, having similar ionic radii. They could prove to be useful pathfinders for molybdenum and tungsten. Surveys using molybdenum and tungsten may still be useful in more detailed follow up work in areas of interest delimited by reconnaissance surveys.

035

Colluvial sampling of the Forth River and its tributaries is recommended as a reconnaissance guide to mineralisation within granite, especially if niobium and tantalum prove successful in the orientation survey as pathfinders for tungsten, molybdenum and tin.

Based on the results of the orientation survey and geological mapping of the latest exposures, it is suggested that a grid be cut over the northern portion of the granite to include the regions of known mineralisation at Sayers, Squib and Hidden Treasure Mines.

The grid proposed consists of a baseline 6400 ft. long with 9 traverse lines each averaging 1500 ft. long, spaced at 800 ft. intervals, providing a total of 13,500 ft. of grid coverage. Whole rock sampling, using a P.I.F. analyser, if successful in the orientation survey, could be undertaken over the grid and if encouraging, intermediate traverse lines could be cut over areas of interest to provide more detailed coverage.

036

7. APPENDIX

7.1 Technique of Soil Sampling

The 'B' soil horizon was sampled wherever possible. A forged-steel soil auger (external diameter 2.2 in.) was used in sampling. Samples were collected in paper sample bags, force-dried, then screened using stainless steel sieves. The -35 mesh fractions were analysed.

7.2 Technique of Whole Rock Sampling

Chip samples were collected in large paper sample bags, crushed and ground to -200 mesh in the mine sample mill at Queenstown. The analyses for copper in some cases were higher than expected ranging up to 0.25% copper in a sample containing no visible mineralisation. The sample mill may be responsible for contamination with respect to copper and it is recommended that further tests be carried out to establish with more certainty whether contamination does occur. If so, the purchase of a sample grinder is recommended for grinding rock samples from exploration leases. A small grinder, capable of grinding down to 150 - 200 mesh from $\frac{1}{4}$ in. chips would be ideal.

7.3 Analysis of Soil and Whole Rock Samples

Samples were analysed by the Assay Department at Queenstown. Both soil and rock samples were dissolved using 1:3 nitric acid. 1 gm. of sample was diluted to 100 ml. with 5% nitric acid. Analysis was by atomic absorption using a Techtron AA3 unit. The lines used for analysis in all cases were the most sensitive and the least subject to interference by other cations. The lines used were 3247 A° (copper), 2170 A° (lead), 2139 A° (zinc), and 2231 A° (bismuth).

037

941039

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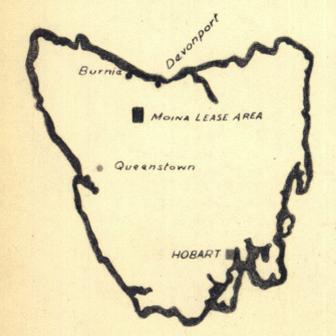
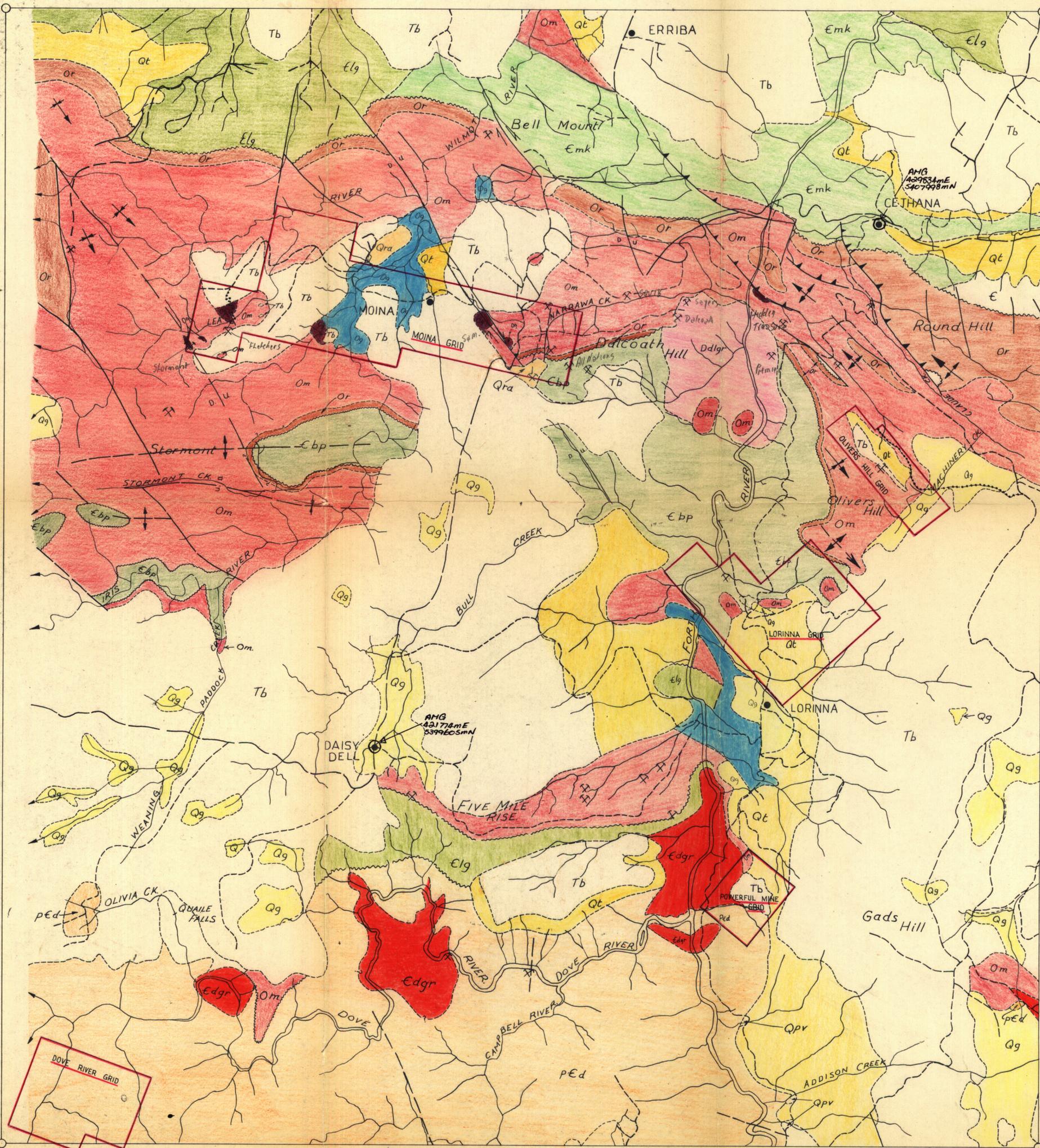
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LEGEND

CAINOZOIC	QUATERNARY	Qra	RECENT Alluvium
		Qt	Basalt talus and landslide debris
		Qg	Quartzite and conglomerate talus
		Qpv	Marsh deposits and residual gravels
TERTIARY		Ts	PLEISTOCENE Varved clays
		T	Sands clays and conglomerate
PALAEOZOIC	ORDOVICIAN	Skarn	Skarn (Metamorphosed limestone)
		Gordon Limestone	Gordon Limestone
		Moina Sandstone including Caroline Ck Beds	Moina Sandstone including Caroline Ck Beds
		Roland Conglomerate	Roland Conglomerate
CAMBRIAN		Bull Creek Formation	Bull Creek Formation
		Lorinna Greywacke	Lorinna Greywacke
		Minnow Keratophyre	Minnow Keratophyre
PRECAMBRIAN		Dove group	Dove group
IGNEOUS ROCKS			
		Tb	TERTIARY Basalt
DEVONIAN		Ddlgr	Dolcoath granite
CAMBRIAN		Edgr	Dove granite
		Es	Serpentine

Established boundary — position approximate
 Inferred probable or indefinite boundary
 Unconformity
 Thrust fault (teeth on upper plate)
 Wrench fault
 Fault with direction of movement

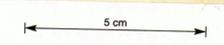
Mine or prospect

Principal roads
 Vehicular tracks
 River or creek

Roads Constructed 1969-70

Anticlinal Axis
 Synclinal Axis
 Anticlinal Axis (position approximate)
 Synclinal Axis (position approximate)

941041



AMG REFERENCE POINTS ADDED

70-698

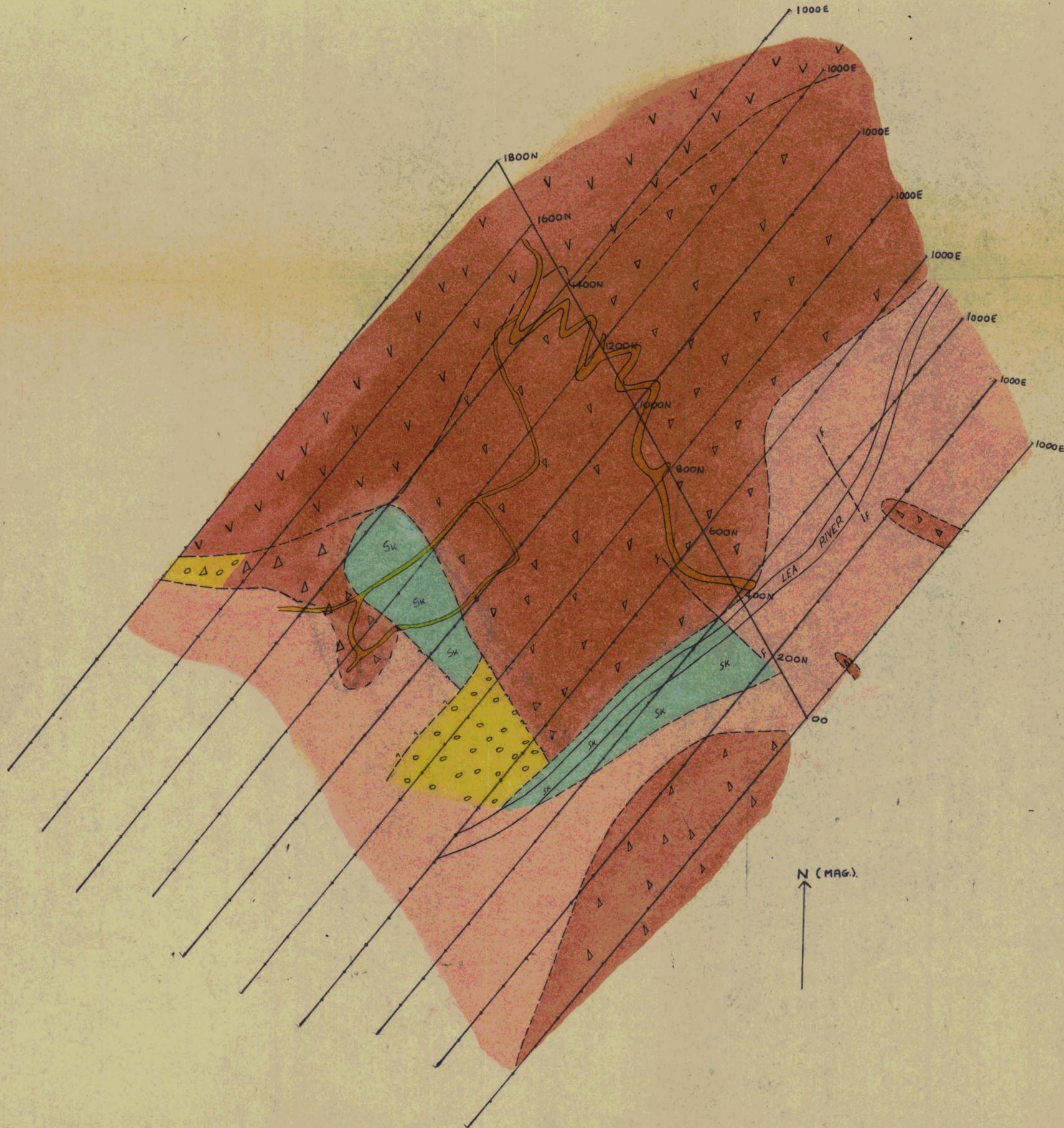
THE MOUNT LYELL M. & R. COY. LTD
 GEOLOGICAL DEPARTMENT

MOINA E.L. 8/65
REGIONAL GEOLOGY

DRAWN BY R.G.W.
 TRACED BY R.G.W.
 CHECKED BY B.C.D.
 DATE 4-6-70
 SCALE 2" = 1 mile.

MAP. 1.
 37/26

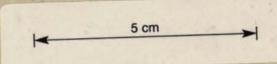
2057



LEGEND

- V BASALT "IN SITU"
- Δ BASALT SCREE
- GREYBILLY CONGLOMERATE SCREE
- QUARTZITE
- SK SKARN
- ROAD

941042



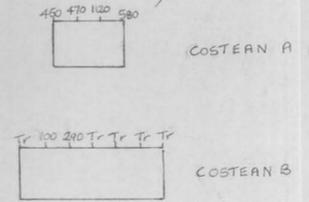
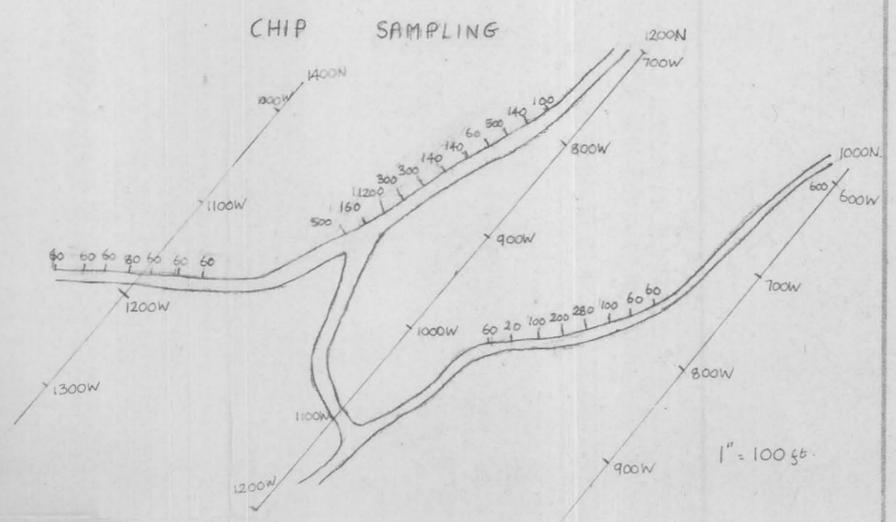
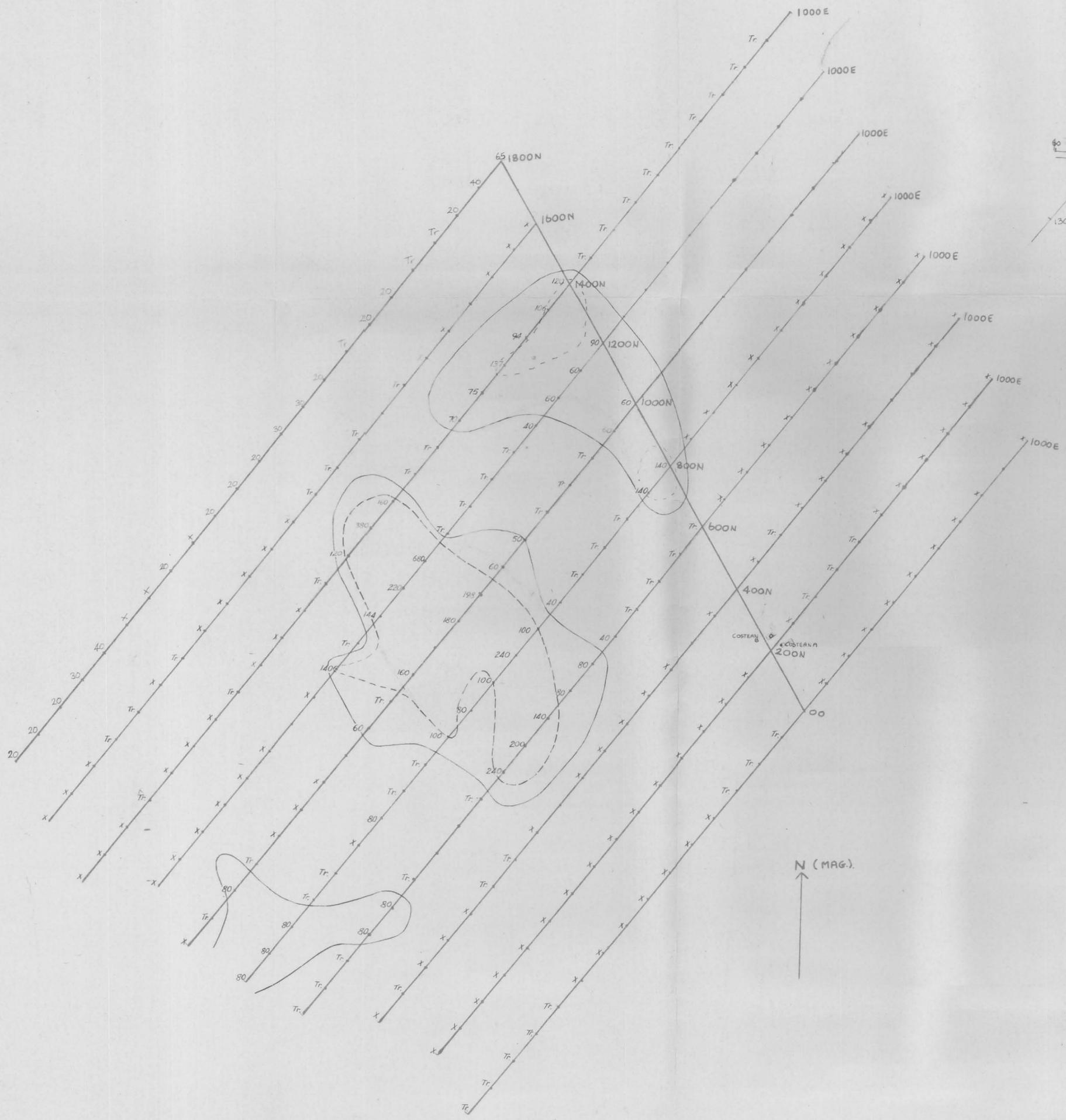
70-698

THE MOUNT LYELL M. & R. COY. LTD
GEOLOGICAL DEPARTMENT

DRAWN BY *B.C.D.*
TRACED BY *B.C.D.*
CHECKED BY *B.C.D.*
DATE *28/4/70*
SCALE *1"=200'*

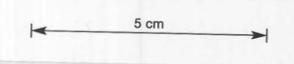
FLETCHERS' ADIT GRID
GEOLOGY

MAP 2
37/26



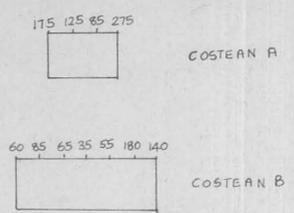
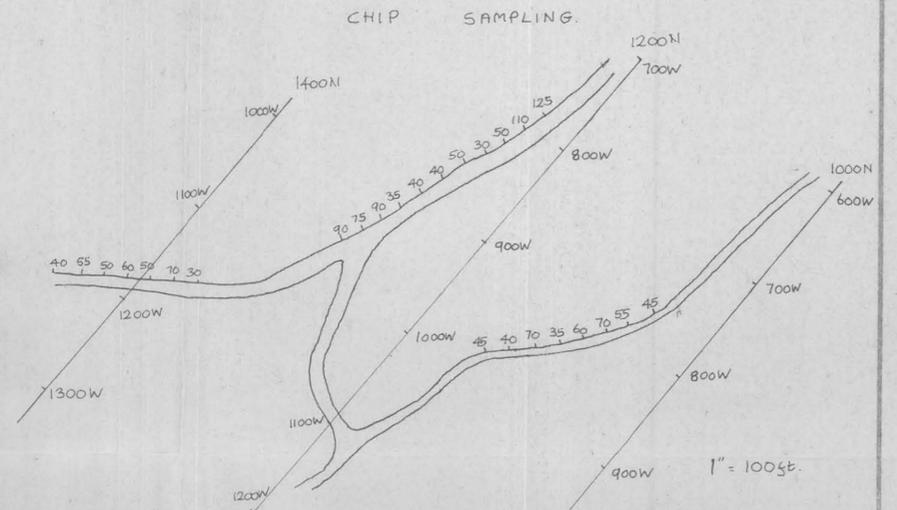
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 — 50 ppm.

941043



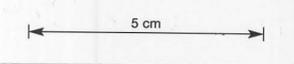
70-698

THE MOUNT LYELL M. & R. COY. LTD		DRAWN BY <i>B.C.D.</i>
GEOLOGICAL DEPARTMENT		TRACED BY <i>B.C.D.</i>
FLETCHER'S ADIT GRID		CHECKED BY <i>B.C.D.</i>
GEOCHEMICAL SAMPLING RESULTS		DATE <i>28/4/70</i>
BISMUTH		SCALE <i>1"=200'</i>
		MAP 3



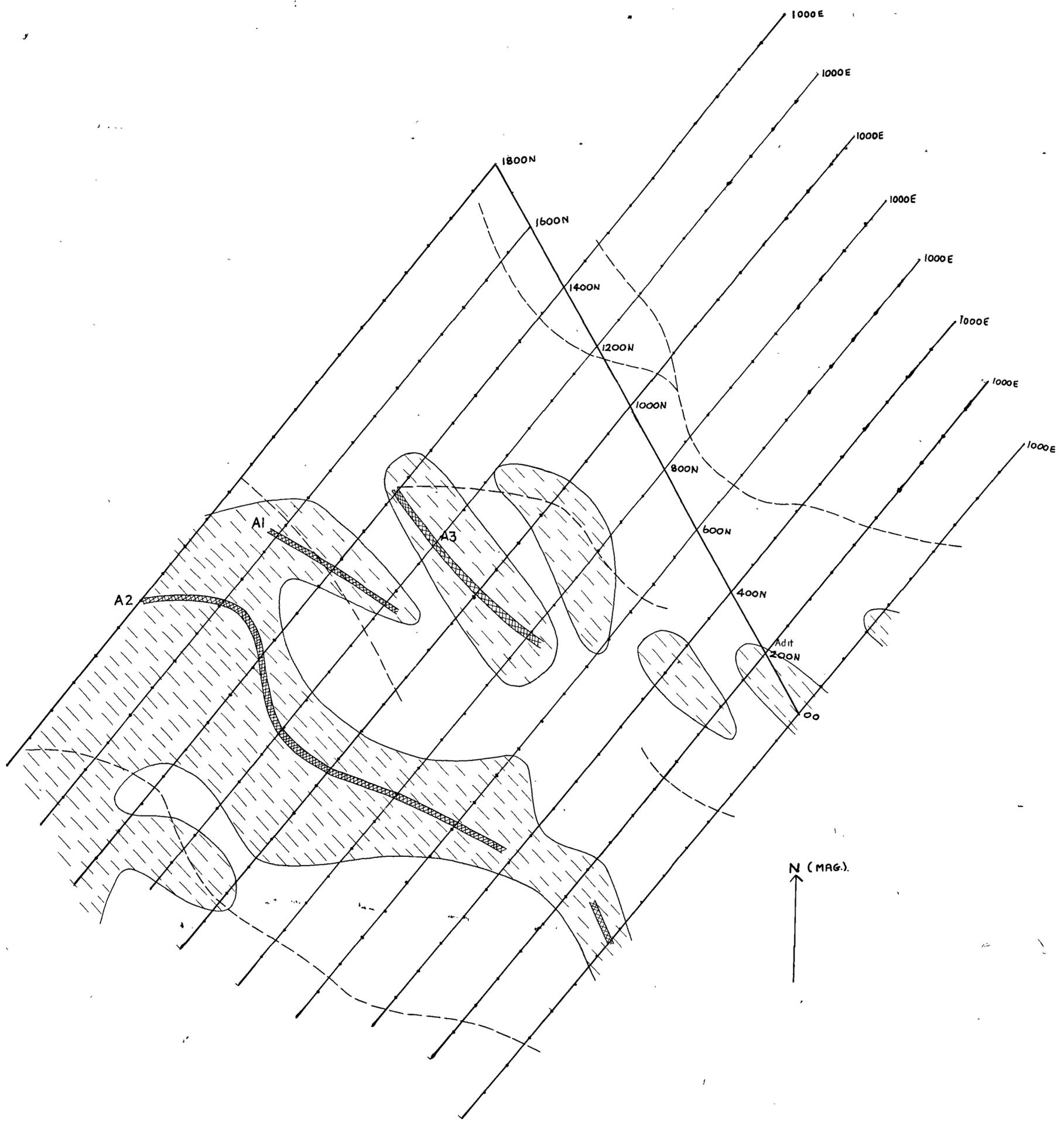
----- 100 p.p.m.
 _____ 50 p.p.m.

941044



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THE MOUNT LYELL M. & R. COY. LTD GEOLOGICAL DEPARTMENT	DRAWN BY <i>B.C.D.</i> TRACED BY <i>B.C.D.</i> CHECKED BY <i>B.C.D.</i> DATE <i>28/4/70</i> SCALE <i>1"=200'</i>
FLETCHER'S ADIT GRID GEOCHEMICAL SAMPLING RESULTS ZINC	MAP 4



LEGEND

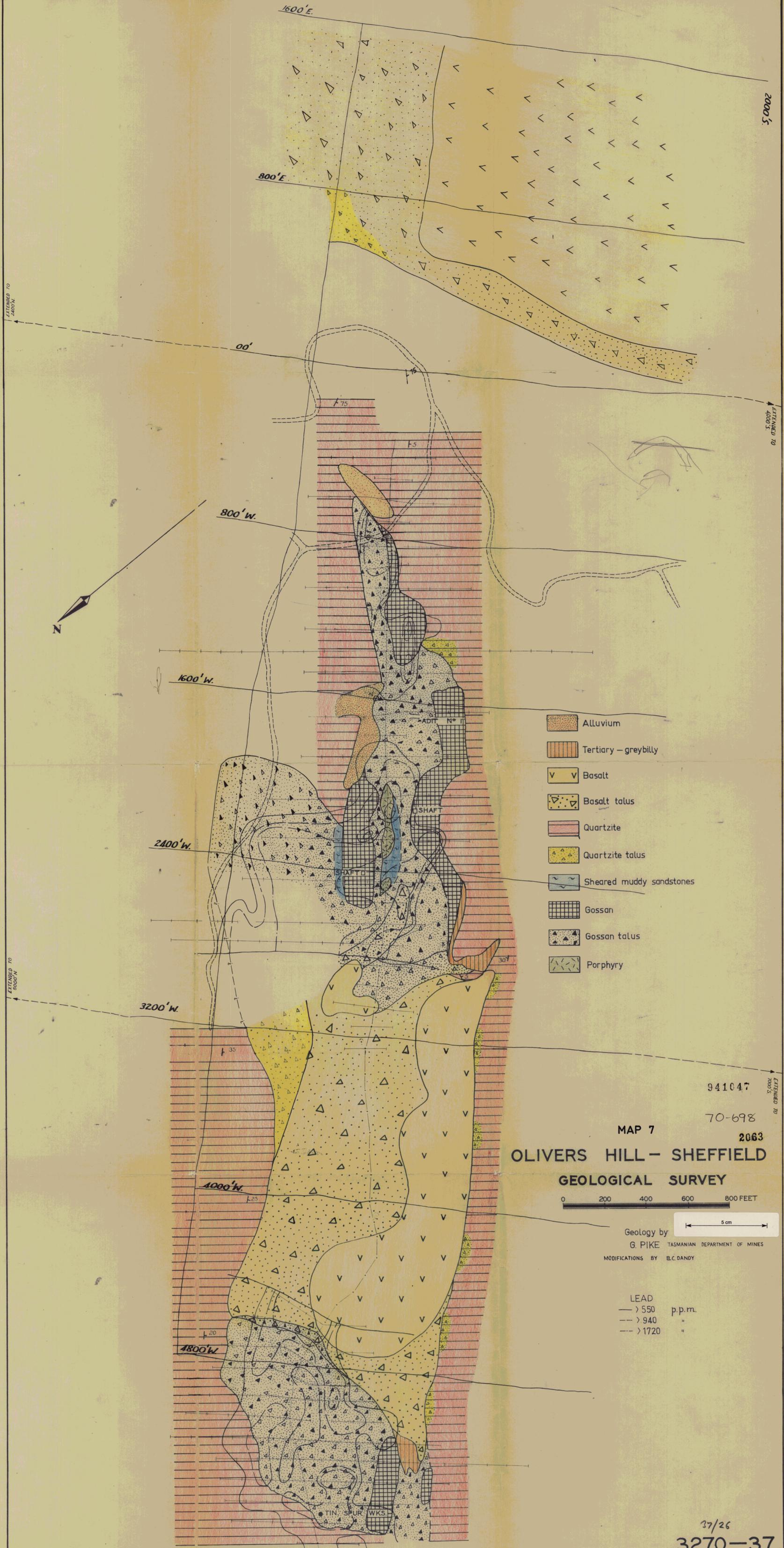
- Axis of polarizable body
- Conductive axis
- Anomalous zone

5 cm

941046

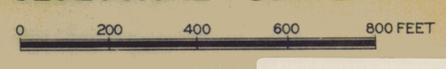
70-698

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN BY <i>B.C.D.</i> TRACED BY <i>B.C.D.</i> CHECKED BY L.A.N. DATE <i>28/4/70</i> SCALE <i>1"=200'</i>
<i>FLETCHERS' ADIT GRID</i> COMPREHENSIVE GEOPHYSICAL MAP	MAP 6 2062



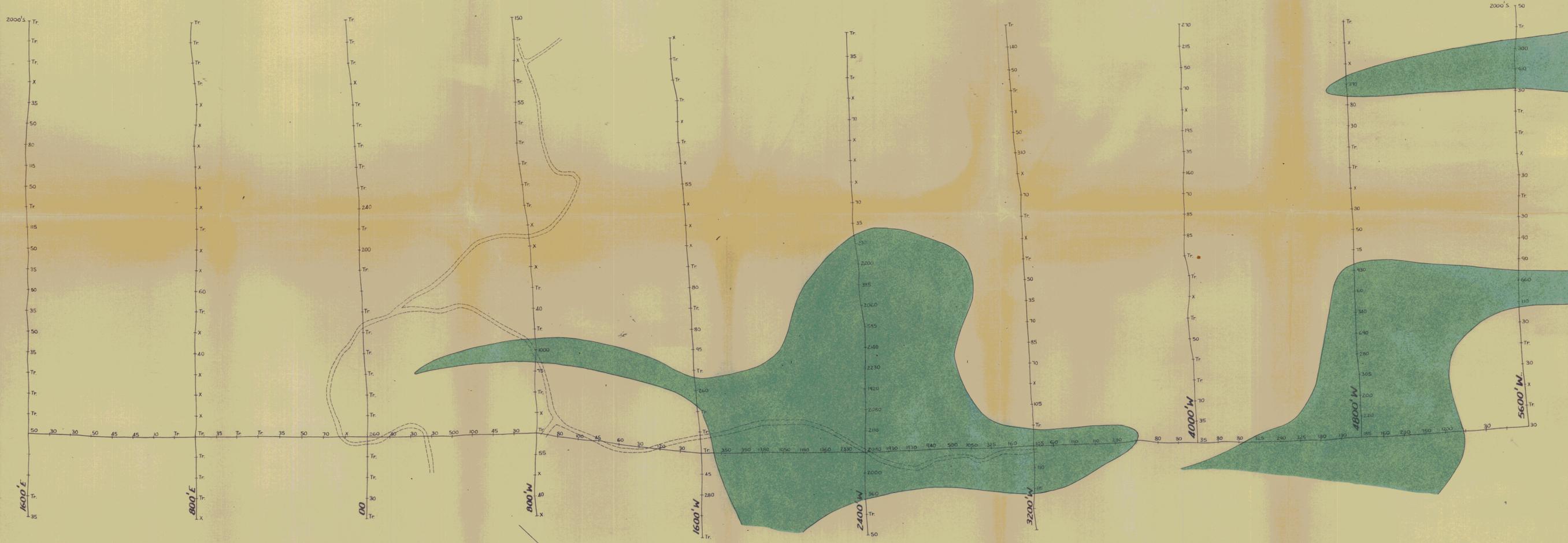
- Alluvium
- Tertiary - greybill
- Basalt
- Basalt talus
- Quartzite
- Quartzite talus
- Sheared muddy sandstones
- Gossan
- Gossan talus
- Porphyry

941047
 70-698
 2063
MAP 7
OLIVERS HILL - SHEFFIELD
GEOLOGICAL SURVEY

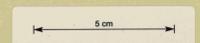


Geology by
G. PIKE TASMANIAN DEPARTMENT OF MINES
 MODIFICATIONS BY B.C. DANDY

LEAD
 — > 550 p.p.m.
 - - - > 940 "
 ····· > 1720 "



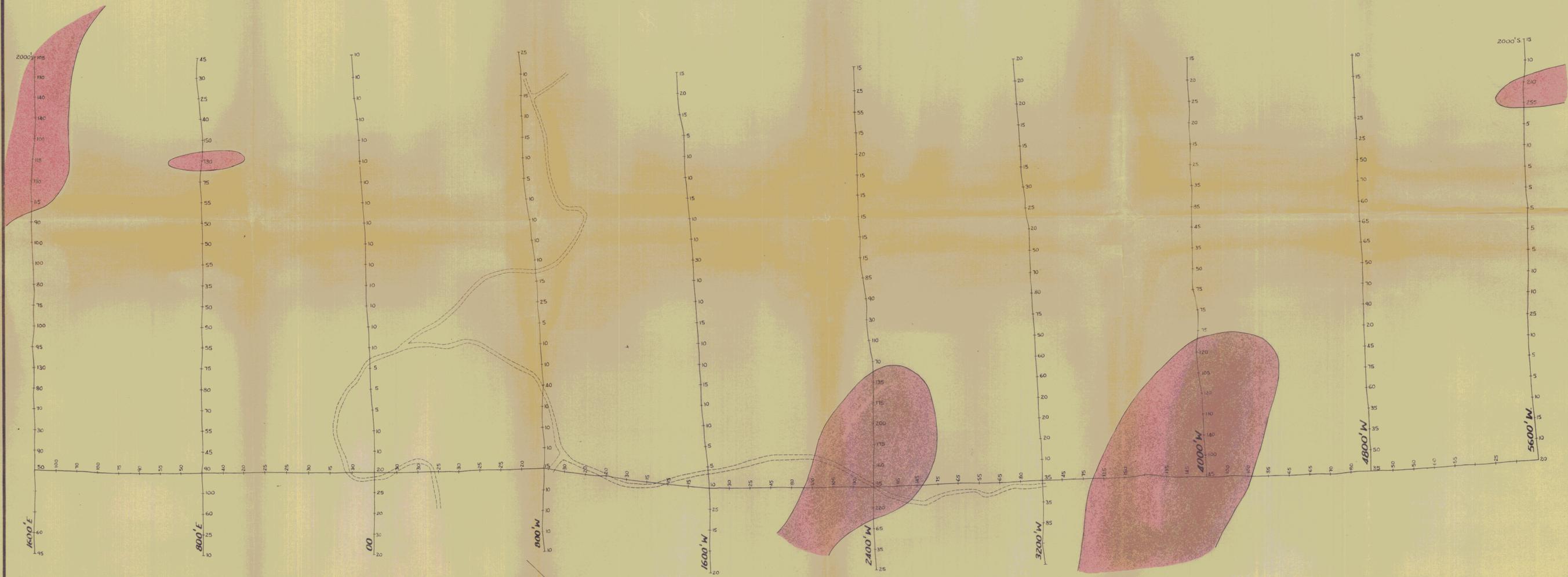
ANOMALOUS ZONES
RESULTS IN PARTS PER MILLION



70-698

THE MOUNT LYELL M. & R. COY LTD		DRAWN BY R.G.W.
GEOLOGICAL DEPARTMENT		TRACED BY R.G.W.
OLIVERS HILL		CHECKED BY J.A.N.
GEOCHEMICAL SOIL SAMPLING RESULTS		DATE 15-5-70
LEAD		SCALE 1" = 200'
2064		MAP 8

941048



LOCALLY ANOMALOUS ZONES
RESULTS IN PARTS PER MILLION

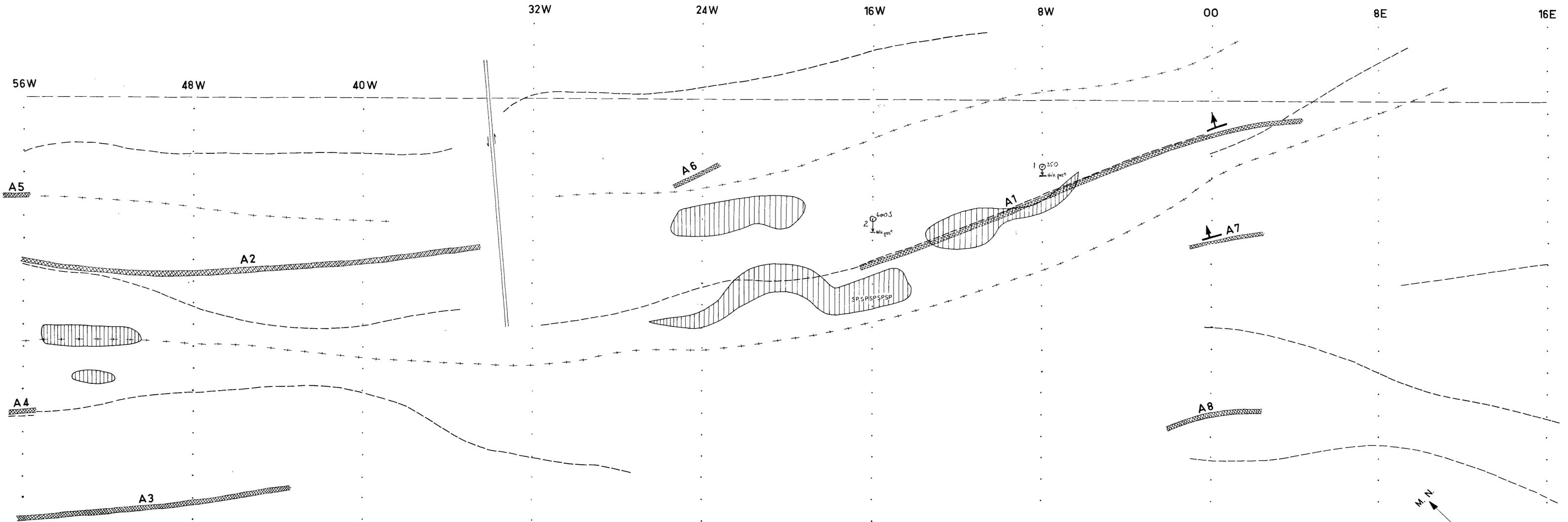
5 cm

70-698

THE MOUNT LYELL M. & R. COY LTD
GEOLOGICAL DEPARTMENT
DRAWN BY R.G.W.
CHECKED BY R.G.W.
DESIGNED BY L.A.N.
DATE 15-5-70
SCALE 1"=200'

OLIVERS HILL
GEOCHEMICAL SOIL SAMPLING RESULTS
ZINC 2065 MAP 9

941049

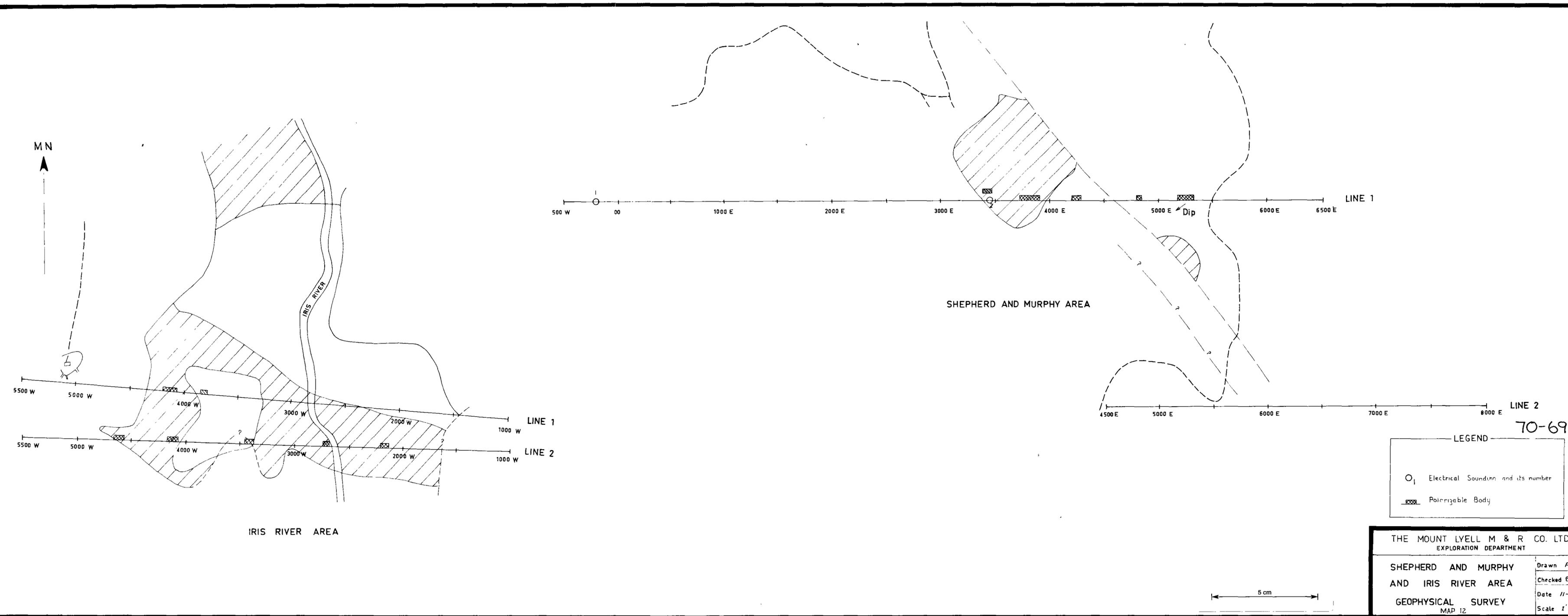


LEGEND

	Axis of polarizable body
	Conductive axis
	Resistant axis
	Self potential axis
	Fault
	Gossanous outcrop
	Dip

70-698

THE MOUNT LYELL M. & R. COY. LTD.	DRAWN BY: R.G.W.
GEOLOGICAL DEPARTMENT	TRACED BY: R.G.W.
OLIVERS HILL GRID 2067	CHECKED BY: B.C.D.
COMPREHENSIVE GEOPHYSICAL MAP	DATE: 12.8.70
MAP 11	SCALE: 1" = 200'



THE MOUNT LYELL M & R CO. LTD
EXPLORATION DEPARTMENT

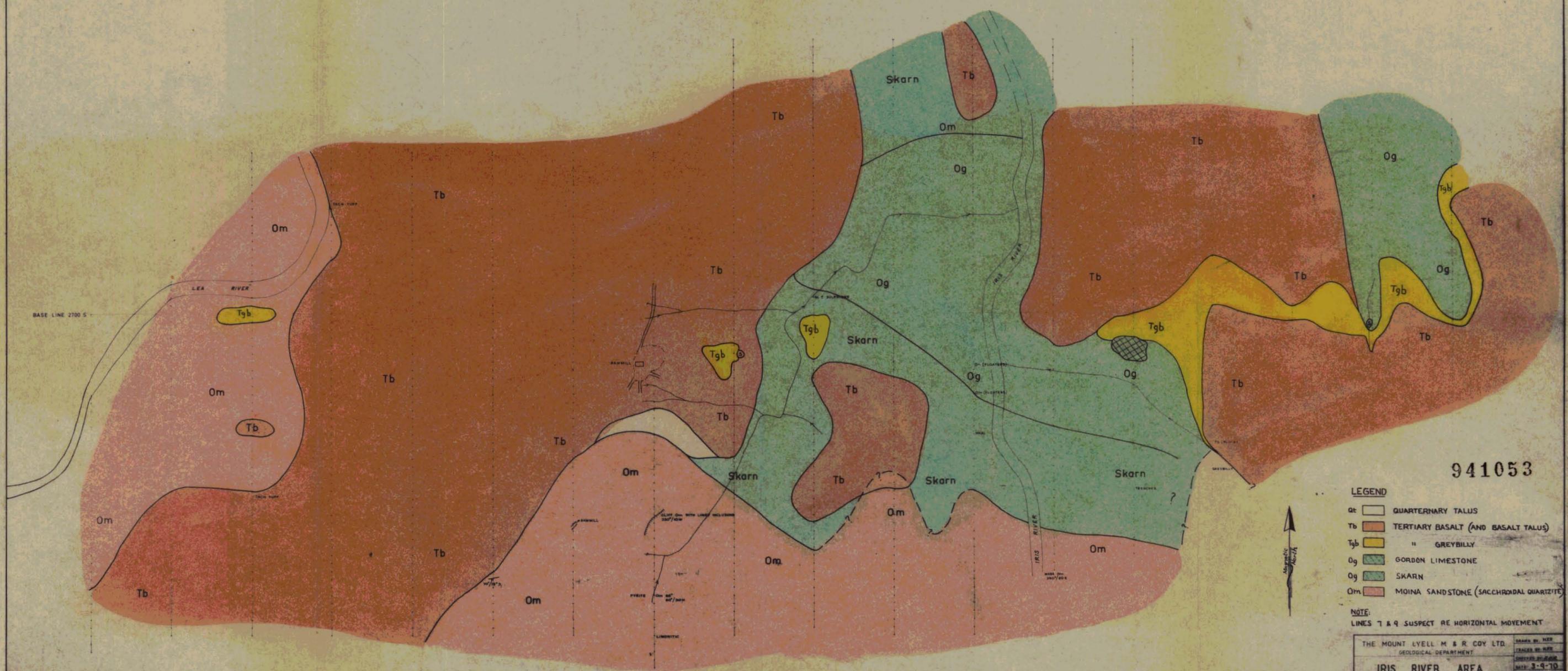
SHEPHERD AND MURPHY
AND IRIS RIVER AREA

GEOPHYSICAL SURVEY
MAP 12

Drawn R.G.W.
Checked B.C.U.
Date 11-8-70
Scale 1" = 500'

941052 2068

9500 LINE 17 W 9000 LINE 16 W 7500 LINE 15 W 7000 LINE 14 W 6500 LINE 13 W 6000 LINE 12 W 5500 LINE 11 W 5000 LINE 10 W 4500 LINE 9 W 4000 LINE 8 W 3900 LINE 7 W 3000 LINE 6 W 2500 LINE 5 W 2000 LINE 4 W 1500 LINE 3 W 1000 LINE 2 W 500 LINE 1 W 00 LINE 0



LEGEND

- Qt QUATERNARY TALUS
- Tb TERTIARY BASALT (AND BASALT TALUS)
- Tgb " GREYBILLY
- Og GORDON LIMESTONE
- Og SKARN
- Om MOINA SANDSTONE (SACCHAROIDAL QUARTZITE)

NOTE:
LINES 7 & 9 SUSPECT RE HORIZONTAL MOVEMENT

941053

THE MOUNT LYELL M & R COY LTD. DRAWN BY: HARRIS
GEOLOGICAL DEPARTMENT TRACED BY: HARRIS

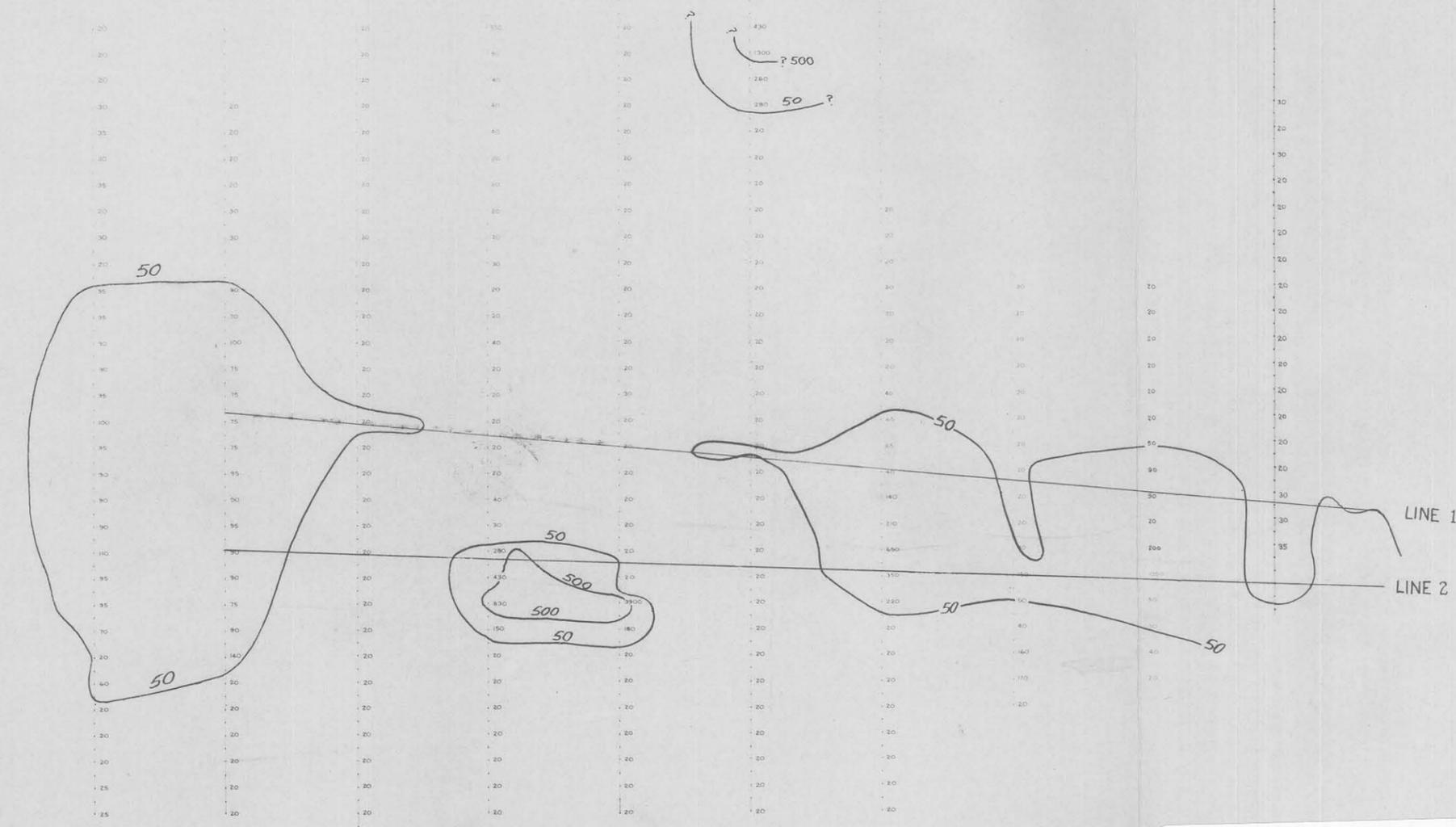
IRIS RIVER AREA DATE: 9-9-70
GEOLOGY SCALE: 5 CM = 1"
MAP 13

37/26

5 cm

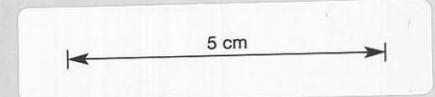
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 LINE 17 W LINE 16 W LINE 15 W LINE 14 W LINE 13 W LINE 12 W LINE 11 W LINE 10 W LINE 9 W LINE 8 W LINE 7 W LINE 6 W LINE 5 W LINE 4 W LINE 3 W LINE 2 W LINE 1 W LINE 0

BASE LINE 2700 S



941054

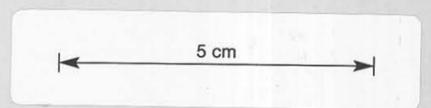
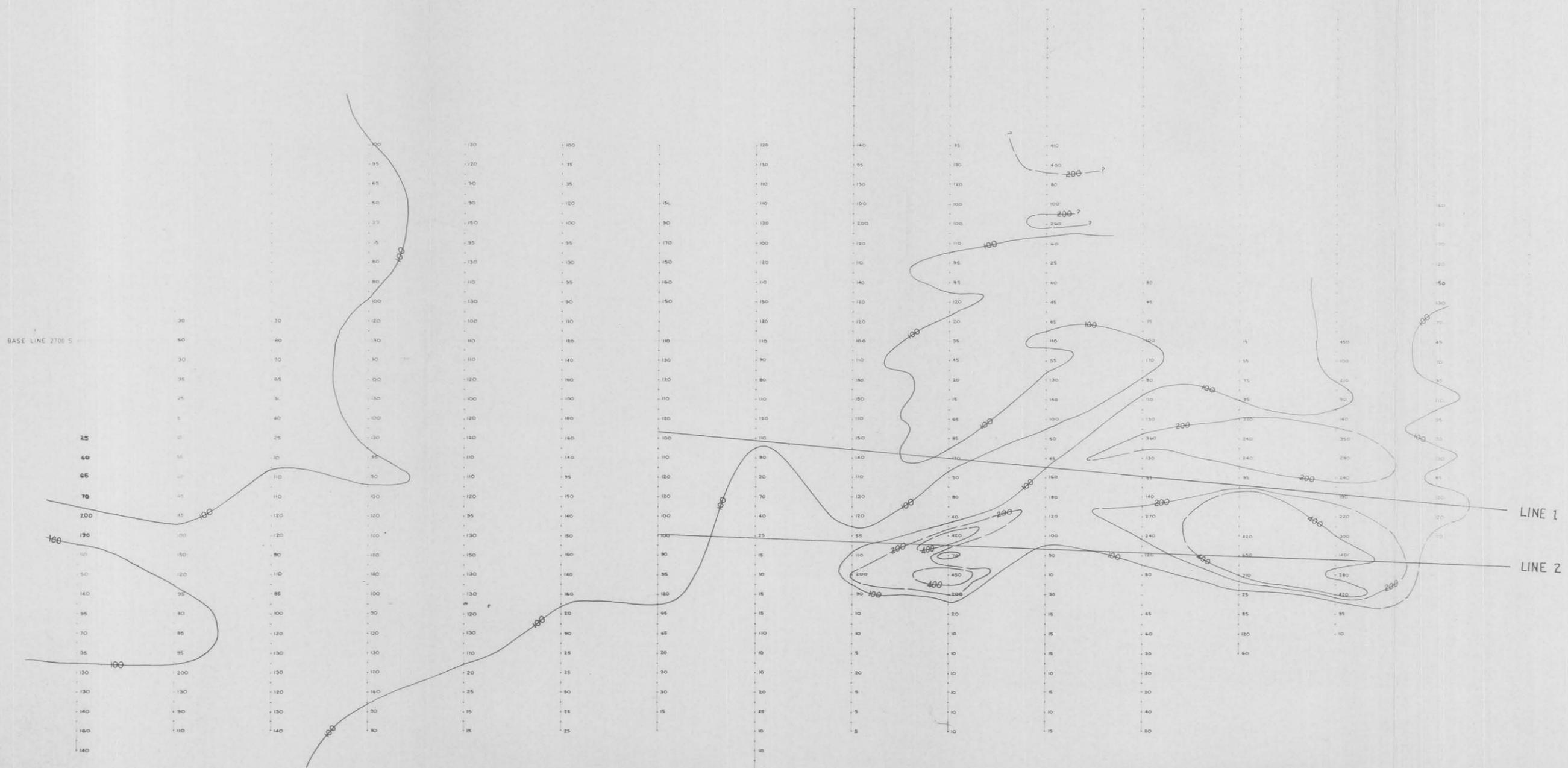
70-698



2070

THE MOUNT LYELL M & R COY LTD
 MINERAL DEPARTMENT
 IRIS RIVER AREA
 BISMUTH
 DRAWN BY HFE
 TRACED BY RGW
 CHECKED BY KOC
 DATE 1-9-70
 SCALE 500 = 1"
 MAP 14

7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 00
 LINE 17 W LINE 16 W LINE 15 W LINE 14 W LINE 13 W LINE 12 W LINE 11 W LINE 10 W LINE 9 W LINE 8 W LINE 7 W LINE 6 W LINE 5 W LINE 4 W LINE 3 W LINE 2 W LINE 1 W LINE 0



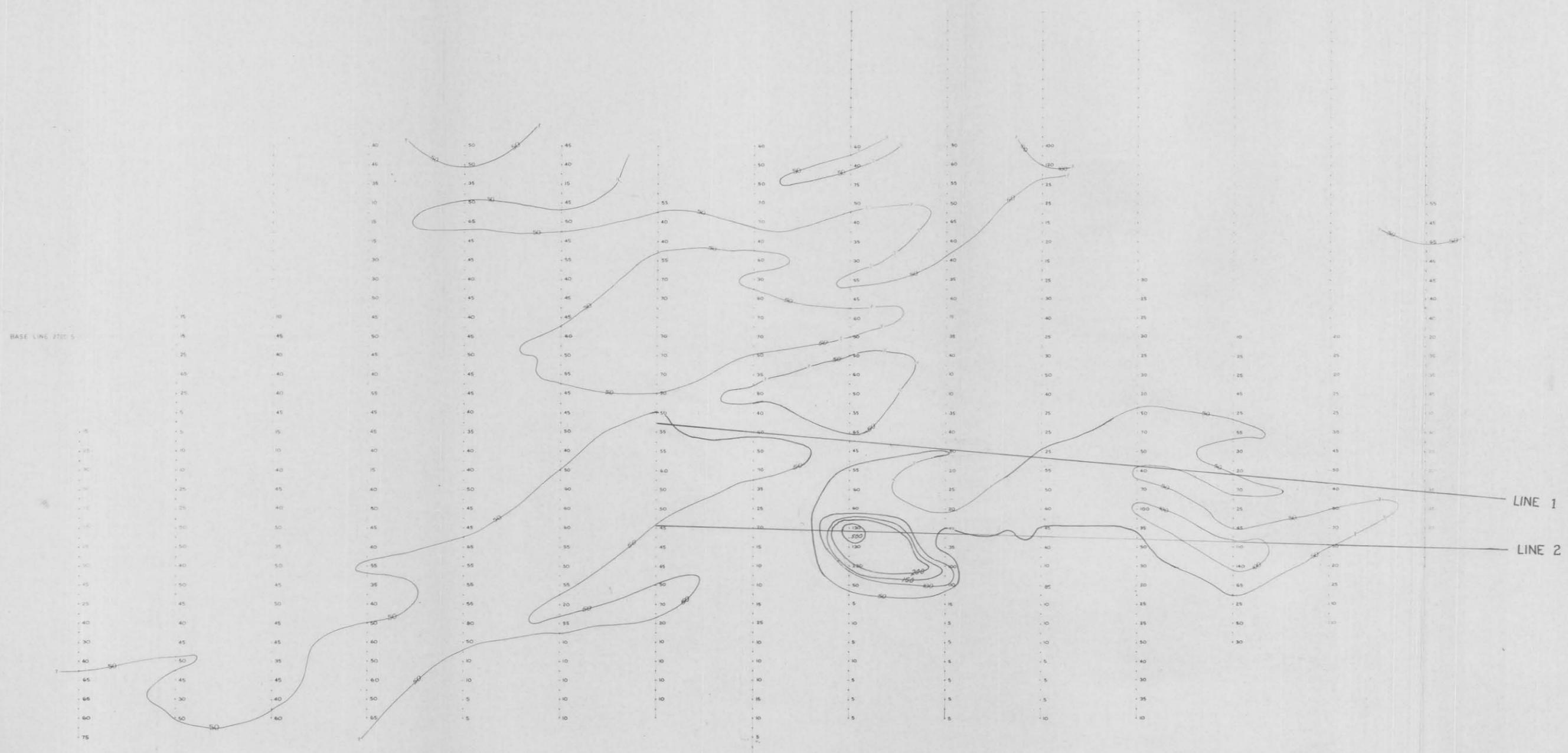
941055

70-698 37/26

THE MOUNT LYELL M & R COY LTD		DRAWN BY: HEE
GEOLOGICAL DEPARTMENT		TRACED BY: RGM
IRIS RIVER AREA		CHECKED BY: EEC
GEOCHEMICAL SOIL SAMPLING RESULTS		DATE: 7-9-70
ZINC		SCALE: 1"=500'
		MAP 15

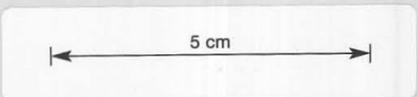
2071

8500 8000 7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 00
 LINE 17 W LINE 16 W LINE 15 W LINE 14 W LINE 13 W LINE 12 W LINE 11 W LINE 10 W LINE 9 W LINE 8 W LINE 7 W LINE 6 W LINE 5 W LINE 4 W LINE 3 W LINE 2 W LINE 1 W LINE 0



LINE 1
LINE 2

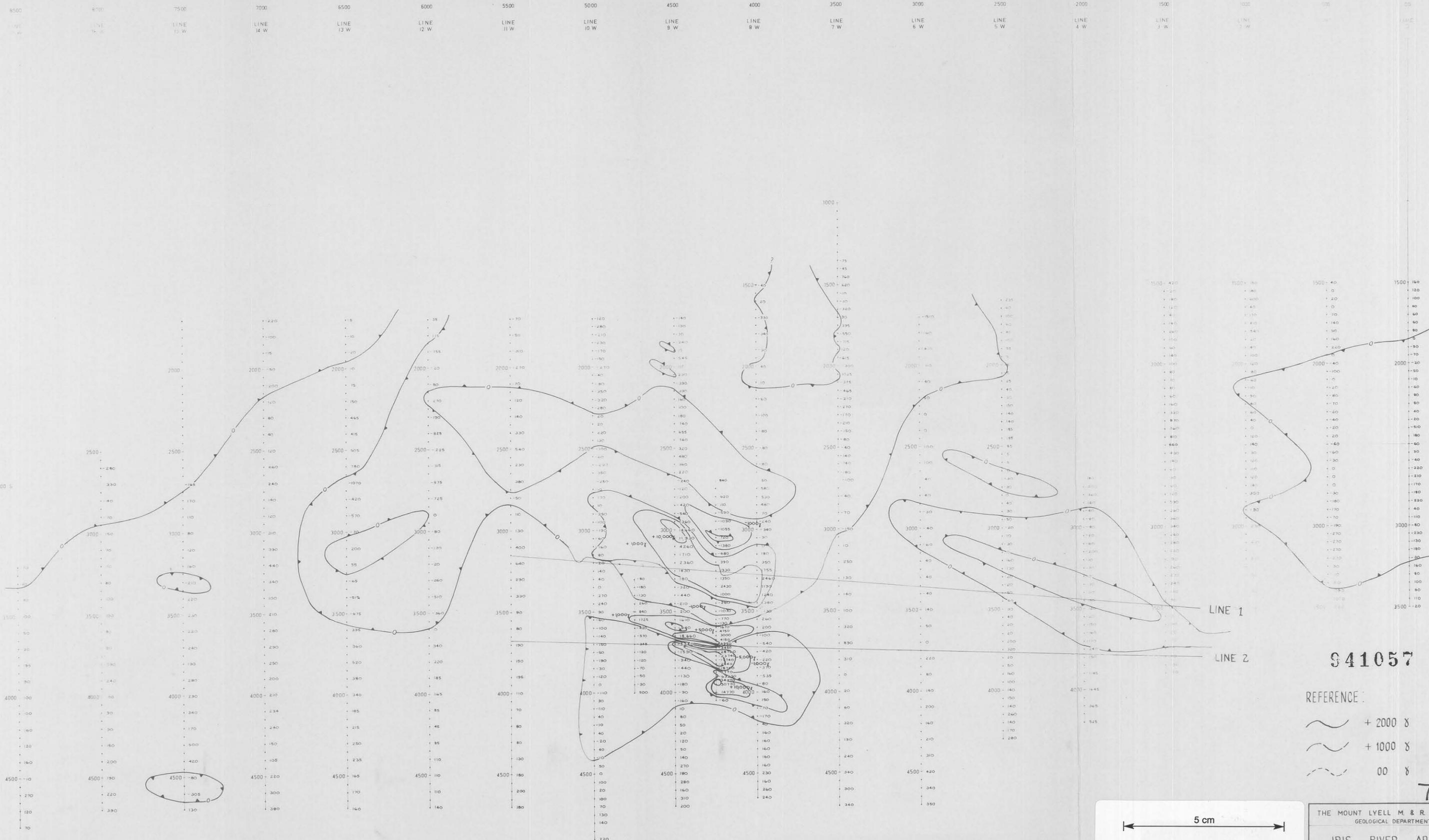
941056



70-698

THE MOUNT LYELL M & R COY LTD. GEOLOGICAL DEPARTMENT	DRAWN BY: HFF TRACED BY: RGM CHECKED BY: <i>kol</i> DATE: 7-9-70 SCALE: 500 = 1"
IRIS RIVER AREA	MAP 16
COPPER	

2072



BASE LINE 2700 S

LINE 1

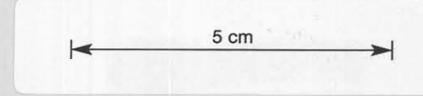
LINE 2

941057

REFERENCE:

- + 2000 γ
- + 1000 γ
- 00 γ

70-698



THE MOUNT LYELL M & R. COY. LTD.		DRAWN BY: MRF
GEOLOGICAL DEPARTMENT		TRACED BY: MRF
IRIS RIVER AREA		CHECKED BY: MRF
MAGNETICS		DATE: 7-9-70
		SCALE: 500 = 1"
		MAP 17

2073



LEGEND

	Om	MOINA SANDSTONE
	Ogs	METAMORPHOSED GORDON LIMESTONE
	Tb	TERTIARY BASALT
●		D.D.H. COLLAR POSITION
—		OUTCROPPING LODGE
- - -		LODGE BENEATH BASALTIC COVER
~ ~ ~		ROAD

70-698

THE MOUNT LYELL M. & R. COY. LTD.
GEOLOGICAL DEPARTMENT

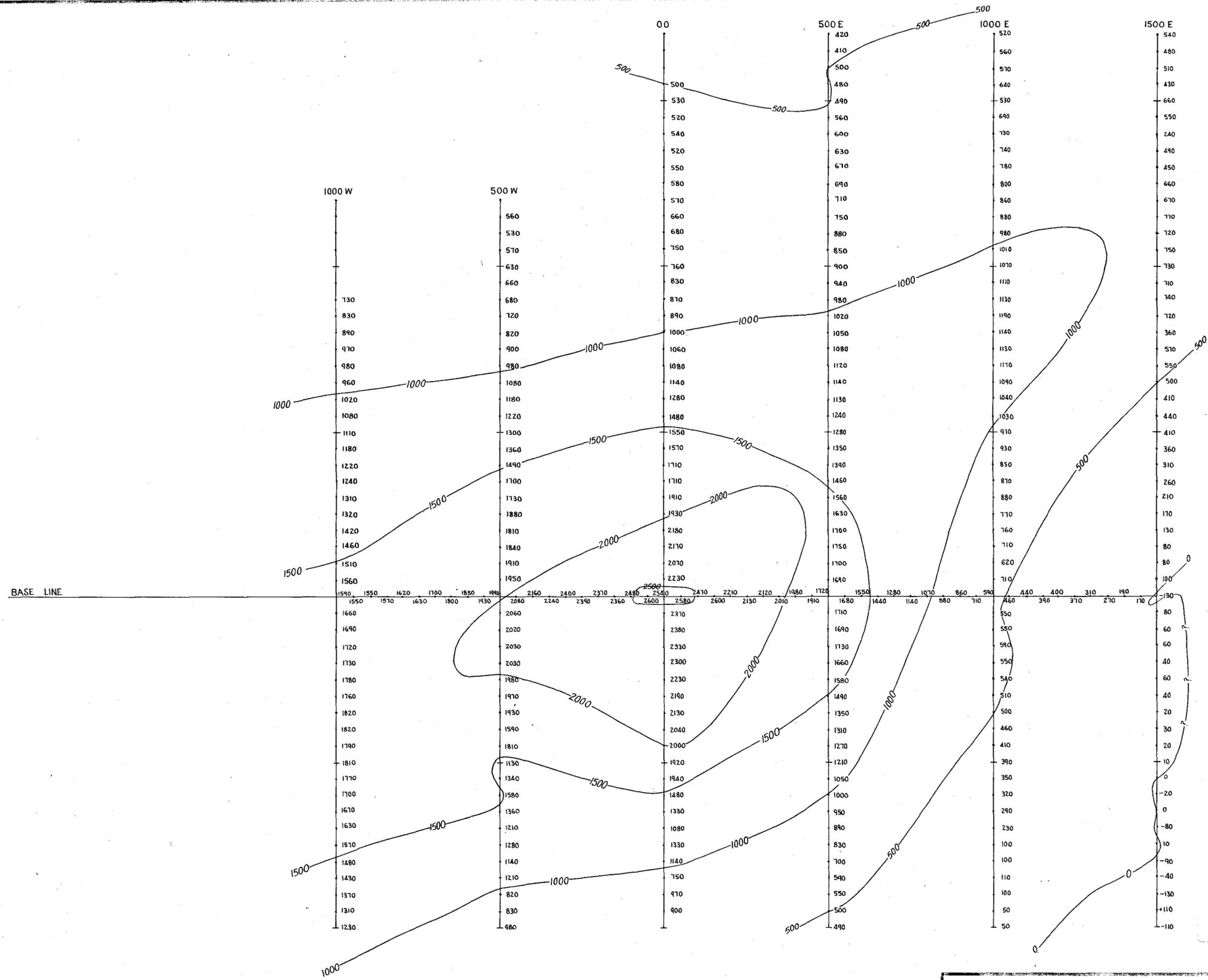
SHEPHERD & MURPHY MINE AREA

GEOLOGICAL MAP
MAP 18

DRAWN P.M.	
TRACED R.G.W.	
CHECKED B.C.O.	
DATE 2-9-70	
SCALE 1" : 200'	

37/26 2074

941058



70-698

THE MOUNT LYELL M. & R. COY. LTD	
GEOLOGICAL DEPARTMENT	
LEA RIVER 'F' GRID 941059	
GROUND MAGNETIC SURVEY	
DRAWN BY	R.G.W.
TRACED BY	R.G.W.
CHECKED BY	L.A.N.
DATE	3-9-70
SCALE	1" : 200'
2075	MAP 19