COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1956, No. 70

# PRELIMINARY REPORT ON A GEOPHYSICAL SURVEY AT MT. LYELL (CORRIDOR AREA), QUEENSTOWN, TASMANIA



*by*

*D. L. ROWSTON*

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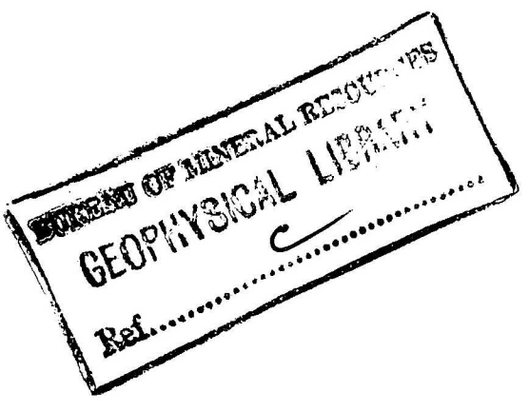



*by*

*D. L. ROWSTON*

# C O N T E N T S



## ILLUSTRATIONS

## 1. INTRODUCTION

In March 1955, the Mt. Lyell Mining and Railway Company Limited applied to the Bureau for a geophysical survey over several areas in the Mt. Lyell district near Queenstown, Tasmania, with the object of obtaining information which would assist the Company in its proposed extensive drilling programme. The application was supported by the Tasmanian Department of Mines and the Bureau agreed to undertake the survey during the summer of 1955/56.

Following preliminary discussions between senior officers of the Geophysical Section of the Bureau and Mr. M. Wade, Chief Geologist of the Company, it was agreed that surveys should be made over five areas, namely, Glen Lyell, Corridor, East Darwin, Jukes and Comstock. Of these, the Comstock, Corridor and Glen Lyell areas are shown on Plate 1.

Previous geophysical work was done in this district by Blazey and Douglas (1934-38) using the equipotential line method. Their results are shown on Plate 1 in the form of Zones numbered 1 to 30 and Indication Zones A, B and C. In order to avoid confusion, these same zone designations are used in describing the results of the present survey where indications obtained in the two surveys appear to coincide. A review of the results of the work by Blazey and Douglas, together with those of a later survey at Gormanston by the Bureau, was made by Richardson (1949), and drilling recommendations for Indication Zones A and B in the Corridor area were made by him.

The survey of the Glen Lyell area was commenced on 21st November, 1955 by a geophysical party comprising D.L. Rowston (party leader), L.V. Skattebol (geophysicist) and one university vacation student. The Department of the Interior, Canberra, provided surveyors for pegging and levelling the geophysical grid. Apart from a break over the Christmas-New Year period, the survey was continued, with the assistance of two additional university students, until 26th March, 1956, by which time the investigation of the Glen Lyell and Corridor areas had been completed. Owing mainly to the difficulty of obtaining field assistants, the survey was terminated a few weeks earlier than had been planned, but arrangements have since been made to continue the work during the summer of 1956/57.

This preliminary report describes the geophysical results obtained in the Corridor area only. A more complete report on this and the Glen Lyell area will be issued later.

The plan of the area surveyed, with mining data added, is shown on Plate 2. The geophysical grid of the Corridor area, which was surveyed from baseline 2000 (true bearing 324° 30'), does not conform to the Mt. Lyell Mine grid. The intersection of baseline 2000 and traverse 16 on the geophysical grid has co-ordinates 00/2000W on the mine grid.

## 2. GEOLOGY.

The Mt. Lyell copper deposits are the subject of an extensive literature, and intensive geological investigations are currently being carried out by the geological staff of the Mt. Lyell Mining and Railway Co. The following brief notes are based on geological maps prepared by the Company.

The copper and iron mineralisation at Mt. Lyell is associated with a broad zone of shearing, the Lyell Shear, which trends north through Ordovician and Cambrian rocks. The effect of the shear has been to convert hard siliceous conglomerates of the Owen Group (Ordovician) and an assortment of sediments of the Dundas Group

(Cambrian) to sericitic and chloritic schists.

Mineralisation occurs in long narrow zones along the schistosity, which is elongated generally about 40° west of north and dips to the south-west. These zones are en echelon, stepping progressively to the south-west, and consist predominantly of pyrite with some low-grade chalcopyrite. The ore bodies in the Mt. Lyell field occur partly as small massive lenses on the contact between the Dundas schists and conglomerates and partly as large disseminated pyrite deposits, with a smaller amount of copper, in schists away from the contact. The ratio of copper to sulphur has a wide range and is much lower, for example, in the "Footprint" disseminated pyrite body than at West Lyell. The ratio also shows a considerable range within individual lenses, the copper content often increasing towards the margin of the body.

## 3. METHODS AND RESULTS.

Four methods of survey were used in the Corridor area, namely, electromagnetic, self-potential, magnetic and geochemical.

### (a) Electromagnetic (Turam).

The electromagnetic method, using Turam equipment, was successful in delineating zones of higher electrical conductivity within the schists. These zones, shown by the equiphase contours on Plates 3 and 4, generally coincide with the earlier equipotential anomalies of Blazey and Douglas but show more detail and continuity.

Plate 3 shows the contours obtained with the primary field cable along baseline 2600, and Plate 4 shows those obtained with the cable along 2000. Terrain, Turam, self-potential and geochemical profiles along selected traverses 26 and 18 are shown on Plates 6 and 7 respectively.

Large phase differences over long sections of the traverses indicate wide bodies of disseminated ore of relatively low electrical conductivity.

The strong Turam anomaly, extending over most of the south-western part of the Corridor area (Plate 3), is almost coincident with the western portion of the "Footprint" anomaly (Indication Zone A) of Blazey and Douglas. Test drilling of the "Footprint" anomaly by D.D.Hs. 76 to 81, revealed a body rich in pyrite but with negligible chalcopyrite over the greater part. The highest copper assays were obtained in D.D.H. 81, along traverse 28, but even there the average is less than one percent over the best part.

One conductive zone revealed by the Turam results, which had not previously been located by the equipotential line method, is situated between 1800 and 2000 on traverses 25 to 34 (Plate 3). It is proposed to designate this as Zone 31. Copper values in a drive from the old Western Tharsis mine increase towards this anomaly but the drive terminated before reaching it. It is doubtful whether D.D.H. 81 (Plates 2 and 6) has tested the conductive body giving rise to this anomaly even if it extends to the depth of the drill hole although it may have entered its south-western edge.

The strong Turam anomaly revealed along the north-eastern part of the Corridor area (Plate 4), coincides with Zone 16 found by the earlier equipotential survey. This anomaly had already been tested by D.D.H. 406, which intersected an average of 1.4 percent of copper over 100 feet of its length. The Turam indication continues along the schist-conglomerate contact and terminates in the north-west at traverse 30. Projections of D.D.Hs. 79 and 406

are shown on Plate 7 for comparison with the geophysical and geochemical profiles along Traverse 18.

A weak Turam indication suggests a connection between Zone 17 and Indication Zone B (Plates 1 and 4), although Indication Zone B has not been fully covered by the Turam survey. D.D.H. 407, which terminates at 140 feet, was drilled to intersect Zone 17; it assayed about 0.2 percent copper. The Anaconda tunnel which intersects Indicatinn Zone B along traverse 34, disclosed less than 0.2 percent copper over practically its whole length with pyrite to a maximum of 20 percent.

From the electromagnetic results it appears that the central portion of the Corridor area is devoid of mineralisation.

(b) Self-Potential.

Self-potential measurements were made using Cambridge Meter No. 225812 and S.P. Meter Type 3A, No. 9094. The self-potential contours (Plate 5) show general agreement with the Turam contours but the results were affected to some extent by stray electrical currents from power lines, telluric currents, poor soil cover and topography.

In particular steep terrain and telluric currents produce a marked effect which masks the self-potential anomaly that might be expected to coincide with the Turam anomaly of Zone 16, which lies along the schist-conglomerate contact in the north-eastern part of the Corridor area. Some discussion of this phenomenon will be given in the final report.

(c) Magnetic.

Observations of the vertical magnetic intensity were made along selected traverses. The test profiles showed no features that could be correlated with the geology and the method was discontinued.

(d) Geochemical.

Soil samples were taken over selected indications for geochemical assay for copper. Testing of samples from traverses 26 and 18 is complete and the results are shown on Plates 6 and 7 respectively. However, the interpretation of the geochemical results requires careful consideration of the effects of such factors as migration and leaching of copper, "salting" etc., and no attempt has been made to include an interpretation in this preliminary report.

## 4. CONCLUSIONS AND RECOMMENDATIONS.

The geophysical survey by the Bureau has outlined several indications. Most of these coincide with those outlined by the earlier equipotential surveys of Blazey and Douglas but some new anomaly zones were also indicated. Comparison with the results of diamond drilling and mine workings shows that the indications are due to zones of pyrite mineralisation with variable amounts of chalcopyrite.

From a study of all the available data it is evident that at least two zones warrant further investigation.

In view of the favourable results from D.D.H. 406, the proximity to the schist-conglomerate contact and the well-defined electromagnetic indication extending over a length of about 1,500 feet, it is considered that the Turam indication in Zone 16 should be tested by drilling along its length between traverses

16 and 28.

Further, the new Turam anomaly (Zone 31), between 1800 and 2000 on traverses 25 to 34, should be drilled along traverse 30 to investigate the source of the indication.

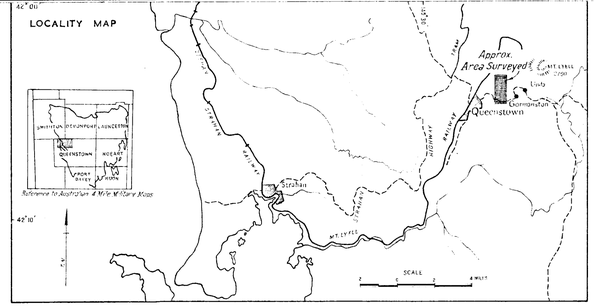
Further exploration should be based on the information obtained from these holes and on a more complete study of the geophysical results.

## 5. REFERENCES.

Blazey, E.L., and Douglas, G., 1934-38. - Company Reports, unpublished (but made available to the Bureau).

Richardson, L.A.R., 1949 - Report on geophysical surveys at Mt. Lyell (Progress Report No.1), Bur. Min. Res. Geol. & Geophy., Records 1949 No. 29.

PLATE I







NOTE: Geophysical Anomaly Zones 1-30, A-C
Blazey and Douglas (1934-38)

Gormanston Geophysical Anomalies
B.M.R. (1946-48) see Dwg. No. G 26-3

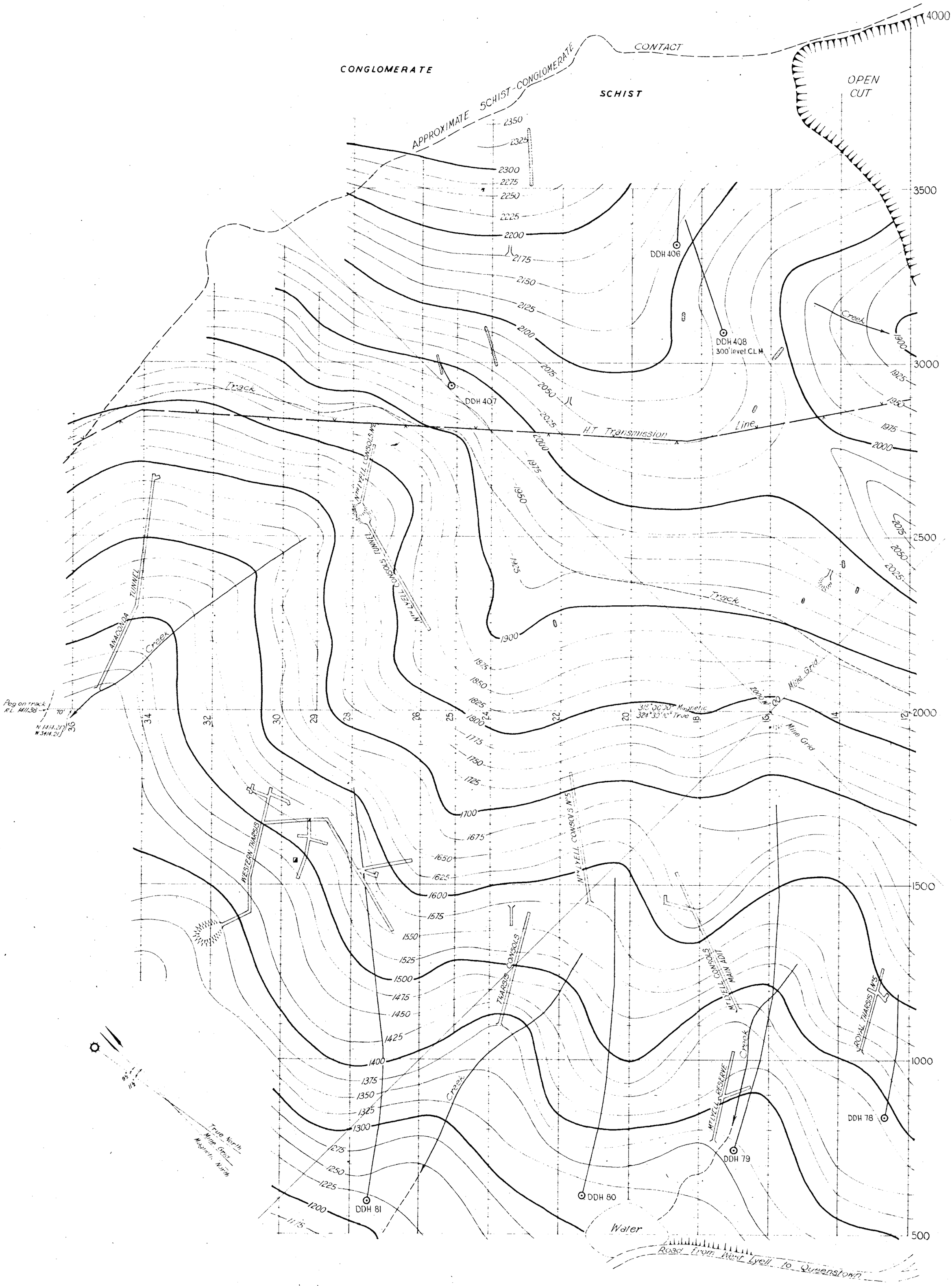
# GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

## LOCALITY MAP

GEOLOGY AFTER MOUNT LYELL M & R CO. LTD. PLAN No GE 10

SCALE IN FEET
500 0 500 1,000 1,500 2,000

GEOPHYSICIST




Adit
Shaft
Costean
Diamond drillhole

SCALE IN FEET

200 0 200 400 600

Contour Interval 25 feet

# GEOPHYSICAL SURVEY AT MT LYELL, QUEENSTOWN, TASMANIA.

# CORRIDOR AREA

## PRELIMINARY PLAN OF GEOPHYSICAL GRID AND TOPOGRAPHY

SURVEYED BY G.S.SCHUNKE, D.P.COOK.
DEPT OF THE INTERIOR,
CANBERRA.

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics G26-23

PLATE 3

36 True Bearing 324° 30′ 34 32 30 29 28 26 25 24 23 22 20 18 16 14 12

2,600′

2000N 00 Mt Lyell Grid Co-ordinates

2,000′

1500′

1,000′

700

Zone 31

Indication Zone A

Zone 27

SCALE IN FEET

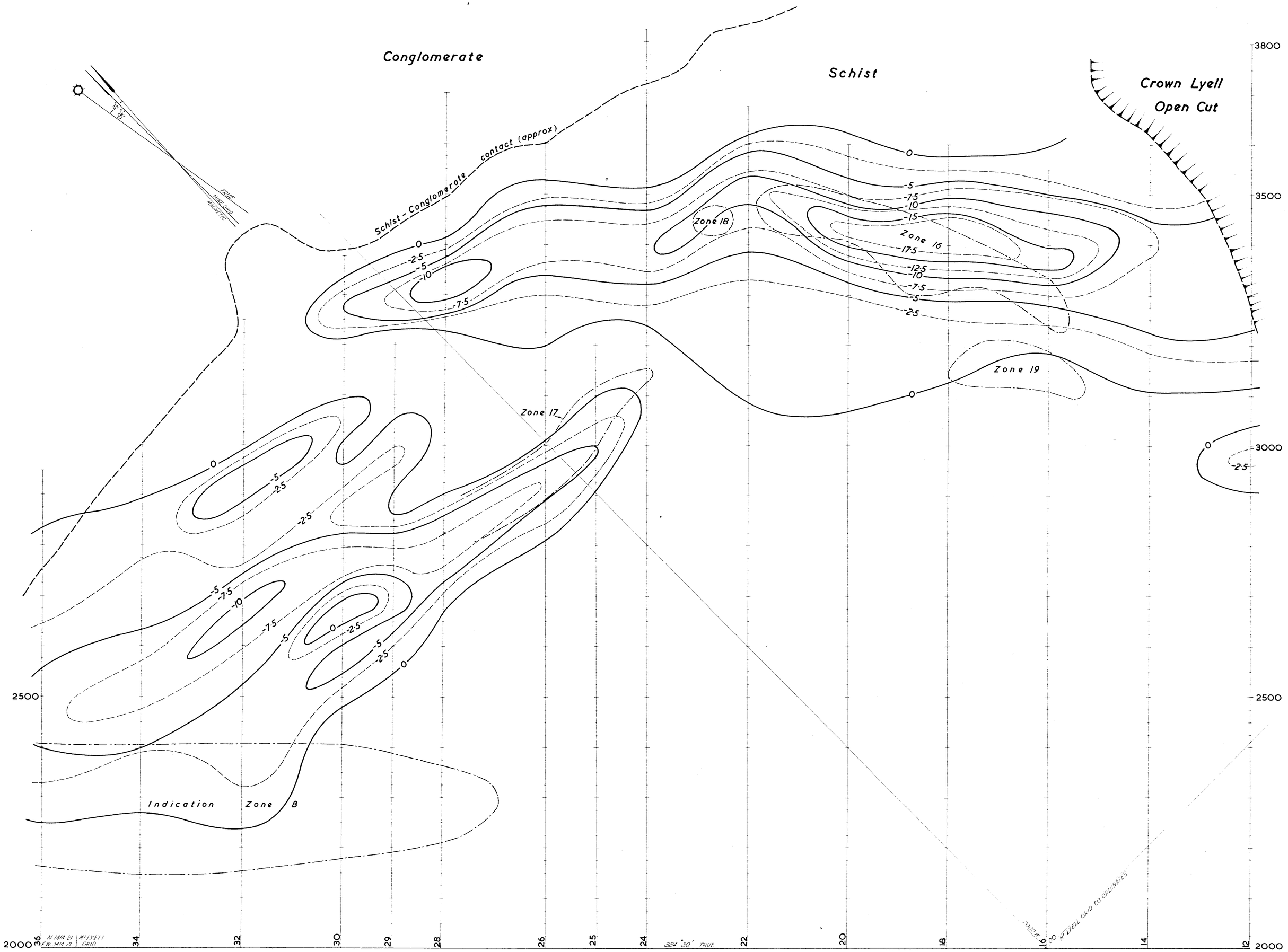
100 0 100 200 300

CONTOUR INTERVAL 2·5°

W. H. Fowerton
GEOPHYSICIST

GEOPHYSICAL SURVEY AT MT. LYELL,
QUEENSTOWN, TASMANIA
CORRIDOR AREA (WESTERN SECTOR)

# TURAM PHASE CONTOURS




SCALE IN FEET

100 0 100 200 300 400 500

CONTOUR INTERVAL 2·5°

D.H. Rowston
GEOPHYSICIST

# GEOPHYSICAL SURVEY AT Mt LYELL, QUEENSTOWN, TASMANIA
## CORRIDOR AREA (EASTERN SECTOR)
## TURAM PHASE CONTOURS

PLATE 5

Crown Lyell Open Cut

Conglomerate

Schist

Contact (approx)

Zone 16

Zone 17

Zone 18

Zone 19

Zone 27

Indication Zone A

Indication Zone B

2000 West 0.0 Mt. Lyell Fire Station

True Bearing 324° 30'

SCALE IN FEET

100 0 100 200 300 400 500

Contour interval 100 millivolts

R. Houston
GEOPHYSICIST

GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA

# SELF-POTENTIAL CONTOURS

*Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics*

G 26 – 27

600 1000 1400 1800 2200 2600 3000 3400 3800

Elevation - feet

2200
2000
1800
1600
1400
1200

TERRAIN PROFILE

Copper - P.P.M

400
300
200
100
0

GEOCHEMICAL PROFILE

PROJECTION D.D.H 81

15%
3.10%
0.5%

$FeS_2$

200' 400' 600' 800' 1000' 1200'

GEOPHYSICAL SURVEY AT MT LYELL,
QUEENSTOWN, TASMANIA.

# CORRIDOR AREA.
# TERRAIN, TURAM PHASE, S.P. & GEOCHEMICAL PROFILES ALONG TRAVERSE 26 AND SECTION THROUGH D.D.H. 81

HORIZONTAL SCALE IN FEET
200 0 200 400 600

D.K. Rowston
GEOPHYSICIST

Phase Difference - Degrees

0
-10°
-20°

TURAM PHASE PROFILE

Millivolts

0
-200
-400
-600

S.P. PROFILE

600 1,000 1,400 1,800 2,200 2,600 3,000 3,400 3,800

Elevation in Feet

2000 1,800 1,600 1,400

D.D.H. 406

TERRAIN PROFILE

100 200 300' 0 10 20 30 % Cu

200 100 0 Cu p.p.m.

GEOCHEMICAL PROFILE

PROJECTION D.D.H. 79

MT. LYELL RESERVE
Cu average < 0·3%

NORTH LYELL OUTCROPS
Cu average 0·25 %

10 20 30 % FeS2

Cu < 0·4 %

10° 0 -10° -20°

Turam Phase Difference

TURAM PHASE PROFILE

0 -200 -400

Self-Potential (Millivolts)

SELF-POTENTIAL PROFILE

GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA

# TERRAIN, TURAM PHASE, SELF-POTENTIAL AND GEOCHEMICAL PROFILES ALONG TRAVERSE 18 AND SECTIONS THROUGH D.D.Hs. 79 AND 406

SCALE IN FEET
200 0 200 400 600

E.K. Gourlay
GEOPHYSICIST