DEPARTMENT OF MINES
SOUTH AUSTRALIA

Geological Report

on

COPPER, SILVER-LEAD PROSPECT, M.C. 4483
SECTION 99, HUNDRED GILBERT, COUNTY LIGHT

(K.F. FERNANDEZ)

by

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METALLICS SECTION

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Map No.	Title	Scale
Fig. 1.	Regional Geological Map Riverton-Clare District	1 inch = 3¼ miles
S-3636	M.C. 4483, Sec. 99, Hd. Gilbert Locality Map Showing general geology and structure form lines.	1 inch = 40 chains

Rept. Bk. No. 58/92
G.S. No. 2841
D.M. 1081/63

10th April, 1964.

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COPPER, SILVER-LEAD PROSPECT M.C. 4483

SEC. 99, HD. GILBERT, CO. LIGHT

(K.F. FERNANDEZ)

1. ABSTRACT

Mineral Claim No. 4483 is located in the Mintaro Shale Formation on the eastern limb of a major fold structure approximated 5 miles east of the town of Riverton. Relatively small lenses of quartz carrying gold, silver-lead, copper and zinc minerals of ore grade occur within the claim boundaries. Similar occurrences are found in approximately this stratigraphic position elsewhere in the area. It is unlikely that the prospect will develop into a major deposit although it may prove to be a profitable mining venture for a small syndicate. Costeaning is recommended to test the grade, width and length of the lodes along strike. Following this, a survey is recommended to pick up all the existing workings.

2. INTRODUCTION

Following a request by Mr. K.F. Fernandez on 19/6/63, for geological assistance in the examination and assessment of a silver, lead and copper prospect near Riverton, the writer visited the area with Mr. Fernandez on 24/7/63. None of the workings were accessible at that time and no mine plans exist. A superficial examination was made of the rock types outcropping in the claim area, in the mine openings and immediately to the east. A few samples were collected from the mine dumps for petrological examination and spectrographic analysis. Mr. Fernandez was advised to costean between the two existing shafts and to the south of the southern shaft, and advise the Department when the work was done.

On 19/9/63 L. Mansfield, Inspector of Mines and Quarries visited the above claim at the request of Mr. Fernandez, and advised the claimholder to cut costeans between the shafts and south of an open cut he had made. At the date of writing this costeaning had not been done.

The Regional Mapping Section is currently mapping in the area and revising work done by A.F. Wilson (1952) in the

Riverton - Clare region.

3. ACCESS & TOPOGRAPHY

Riverton is approximately 60 miles by road north of Adelaide. The region is part of the Northern Mount Lofty Ranges and is generally of gentle relief. Rainfall is reliable with a winter maximum of between 18 and 30 inches.

The claim is immediately to the north of a well graded unsurface country road approximately 5 miles to the east of the town of Riverton.

4. REFERENCES

BROWN, H.Y.L., 1908. Record of the Mines of South Australia

WILSON, A.F., 1952. "The Adelaide System as developed in the Riverton-Clare region, northern Mount Lofty Ranges, South Australia. Trans. Roy. Soc. S.Aust., 75, 131-149.

RAMBERG, H., 1952 "The origin of metamorphic and metasomatic rocks".

MENDELSOHN, F., 1961. "Ore Genesis, in The Geology of the Northern Rhodesian Copperbelt. (Ed. F. Mendelsohn) pp. 130-146. (7th Commonwealth Mining and Metallurgical Congress South Africa).

THOMSON, B.P., and COATS, R.P., 1964. "Pre Burra Group sequences in the Adelaide Geosyncline - the Callana Beds". Quart. Geol. Notes., No. 9, 3-5.

MIRAMS, R.C., and FORBES, B.G., 1964. "Burra Group". Quart. Geol. Notes, No. 9, 5-7.

COATS, R.P., 1964. "Umberatana Group". Quart. Geol. Notes, No. 9, 7-12.

5. GEOLOGY

The regional geology of the area has been discussed by Wilson (1952) who produced the first comprehensive regional geologic map of the district which is appended (fig. 1) to this report. All the older sediments here belong to the lower part of the Adelaide system and have been placed in the River Wakefield Group, Burra Group, and the Lower formations of the Umberatana

Group.

The River Wakefield Group has been described (Wilson 1952) as an extensive group of alternating sandy phyllites, quartzites and occasional lenticular bodies of dolomite and limestone which comprise the oldest rocks which outcrop approximately 6 miles to the east of Riverton in this area.

The overlying Burra Group which includes the Rhynie Sandstone, Skillogalee Dolomite, Woolshed Flat Shale, Undalya Quartzite, Auburn Dolomite and Saddleworth Formations occupies approximately 80% of the area in Fig. 1. Conformably overlying the Burra Group are units of the Umberatana Group which include the Leasingham Quartzite, Mintaro Shale, Gilbert Range Quartzite and Appila Tillite formations.

The regional trend of the main fold axes is N-S. Between Riverton and Clare a major drag fold and smaller associated drags which trend towards the north-east have been interpreted by Wilson (op. cit.) as the result of the eastern area moving upwards and northwards relative to the western block.

Two main faults in the area trend meridionally and have been named by Wilson as the Alma and Gilbert Range faults respectively. Both dip steeply to the west, the relative movement being east block up. Small silver-lead-copper sulphide vein fillings are reported to be associated with the Gilbert Range fault zone.

Mineral Claim 4483 is in section 99 in the Hundred of Gilbert and covers an area of approximately 26 acres all of which lies within the boundaries of the upper part of the Mintaro Shale Formation which Wilson notes as being argillaceous but still notably calcareous in place. The beds strike N-S and dip to the east at 65°. (Since the field inspection and the writing of this report the claim pegs have been changed and the claim boundaries include the upper part of the Mintaro slate formation and the lower part of the Gilbert Range Formation).

Outcrop in the section is poor; most of the samples collected for laboratory investigation were taken in the vicinity of the mine working, two rock samples being collected from the dump of the northern shaft and two from the dump of the southern.

The sediments in the mine area are sheared phyllitic and arenaceous dolomites, magnesites and protoquartzites. Petrological descriptions of the rock samples are appended to this report (See Appendix I. report M.P. 1157-63). Small lenses of quartz parallel to the bedding and carrying silver lead and copper minerals have been mined near the centre of the lease.

In the Record of the Mines of South Australia (1908) two mines are described as being located 5 miles NE of Riverton, these are the Belvedere and Peter's Hill Mines. It is probable that Peter's Hill Mine is the mine currently being investigated. Assays in above publications list gold in addition to silver lead and copper in the mines. Wilson (op. cit.) also notes the occurrence of auriferous quartz veins in the underlying Rhynie Sandstone Formation in this region.

Spectrographic analysis of rock samples taken by the writer revealed anomalous base metal values in the sediments, particularly zinc (see Appendix II). These minerals are not obvious in thin sections of the country rock possibly because of their relative scarcity and the fact that they are predominantly of a secondary nature. Small quantities of copper sulphide and probably lead sulphide have been identified in the country rock. (See Appendix I addendum to report M.P. 1157-63). There is a marked difference in the relative abundances of the minor elements (cobalt, nickel, silver, chromium, vanadium, manganese, barium, and titanium) between the sediments and the lode rock (see appendix II compare samples A2720/63 - 2722/63 with A2723/63).

Since there is no igneous activity in the area and no Palaeozoic granites are known to occur anywhere near these deposits, nor is there wall rock alteration in the vicinity of the lodes or any obvious channelway to give access for ore bearing solutions, some origin other than an igneous source should be considered to explain these mineral occurrences. Quarts veins and lenses are commonplace in siliceous arenites in areas remote from any igneous activity. Ramberg (1952) has suggested that some of these may be due to migration of silica into low pressure energy temperature areas. Williams (1960) invokes the mobilisation and migration of copper, silver and lead minerals along pressure, energy, temperature gradients at Mt. Isa mines to account for movement of the ore minerals. F. Mendelsohn (1961) states "The quartz veins in the Katanga system (and Basement rocks in part) have been shown to be metamorphic veins, and material has migrated into the veins from the ore beds; migration from the veins would be expected with feeder veins". In this paper Meldelsohn also illustrates the lateral migration of copper sulphides into cross cutting fractures near the base of the B ore body at Mufulira. It is suggested that the veins examined on M.C. 4483 may be of metamorphic origin.

6. WORKINGS

Two shafts approximately 300' apart are reported to be connected by a drive. The northern shaft is vertical and filled to approximately 60 feet from the surface. The southern shaft which underlies to the east at 62° is reported to be 120 feet deep. Stoping has been carried out over a width of nine feet northwards for an unknown distance from the southern shaft. None of the workings were accessible at the time of the writer's visit.

6. CONCLUSIONS AND RECOMMENDATIONS

Lenticular quartz lodes found on M.C. 4483 parallel the bedding and carry silver-lead and copper ore minerals of economic grade in places.

The lenses are relatively small and sporadically distributed in the Mintaro Shale Formation. It is probable that other lodes occur along strike and down dip, and these would be similar in size and composition to the lodes already worked.

It is unlikely that the prospect will develop into a major deposit although it may be worked profitably by a small syndicate.

Costeaning across the strike of the lodes between the shafts is recommended to test their extent, width and grade. Mapping of the existing workings is desirable for record purposes; this can be done when the costeaning has been completed.

The area appears to be suitable for geochemical investigation and a low priority geochemical exploration survey of the area may locate additional lodes similar to the ones already worked.

L. G. Nixon
Senior Geologist
METALLICS SECTION

LGN:AGK
10/4/64

APPENDIX 1

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REF. MP 1/2/0

REPORT MP1157-63

MATERIAL:	Rock samples (5)
LOCALITY:	Hd. Gilbert, Sect. 99, Co. Light, M.C. 4483
IDENTIFICATION:	P296-300/63: L.G.N. 155-9/63

Investigation and Report by: P.J. Sweeney

THE PETROLOGY OF FIVE ROCKS FROM HUNDRED OF GILBERT

P296/63: L.G.N.155/63: TS12952: PS7774

This rock is a sheared, banded, sandy magnesite in which three s-surfaces are evident. S_1 is sedimentary bedding as is shown by bands of silt to fine sand grade quartz grains. The grains of quartz are fractured and often severely granulated but have sutured together where in juxtaposition. Apparently the initial stage of shearing was parallel to bedding as the grains are broken by a series of fractures parallel to S_1. This could indicate the competency of the sandy laminae compared to the carbonate which appears to have flowed. Fractures in the grains are filled with carbonate. Quartz also occurs in the carbonate bands where it is to a large extent authigenically replaced by the magnesite. Here the grains are fine and lenticular and show a crystalline foliation. S_2, the foliation shown by muscovite, is parallel to S_1. An S_3 surface is developed at an angle of 30° to S_2 by a later period of shearing; this plane is also shown by foliation of muscovite and "flowage" of the carbonate. The muscovite flakes are narrow and generally quite elongate. The carbonate mineral, magnesite, was identified by x-ray diffraction; some iron is present in the magnesite, probably in the form of siderite. Iron oxide (?goethite) is a common constituent occurring throughout the rock; in part it shows a flow-like habit possibly due to recrystallisation under shearing conditions. Tourmaline is present in accessory amounts. Late stage fracturing at right angles to S_1 has caused displacement of the laminae; veinlets of a carbonate mineral traverse the rock.

The only primary sulphide mineral found in the rock is pyrite. It occurs rarely as fractured grains altered to goethite along the fractures and around the margins; the goethite is often banded.

P297/63: L.G.N.156/63: TS12953

This rock could be classified as a phyllite or a quartz-muscovite-biotite-dolomite schist in which two s-surfaces are evident. The original rock type was probably a banded sandy argillite.

S_1, or bedding, is shown by fine sand grade quartz-feldspar bands alternating with muscovite layers. The feldspar, which is very minor, is plagioclase and orthoclase. The bands vary in thickness from one to another and slightly along their length. Grains are sutured where in juxtaposition but the majority have granulated boundaries.

Dolomite and muscovite occur together and the foliation of the muscovite gives rise to the S_2-plane which is at an angle of 30° to bedding. The carbonate in part shows a "flow" structure. Occasional unaligned flakes of muscovite and chlorite occur; these are thought to be relict original constituents. Quartz and feldspar also occur in these bands; here the grains are of silt grade and are roughly aligned with their length parallel to S_2. Biotite occurs throughout the rock as fairly fine, irregular flakes but is more concentrated in the quartz-rich laminae. The flakes show no alignment which may indicate that the pressure-temperature conditions were such that biotite did not recrystallise and become aligned parallel to S_2. Fine opaques are scattered through the rock and tourmaline and zircon are accessory. Epigenetic opaques are rare.

PR98/63: L.G.N.157/63: TS12954

This rock is an irregularly bedded, impure, sheared proto-quartzite of fine grain size. Cementation was originally by secondary overgrowths but shearing has caused granulation and some grains have been recemented by suturing. A few grains still show relicts of the secondary overgrowths. The original rock was probably fairly even grained. Feldspar is a minor constituent and is present mainly as plagioclase with only rare grains of orthoclase; sericitisation is slight. Fine iron oxide occurs intergranularly and also concentrated into pods. Large rounded grains of tourmaline and finer zircon are accessory. Apparently contemporaneously with shearing and granulation sericite was introduced. This mineral occurs as fine needles and slightly coarser flakes with some secondary iron oxide along the major fracture zones, in fractures in grains and inter-granularly.

P299/63: L.G.N.158/63: TS12955: PS7775

This is a coarse cellular boxwork formed by magnesite. The boxworks are generally rather shapeless but occasional indications of rectangular or square cells are observed; cross structures are common. The walls are composed of iron-stained, fine-grained carbonate with an inner layer of limonite and/or goethite. Malachite sometimes occurs within the cells or lining the walls.

The main copper mineral present is bornite. This mineral occurs as rather shapeless grains altering to neo-digenite at the rims which is in turn replaced by covellite. Neodigenite occasionally replaces covellite and is sometimes intergrown with chalcocite as alteration products of bornite. Traces of chalco-pyrite occur within the bornite.

P300/63: L.G.N.159/63: TS12956

This is a sheared, granulated, fine-grained sericitic proto-quartzite. The original rock was probably fairly even-grained but the constituents now have granulated margins and show strain extinction. Feldspar, orthoclase and plagioclase, is a minor constituent. Lenses occur in which sericite is predominant and quartz is of finer grain; it is not certain whether these are fracture zones as in P298/63 or originally laminae of argillaceous material which has recrystallised to sericite. Sericite and carbonate occur in the quartz-rich areas of the rock, the carbonate sometimes being present in rhombohedral sections. Iron oxide is common as fine grains scattered throughout the rock but often concentrated in pods; this may indicate segregation during recrystallisation. Tourmaline and zircon are present in accessory amounts. Fractures are filled with iron-stained carbonate.

ysc:3

ADDENDUM TO REPORT MP1157-63

THE PETROLOGY OF FIVE ROCKS FROM HUNDRED OF GILBERT

INTRODUCTION

Three of the rocks of the five submitted were found to contain anomalous concentrations of copper, lead and zinc. The crushed material remaining from spectrographic analyses was re-examined to determine the mode of occurrence of the three elements. Examination was by oil immersion and mineragraphic methods supplemented by X-Ray diffraction where applicable.

RESULTS

P296/63: A2720: LGN155/63

The briquette (PS7774), originally made from this sample, was re-examined and found to contain traces of malachite, thus explaining the copper content of the rock.

The crushed samplewas split into heavy and light fractions using tetrabromoethane (S.G.=2.95). The heavy fraction was again centrifuged in T.B.E. and the heavy minerals from this split centrifuged in Clerici solution (S.G.=3.9). This final heavy mineral fraction was examined by oil immersion methods and found to consist of smithsonite and cerussite which was later confirmed by X-Ray diffraction. It is not known whether these minerals occur intermixed with the magnesite present or in the late veins of carbonate which traverse the rock. This could be ascertained if further samples are submitted.

P297/63: A2727: LGN156/63

The crushed sample was split into heavy and light fractions; a portion of the heavy fraction was briquetted (PS7983) and the remainder examined by oil immersion methods.

Mineragraphic examination showed the presence of very minor amounts of cuprite and traces of chalcopyrite. Another mineral thought possibly to be galena, occurred in trace amounts but this tentative identification could not be confirmed. Oil immersion examination showed that dolomite formed the bulk of the heavy fraction but the quantity was insufficient to allow another heavy mineral separation using Clerici solution as in the above. However, it is suggested that lead and zinc again occur as their carbonates.

P298/63: A2722: LGN157/63

This sample was treated in the same manner as the above. Chalcopyrite (PS8016) was found to occur in trace amounts but specific lead and zinc minerals were not found. A carbonate mineral occurs in traces and is possibly smithsonite or cerussite. Other minerals occur in too small a quantity to allow identification and may contain lead and/or zinc.

eo:1

APPENDIX 2

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REF. AN 1/2/0

REPORT AN1158-63

LOCALITY: Hd. Gilbert, Section 99, Co. Light, M.C. 4483

IDENTIFICATION: LGN155/63-159/63

SEMI-QUANTITATIVE ANALYSIS
BY EMISSION SPECTROSCOPY

	Sample Mark	Copper Cu	Lead Pb	Zinc Zn	Cobalt Co	Nickel Ni	
LGN155/63	A2720/63	2,000	8000	xx 10,000	20	80	N.Shaft dump
LGN156/63	A2721	30	100	2,000	12	25	" " "
LGN157/63	A2722	800	80	7,000	12	20	outcrop
LGN158/63	A2723	xx 10,000	4000	xx 10,000	10	20	S.Shaft dump
LGN159/63	A2724	50	30	800	20	25	" " "

SEMI-QUANTITATIVE ANALYSIS
BY EMISSION SPECTROSCOPY

	Sample Mark	Silver Ag	Chromium Cr	Vanadium V	Manganese Mn	Barium Ba	
LGN155/63	A2720/63	5	400	50	400	250	N.sha dump
LGN156/63	A2721	0.3	800	80	200	400	" " "
LGN157/63	A2722	2	1000	30	20	500	outcro
LGN158/63	A2723	50	15	x 1	5	15	S.shaft dump
LGN159/63	A2724	1	1000	40	150	500	" "

SEMI-QUANTITATIVE ANALYSIS BY EMISSION SPECTROSCOPY

	Sample Mark	Iron Fe	Calcium Ca	Magnesium Mg	Titanium Ti	Potassium K	Molybdenum Mo
LGN155/63	A2720/63	x 3	L	H	0.4	approx.7	1
LGN156/63	A2721	2	L	H	0.5	" 10	1
LGN157/63	A2722	1	M	M	0.2	" 5	1
LGN158/63	A2723	0.6	L	L	0.05	" 2	x 1
LGN159/63	A2724	1	H D	H	0.4	" 7	1

Gold (Au) - all samples less than 3 ppm

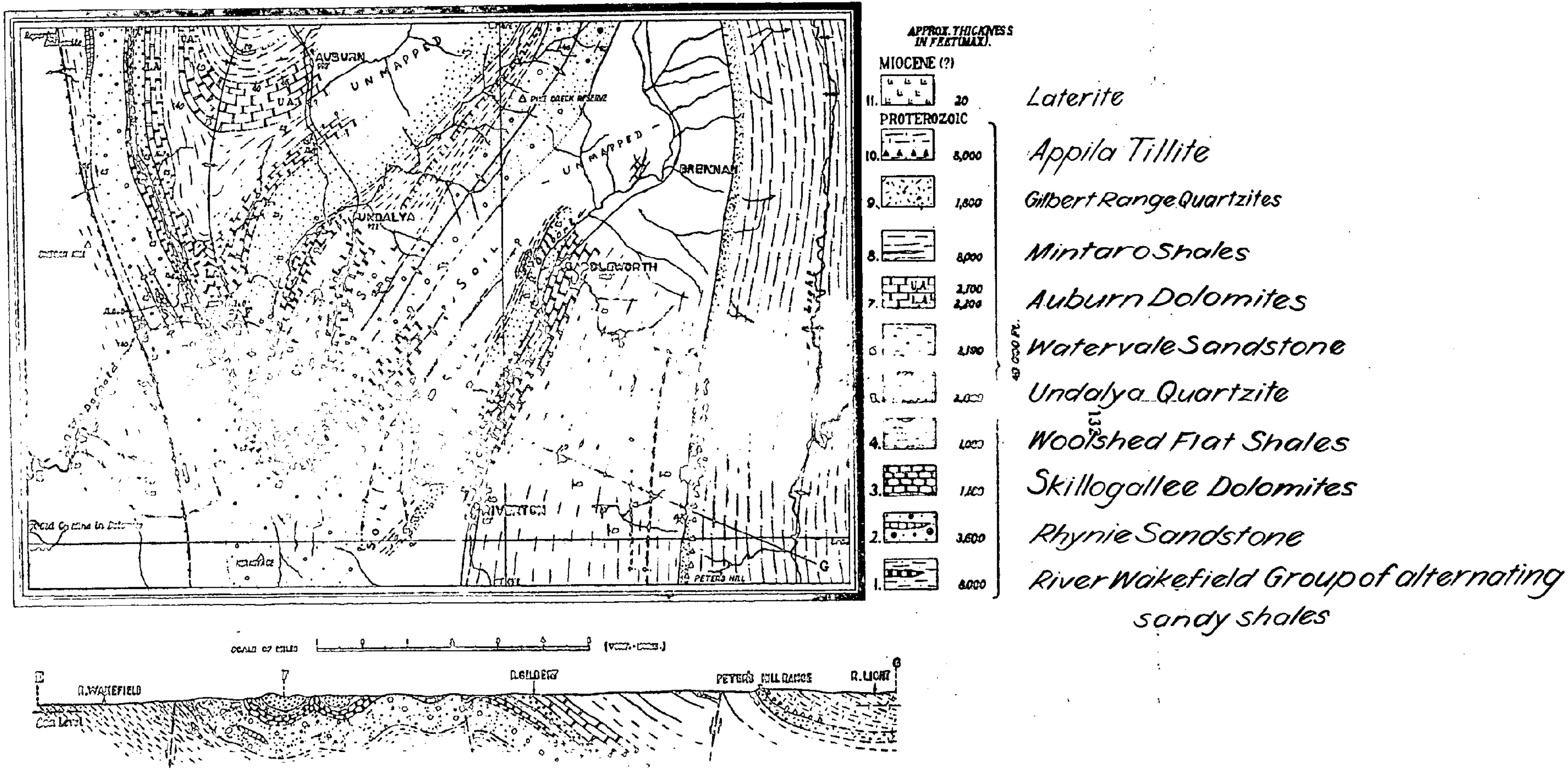
x indicates less than

xx indicates greater than

H = high L = low M = medium D = dolomite

Analysis by: A.B. Timms

lk:2


AUBURN
UNMAPPED
UNDALYA
SOIL
BRENNAN
SADDLEWORTH
RIVERTON
PETERS HILL
G
F
APPROX. THICKNESS IN FEET (MAX).
MIOCENE (?)
11. 20 Laterite
PROTEROZOIC
10. 5,000 Appila Tillite
9. 1,600 Gilbert Range Quartzites
8. 8,000 Mintaro Shales
7. 2,700 2,300 Auburn Dolomites
6. 3,190 Watervale Sandstone
5. 2,000 Undalya Quartzite
4. 1,000 Woolshed Flat Shales
3. 1,100 Skillogallee Dolomites
2. 3,600 Rhynie Sandstone
1. 8,000 River Wakefield Group of alternating sandy shales
R. WAKEFIELD
Sea Level
PETER'S HILL RANGE
R. LIGHT

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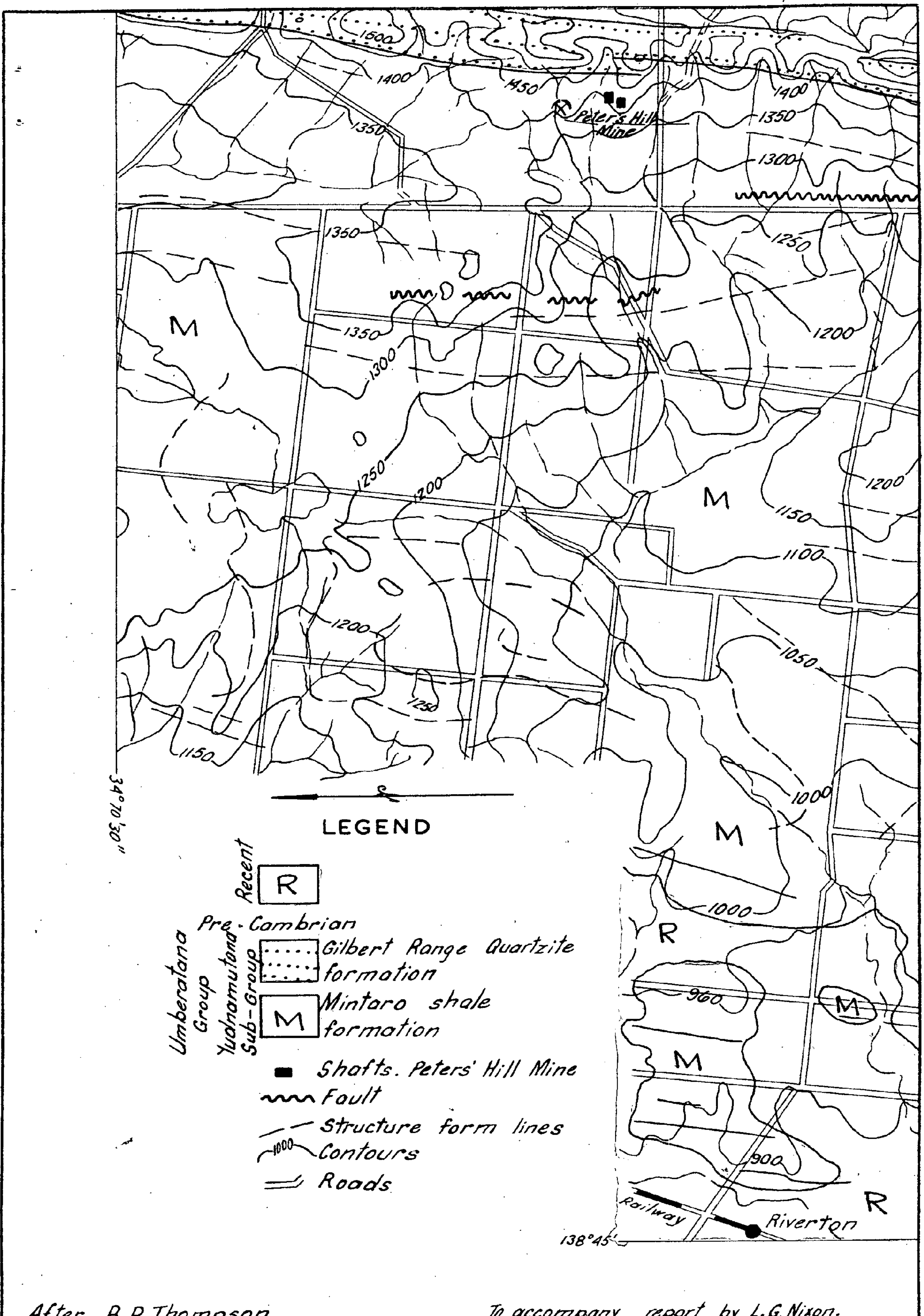

After B.P. Thompson.   To accompany report by L.G. Nixon.

S.A. DEPARTMENT OF MINES

Approved	Passed	Drn.	M.C.4483 SEC.99 HD. GILBERT	D.M.	Scale 40 Chns. to 1"
		Tcd. B.S.	LOCALITY MAP SHOWING	Req.	S 3636
		Ckd.	GENERAL GEOLOGY		GK4.
Director		Exd.	& STRUCTURE FORM LINES		Date 9-4-64

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