

1171 TRANS.

INTRODUCTION

In 1947 J.J. Burke and party commenced prospecting a silver-lead lode near the intersection of Dixon and Colville Streets in the town area of Queenstown. A 10 acre lease No. 113M/47 was subsequently taken out and prospecting by means of a shaft was initiated. The shaft was sunk to about 35 feet. Some time subsequent to 1947, the Mount Lyell M. & R. Co. Ltd. put down four diamond drill holes in the area. In 1950, as a result of conversations with Mr. Burke, the Director of Mines directed that a geological survey be made of the area with a view to determining the probable extent and value of the area.

MAPPING AND FIELD PROCEDURE

The Mt. Lyell Co's plan of the Queenstown area on a scale of three chains to the inch was made available to the writer. Aerial photographs of the town area on an approximate scale of 1/8000 were made available by the Inspector of Mines at Queenstown. Mapping consisted of an inspection of the photographs prior to going into the field during which time the major geological features were outlined. In the field, detail was plotted on to the photos and the whole of the information plotted back from the photos on to the Mt. Lyell Co's plan using street intersections etc as reference points. A copy of the resulting plan accompanies this report.

The Mt. Lyell Co's plan and section of drill holes was made available to the writer and a copy is attached to this report. The Inspector of Mines at Queenstown took a number of samples from the area and from the shaft while work was in progress and details of the resulting assays are included below.

### TOPOGRAPHY

The town area of Queenstown occupies an elongated basin surrounded by high hills. Several prominent low hills protrude an average of 150-200 feet above the floor of the basin. Lease No. 113M/47 is located on the northern flank of one of these hills known locally as Sandstone Hill. West of the western boundary of the lease, the porphyroids occur as prominent hills rising towards Mount Owen.

### GENERAL GEOLOGY

It was at once realised when the fieldwork commenced that little information could be obtained in the prospect area itself. The shaft was full of water and could not be inspected but material from the dumpheap showed clearly that silver-lead ore occurs in a black limestone pug. Outcrops of Gordon River Limestone occur near at hand. Apart from this fact and the obvious contact of quartzite overlying limestone just south of the shaft, little further information could be gained in the immediate vicinity of the prospect and the geological investigation devolved into a structural interpretation of the adjoining southern area. The geology of the whole Queenstown area is exceedingly complex and, although many geologists have worked in the area, no finality has yet been reached as to the ultimate structure of the area as a whole. However, it is considered that the interpretation of the area studied during the present investigation is the correct one.

The most prominent topographical feature, Sandstone Hill, is the nose of a very sharp, plunging syncline, the axis of which curves from the top of the hill westwards towards the old cemetery site then south paralleling the railway to Strahan and lying some eight chains west of the railway. From its lithological

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characteristics, distinctive weathering, presence of a "pink band" and relationship to the underlying Gordan River Limestone, this sandstone has been identified as the Crotty Quartzite as defined by Gill and Banks P.263. South of this ridge, two further prominent ridges appear on the photographs. The first of these shows a "nose" crossing the southern boundary of the old cemetery site and has been identified on lithological evidence as the Keel Quartzite (Gill and Banks P.265). Some eight chains south of the Keel ridge, a third ridge occurs. This is also a quartzite. On the crest of this ridge, near the "nose" crinoid stem remains and impressions of brachiopods were observed. From the occurrence of these fossils, the lithology and relationship to other beds, this ridge has been identified as the Florence Quartzite (Gill and Banks P.265). Between the Keel and the Florence Quartzite ridges, is a development of shale partly converted to slate. On the northern side of the Keel ridge similar shales occur.

The succession above described agrees closely with that which has been worked out for the Zeehan basin. The Tasmanian Smelting Co's works at Zeehan were built on the edge of a sandstone ridge (Crotty Quartzite) dipping to the West and the succeeding beds to the west are shale, Keel Quartzite, shale, Florence Quartzite, and Bell Shales. In the Queenstown area the Bell Shales have not been recognised.

The succession at Queenstown is complicated by (a) intrusives and (b) glacials and alluvium.

Intrusives A large body of porphyroid rock occurs just east of the syncline and rises to high hills towards Mount Owen. On the plan the contact of the porphyroids with the sedimentaries is shown as a fault contact. This may not necessarily

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be the case but the point is not of importance.

Whatever the type of contact, the porphyroids cut off the limestone and so form the eastern limit to the probable area over which ore may occur.

Within the sedimentary series is a further area of intrusive rock. It occurs stratigraphically between the Crotty Quartzite and the shale below the Keel Quartzite. The ultimate character of this rock was not determined. At first sight it appears to be a bedded material but closer inspection establishes its intrusive nature and the apparent bedding is shown to be shear planes. The distribution of this rock on the surface is as shown on the plan. Its sub-surface distribution has an important bearing on the underground extension of the limestone as will be shown later.

Glacial and Alluvium The prominent ridge behind the Lyell District Hospital known locally as Hospital Hill consists of ill-sorted partly rounded boulders. It is a fluvio-glacial deposit possibly a moraine. The deposit has no depth and rests on intrusives. It has no bearing on the distribution of the limestone.

Almost all the flat area of the town is covered by a comparatively thin skin of alluvial wash. Although this wash has no direct bearing on the distribution of the limestone it is an awkward factor as it obscures the limestone outcrops. For this reason the northern extension of the limestone can only be inferred and its presence must be proved by boring.

In addition to the probable fault along the eastern margin of the syncline, a definite fault occurs along its western margin. This fault can be observed in at least three places.

(1) A marked change in the attitude of the shear planes in the intrusives can be observed in the cutting in the

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road to the hospital gates. At this point the fault plane can be pinpointed accurately.

(2) The sudden cutting off of the Crotty Quartzite in Powell and Beardesley Streets marks the fault plane.

(3) A spring in Mellor Street is located on the fault.

It has been shown, then, that the succession in the portion of the Queenstown area investigated agrees closely with that occurring in the Zeehan basin with the exception that the Queenstown succession is complicated by intrusives. It is reasonable, therefore, to apply to the Queenstown area the principles of ore deposition which have been fairly thoroughly worked out for the Zeehan area.

At Zeehan, where-ever the Gordon River Limestone is exposed beneath the Crotty Sandstone a band of black pug occurs and usually both the pug and the limestone are found to carry silver-lead ore. Instances of this occur at the Oceana Mine, the Mariposa and adjacent area on the Zeehan-Queenstown Road and in the town area of Zeehan. At Dixon Street, a black pug occurs between the Crotty Quartzite and the limestone. So far, work has been confined to the pug itself which has been shown to carry silver-lead ore. It is not known, therefore whether the ore extends to the solid limestone but such is most likely to be the case. The presence of the pug along the contact is readily explained. The limestone is fairly argillaceous and fine grained. The contact between two dissimilar beds is usually a zone of weakness and in the present case of contact between limestone and quartzite it has become a water channel. Percolating waters have dissolved out the lime content of the limestone and left the argillaceous material as a pug. By reference to the known Zeehan areas mentioned above, it may be inferred (a) that the pug zone is not likely to be very

wide (b) that the zone will dip under the Crotty Quartzite that is to the south and (c) that the zone is likely to decrease in width with increasing depth. Again, by reference to the known areas, it is likely that the zone or zones of mineralisation will parallel the limestone-quartzite contact.

#### DISTRIBUTION OF LIMESTONE

Being a readily soluble rock, the limestone typically forms areas of low relief along the margins of quartzite hills. Unfortunately, these low areas are usually covered by alluvial deposits which, as in the present case, mask the true extent of the limestone. The actual surface distribution is shown on the plan. The eastern limit is marked by the porphyroid intrusion, the western limit by the fault crossing Powell and Beardesley streets. The southern limit is masked by alluvial and would have to be determined by boring if required. On the south, as stated above, the limestone will dip under the quartzite. Normally it would parallel the quartzite down to an unknown depth but the presence of the intrusives introduces a complication. If the intrusives expand below the surface they will probably cut off the limestone. This point must be determined by boring. Also the southern continuation is more important than the northern from the point of view of ore reserves and mining.

#### MOUNT LYELL CO'S BORES

Copies of the Mount Lyell Co's plans are attached to this report. Unfortunately the results of assays of sludge and cores was not available to the writer. It will be seen from the plans that bores Nos 1 & 2 were located approximately along the dip and, as expected, were mostly in pug. The bands of sandstone met with are to be explained by inferring that the limestone-quartzite is not a clean one but that bands

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of limestone occur in the quartzite and have subsequently been converted to pug. No. 4 bore was almost along the strike of the sandstone and was therefore much longer than was necessary. With regard to No. 1 bore, the cavity at the end probably indicates that the bore was about to enter solid limestone.

ASSAYS

The following assays of samples submitted by the Inspector of Mines at Queenstown are included. The assays were made by the Mines Department Laboratory at Launceston.

SAMPLE	CONSTITUENT	PER CENT	OZ.	DWTS.	GRS.
131	Gold	Nil	Trace	1	5
	Silver		0		
	Lead				
132	Gold	Nil	Trace	1	9
	Silver		0		
	Lead				
133	Gold	Nil	Trace	2	0
	Silver		0		
	Lead				
134	Gold	Nil	Trace	2	9
	Silver		0		
	Lead				
135	Gold	Nil	Trace	6	19
	Silver		0		
	Lead				
136	Gold	Nil	Trace	12	0
	Silver		0		
	Lead				
355	Gold	14.9	0	0	14
	Silver		13		
	Lead		10		
356	Gold	20.5	0	2	14
	Silver		15		
	Lead		0		
357	Gold	66.6	0	0	19
	Silver		53		
	Lead		12		

Samples 131 - 136 were from an auger hole put down to a depth of 10 feet  
 131 from 6" to 1'6"  
 132 " 1'6" " 3'  
 133 " 3' " 4'6"

134	from	4'6"	to	5'6"
135	"	5'6"	"	7'6"
136	"	7'6"	"	10'

Samples 355 - 357 were from the prospect shaft.

355 is from the north wall of the shaft which shows mineralisation over an area of about 4' x 4' x 3' from the bottom of the sink up to 23'6" from the surface.

356 is from selected pieces of the ore taken from the shaft spoil when sinking from 22' to 27'

357 is some concentrate obtained by dish washing of some of the pug material which has formed the bulk of the dirt taken from the shaft during sinking from 17' to 21'.

### CONCLUSIONS

- (1) The prospect may be regarded as a silver-lead show, the ore occurring in limestone pug and possibly in limestone.
- (2) Ore is not likely to occur outside the limestone area to any great extent.
- (3) It has been shown that the area is geologically similar to the known silver-lead area of Zeehan.
- (4) So far, no definite lode has been discovered in the pug but disseminated patches of clean ore occur. No investigation of the solid limestone has so far been undertaken to determine whether it carries ore.
- (5) It is considered likely that the occurrence will resemble that of the town area of Zeehan where many small lodes and patches of ore occur distributed in limestone and pug.
- (6) It is possible that lodes occur in the limestone as at the Oceana and Mariposa. This possibility is well worth investigating.
- (7) The eastern and western limits of the limestone and thus of the possible area over which ore occurs are fairly clearly defined. The northern limit could be determined by boring through the overlying wash and the southern extension by boring at right angles to the dip of the quartzite.

Recommendations

(1) If it is intended merely to work the deposit as a small show the present method of shafting and driving could well be followed. Patches of ore will be met with separated by barren ground. Surface trenching will not be of much assistance here. If it is desired to follow the ore shallow diamond drilling in the vicinity of the shaft is to be recommended.

(2) Operations on a larger scale would involve first of all the delimiting of the limestone area and the determination of lode channels and ore reserves.

This would involve the following:-

(a) Boring at  $45^{\circ}$  in a northerly direction along Latham Street. The first bore should be put down at the north end of the street at the quartzite-intrusive contact. A series of bores located along the street would trace out the limestone-quartzite contact but would of course become successively deeper.

(b) A series of bores paralleling the above and located along Dixon street from the shaft towards Orr Street would probably pick up lodes occurring in the solid limestone. These bores would not be deep.

(c) The lateral extent of any lodes found could probably be inferred from the E-W extent of the limestone.

REFERENCE

Gill and Banks "Silurian and Devonian Stratigraphy of the Zeehan Area" (Papers and Proceedings of the Royal Society of Tasmania 1949 pages 259-271)

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HOBART

Zeehan  
20 December 1950.