

GSREP2

Tasmania

DEPARTMENT OF MINES

GEOLOGICAL SURVEY REPORT

No. 2

The Silver-Lead Lodes of the Waratah District

BY

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Issued under the authority of
The Honourable A. E. SOLOMON, Minister for Mines



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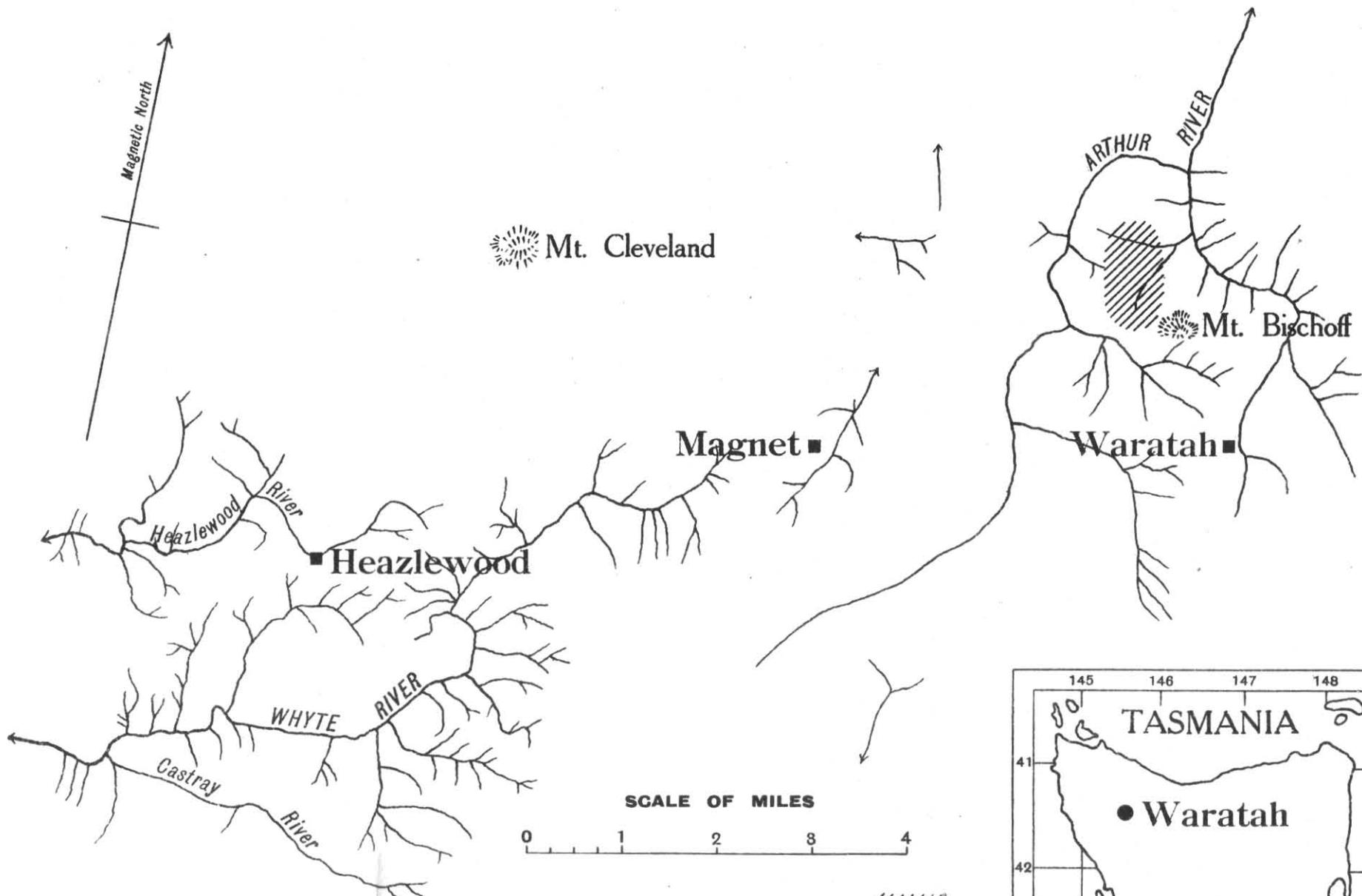
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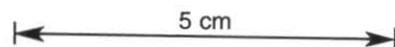
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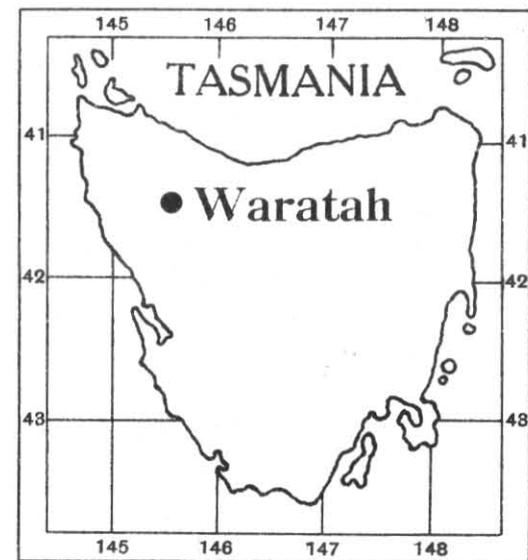
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Area dealt with in Report No. 2 

LOCALITY PLAN

5 cm 



L. Keith Ward
 Assistant Government Geologist
 30. 12. 11.

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The Silver-Lead Lodes of the Waratah District.

I.—INTRODUCTION.

THE area with which this report deals is situated immediately to the westward of Mt. Bischoff, which is a residual prominence standing some 500 feet above the level of a great dissected peneplain.

The Arthur River and the Waratah River are two of the principal streams which have carved deep gorges in the peneplaned surface. Mt. Bischoff is a peak surmounting the portion of the peneplain which lies between the two rivers mentioned.

The area examined by the writer is below the surface of the old peneplain, and occupies a position between the crest of Mt. Bischoff and the Arthur River.

Despite its immediate proximity to the great Mt. Bischoff Mine, there has not been at any time a considerable amount of prospecting carried out in this rough and heavily-timbered country, much of which remains almost unexamined even at the present time.

There are at the present time five mineral sections taken up with the object of proving the silver-lead lodes now known to exist, and the results already obtained serve to indicate how long the mineral resources of the West Coast may lie concealed by the vegetation within only a few miles of a large township connected with the rest of Tasmania by a railway line.

It is reported that silver-lead ore was first discovered in the district early in the year 1891, within the boundaries of Section 4733-m. This discovery, to which the name of the Silver Cliffs Mine was given, was visited by Mr. A. Montgomery, then Government Geologist. His report, which deals briefly with the lodes and the mine workings, was published in a "Report on the Country Traversed by the Route of the Proposed Waratah to Zeehan Railway," dated February 4, 1892.

At a later period the mine was visited by the late Mr. J. Harcourt-Smith, Government Geologist, who gave an

account of the progress of the mine in his "Report on the Mineral District between Corinna and Waratah," dated July 25, 1897.

Since that date no report has been made by any officer of the Geological Survey of Tasmania. The present report embodies the results of observations made by the writer during an examination extending from December 2 to December 5, 1911. No detailed examination of any large portion of the surrounding country having been made by the writer, it is impossible to give more than a general account of the apparent relations of these silver-lead lodes to the other lodes of the region. The discussion of such matters is therefore of a general nature only, and involves only the statement of the apparent consanguinity of occurrences which have received more minute investigation in other western Tasmania mining fields.

II.—THE GEOLOGY OF THE AREA IN WHICH THE SILVER-LEAD LODES OCCUR.

(a) GENERAL GEOLOGY.

The greater part of the area under discussion is occupied by sedimentary rocks of variable character. Among them the most common rock-type is slate, but sandstone, usually altered to quartzite, is in many places to be seen interstratified with the finer grained sediments. Both must certainly be regarded together as forming portion of the same series.

With these normal sediments there is found at one place in the underground workings on Section 4613-M (in the face of the No. 2 tunnel) a breccia in which the fragments are all very angular. This rock is probably of pyroclastic origin. The association of breccias with slates is common in many parts of western Tasmania, and it is believed that the group (together with various igneous rocks) is of Cambro-Ordovician age.

There is one massive outcrop of igneous material which forms a prominent knob in Section 4820-M, and the southward extension of which into Section 4613-M has been proved by the trenches. This rock is a medium to fine-grained one, and the colour is dark-green where freshly broken surfaces are exposed. It shows a tendency to weather concentrically, and the superficial crust of decaying rock material is deeply stained with limonite. No microscopical examination having been undertaken it is not possible to give the rock an exact name. Its general appearance, however, is such that the writer would provisionally classify it with the diabasic intrusives and extrusives of the Cambro-Ordovician series. These are igneous rocks of medium basicity, which have undergone some alteration subsequently to the period of their consolidation; and in some places, as, for example, in the Mt. Balfour mining field, they have undoubtedly affinities with quartz-diabases of normal habit.

The relation which this igneous rock bears to the juxtaposed sediments cannot yet be ascertained for want of the necessary exposures at the contact between them.

The structural features of the district as a whole have not been deciphered for the reason that the small amount of information available with regard to the strike and dip of the sediments has been derived chiefly from places in the immediate vicinity of planes of dislocation. It would

appear that the strike of the slate series tends to conform to a direction bearing E.N.E., and that the dip is to the N.N.W. This being so, the observed direction of elongation of the outcrop of diabase is proof of the intrusive character of that rock.

No sign has yet been detected of the presence, within the area here being discussed, of the acidic granite porphyry dykes which are so abundantly represented on Mt. Bischoff to the eastward.

(b) ECONOMIC GEOLOGY.

The lodes which have been prospected contain the spathic or sideritic type of lead ore at almost all points along their courses. The pyritic type seems to be present in some places; but these occurrences are not predominant, and are found forming portions of lodes which are on the whole characterised by the presence of carbonates. Some quartz is usually present in addition to the siderite, and at one place (the No. 1 lode, on the cliff face, in Section 4733-M) becomes the most abundant gangue mineral.

The metallic minerals of value are argentiferous galena and zinc blende, and in addition to these jamesonite has been recorded by Messrs. Montgomery and Harcourt-Smith. The galena is certainly of good grade, the proportion of silver present being over an ounce to the unit of lead. Traces of gold have been found in the galena. No attempt has been made to find a market for the zinc blende which is in some places the dominant metallic constituent of the No. 2 lode in Section 4733-M. The lead ore of the other lodes is noticeably free from zinc blende.

The examination of the sketch-map upon which the lodes are marked will show that the crustal fractures which have served as loci for ore-deposition are irregularly disposed, and that they are independent of the structure of the rocks traversed. In only one case—that of the meridional lode in the northern part of Section 4613-M—does the strike of the lode conform to the orientation of a geological unit. At this place the lode follows the boundary between the igneous rock and the slate.

There are a few places in which the country-rocks adjoining the lodes have been attacked by the mineralising solutions, so that they are noticeably altered. As might be expected the igneous rock is most changed in this way and largely converted into carbonates. With the carbonates some greenish scaly mineral, which may perhaps be a chromiferous sericite, is developed, and imparts a general

greenish tint to the rock. Traces of sericite were noticed in the slate adjoining the No. 1 lode in Section 4613-m.

The internal structure of the lodes, though not always perfectly simple, does not call for much comment. The place of a simple fissure is in some places taken by a large number of small fissures which are irregularly oriented, but which in the aggregate constitute a formation of which the strike is quite plain. The prospecting of such a formation (*e.g.*, the No. 1 lode in Section 4613-m) must of necessity be attended with some difficulty, since it is quite impossible to determine which of several veinlets showing in the face should be followed in driving. It is only possible to carry forward the drive along the general course of the formation as a whole, and to put out crosscuts at various points to ascertain its limits on either side of the development drive.

It is not possible to state definitely whether any of the lodes of the district are older than others. The variety in the mineral composition of the different lodes is not so marked that the vein-stuff might not have been introduced into all the fissures synchronously. Whether any of the fractures now filled with ore are older than others is undetermined. The two places at which there are exposures of the meeting-place of fractures give no definite information. While one fissure may have predated the other, it is yet quite possible that the two fissures were simultaneously formed by compressional or torsional stresses. If this is the case search for the continuation of a fissure which ceases abruptly where it meets another would be fruitless. There has been in the opinion of the writer no material fracturing of the lodes after the period of ore-deposition, for the vein-matter is free from signs of crushing. There may have been slight movement along the course of the fractured zone filled by the No. 1 lode on Section 4613-m, for there are brecciated fragments of galena found in seams of pug in some places. This movement, however, does not appear to have been large.

Secondary alterations in the lode-matter have not produced any noticeable bulk of oxidised ore. The galena occurs almost at the surface in most places where it has been shown to be present.

There is one strong outcrop, however, of gossan which has not yet been exposed in depth. This lode, which is known as "Chaffey's Lode," may possibly be composed of carbonate of iron and a little quartz in depth. But until deeper exposures are available for examination, speculation is idle.

The limonite which is common about the outcrop of the diabasic igneous rock is quite possibly due only to the iron content of that rock, and not to the oxidation of vein-matter.

The silver-lead lodes of this area are certainly genetically related to a number of other similar lodes which are distributed along a well-defined zone, the extent of which, as far as is now known, is shown on the Locality Plan (Plate I.) accompanying this report. The zone extends in a direction bearing approximately E.N.E. from the district, including Heazlewood and the upper waters of the Castray and Whyte Rivers through Magnet to Mt. Bischoff. At its western borders lie the Long Tunnel, Heazlewood, Whyte River Silver, Godkin, Godkin Extended, Bell's Reward, Confidence, and Washington Hay Mines.

Between this area and the Magnet silver-lead-bearing lodes are known to exist, but have received little attention. The country east of the Magnet and between that mine and Mt. Bischoff should be diligently searched for larger lodes than those which have already been located.

It has been pointed out elsewhere by the writer that the general trend of the granitic intrusions—the Meredith Range *massif*, the Heazlewood *massif*, the granite-porphyrty of Mt. Bischoff, the granite *massif* of the Hampshire Hills—is in a direction bearing approximately E.N.E., and coinciding therefore with the trend of the belt of the silver-lead lodes.

This coincidence is not accidental. In Bulletin No. 12 of the Geological Survey of Tasmania, in dealing with the X River Tinfield, the writer has briefly indicated the relationship between the stanniferous lodes and the silver-lead lodes of another (parallel) belt of mineralisation.

The general features of the mineralisation along the Meredith Range-Bischoff-Hampshire Hills zone are almost identical with those which characterise the Heemskirk-Zeehan-North-Dundas-X-River-Farrell-Middlesex zone. Within the boundaries of acidic igneous rocks, or within a very short distance of them, the lodes carry tin, tungsten, or bismuth. At a little distance from the igneous rocks the lodes distributed along the zone carry silver, lead, and zinc.

The area under discussion lies at the eastern end of the silver-lead belt as far as is yet known. In prospecting for any extension of the belt the facts stated here with regard to its general orientation should be borne in mind.

The association of tin ore with ores carrying silver-lead is one now fully recognised for the Western Tasmanian

mineral fields, which are distributed along the two belts to which reference has been made. It is not usually remembered by prospectors that the two types of ore-deposits are very closely related. In Zeehan silver-lead ores predominate, and tin ore is subordinate. The same statement holds good for the Five-mile district. At North Dundas and the X River the preponderance of the metals is reversed, and the silver-lead ores become insignificant, but they rise again to predominance at Mt. Farrell. The writer has made no detailed study of the belt with which this report specially deals, but desires in passing to remark that argentiferous galena is known to exist within the boundaries of the Mt. Bischoff Mine itself.

III.—THE LODES AND THE WORK DONE UPON THEM.

The group of five mineral sections—4613-m, of 80 acres; 4733-m, of 40 acres; 4820-m, of 80 acres; 4821-m, of 40 acres; and 5061-m, of 42 acres—are leased by the Bischoff Balfour Prospecting Association. The association was formed in the first place to work Section 4613-m, on which work was resumed, after an interval of inactivity which extended over two years, in January, 1910. At a later period the old Silver Cliff Mine, the principal workings of which lie within Section 4733-m, was acquired by the association, and work was started there in January, 1911.

At the time of the writer's visit the energies of the company were being entirely directed towards the prospecting of Section 4613-m, within which three well-defined lodes have been located.

The most prominent outcrop is that of a gossanous lode known as "Chaffey's Lode," which follows for the greater part of its length an east-and-west course, but turns a little to the south-west at its western end. The outcrop consists mainly of limonite and quartz, and the country-rock alongside the lode is silicified. Some specks of galena are reported to have been seen in the gossan, but the distribution is clearly not general throughout its mass. A tunnel has been driven westwards for a distance of 45 feet on the course of this lode from the eastern side of the ridge which the outcrop crosses. Some massive gossanous bands were cut in the earlier part of the tunnel, but the contents were not assayed. The face is in silicified breccia traversed by soft seams of pug, which may perhaps represent decomposed carbonates and soft country-rock. This tunnel should be continued to come under the old excavations in the outcrop on the top of the ridge. No great distance will have to be traversed, and at no other place can a similar depth below the outcrop be reached with so small an expenditure of time and capital. While the galena content of the lode may never have been large, it is necessary to expose the lode at the greatest possible depth to determine what superficial leaching has taken place.

On the western flank of the ridge another tunnel was driven in an easterly direction. The outcrop of the gossan lode turns a little towards the south-west above this tunnel, and the lode has not been exposed by it. The lode appears to lie to the southward of the line of the tunnel, and a

crosscut should be driven southwards from the face of the adit to intersect it. Before this work is carried out it would be well to prospect the surface for a short distance to the south of the mouth of the tunnel.

In driving this adit two veins were intersected. The first was met with at a distance of 57 feet from the entrance. The lode-matter is a dense band of silicified country carrying numerous small veins of iron carbonate, with which are associated zinc blende and galena in small amount. The strike of the vein is N. 30° E., and the dip to the south-west at 80° . The vein is not of very promising appearance where cut, but should be further exposed, since it appears to be certainly the lode containing the good shoot of ore found to the northward and prospected from the No. 2 tunnel, as described below. Beyond this lode the country-rock is at first a little crumpled, and then as the drive continues it becomes regularly bedded, with a dip to the northward at 40° . At a distance of 191 feet from the entrance another vein consisting of quartz and pyrites, with traces of galena, was cut. This vein dips back towards the first mentioned at a flat angle, being probably a branch from it. The drive was continued for a total distance of 244 feet, and at the end a crosscut was carried northwards for 50 feet without result. A southerly crosscut at this place has been suggested above, in order to intersect Chaffey's lode.

A second tunnel was driven on a bearing of E. 23° S. into the hillside at a point some distance to the northward to cut the No. 1 lode, which had been located in a small creek. The trench in the creek shows the vein-matter to consist of siderite, with galena and traces of zinc blende, in veins traversing quartzite.

At a distance of 110 feet from the entrance the No. 1 lode was cut. It was at this place of poor quality. The adit crosscut was continued for 147 feet beyond the point where the lode was cut. For the first few feet of this distance a small vein of siderite, carrying galena and some blende, was followed. It is a small branch of the No. 1 lode. Beyond this the adit met with nothing of value, although it appears to have traversed the meridional lode known as "No. 2 lode," to which reference is made below. The face of the adit is in rather soft breccia.

A drive was carried northwards for a distance of 40 feet from the point where the adit cut the No. 1 lode. The lode is poor at this place, consisting of siderite with only traces of galena here and there in veins traversing somewhat greenish sericitised slate. The formation is a compo-

site one, but there is a well-defined footwall (south-eastern) deeply grooved and polished. The grooves of this slickensided surface dip to the north-east at a flat angle. There is a seam of pug lying on this smooth surface.

The southerly drive on the lode has been much more fruitful of results. For the first few feet the lode was poor, save for some veins carrying galena, which were followed in a south-easterly direction into the footwall at points distant 13 and 40 feet respectively from the adit crosscut. These are clearly subsidiary veins, which are components of the whole fissure system occupied by the formation. The general strike of the formation is S. 30° W., but the strike of the small components is very variable. From a point distant 70 feet from the adit a general improvement in the quality of the lode is noticeable. The veins of galena become stronger and more numerous. An easterly crosscut, 126 feet from the adit, shows some good milling ore. At a distance of 152 feet from the adit a short crosscut to the west has not yet passed through the ore-bearing zone at that place. It should be continued to ascertain the full width of the formation on the western side of the drive. There are strong seams of galena in graphitised slate showing in the face of this crosscut, the whole body constituting good milling ore. Opposite to this crosscut is a short one driven eastwards, the total width of the formation at this point being at least 16 feet.

At a distance of 173 feet from the adit another westerly crosscut was being started at the time of the writer's visit. This crosscut is in fair milling ore. Beyond this point the drive turns a little to the southward on poor material. It may be a little to the eastward of the main track of the formation at this point. A short crosscut to the westward is required to settle this matter; or else the main drive might be turned more to the south-west from the place where its course was changed to follow a subsidiary fracture.

The face of the drive was, at the time of the examination, 210 feet from the adit crosscut.

The shoot of ore traversed by this main south drive is certainly a valuable one. Enough work has been done to prove that there is an ore-body of considerable size, and every effort should be made to prospect the shoot at greater depths. The western slope of the ridge is fairly steep, as it slopes towards the Arthur River, and a deeper-level tunnel could be brought in.

The grade of the galena is good. Picked samples containing 64.5 and 72.0 per cent. of lead were found by assay

to carry 84 oz. 12 dwt. and 100 oz. 5 dwt. respectively of silver to the ton, and distinct traces of gold.

The seams and bunches of galena are noticeably free from zinc blende, and show here and there films of sericite with the siderite and slate gangue.

A short distance to the east of this lastmentioned lode is one which has a meridional strike, following the western boundary of the basic igneous intrusion. A little work which has been done on the outcrop of the lode gave promising results. The lode-matter consists at the surface of gossan carrying galena and zinc blende in veins and bunches. A shallow tunnel was driven, but the results obtained were not very satisfactory. The lode-stuff is largely carbonated country-rock, with veins of siderite. There is a greenish mineral associated with the lode—perhaps a variety of sericite. In some parts of the gossan there are kernels of country-rock coloured bright green by this mineral. The surface work carried out upon this formation shows its course to be north and south, and its northern continuation to extend as far as the northern boundary of Section 4613-m. In depth, where it was intersected by the No. 2 tunnel, the lode is of no value, and further work upon it underground should be postponed for the present.

A little work has been done at a few places in the north-eastern part of this section, but no discoveries of importance have been made. At one point a small quartzose vein carrying colours of galena was cut in a trench, but it does not give much promise of developing into a lode of importance. Its relationship to the other known veins cannot be determined from the existing exposure.

The other workings within the area examined are for the most part situated in Section 4733-m on the lodes worked by the old Silver Cliff Company.

There are two well-defined lodes, both of which have been prospected by the former lessees.

The No. 1 lode outcrops boldly upon a steep cliff face, and has given its name to the old mine. Some small portion of the lode still remains *in situ*, but the greater part of the easily accessible ore has been broken away. From this broken ore the galena has been picked and despatched to the smelter.

The lode is a composite one, with structural resemblances to the No. 1 lode in Section 4613-m, and its general strike is N. 35° E., and dip south-easterly at 70°.

In composition the vein is characterised by a gangue which is for the most part coarse crystalline quartz and

semi-digested slate hardened by silicification. The galena still visible is of coarse grain, and is distributed throughout the lode-matter in veins and pockets. Very little zinc blende is associated with it, but some antimonial lead ore such as jamesonite seems to be present in small amount, giving rise to the yellow oxide of antimony on the weathered surfaces. The broken ore which has fallen down the steep hillside shows many good patches of clean ore and siliceous second-class ore.

A tunnel was driven to cut this lode at a shallow depth, with results that were disappointing in view of the quality of the outcrop on the surface. A drive north on the lode soon passed beyond the ore-shoot. It was continued for some distance along the course of the lode-fissure, which is well-defined, and has a well-defined hanging-wall horizontally grooved. The fissure bends, from a course of N. 35° E., first to N. 50° E. and then abruptly to N. 70° E. The fracture is not a simple one, but these northerly components have not served as loci for ore-deposition, and work has been abandoned.

It is noteworthy that no attempt has been made to follow the ore-shoot exposed at the surface in a southerly direction, either on the surface or in this tunnel. This work should certainly be carried out at an early date, for the superficial portion of the shoot is of excellent quality, and the pitch of the shoot has been proved not to be to the northward. Whether it continues in a southerly direction towards the No. 2 lode should certainly be ascertained.

A lower tunnel, affording about 45 more feet of backs, has been begun, but was never continued far enough to cut the No. 1 lode. It also might well be utilised to prospect for any southern extension of the shoot exposed on the cliff face.

To the north of the open-cut bench on the cliff face little can be seen of the lode. Close to the creek at the foot of the cliff, and to the north-east of the cliff workings, there is a small opening made in the steep western wall of the gorge. At this place there are a few small seams of siliceous vein-matter, carrying a small amount of galena. With them are associated some narrow veinlets of pyrite, which open out here and there into spheroidal aggregates. After weathering hemispherical cavities are left in the surfaces of exposed veins, from which the pyrites has been removed in solution. This occurrence of vein-matter may be connected with the fractures seen in the tunnel below the cliff face, which, as mentioned above, trend more and

more to the eastward as the drive was continued northwards. In themselves they are not promising.

Still further north, and almost on the northern boundary-line of Section 4733-m, some gossan has been exposed in an old trench near the creek level. A few feet higher upon the spur which occupies the space between the two creeks there are also signs of gossan. Not enough work has been done here to enable any pronouncement to be made with regard to the probable nature of this gossan in depth. It is certainly advisable to expose it by a deep trench, and if it shows any continuity up the spur, to drive a tunnel on its course. The position of the outcrop is such that it may have some connection with the No. 1 lode outcropping on the cliff face.

The No. 2 lode lies a little to the south-west of the cliff exposure, and has a strike of N. 5° W., with a steep dip to the eastward. The lode was energetically prospected by the former lessees of the section at two levels. It is one in which the prevalent gangue is carbonate of iron, and in which galena and jamesonite are associated with pyrite and zinc blende. There is little of the original lode-matter carrying galena to be seen, for the good ore has been sold, and the spoil-heaps contain chiefly zinc blende and pyrite. A valuable shoot of ore was worked from the upper adit, and a shaft sunk to a depth of 50 feet. Then a low-level tunnel, 130 feet below the collar of the shaft, was driven, and the lode was cut. The drive on the lode was continued northwards below the good shoot of ore located on the surface. The results were on the whole disappointing, the ore consisting of siderite containing pyrite, zinc blende, and bunches of galena. The drive was carried for 85 feet northwards beyond a rise put up to connect with a winze in which good ore was found in the upper tunnel workings. At this point the lode ceased abruptly against a cross-course. Whether this is the No. 1 lode-fissure is not quite certain. It is very probable that it is; but in the absence of an accurate survey of the mine workings it is not possible to form a definite decision.

The relationship between the No. 1 lode and the No. 2 lode has never been determined. The two lodes may be the fillings of simultaneously-formed fissures, or of two fissures of different ages. It does not seem likely to the writer that there were two different periods of mineralisation between which the faulting of the earlier-formed lode took place. This being the case, it is almost useless to expect to find a faulted portion of either lode beyond the point of intersection. At the surface no sign of the extension of either

lode beyond the intersection has yet been found. A few trenches might well be cut to settle this matter, their direction being chosen to be across the line of strike of each lode and their positions on these lines of strike.

Still another tunnel was driven to prospect this No. 2 lode. The present leaseholders began a drive on the course of the lode from its southern end. Close to the approach a promising make of ore was located, but this gave out as it was followed north. The drive was continued for 100 feet, and traversed slate carrying many small veinlets of siderite, with which pyrite, zinc blende, and galena are associated. These have no regular orientation, and no special veinlet can be singled out for special attention in future prospecting. The only recommendation to be made is that crosscuts be put out on either side of the development drive at frequent intervals, lest a larger make of ore be allowed to remain hidden in the wall-rock.

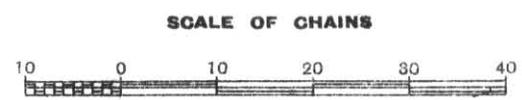
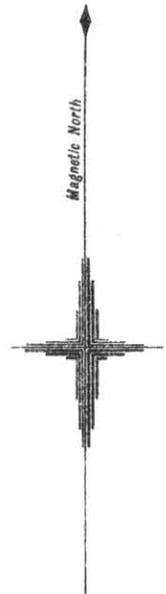
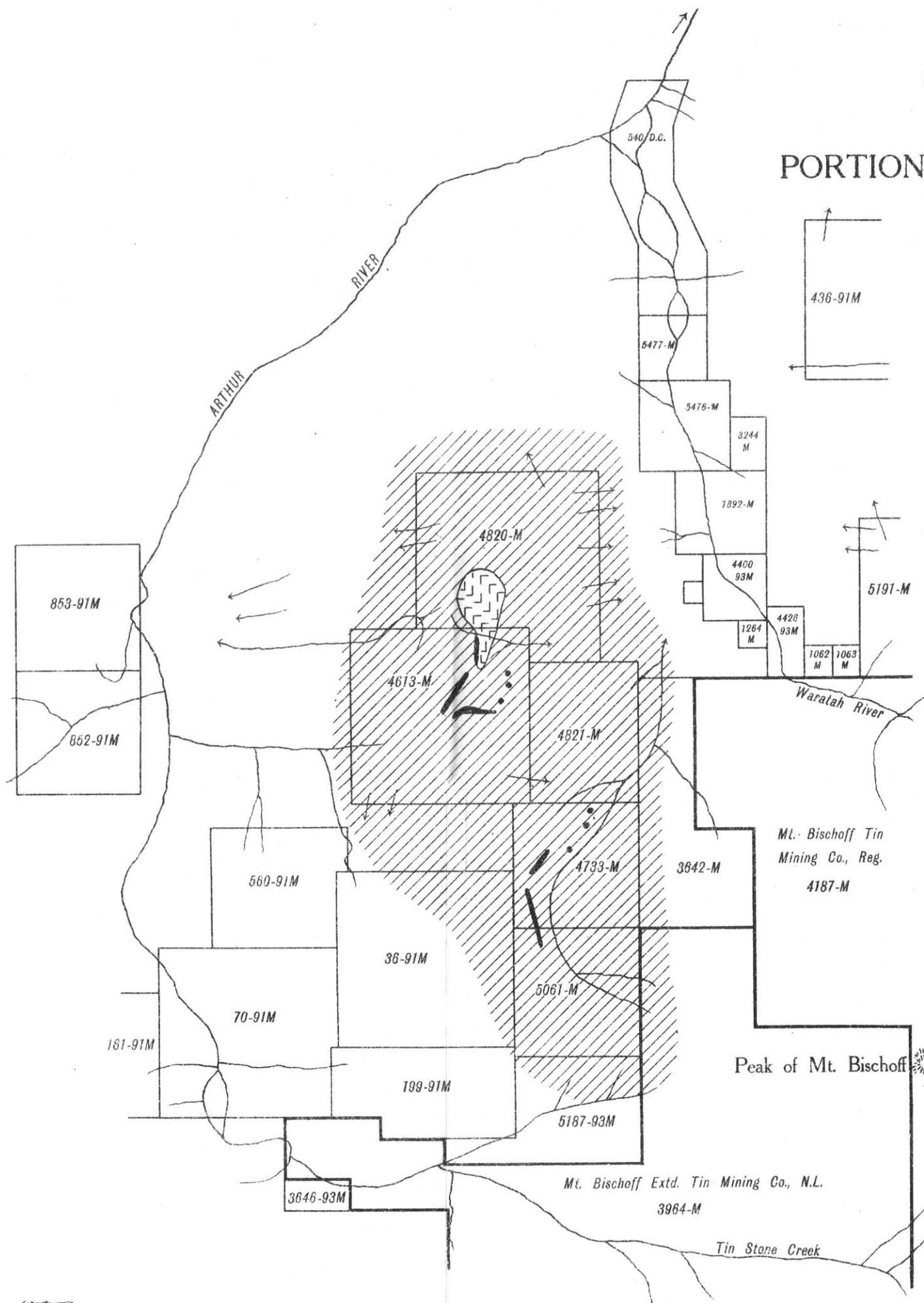
The total output of argentiferous galena from the old Silver Cliff Mine is reported to be 160 tons, of which the total value was £3200. All of this ore was won from Section 4733-m.

The newly-discovered shoot of ore in the northerly section, 4613-m, appears to the writer to be the most valuable ore-body yet located in the area, and it has not yet contributed to the output. The future of the property therefore promises to be successful; and it is probable that fresh discoveries will be made in the district as the value of the known lodes becomes more fully realised.

L. KEITH WARD, B.A., B.E.,
Assistant Government Geologist.

Launceston, 30th December, 1911.

GEOLOGICAL SKETCH MAP OF PORTION OF THE WARATAH DISTRICT

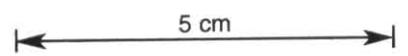


LEGEND

- Slate and Quartzite . . . CAMBRO-ORDOVICIAN
- Diabase CAMBRO-ORDOVICIAN
- Lodes

KEY TO NUMBERS OF MINERAL SECTIONS.

Number of Section.	Acres.	Lessee.
4613-M	80	Bischoff-Balfour Pros. Asscn.
4733-M	40	
4820-M	80	
4821-M	40	
5061-M	42	



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