

THE ALLUVIAL AND DETRITAL TIN ORE OF
WARATAH RIVER VALLEY

Introduction

In the valley of Waratah River are deep and extensive deposits of tin-bearing alluvial and detrital materials which, in the near future, are likely to receive careful attention. These deposits were briefly referred to only in Geological Survey Bulletin No. 34 dealing with the Mt. Bischoff Tin Field because at the time very little information relating thereto was available for publication. The records of the early explorers had been mislaid or lost and the requisite data to serve as a basis of valuation could have been regained only at great expense of time and money. Since then some of the records of work performed on that section enclosed within the the boundaries of the Mt. Bischoff Tin Mining Co's properties have been found, and additional information relating to the northern group of properties leased by L. J. and R. E. Smith has been obtained as a result of a recent visit of inspection. However, much exploratory work remains to be performed before their true value can be determined.

It was intended, in this report, to deal only with the results of the recent investigation of the northern section, but the necessity for a complete account led to the inclusion of the other.

Topography

Waratah River Valley is the chief physiographic feature of the area. The source of the river is in the basalt plateau country south-east of Waratah township, and augmented in volume by tributary streams of the rivers diverted to and regulated by dams, flows slowly to the edge of the plateau, thence in cataracts to the bottom of the main valley. Hills on either side rise upwards of 800 feet. At the point where accumulation of alluvial and detrital materials begins the Tertiary basalt and sedimentary rocks have been entirely removed, the concentrated tin-bearing deposits resting on Cambro-Ordovician slates and sandstones.

Having reached that level the rate of corrosion was arrested and lateral erosion set in. Thus in the lower reaches the valley was widened and tin ore was concentrated in the gravels and boulders. The stream is now becoming entrenched in its old bed.

Nature of the Materials

The materials in both sections of the lead are similar in nature, having been derived from the one source, but the components differ greatly in size and degree of attrition. Thus in the northern section the boulders and pebbles of sandstone, quartzite, porphyry and slate, of which the alluvial gravels are almost wholly composed, are much smaller and more rounded than those of the southern section. There a boulder of eighteen inches longest dimension is uncommon, whereas in the southern section large boulders predominate. Much of the material in the southern section is detrital and some of it on the mountain flanks is talus. In both sections the proportion

of material of fine grain size is very small. Few boulders, however, are found exceeding two feet six inches in diameter, and these only at the head of the lead.

Origin of the Components.

With the exception of basalt, occasional boulders of which are found in the "wash", all component rocks have been derived from Mt. Bischoff. They represent in part the waste of the wall-rock and lodes of Mt. Bischoff. Since the close of the Tertiary period Mt. Bischoff and its ore-bodies have been subjected to continuous erosion, the greater part of the waste rock and tin ore having been shed into the valley of Waratah River where the heavier materials have become concentrated. The greater part of the heavier particles remained in the upper reaches of the stream, while the finer were carried further on. In the steeply inclined portion of the valley very little alluvial material has collected, but where the stream has approached grade lateral erosion has increased the width of the valley and gravels and sand have accumulated. The greater part of the heavy tin ore has worked downward through the gravels to the bed-rock where the richest concentrations have been found.

As erosion has been rapid and continuous till recent time terrace gravels have not been formed. The tin-rich gravels occupy the floor of the valley. Moreover, the uppermost bed (5 feet thick) is almost barren of tin ore.

Extent of Workable Ground

In the northern section (Smith Bros.) the deposit extends over a mile in length, but 60 chains only of this ground is likely to prove sufficiently rich to be worked at a profit. The lateral extent is much greater than in the southern section and the material can be handled at a much lower cost.

In the southern section (Mt. Bischoff Tin Mining Company Registered) the alluvial and detrital material is nearly a mile in length, and the workable ground is much deeper than in the northern section.

Vegetation

The floor of the valley has been almost completely denuded of large trees. In places on both sides small clumps remain, but their removal can be accomplished at a small cost.

Water Supply

The chief sources of water supply are held under lease by the Mt. Bischoff Tin Mining Company Registered in dams containing 500,000,000 gallons of water. This supply is now used in the generation of electric power and to furnish water for the milling and concentrating plants. The whole of this supply would be required if it is decided to work the alluvial and detrital deposits of Waratah Valley. This supply could be augmented by the diversion of Fossey Creek and the repair of two dams not in use.

One other available supply (Lyon Creek) could be tapped.

Method of Operation

The ordinary methods of hydraulic sluicing cannot be employed here because the grade of the river is too low and the proportion of large stone too high. Dredging, likewise, cannot be employed. Hydraulic elevation and sluicing is the only practical method of operation.

The chief difficulties are presented by the high proportion of large stone and the risk of flood waters.

If it is decided to utilize the water supply and sluices belonging to the Mt. Bischoff Tin Mining Company, the water race would be carried to a point on the northern flank of the mountain about 800 feet above valley floor level. The cost of this work would be very heavy.

It was suggested that an adit on the east side might be used in this connection, but it is 12 feet too high.

The basalt hill on the east side of the valley provides a much better carrier for the water. If arrangements cannot be made with the Company for the provision of water from the main water race, that discharged from the milling plant might be used to augment other supplies.

NORTHERN SECTION

Area

This section of the deposit is held under lease by E.J. and R.E. Smith of Ulverstone. The properties, listed in order from north to south, consist of: dredging claim 678 of 38 acres; mineral leases 9416 of 10 acres, 9417 of 20 acres, 9460 of 20 acres, 9462 of 10 acres, 9461 of 2 acres, 9405 of 6 acres - a total area of 106 acres extending over a mile along the course of Waratah River. The valley floor nowhere exceeds 15 chains in width, and in one place the sides approach within 3 chains.

Situation

The extreme end of the property is four miles from Waratah township, and the near end adjoins lease 4187/M of the Mt. Bischoff Tin Mining Coy. Reg. A road leads from Waratah along the eastern side of Mt. Bischoff to the edge of the valley floor, whence tracks allow of easy access to every part.

The Mineral Leases

Dredging claim 678 - The alluvial ground on this lease extends from Arthur River half a mile southward. It is from 6 to 10 chains in width and 8 to 12 feet deep. The upper five feet of this bed is nearly barren of tin, and in the lower part the ore is in small proportion and of fine grain size. On the west side coarser grains of tin ore are found in the "wash" near the bank, but the extent is not great. This property is not of any present value.

Mineral Lease 9417 - The proportion of tin ore in the gravels is decidedly greater here and it is coarser in grain. Moreover, the alluvial ground is wider (8 to 12 chs.) and deeper (12 to 20 ft.) than in lease 678. Near the southern end of the lease a hard slate and quartzite bar extends at right angles across the flat. It is on the south side of this bar that the deeper and richer ground is found.

Mineral Lease 9460 - Near the northern boundary of this block seven shafts spaced one to one and a half chains apart have been sunk through the alluvial gravels to bedrock. These shafts extend over a width of nine chains and are from 12 to 30 feet in depth. This work was performed 20 years ago and the records are not available. An attempt was made to unwater two of them during the recent visit of inspection. One was unwatered to 24 feet (6 feet of silt remaining) and dish prospects were taken to ascertain the nature of the ore and the proportion in the "wash". From a few dish prospects of the material gouged from the sides of the shaft at 22 feet and 15 feet the proportion of tin ore was found to be 1.38 lb. per cubic yard. This cannot be regarded as a representative sample of the material. The tin ore was coarse in grain, ranging in size from pin-head to pea. It was associated with rather coarse gravels (the pebbles being from 2 inches to 12 inches in diameter) and a little sand.

An attempt to unwater another shaft on the bank of the Waratah River was unsuccessful. In addition to these, many shafts were sunk about 25 years ago in other parts of the block, but all the records have been lost.

Mineral Lease 9462 - The alluvial ground occupies the greater part of this block, and the materials contain a higher proportion of tin ore. The ore, moreover, is of coarser grain-size and the wash is of equal thickness.

Mineral Leases 9405 and 9461 - On the southern boundary of block 9405 a shaft 27.5 feet deep has been sunk to bedrock. A test of all the material from top to bottom of the shaft, including 5 feet of barren overburden, showed that the material contained an average of 7.12 lb. of tin ore per cubic yard. Numerous pebbles of tin ore up to half an inch in diameter were found here and some much larger.

Block 9461 lies west of and adjoining 9405. This encloses an old flood plain of Waratah River in which rich tin-bearing gravels have been proved to a depth of 23 feet. Prospects by dishing indicate an average tin ore content equal to 5 lb. per cubic yard.

Quantity of Alluvial Material Available.

It is impossible, without data based on a careful survey of the area, to arrive at a true estimate of the quantity of material available for treatment. From notes taken during a two day visit of inspection a rough estimate has been arrived at. Excluding the material on dredging claim 678 and mineral lease 9416 the properties contain 1,422,960 cubic yards of alluvial material.

It is more difficult to arrive at an estimate of the tin ore content as information is very meagre.

Suffice it to state that the proportion of tin ore varies from one to seven pounds per cubic yard of material.

Detrital Deposits

The lessees of the northern section of the lead have applied for a lease 7293/M of 40 acres lying west and adjoining mineral leases 9417 and 9460. On this property the tin-bearing material consists of friable sandstone and quartz porphyry. This material represents the disintegrated portion of a contact lode deposits outcropping on the hill ridge farther westward. From the level of the valley floor the material has been exposed in open cuts to a height of 15 feet. Dish samples of the detritus at the base of the open-cuts yielded free tin ore in the proportion of 2.7 lb. per yard, and other samples from the same part yielded tin ore:-

	0.06	per cent	- free tin oxide.
	<u>0.45</u>	" "	- tin ore in the stone.
Total	<u>0.51</u>	" "	- tin ore in the samples.

Specimens of sandstone when crushed and panned yielded a rather high proportion of tin ore.

It is not considered that these samples are truly representative of the material as a whole. The average recoverable content as determined by the treatment of over 100 tons of material by Roberts and party in their milling and concentrating plant amounted to 0.2 per cent. It is evident that the employment of sluicing methods on material of this nature is not an economic possibility.

Dish tests of the detritus at several points between the base and summit of the ridge showed the presence of tin ore.

A great deal of exploratory work is necessary before an idea can be formed of the value of this property.

Production

Tin ore to the value of £15,000 has been produced by Roberts and party from these properties. The greater part of the output, however, represents the ore recovered from the accumulated tailings of the early sluicing operation of the Mt. Bischoff Tin Mining Company.

SOUTHERN SECTION

The southern section of the lead passes through land held under leases 4187/M and 5579/M by the Mt. Bischoff Tin Mining Company Registered of Launceston. The material on these properties consists of alluvial, detrital deposits in the creek and talus on the mountain side. It varies in thickness along the course of the River from 27 to 53 feet and is richly tin-bearing from 5 feet to the bottom. Except in the main channel the rock is regular and the proportion of boulders is large. The removal of rock lumps of large size is one of the chief difficulties to be overcome.

Talus deposits consist of the waste of the ore-bodies and disintegrated wall-rocks occupying the northern and eastern slopes of the mountain. For sometime this material provided a large source of supply for the

battery. Very extensive deposits remain to be worked. This can be performed satisfactorily by hydraulicing and sluicing. It is reported that the richest of the talus deposit is the upper part.

Quantity and Value of Material Available

An estimate of the quantity of tin ore in the detrital and alluvial deposits on these properties was prepared by Sentator J. D. Millen, late Mine Superintendent for the Mt. Bischoff Tin Mining Company. This estimate was based on information obtained in sinking a number of shafts spaced at regular intervals, through the deposits to bed-rock. According to his calculations the material available amounts to 675,000 cubic yards containing 0.92 per cent tin per ton. By computation the following is arrived at:-

22.4 x 0.92 = 6.496 lb. of tin per ton of material. Assuming that 1 cubic yard of material weighs 1½ ton, then 1.5 x 6.5 = 9.75 lb. tin per cubic yard or 12 lb. of tin oxide per cubic yard.

This estimate is not of free tin ore only. It includes that enclosed in the rock which cannot be recovered in sluicing. Later prospecting work has revealed free tin ore in the proportion of 7 lb. per cubic yard near the northern boundary, and it may be safely assumed that the proportion will not be found to decrease in a southerly direction towards the course.

The practical considerations arising out of the recent investigation may be briefly summarised:-

- 1) Over 2,000,000 cubic yards of material of unknown value is available for treatment.
- 2) The first operation is to determine the proportion of free tin ore in every part of the area and record the proportion of rock (exceeding 12 inches diameter) in the wash.
- 3) The two properties should be operated by one Company.
- 4) The whole water reserve of the Mt. Bischoff Company will be required for successful operation.
- 5) The less rich more extensive ground in the northern section can be operated at much lower cost than the heavier and richer materials of the southern section.
- 6) These deposits represent the greater part of the concentrated waste of the Mt. Bischoff ore bodies. Therefore the proportion of tin ore should prove to be sufficiently large to allow of profitable operation.

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19.6.25