REPORT ON

THE ABERFOYLE TIN MINE

TASMANIA

by

G. Lindesay Clark

24th May 1928

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REPORT.

ON

THE ABERFOYLE TIN MINE TASMANIA.

by H. Hinsworth 24/5/28

LOCATION: The Aberfoyle Mine is located on the Eastern slopes of Ben Lomond, 15 miles from Avoca, at an elevation of about 2000 ft.

TOPOGRAPHY: The lodes occur in a marchy flat in rugged country. The Aberfoyle Creek has cut a gorge about 600 feet east of the main shaft.

TIMBER: Plenty of timber both for mining purposes and fuel exists in the neighbourhood.

WATER: In winter the water supply for present purposes is ample. In the Summer this supply may not be adequate, but there is no doubt that plenty of water for all purposes could be got in the district at a moderate cost. This work need not be done until later.

GEOLOGY: The tin occurs in numerous small quartz veins running in general North and South direction through the altered slates and sandstones of the district which have a definite cleavage about 45° West of North. The veins have an average dip of 66° where exposed in the level.

The lodes have come from the granite massif underlying the sedimentary rocks. The granite outcrops along the road about two miles from the Mine. The lodes will continue down to the granite and probably penetrate it some distance. The depth to which the tin contents will continue is unknown, but since the tin is widely distributed in a district of high relief it is probable that the values will continue deep enough to provide sufficient ore to make a big Mine, providing the average grade is payable.

There appears to be a fractured zone of at least one hundred feet in width in which the tin lodes occur. Plan No. 2 shows the relative position and dip of the lodes in this zone. The fracfactors which would chiefly influence the distribution of the lode forming solutions and therefore the size and number of the lodes in the zone are the strength of the country rock and the amount of fracturing to which it had been subjected. Therefore in passing from one country rock to another it is possible that the structure of the vein system might change.

The present appearance of the lodes is that of an irregular network running North and South in the fractured zone. It is quite possible, in depth or laterally, the network might develop

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into one or more larger lodes but there is no indication at present that they will do so.

The walls of the lodes are generally good and will not cause any difficulty in mining except on the eastern lode. Here a much fractured formation runs across the lode at a small angle and will require timbering.

In addition to the tin lodes on the main fracture zone two larger quartz lodes running about 40° to45° West of North along the cleavage of the country rock, occur to the East, as shown on Plan No 1. As far as known these are barren though practically no work has been done on them. A small quartz leader carrying rich tin, bearing 17° East of North, runs across them at the small pit shown on the plan. The tin in the material from the pit probably came from this leader. These barren lodes may possibly belong to an earlier or later system of lodes than the tin bearing ones, since in the vicinity of the main shaft all the lodes carry tin. As these so far barren lodes are easily the biggest in the vicinity, some work should be done on them.

The junction of the small rich leader and the wide lodes should be exposed to see if tin penetrates the larger bodies and when the Mine has been opened up the larger lodes should be prospected where they cross the main fracture zone.

No further notes on the geology are included here as it was thought unnecessary for the purpose of this report.

MINE WORKING: The mine workings are shown on the plans Nos. 1 and 2 herewith. Some minor faults occurring in the Mine are not shown on the plans.

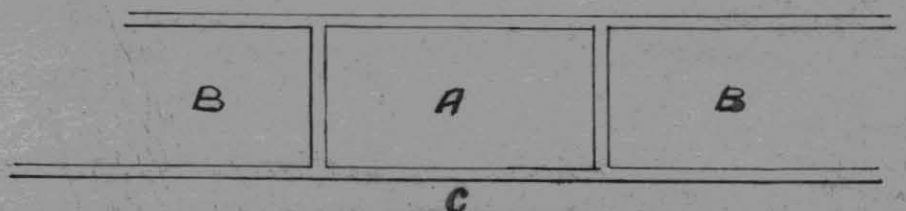
QUANTITY OF ORE: It is usual to divide the ore in a mine into three classes :-

Proved Ore

Probable Ore

Possible or Prospective Ore.

The sketch shows a longitudinal section of a vein opened up by drives and winzes.



Proved ore includes ore broken in the stopes or on the surface and ore in place in the mine but exposed on four sides by

002 drives and winzes. Thus Block A in the sketch is proved ore.

Probable ore is ore exposed by drives or winzes on two or three sides and the Blocks B are probable ore.

Possible or prospective ore is exposed on one side only, being the extensions in depth or laterally of the ore body. Thus Block C is possible ore.

At the Aberfoyle Mine the only proved ore is 260 tons broken on the surface. This figure was given me by Mr. Hooper from mine records. The probable ore in the mine is that exposed in the East Drive. Assuming an average width of quartz of 16" the quantity in this block is 800 tons of quartz or allowing for dilution (see below) 1600 tons of mill dirt.

The small amount of ore should be regarded as indicating the amount of development done, not the amount of ore which may exist in the mine.

No indication of the amount of "possible ore" in the mine can be given at present but the following figures will give some idea of the amount of ore which veins of this size would yield.

Tin has been found from the main shaft as far as McCormack's shaft, a distance of about 750 feet. Seven lodes have been cut in the crosscut of an average width, where sampled, of 12 inches. If, then these seven lodes were proved to be payable over a length of 1,000 feet they would yield 50,000 tons for each hundred feet in depth extracted or 100,000 tons of mill dirt allowing for dilution (see below).

Owing to the narrow width of the lodes some dilution of the quartz, sent to the mill, with mullock will occur. For present purposes the assumption is made that half ofthe ore sent to the mill will be mullock and estimates have been based on this figure. Should great care be taken, cleaner quartz could be sent to the mill but it would be offset by greater cost in doing so; and I believe that estimates based on the above will be as close as can be got at the present time. All estimates based on the amount of quartz in the mine will therefore be increased by 100% in calculating the amount of ore sent to the mill. The dilution is difficult to estimate as it depends on many factors.

VALUE OF THE ORE: The value of the ore is based on the sampling done by me on my recent visit. The sites of samples are shown on Plan No. 2, and the details of the results are given in Appendix 1. All quartz exposures were sampled. Assays were done by Messrs. Glover & Goode by the vanning method. Checks were done by the wet chemical method by Mr. Dodd.

The average value of the quartz sampled was 1.9% metallic tin over an average width of 12" according to Messrs. Glover & Goode's vanning assay.

Mr. Dods' check assays were not received until after my meeting with your Directors on 24/3/28. It appears from these results that the recovery in the Mill will probably be better than that given in the table below but no so much better as to modify the recommendations in the report.

The average value of quartz from six check assays done by Mr. Dods by the wet chemical method was 3.9% mettalic tin (see appendix 1). On comparing the samples checked by Mr. Dods with those given by vanning assay by Messrs. Glover & Goode the percentage recovery in the vanning assays was 60%. The average value of the above six assays made by the vanning method by Messrs. Glover & Goode was 2.3% metallic tin.

A grab sample was taken of the mill dirt stacked on the surface. The vanning assay result of this sample by Messrs. Glover & Goode was 0.66% metallic tin and by Mr. Dods 0.83% metallic tin. A wet chemical assay by Mr. Dods gave 0.97% metallic tin.

Based on the assays of the quarts and allowing for 100% dilution of the quartz with mullock the average value of the ore sent to the mill would be 0.95% vanning assay. This would indicate that the dilution in the present dump is rather greater than 100% as is probably so, due to the broken formation along the Eastern lode from which most of this ore has come.

The grab sampling of the ore broken and the mail sampling of the quartz veins are two quite independent methods of sampling. Taking into account the dilution of the quartz with mullock the agreement between the two methods is fairly close and therefore indicates that the sampling results may be taken as reasonably accurate.

In estimating the value of the ore the mill recovery is taken as equal to the vanning assay return when that method is used. While the vanning assay gives valuable indication of the ease of recovery etc., it is likely to give variable results according to the skill of the vanner. Accordingly the wet chemical assay should used as a basis for estimating. It was not possible to arrange for this to be done in time for this report.

The probable reason for the overestimation of values is that the samples were not systematically taken during the development work and there is a tendency to select the better ore for samples. Also, if the work is not systematic, enrichment may occur when getting the sample if care is not taken. Further, there is a considerable amount of coarse pyrites with the tin which may have caused errors in the vanning assay. For example, Mr. Dods' vanning assay of the grab sample the concentrates weighed 2.2% of the sample taken but only assayed 38% metallic tin.

COSTS: The cost of working a system of narrow veins is high for the following reasons :-

1. A greater width of ore than the actual quarts will have to be broken in the stopes.

2. The development cost per ton of ore will be high since a small tonnage will be developed per foot of development due both to the narrow lodes and to the probability that the lode will only carry payable values over a portion of their length the whole of which has to be driven along to prospect it.

3. Dilution of the quartz with mullock will occur in mining which will increase the tonnage to be milled.

It is difficult to estimate closely the cost of working until the mine is further developed. My preliminary estimate is 36/- per ton of ore milled including development, mining and milling of the ore.

The following table shows the value of the ore as sampled based on the following :-

1. The dilution of the quartz with mullock in the mill ore is 100%.

2. The cost of smelting and realisation is £25 per ton of the tin which is allowed for by deducting this figure from the London price of tin when calculating the value of the ore.

3. Since the assays given are vanning assays (Glover & Goode) the recovery is taken as equal to the mean assay value of the ore.

London Price of Tin per ton	£200	£230	£250	£300
Value of Mill Dirt per ton from quartz veins containing 1.9% metallic tin, vanning assay	33.2/-	40.9/-	42.7/-	52.3/-
Cost of mining per ton	36/-	36/-	36/-	36/-
Margin Profit per ton of ore milled	- -	4.9/-	6.7/-	16.3/-

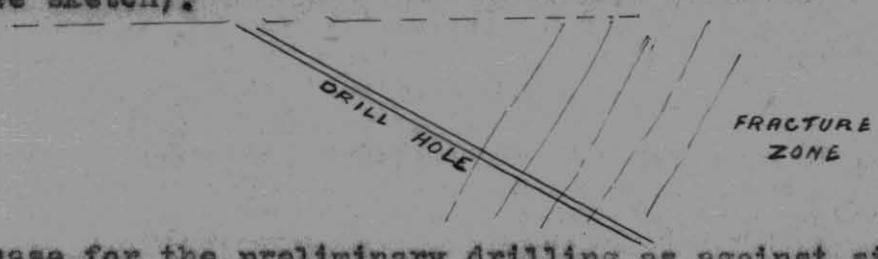
The present grade of ore will therefore more than pay expenses but will not show sufficient margin of profit for working. If, however, larger veins were met the position would be greatly improved and this grade of ore would return a margin of profit of about 25/- per ton with tin at £200 per ton in lodes of 3 ft. width or over.

FUTURE POLICY: The present position is that the small portion of the field so far prospected shows a network of narrow lodes along a line of fracture in which all the lodes intersected carry tin of a grade which would be very profitable in larger bodies. The mineralisation along the fracture zone has been intense to produce so many veins and if the geological conditions were favourable so that the mineral bearing solutions were concentrated along a few lode channels they would probably form large ore bodies. This has already happened in the district at Storey's Creek. Taking into account the type of the deposit and the above, the chance of finding larger or

richer lodes either laterally or in depth is sufficiently good to justify continuing prospecting on the lines set out below.

In view of the assay results the policy of the Company should be reconsidered as there is no chance of paying for development work with the proposed mill on the grade of ore developed, and accordingly I would suggest that construction on the mill should be stopped.

Larger or richer lodes may exist either laterally or in depth. The line of fracture should be prospected by a series of parallel tranches 200 feet apart across the mineralised zone. The trenches should only be dug where they can be sunk dry; for example, to the south of the Main shaft. Small pits would be sunk on lodes intersected. This will prospect the line laterally at the surface. The sinking of the main shaft to prospect in depth should be postponed. Instead of this a series of inclined diamond drill holes should be put down to cross the fracture zone at from 300 to 500 feet in depth. (See sketch).



The case for the preliminary drilling as against sinking a main shaft at once is as follows :-

The diamond drill holes while admittedly not giving a fair indication of values yet would show the existence of larger bodies and their position and in so doing would prospect a long length of lode at a reasonable cost. If a large lode were met in the drill holes even if the tin values as shown by the drill were low, it would then be advisable to sink and prospect it, as its location would be known and extensive prospect driving would be unnecessary.

On the other hand, sinking a shaft at once would be expensive and to prospect a length of lode comparable with that which could be tested by the drill would cost probably three times the sum spent on drilling, since a long distance would have to be driven as well as a number of crosscuts put across the fracture zone. Even when this was done it might be then found that the site of the shaft was not very suitable due to its distance from the payable part of the field. In my opinion, therefore, there is no doubt that, under the circumstances at the Aberfoyle Mine, preliminary diamond drilling is the proper course. If promising results are obtained in drilling then work should be begun on a main shaft and the lode be opened up.

To carry out this work the following sums would be required:-

Trenching	£500
Drilling 3,500 ft. @ 20/- per ft.	£3,500
Assaying, Supervision, Administrn.	1,000
Total	£5,000

The diamond drill should do approximately 100 ft. of boring per week working two shifts.

PROSPECTING WORK: The trenches should be systematically laid out and surveyed. Samples should be taken from the lodes and all results plotted on a plan. The work will need close supervision as the details may require modifying as information is obtained. Once a decision is made, the work, both trenching and drilling, should be begun together.

I have not included estimates for shaft sinking, which have ~~begun~~ been prepared, or notes on sampling of development work, etc., as they appear unnecessary at present. However, I shall be pleased to forward them if you wish.

(Sgd.) G. LINDESAY CLARK.

24/5/1928.

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Copy of Report by E. C. Saint-Smith, F.S.T.C.

7th August, 1927.

ABERFOYLE TIN DEPOSITS, TASMANIA.

In compliance with your wishes, I have examined the lode tin occurrences occurring on and near the areas controlled by the Aberfoyle Tin N.L. in the Storey's Creek district near Avoca, North Eastern Tasmania, and the appended short notes have been prepared at your request for the information of the Directors of that Company.

Geology: Both the Storey's Creek and the Aberfoyle lodes occur in sedimentary formations of palaeozoic age (quartzite, shales, conglomerates, etc.) which have been intruded by an extensive mass of granite; the granite outcrops some half to three-quarters of a mile to the eastward of the tin-wolfram lodes, and there can be no doubt whatever but that to the crushing of the sediments by the granite intrusions and the injection of metalliferous quartz veins, stringers and seams into the fissures produced by the crushing, we must ascribe the occurrences of tin and wolfram now under review. The general strike of the sediments appears to be about north-west south-east with a consistent westerly dip at least 70 degrees wherever observed, whereas the contained lodes at Aberfoyle trend closely approximate to a north-south course, the dip being also to the west but at a lower angle than that seen in the host rocks. At both Storey's Creek and A berfoyle the quartz veins are clearly occupying lengthy fissures in the quartzites and can reasonably be expected to persist for notable distances, both in length and depth. The ore shoots occurring within these quartz veins have a marked tendency to pitch rather sharply to the north; this fact should be borne in mind should the Directors later on decide to sink a main

haulage shaft.

The Cassiterite is typically very coarse in grain and of a light brown colour with a distinctly resinous lustre.

At the Aberfoyle workings the quartz is of the glassy brittle variety and is somewhat cavernous as the result of the decomposition of contained seamlets and rounded patches of iron pyrites. No wolfram whatever was seen by me in any of the 70 tons of ore now lying at grass on Mineral Leases Nos. 9223M (80 acres) and 8245M (20 acres); at the Storey's Creek property, however, all the lodes seen show wolfram and iron pyrites in association with the tinstone. The quartz has partly replaced the crushed country rock along the fissures with the result that "horses" of country rock occur within the quartz lodes and give the appearance of having caused splits in the reefs; these sedimentary inclusions are usually themselves stanniferous and may be considered as portion of the pay shoot.

At Aberfoyle the reefs visible at the time of my visit last week mostly show a strongly defined footwall - probably an original fracture line. Along the margin of the quartz is frequently a rich seamlet of coarsely crystallised tinstone "frozen on" to both the footwall country and the reef and it therefore becomes necessary to break the smooth footwall when winning the ore. In the central portion of some of the veins is coarsely crystallised quartz which has not completely filled the fissures.

Owing to the severe weather conditions obtained during my inspection of this area, it was not found possible to make any extensive survey of the field, but a plan showing the known lodes, existing shafts, etc., on the Aberfoyle property will be forwarded to you during the week.

Prospecting Operations: On the main (80 acre) lease - M. L. 9223M - work was being concentrated on the sinking of a straight shaft located about 15 feet westerly of the main lode channel. This lode channel can be traced northerly into M. L. 8327M and may also prove to be continuous southerly into M.L. 8245M; it is therefore advisable for your Directors to secure these areas if available. The straight shaft had reached a depth of 70 feet and is being continued to a depth of 100 feet before opening out easterly. Unfortunately the location of the lodes on this 80-acre block renders it difficult to handle the large flow of surface water draining from the extensive marsh lying to the north of the workings; this marsh is being fed by the numerous streams heading in the snow-covered Ben Lomond range a few miles northerly, and no relief can be hoped for from the heavy surface water until about Christmas time. The water met with in the straight shaft is coming in from between the 30 and 45 feet marks. The volume of water now being handled is about 4,500 gallons per hour and apparently gradually increasing. As a result of this inflow, progress in shaft sinking is necessarily very slow - in fact, during the last week only 18 inches was recorded. By reason of the extreme coldness of the water and also its volume, great difficulty is being experienced in keeping men at work in this shaft; on several occasions miners on being hauled to the surface were so numbed that they had to be lifted out of the bucket. If it is decided by your Directors to persist with the present programe of continuing this shaft to the 100 ft. mark, it becomes imperative to make a cistern on the side of this shaft as recommended by Mr. Hooper recently; but as the object of sinking this straight shaft is apparently for the purpose of testing the lode channel between its western margin and the Prospecting Shaft within

the lode channel, no good purpose would, in my opinion, be served by a continuance of the present highly expensive and necessarily slow operation of deepening the shaft. I am strongly of opinion that, under the existing conditions, the best course to pursue would be to open out at the 60 ft. level and drive easterly across the lode channel; at the same time the Prospecting Shaft should be continued on the underlie following the tin lode seen in the latter shaft. Seeing that Mr. Manager Searle had definite instructions to put in a cistern, I recommended him to commence the excavation on the same (eastern) side of the shaft as would the crosscut above suggested.

As the lodes cut in this shaft are now close-timbered, it was not possible to make an examination of same, but the ore at grass is of good grade and similar to that seen at the Prospecting Shaft.

Recommendations: (a) For the immediate present I would suggest the following plan of campaign:-

1. Open out easterly at the 60 ft. mark in the Straight Shaft and drive to the lode being sunk on in the Prospecting Shaft: distance about 50 ft.; approximate cost £200.
2. Contemporaneously, sink the Prospecting Shaft from its present depth of 40 ft. to meet the connection with the drive from the Straight Shaft; cost £50.
3. Then drive both ways on the lode at the Prospecting Shaft; cost about £2 per foot.
4. Continue the crosscut (No. 1) easterly to the footwall of the lode channel; distance about 25 ft.; cost £50.

The above prospecting would occupy about three months, when a return to drier weather conditions may be expected.

When the dry weather returns, then (b)

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1. Continue the Straight Shaft to a total of 130 ft. cost about £400
2. Then open out her at 120 ft. mark and crosscut westerly to test the two reefs cut in this shaft; distance about 35 ft. cost approximately £110.
3. Sink winzes along the drive at the Prospecting Shaft at, say, 50ft. intervals; estimated cost £3 per foot.
4. Providing that the Southern lease is then owned by the Aberfoyle Company, sink an underlie on the hanging-wall lode formation from the surface at the end of the (collapsed) tunnel.

Later on, the following work should be carried out, (3)

1. Continue sinking the No. 1 North Prospecting Shaft on the orebody seen there:
2. Sink a new Prospecting Shaft at a suitable point southwards of the present known lode channel outcrop (i.E. between the Prospecting Shaft and the tunnel on the south block.)
3. Sink a new Prospecting Shaft on the lode seen near the footwall of the lode channel midway between the No . 1 North Shaft and the Prospecting Shaft.

When the above work is completed, your Directors will then be in a position to determine the site for the main ~~buildings~~ haulage shaft and also the class of Mill best suited to treat the ore available

(Sgd.) E. CECIL SAINT SMITH, F. S. T. C.