BLUE TIER TINFIELD.

SOUTHERN AREA

Preliminary Statement

In January 1928, the Tasmanian Government, acting on the suggestion of the Development and Migration Commission set up a Committee of engineers to advise and report upon the economic possibilities of the Blue Tier Tinfield. The engineers selected first the southern area for investigation, and, as preliminary steps arranged for an amalgamation of interests of the existing lessees and the reservation of the Crown Land around and about the leased ground.

The following statements are based upon their report.

Area.

Leased ground	486	acres
Crown Land Reserved	2,434	"
	2,920	"

(The Crown Land will be made available if desired).

Locality.

The Blue Tier Mines are situated in North Eastern district 18 miles by road from Herrick (terminus of North Eastern Railway) which is 85 miles by rail from the port of Launceston.

Ore Bodies.

Comprised in the leased ground are four groups of lodes, named in the order of their importance.

1. Anchor
2. Liberator - Crystal Hill
3. Australia
4. Summit

(These are fully described in Bulletin 38 issued by the Department of Mines).

Method of Operation.

Open-cut and quarry have been decided upon as the most suitable and economical methods of ore excavation.

Ore Reserve.

Although a large reserve of ore undoubtedly exists, the amount cannot be expressed in figures until the dimensions of the several deposits have been determined. A minimum of 34,000,000 tons is required.

Testing the Deposits.

The Government is prepared to advance in the £ for £ basis up to £5000 to an approved organization for the purpose of testing the extent and value of the deposits, such amount to be repaid upon terms and conditions to be agreed upon.

Value of the Tinstone.

Mining and Milling operations have been carried on at each of the mines but on the Anchor only on a sufficiently

large scale to provide reliable information as to value. Over 1,400,000 tons of stone has been mined and treated for a return of 0.20% tin oxide per ton. The losses were rather high and might have been reduced under present-day conditions.

Production.

The Anchor companies produced over 3,000 tons of concentrated tin ore, and other companies operating other deposits produced in the aggregate 1,000 tons of tin ore.

Scale of Operations.

The scheme is based upon the excavation and treatment of a minimum of 1,500,000 tons per annum.

Working Costs.

The estimated cost of mining and milling (excluding realisation and smelting) is 3/6 per ton based on an output of 1,500,000 tons per annum and allowing 10% in addition for variations of the existing basic wage.

Power.

It is estimated that the power requirements will be 4,000 horse-power maximum. The Tasmanian Government will supply that amount at £5/10/- per horse-power year delivered at the mine.

Water-Supply.

An ample supply is available for milling and concentrating purposes. Water-races connect with the mine.

Timber.

An ample supply in the neighbourhood for all requirements for many years is available.

Capital.

The estimated capital required for equipping the mine is £525,000 exclusive of purchase price of the properties and extra-ordinary expenditure upon electric power equipment.

Purchase Price.

The total amount of the purchase price of the leased ground is £70,000 cash.

Estimated Profits.

Assuming an average saving of 0.20% tin oxide assaying 72% tin it is estimated that the profit will be:-

1.68 shillings per ton of stone with tin at £200 per ton
3.08 " " " " " " " " £250 " "
4.48 " " " " " " " " £300 " "

or annual profits in an output of 1,500,000 tons of stone of £126,000, £231,000 and £336,000 respectively.

Lines of Transport.

A good macadam road connects the mine with the

the railway at Herrick.

Communication.

Telephone and telegraph means of communication are provided. Mails are delivered daily.

General Remarks.

It is the considered opinion of the Committee that the deposits are of such magnitude and value as to warrant the expenditure of at least £10,000 in their exploration by drilling. Past operations on the Anchor body gives an idea of the average tin ore content of the stone and of its nature and physical condition. On that information as a basis for calculation it appears certain that operating under present-day conditions with modern plants will lead to the final success precasted in this report.

REPORT OF THE

BLUE TIER TIN COMMITTEE

INDTODUCTION -

In January, 1927, the Tasmanian Government, acting on the suggestion of the Chairman of the Development and Migration Commission arranged for a Committee consisting of:-

Mr. Cecil G. Ryan (Chairman), Managing Director of the Pioneer Tin Mining Company,

Mr. Lindesay C. Clark, M.C.E., General Manager of the Briseis Tin and General Mining Company,

Mr. H.A. Curtis, A.M.I.E. Aust., M.Am. I.E.E., Chief Engineer & General Manager of the Tasmanian Government Hydro-Electric Department.

Mr. A. McIntosh Reid, Director of Mines in Tasmania.

Mr. G. Lindesay Clark, B.Sc., M.M.E., Consulting Engineer, Temple Court, Melbourne, who was engaged by the Development and Migration Commission to act as its representative on the Committee and as full-time Executive Technical Secretary.

to be appointed with the following terms of reference -

"To advise and report upon the economic possibilities of development of a large scale treatment of tin bearing granites of north-eastern Tasmania, and to recommend what further investigations and tests, if any, are necessary to enable the Committee to furnish a final report to the Government".

GENERAL -

The Committee at its first meeting considered that the terms of reference as set out above involved answering the follwoing questions :-

1. Are the prospects sufficiently good to warrant an attempt to develop the deposits?

2. If so, where would work be begun, what method of testing should be adopted, and what would it cost?

3. If it is decided to test the area, what arrangements should be made with the existing leasholders?

As a preliminary measure the Committee advised the Government to withdraw the area shown on the chart attached, known as the "southern area", from the operations of the Mines Act, and also to try to arrange for the existing leasholders in the southern area to amalgamate their leases into one property. The southern area was selected as containing, on existing data, the most promising deposits for large scale operations.

At subsequent meetings the details of boring, developing method of working and milling were discussed.

The conclusions of the Committee on the above-mentioned questions are set out below:-

1 PROSPECTS.

Comprised in the leased ground are four groups of orebodies, named in the order of their importance:-

1. Anchor,
2. Liberator-Crystal Hill-Don,
3. Australia,
4. Summit.

The Geological Survey Bulletin by the Director of Mines on the Blue Tier Tin Field, which is attached, deals with the geology of the deposits in detail. The tin is disseminated through the ore-bodies and the grade is improved by small irregular enrichments. The ore is soft to mine and easily milled except for a proportion of fine tin. The ore would be suitable for mining by mechanical shovels, and a simple gravity concentrating mill would suffice for its treatment.

There have been several attempts to work the deposits but only one, by the Anchor Tin Mining Company, on a sufficiently large scale to give information of value to the Committee. This company treated approximately 1,400,000 tons for a return of 0.20% of tin oxide. With more modern plant and greater attention to the saving of fine tin a somewhat higher return could have been obtained. Further notes on the results of the Anchor work, including costs of working, are given in Appendix I, and these indicate the ease of working of the deposits.

There are several hundred of acres in the vicinity of the Anchor orebody which may contain ore, to a depth of at least 100 ft. similar to that mined by the Anchor Company and, in addition to this area, there are large deposits in the vicinity of the Liberator and the Australian workings.

The Committee considers that the most economical output would be that of a large electric shovel working continuously on three shifts. This output, making allowances for all stoppages incidental to this work, would be about 1,500,000 tons per annum.

Preliminary estimates, working at this output, have been made of working costs, power requirements, number of men employed, capital cost of plant and the probable profit from ore from which 0.20% of tin oxide assaying 72% metallic tin is obtained, and are as followes:-

(As requested by Mr. Gepp, these estimates have been made on a basis of working 24 hours per day for 365 days per annum).

(a) Working Costs -

The estimated cost of mining and milling, including obsolescence, redemption of capital and general charges, but excluding realisation and smelting, which are dealt with as shown below, is 3/6 per ton of ore milled based on an annual output of 1,500,000 tons a basis labor rate of 13/- per day (plus 10% allowance for variation and power at £5.10.0 per horse-power year maximum demand, supplied at the mine by the Tasmanian Government.

(b) Power -

The estimated power requirements are 4,000 horse-power maximum demand. The Tasmanian Government will supply this amount of power at £5.10.0 per horse-power year delivered at the mine.

(c) Number of Men -

The number of men employed directly by the organisation would be approximately 300.

(d) Capital -

The estimated capital required for the purchase and installation of equipment is £525,000 made up as follows:-

Mine and Transport	...	£149,000
Mill	...	300,000
Sundry essential services and Contingencies . .		76,000
		£525,000

This does not include the purchase price of the property from the present leaseholders, nor any capital expenditure for power supply which would be incurred from the point of supply by the Governments to which secondary side of the transformer on the mine leases. The secondary voltage would be 6,000 or 11,000 volts.

(e) Probable Profits -

Allowing for a deduction of £15 per ton from the London price of tin and of two units from the assay value of the concentrates to cover smelting and realisation charges and smelting losses respectively the following table shows the estimated profits which would result from working the property at the rate of 1,500,000 tons per annum. The recovery from the ore is taken at 0.20% tin oxide assaying 72% metallic tin which is, as nearly as can be got, the recovery obtained from working the Anchor Mine.

London price of tin	£200	£250	£300
Less deduction for smelting and realisation charges	185	235	285
Value of ore from which 0.20% tin oxide assaying 72% (less 2 units deducted for smelting loses) is recovered per ton.	5.18/-	6.58/-	7.98/-
Working costs per ton	3.5/-	3.5/-	3.5/-
Margin of profit per ton	1.68/-	3.08/-	4.48/-
Annual profit on output of 1,500,000 tons	£126,000	£231,000	£336,000

There is no reason to suspect that the present Anchor workings are not surrounded except to the east by open cut ore of similar value to that worked in the past and that a vigorous boring campaign would not develop a tonnage sufficient to give a life of twenty years to the mine working on the scale indicated above.

The "Anchor" results given in Appendix I. show a considerable loss of fine tin in the tailings. As this loss was determined by vanning, which is recognised as giving low results on fine material, it may be assumed that a modern plant would have effected a better recovery on this ore.

The Committee thinks it is not too sanguine in suggesting that the recovery might have been increased to about 0.24% of tin oxide.

Using this figure for the recovery from the prospective ore instead of 0.20% tin oxide, the probable profits are as follows -

London price of tin	£200	£250	£300
Less deduction for smelting and realisation charges	18.5	235	285
Value of ore from which 0.24% tin oxide assaying 72% (less 2 units deducted for smelting loss) is recovered per ton	6.22/-	7.90/-	9.58/-
Working costs per ton	3.5/-	3.5/-	3.5/-
Margin of profit per ton	2.72/-	4.40/-	6.08/-
Annual profit on output of 1,500,000 tons	£204,000	£330,000	£456,000

In view of the above the Committee considers that an attempt to develop the deposits is fully justified.

2. TESTING -

The vicinity of the Anchor orebody is recommended as the most promising area on which to begin work though there are others near the old Liberator and Australian workings, which are worthconsideration later.

The method of prospecting proposed is to bore the area at the corners of squares of sides of 400 ft. following by check boring at the centres of these squares in selected parts of the area first bored. This is equivalent to boring at the corners of squares of sides of 283 ft. Prospecting results will indicate whether this is sufficiently close boring.

The plant proposed for this work is a light percussion type drilling machine, similar to that made by the Goldfields Diamond Drilling Company.

The expenditure on the field, including the purchase of three of these machines, before beginning boring, would be £2,000. The estimated cost of drilling, using three of these machines on two shifts, apart from this expenditure, will be 13/4 per ft. including local supervision and assaying. Detailed recommendations on the method of boring are given in Appendix III. The Committee wishes to draw attention to the need for standardising assay methods, notes on which are given in Appendix IV.

3. LEASEHOLDERS.

At its first meeting, the Committee advised the Government to withdraw all Crown Lands in the southern area (shown on the Chart attached) from the operation of the Mining Act, and also to try to arrange for the amalgamation of leases already held within this area. This has been done and a syndicate has been formed which has empowered the Government to deal with the whole of the southern area as one property.

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APPENDIX - 1.

WORKING RESULTS OF THE ANCHOR MINE.

This mine closed down before the outbreak of war. It had then excavated and treated about 1,400,000 tons of tin bearing granite for an average return of 0.20% tin oxide.

Detailed working costs during the whole of the period are not available but reliable records, covering the period 13/10/02 to 6/6/03, have been obtained by the Committee in addition to the information published in the Geological Bulletin.

The ore was broken down by hand drilling and blasting, hand loaded to horse-drawn trucks, dumped on to gyratory crushers broken to 2½" gauge, trucked to battery (with 800 lb. stamps and mortar boxes with screens of either 100 punched hole per sq. in. or 12 x 12 or 14 x 14 wire screens), classified and dressed on coarse & and fine Hartz jigs, frue vanners and cornish buddles. The ore is easily crushed as during this period the stamp duty was 4.3 tons per 24 hrs. The cost of explosives, reduced to present day prices, was 3.07d per ton. The cost of mining and treatment (excluding administration, smelting and realisation) to placing the concentrates in bags at the mine was as follows:-

Mining -	Labour	16.14	
	Stores	3.92	20.06
Milling -	Labour	9.27	
	Stores	3.34	12.61
	Total		32.67d. per ton.

These figures cannot be reduced to present day figures for lack of information, but the basic rate of wages has increased about 1.58 times.

In 1902/3 tests were made to ascertain the extent to which the ore had to be crushed to completely free the tin from the gangue. The result indicated that crushing through an 0.05 inch aperture was sufficient.

An automatic continuous sampler was introduced at this time, which provided two independent samples daily. It was found that the tailings on 120 mesh seive contained only a trace of tin, but those through 120 mesh (being about 34% of the whole) yielded from 2-3 lbs. of tin oxide per ton when assayed by vanning. Since the vanning assay would lose a considerable amount of this fine tin, the amount lost in the tailings would be greater than this.

With better apparatus for slime treatment, a higher return would therefore have been obtained.

During this term 77,470 tons of ore were milled for a return of 119 tons 2 grs. 2 lbs. of metallic tin from concentrates assaying 72.14% as determined by the Mt. Bischoff Smelting Co., which equals and average yield of 0.214% tin oxide.

APPENDIX 11.

WORKING COSTS.

The estimates are based on the following premises:-

Annual output 1,500,000 tons per annum.

Working time per annum 365 days, 24 hrs per day
(Less 10% allowance for major breakdowns).

Basic rate 13/- per day plus 10% for possible variations.
(The usual margins are added for skill.

Power delivered on the mine at £5.10.0 per horse-power year of the maximum demand.

The ore weighs approximately 2 tons per cubic yard in place.

The ore is an altered granite much softer than the unaltered granite of the district. The working results given in Appendix 1 of the old Anchor Mine indicate the ease of treatment, and in addition to construction costs for two rock fill dams built of the hard unaltered granite of the district have been used as guides in estimating.

The 10% allowance for major breakdowns is considered sufficient in view of the fact that stand-by units are provided for in the capital estimates for all the large units of plant except the large jaw breaker.

1. Power - The power requirements are estimated at 4,000 horse power maximum demand. On an output of 1,500,000 tons per annum and power cost of £5.10.0 per horse-power year, this amounts to a cost per ton - 3.52d.

2. Breaking Ground - Using jackhammer drills, an average rate of drilling of 50 ft. per machine shift is allowed. (In the unaltered granite in the district, drillers averaged 40 feet. per shift which rock, as noted, above, is much harder than the Anchor ore). Allowing for drillers working six shafts per week, day shift only, they will have to break 4,800 tons per shift. Allowing for 0.2 ft. of drill hole per ton of ore broken the footage drilled will be 960 ft. per shift which would require 20 drillers.

20 men @ 17/6 per shift	350/- per day	0.88d ton
Explosives, fuse and detonators		3.50d "
Steel and Steel sharpening 10/- per machine shift 200 per day		0.50d "
Pipes, fittings drill repairs 20/- per machine shift 400 per day		1.00d "
		5.88d "

The cost of explosives in breaking hard unaltered granites in the district was 2.60d. per ton. An extra 0.9d per ton is allowed for additional popping. (See also Appendix 1. for cost of explosives at Anchor Mine).

3. Loading - The ore will be loaded by an electrically operated shovel with a 4-5 cubic yard dipper.

On the annual output of 1,500,000 tons on 365 days per year, the average daily output, - 4,110 tons. The shovel operates 24 hours per day.

Labour		Cost per day:
1 Driver	20/- per shift	60/-
1 Rackman	18/- " "	54/-
1 Greaser	18/- " "	54/-
2 Pitman	15/- " "	90/-
1 Faceman	18/- " "	54/-
Foreman	27/- " "	81/-
		393/-
	Cost per ton	1.15d. per ton
	Oil and Grease 37/6	.11
	Maintenance £50 per day 1000/-	2.93
		4.19

4. Transport - The probable length of haul to the mill site is about 1½ miles.

Three rakes using two electric locomotives would be used.

Operating Labour		Cost per day
2 Drivers	18/- per shift	108/-
2 Guards	18/- " "	108/-
1 Pointsman	15/- " "	45/-
		261/-

Track Labour			
1 Ganger	20/-		20/-
10 Men	15/-		150/-
		Total per day	431/-

Labour per day 1.26d. per ton.

Plant Maintenance.

Annual cost 20% of cost of equipment in use £41,000 - £8,200 per annum 1.31d. per ton.

Track Maintenance.

Annual cost 25% of £21,000 - cost of 3 miles of track (includes siding etc.) - £5,250 per annum .84d. " "

3.41d.

5. Mill -

Shift Operating Labour.		Cost per day.
1 Shift Engineer	40/- per shift	120/-
Crushing Section		
8 Men	15/-	360/-
		480/-

Concentrating Section.		
1 Man Classifer @	15/-	45/-
1 " Jigs	15/-	45/-

1	Leading Hand Tables	20/-	60/-	
7	Men Tables	15/-	315/-	
1	Leading Hand Slimes	20/-	60/-	
2	Men Slimes	15/-	90/-	
2	Pump Attendants	15/-	90/-	
1	Plant Attendant	18/-	54/-	
1	Tailing Launder Attendant	15/-	45/-	
				1284/-

Day Labour Operating.

3	Tin Dressers	18/-	54/-	
3	Men Collecting Tin	15/-	45/-	
3	Tin Baggers	15/-	45/-	
6	Miscellaneous	15/-	90/-	
				234/-

Day Labour Miscellaneous

2	Electricians	18/-	36/-	
2	" Labourers	16/-	32/-	
4	Fitters	18/-	72/-	
4	" Labourers	16/-	64/-	
1	Blacksmith	18/-	18/-	
1	Striker	16/-	16/-	
2	Carpenters	18/-	36/-	
2	" Labourers	16/-	32/-	
				306/-

Total labour per day 1824/-

Cost per ton labour 5.33d.

This allows for 37 tons per man shift.

Maintenance Stores.

Crushing Section	4.5d
Concentrating Section	1.0d.
Miscellaneous add 25%	1.4d.

Cost per ton stores 6.90d.
Cost per ton milling 12.23d.

6. Administration.

Mine Administration	£15,000	per annum
Insurance rates, rents, workers' compensation, etc.	5,000	" "
	20,000	
Head Office	6,000	
	£26,000	

Cost per ton - 4.16d.

7. Redemption of Capital and Provision for Obsolescence of Plant.

(a) Redemption of Capital. If the total capital of the company is assumed to be £75,000 as suggested by Mr. Gepp, and the life of the mine to be 20 years, and Annual Charge of £22,700 paid into a Sinking Fund and invested at 5% is required to redeem the capital on exhaustion of the Mine.

(b) Provision for obsolescence of Plant. The maintenance Charges allowed in the Working Costs are sufficient to keep the plant in first class running order, and in view of its first cost having been redeemed as above, any further charges on account of Depreciation would be for obsolescence only.

It is unlikely that any serious charge of this description during the first ten years of the life of the mine will arise.

An Annual Charge of £10,000 is allowed for this item, which invested at 5% would amount in 10 years to £125,700. This sum with the continued charge of £10,000 per annum would provide a liberal allowance for any expenditure under this heading during the latter half of the life of the mine;

Redemption	...	£22,700 Per annum
Obsolescence	...	10,000 " "
		32,700

Cost per ton 5.24d.

Summary of Costs.

Power	3.52d. per ton
Breaking	5.88
Loading	4.19
Transport	3.41
Mill	12.23
Administration	4.16
	33.39
Add contingencies 10%	3.34
Redemption and Obsolescence	5.24
	41.97d.

Say 3/6d. per ton.

APPENDIX III

METHOD OF PROSPECTING

Before deciding on the method to be adopted for prospecting the deposits, the following systems were considered in detail:-

A. Shallow hole prospecting by hammer drills followed by deeper percussions drilling at the centres of the squares laid out by first series of bores with the hammer drill.

B. Diamond Drilling.

C. Percussion drilling using a drill driven by an electric motor, and three drills being supplied with power from a portable crude oil driven alternator.

D. Percussion drilling using a petrol engine mounted on the drill carriage to drive the machine.

The chief points to be considered in the selection of the Drilling Plant were -

a. The portability of the plant over the rough country.

b. The greater reliability of samples from a large diameter hole than from a small one.

c. The purchase price of equipment

d. The cost of drilling

e. The depth to which the plant would bore.

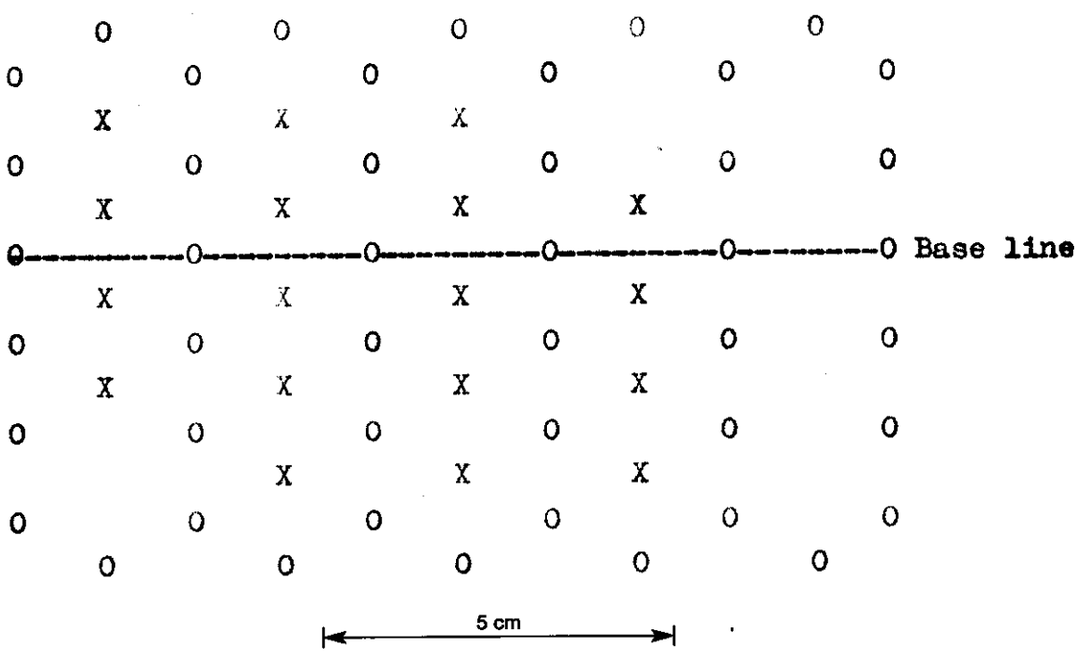
In the opinion of the Committee the petrol motor driven percussion drill would be the best for the purposes of this campaign, and they advise that the following procedure be adopted in carrying out the works.

1. Organisation - The work in the field requires the full time supervision of a properly qualified engineer. A minimum salary of £600 per annum will be necessary to attract a suitable man. The field organisation should include an assayer and all assays should be made on the field.

2. Type of drill adopted.- The modified Victoria Drill proposed to the Committee by the Goldfields Diamond Drilling Company is recommended as being the most suitable. This is a light portable percussion drill capable of drilling a hole 4 to 5 inches in diameter to a depth of 300 ft. and driven by a petrol engine mounted on the drill carriage.

3. Area to be drilled and spacing of drill holes- The first area to be drilled is the Anchor orebody which is shown on the plans accompanying the Geological Survey Bulletin. Drilling should be begun in the vicinity of the old Anchor Mine workings and extended along the ore bodies. The procedure would be to first set out a base line running parallel to the main greisen ore bodies and then to drill bores at 400 ft. intervals along and on each side of the base line until the payable limits of the ore body were reached, when the interval might be reduced to more closely define the payable limits. The promising portion of the area drilled at 400 ft. centres would be drilled at the centres of the squares set out in the first series of bores. This would be equivalent to boring at 283 ft. centres.

The arrangement is shown below -



O: Holes on first series of bores at 400 ft. intervals except at margin as shown.

X: Holes in second series of bores superimposed on first series at 400 ft. intervals in restricted areas.

The result of the second series of holes will be checked with the first series of holes and the area selected for reboring and a close agreement between the two would indicate that the area was sufficiently closely bored to take into account the irregular rich patches in the ore body. If a fair agreement between the two sets of holes is not obtained, the Committee recommends that closer boring at the centres of the 283 ft. squares should be carried out.

The tonnage required to provide for a life of 20 years on an output of 1,500,000 tons per annum is 30,000,000 tons. One hundred acres to a depth of 100 ft. contains approximately this tonnage, viz. 32,000,000 tons.

The Anchor area is the largest and most promising of the ore bodies but there are others, namely, the Liberator and Australian ore bodies which may also yield large tonnages of ore.

4. Estimate of Cost. The estimated cost of drilling is 15/4 per foot drilled using three percussion drills on two shifts. This includes local supervision, surveying and assaying. The estimate allows for boring to a depth of 100 ft.

An expenditure of £2,000 would be incurred before beginning drilling to cover the purchase of drills etc.

The rate of drilling using three drills on each of two shifts would be approximately 240 ft. per week.

APPENDIX IV

ASSAYING METHODS

In view of the importance of accurate assaying in dealing with the development of large tonnages of very low grade ore, and the difficulty of assaying tin ores, the Committee considers it essential that the technique should be standardised and checked before beginning work.

The wet chemical assay will determine the total tin contents and the vanning assay will serve both to check the chemical assay and also to indicate the proportion of tin which will be easily saved in a mill with a simple gravity concentration flow-sheet. The two methods should be used.

The vanning assay in skilled hands will recover practically all the coarse tin but it will lose much of the slime tin. Owing to this, since the slime tin is the difficult part to save, the vanning assay will indicate the proportion of easily saved tin while the difference between the wet chemical and the vanning assay will give the amount of tin which will be difficult to save and therefore indicate the extent to which attempts to improve the recovery should be carried.

The wet chemical assay for tin ores was investigated by the Tin & Tungsten Research Committee and the results published in a paper by H.W. Hutchin in the Transactions of the Institute of Mining & Metallurgy 1917-19, p. 348.

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