GROOM RIVER ALLUVIAL TIN ORE DEPOSIT

Introduction

This alluvial area consists of the drainage basin of Groom River, the headwaters of which rise at the south-western end of Blue Tier. Tin ore was discovered here many years ago, but productive mining has been confined to the upper reaches owing to the obstructions caused by the dumping of tailing from the Anchor Mills into the stream lower down.

This report deals only with the sections of the river valley held under lease by the Groom River Tin Syndicate. In the work of examination it was thought desirable to check the boring performed by the Syndicate's Engineer, and also to bore other untested lots for the information of the Syndicate and the Department. The information so obtained forms the basis of calculation of value, and may prove helpful in the designing of plans for the operation of the deposits on a commercial scale.

THE PROPERTIES OF GROOM RIVER TIN SYNDICATE -

The areas held under lease and freehold extend three miles up the valley of the River and consist of:-

Lease	10064M	of 20	acres
"	10063M	" 20	"
"	10062M	" 20	"
"	10061M	" 20	"
"	10033M	" 40	"
"	10056M	" 80? - 63	acres
"	10058M	" 10	"
"	10057M	" 5	"
Dredging Claim	744	" 20	"
A total of		235	acres and
Freeholds Yost Flats		of 49	acres
Anderson's Farm		100	"
Booth's Farm		25	"
Singline's Land		27	"
A total of		201	acres

Of these areas, however, a very small portion only is occupied by tin ore-bearing beds of gravel.

Topography

Groom River is a youthful stream occupying a V-shaped valley cut deeply into granitic rocks of varying nature and hardness. The variation in the nature of these granitic rocks is responsible for the division of the valley floor into a number of small basins connected one with another through narrow rock-bound gorges.

These bars of hard rock caused lateral erosion of the softer rock and the formation of comparatively wide basins. Logs collected against the bars formed an obstruction which in flood time added to the lateral corrosive effect of the waters. It is apparent that the accumulation of drift sand and silt is due to the partial obstruction of the channel by drift wood and logs.

General Geology -

Character of the Rocks - The solid sedimentary rocks of the district consist mainly of sandstones, slates, phyllites, and coarse clastic rocks of Cambro-Ordovician age, and their metamorphic equivalents. In places intrusive granite of Devonian age has affected these sediments: sandstones have been altered into quartzites and excessive alteration of the clastic rocks has given them the character of schists. Groom River itself is confined to a granite valley east of the sedimentary igneous line of contact.

Small diabase dykes of Mesozoic age intrude the older rocks locally.

Unconsolidated deposits mantle the valley floors and portions of the sides. They include gravels laid down by Groom River, and detritus on the east side of the valley derived from tin-bearing granites.

Only the general distribution of the stream gravels is indicated on the map.

Recent Deposits - The Recent deposits of this area, the main object of this investigation, are of fluviatile origin. These fluviatile deposits include the tin-ore-bearing gravels of the valley bottom of Groom River and of small alluvial fans of tributary streams now covered with accumulations of tailing from the mills of the Liberator and Anchor Mines, which have crushed 2,000,000 tons of stone.

The natural beds are composed of coarse gravel, fine gravel, sand and silt. The coarsest and richest bed lies at the bottom along the gutter of the old stream. It consists of pebbles and sands and occasional large boulders (up to 15 inches), of quartz and porphyritic granite, and is narrow in comparison with the present valley bottom, which marks the extent of the present flood plain. Overlying the basal gravels are beds of fine gravel and drift sand and clay composed largely of the same materials and carrying a little tin ore. The flood plain carries only the finer grades of alluvial material, so that although the main channel is built up with gravels and boulders other parts of the present valley bottom are occupied by natural sands and silts and by tailing from the mills.

As regards the source of the tin ore and the associated pebbles of quartz, granite and porphyritic granite, it is evident that these materials constitute the waste of the large ore-bodies of the Anchor and other mines exposed and trenched by the action of the river and its tributaries. These waste materials have been carried downstream and the tin ore concentrated in the basal gravels.

As might be expected the heaviest boulders find permanent lodgment in the upper reaches as at Anderson's ground. The smaller boulders and gravels and much of the sands, silts, and tailing from the mills, are carried further downstream, the distance depending upon their fineness. Thus, there is a gradation from coarse to fine materials along the main flood way from the source through the properties. In the upper reaches (Anderson's ground) the average depth of alluvium is 10 feet, consisting of 5 to 8 feet of sandy clay, overlying 6 inches to 1 foot of drift sand, resting upon 3 to 5 feet of gravel and boulders. Here the boulders up to 15 inches diameter constitute one-fifth in bulk and the pebbles 2 inches to 6 inches in diameter one quarter of the whole.

The tin ore is mostly fine in grain, a considerable proportion being finer than 80-mesh. It is of good quality, but a little of pleonaste, zircon, and ilmenite is found in association.

THE DISTRIBUTION AND VALUE OF THE DEPOSITS -

The distribution of the tin ore-bearing gravels along a certain narrow gutter is indicated on the accompanying map by red lines. The boundaries of the gutter have been determined by drilling and by shaft sinking. All the drilling work has been performed for the Department by T.E. Bailey and the weighing and assaying of the concentrate by L.H. Bath of the Government laboratories.

In the work of testing these deposits the Syndicate sunk 39 holes and the Department 44 bore holes. The Department checked also the value of the gravels opened in some of the 33 shafts.

Details of the results of the testing operations are given in the subjoined tables.

NATURE AND THICKNESS OF THE BEDS OF ALLUVIUM (IN FEET)

MATERIALS	REMARKS	Number of bore hole											
		54	55	56	57	58	59	60	61	62	63	64	65
Battery tailing	fine-trace	8.5	7.0	7.33	4.5	6.0	9.33	12.0	13.33	7.5	11.5	7.0	7.5
Black soil	"	2.0	4.0	3.0	1.0	2.0	3.67	2.33	-	3.0	2.0	4.0	5.0
Sand & clay	"	4.8	1.0	2.67	7.0	2.67	-	-	-	-	-	4.5	-
Sand & drift	fine tin ore	1.4	3.0	2.0	2.5	2.0	3.0	1.67	1.5	6.0	2.0	1.5	4.0
Sands & gravels	fine to coarse tin ore	1.7	1.5	2.1	3.33	-	2.16	1.75	2.5	0.5	3.0	1.5	1.0
Granite	bedrock	hard	hard	hard	hard	soft	hard	hard	soft	hard	hard	hard	hard
	Depth of hole	18.4	16.5	17.1	18.22	12.67	18.16	17.75	17.33	17.0	18.5	18.5	17.5

MATERIALS	REMARKS	Number of bore hole											
		47	48	44	46A	49	50	45	51	53	32B	31A	52
Battery Tailing	fine tin ore in traces	6.0	6.5	8.0	7.0	5.0	5.0	6.5	8.0	8.33	6.5	5.5	3.33
Black soil	"	-	0.5	1.0	0.5	3.5	6.0	1.0	2.0	5.0	3.5	2.5	2.41
Sand & Clay	"	-	2.0	4.0	2.5	1.5	-	3.0	5.0	-	3.0	4.0	7.25
Sand & drift	fine tin ore	1.0	1.0	2.0	1.0	4.0	3.0	5.0	1.0	3.67	2.75	3.5	3.33
Sands & gravels	coarser tin ore	1.0	1.25	-	1.0	1.0	2.25	2.5	2.16	2.0	4.925	2.5	2.41
Granite	bedrock	hard	hard	hard	hard	hard	hard	hard	hard	hard	hard	hard	hard
	Depth of hole	8.0	11.25	15.0	12.0	15.0	16.25	18.0	18.16	19.0	20.67	18.0	18.73

		42A	66	67	68	69	70	40	41	42	43	44
Battery tailing	fine tin ore in traces	6.75	5.0	9.33	4.0	5.0	8.0	6.5	6.5	6.5	12.0	8.0
Black soil	"	-	4.67	0.5	2.0	3.0	2.0	1.5	4.5	6.0	6.0	6.5
Sand & clay	"	3.0	-	2.0	6.0	5.33	-	-	-	-	-	-
sand & drift	fine tin ore	6.25	5.0	2.5	5.0	-	2.0	8.67	5.0	4.0	-	-
Sands & gravels	coarser tin ore	1.33	0.5	0.67	1.0	0.67	1.0	2.00	2.0	1.75	2.5	3.25
Granite	bedrock	hard	soft	soft	soft	soft	hard	hard	hard	hard	soft	soft
	Depth of Hole	17.33	15.17	15.0	18.0	14.0	13.0	18.67	18.0	18.25	20.5	17.75

MATERIALS	REMARKS	Number of bore holes		
		45	46	47
Battery tailing	fine tin ore in traces only	6.0	10.0	
Black soil	"	4.0	-	
Sand & clay	"	2.0	2.0	
Sand & drift	fine tin ore	4.0	1.0	
Sands & gravels	coarser tin ore	2.0	2.0	
Granite	bedrock	soft		
	depth of hole	18.0	15.0	

In the calculation of the proportion of tin ore in the alluvial deposits the following formula, based on a bore-hole 3 inches in diameter, was used:-

$$\text{Lbs. of tin ore per cubic yard} = \frac{\text{Number of grains of tin ore} \times 0.077}{\text{depth of hole in feet.}}$$

In each case the concentrate of tin ore, obtained by vanning all the material extracted from each hole, was analysed, and from the result so obtained the proportion of tin ore of 70 per cent quality was calculated.

TIN ORE CONTENT

Registered No.	Number of Sample	Number of Bore Hole	Locality	Weight of Concentrates oz.	Proportion of tin in concentrate %	Tin ore in lbs. per cub. yd.(70% grade)	Depth of Bore hole in feet	Remarks
880	1	47	Booth's block	0.075	55.14	0.139	8	Diameter
881	2	48	" "	0.603	51.98	0.075	11.25	
1000	3	45A	C. Yost's block	1.148	45.28	0.76	18.3	of bore
1001	4	49	Yost's block	0.765	37.84	0.51	15.3	
1002	5	44A	C. Yosts block	0.015	40.80	0.0108	15.3	holes
1003	6	46A	Booth's block	0.084	47.07	0.086	12.3	
1004	7	50	C. Yost's block	0.53	54.66	0.48	16.25	4
1038	8	42A	" "	0.232	52.4	0.189	17.3	inches
1039	9	31A	" "	0.528	49.6	0.39	18.25	
1040	10	32B	" "	1.06	47.4	0.65	20.7	
1041	11	51	" "	0.184	36.1	0.098	18.1	
1042	12	52	" "	0.110	52.2	0.082	18.75	
1043	13	53	P. Yost's	0.775	54.26	0.58	19.3	
1044	14	56	S.W.Corner 10033/M	0.230	58.6	0.21	17.1	
1091	15	54	P. Yost's block	0.41	55.33	0.340	18.33	
1092	16	55	" "	0.37	51.2	0.309	16.5	
1093	17	59	10033/M	0.48	51.66	0.37	18.18	
1094	18	57	"	0.197	54.4	0.158	18.3	
1095	19	58	"	0.168	67.8	0.168	18.3	
1147	20	60	Singline's block	0.041	50.8	0.03	17.75	

cont...

TIN ORE CONTENT (cont.)

Registered No.	Number of Sample	Number of Bore Hole	Locality	Weight of Concentrates oz.	Proportion of tin in concentrate	Tin ore in lbs. per cub. yd.(70% grade)	Depth of Bore hole in feet	Remarks
1147	20	6o	Singline's W. Block	0.041	50.8	0.03	17.75	
1148	21	61	" "	0.361	48.3	0.271	17.33	
1149	22	62	" "	0.129	65.0	0.133	17.00	
1150	23	63	" "	0.559	53.0	0.432	18.50	
1151	24	64	10062/M	1.004	58.1	0.850	18.50	
1173	25	65	10063/M	0.36	57.44	0.319	17.50	
1174	26	66	"	0.526	52.96	0.49	15.18	
1175	27	67	10063/M	0.148	47.86	0.128	15.00	
1176	28	68	"	1.06	55.72	0.049	18.33	
1177	29	69	10064/M	0.047	62.66	0.056	14.00	
1178	30	70	"	0.04	65.40	0.0529	13.33	
		40			37.50	0.806	18.67	
		41			45.35	0.28	18.00	
		42			51.95	0.76	17.25	
		43			36.66	0.27	20.50	
		44				0.32	17.75	
		45			44.28	1.47	18.00	
		46	Booth's block		50.10	2.10	15.00	

TEXTURE OF THE TIN ORE -

The tin ore of the productive beds is generally sub-angular to rounded, brown to black in colour, and rather fine in grain. The texture of the tin ore shows a fairly thorough assortment, very few coarse particles being found, yet the greater part is not of extreme fineness.

The very fine tin ore in the uppermost bed (tailing) is lost in the operation of sluicing, and it is not regarded as of sufficient value to attempt its recovery with the main product by the adaption of other methods.

An idea of the various grades of tin ore may be gained by reference to the following table:-

LOWER REACHES

	Retained on			Passed thro'
	20 mesh	40 mesh	80 mesh	80 mesh
	%	%	%	%
40	0.82	3.67	30.26	65.25
41	-	2.68	48.33	45135
41	0.34	8.96	64.48	26.22
43	-	-	41.93	58.07
44	0.88	5.32	53.28	40.52
45	0.23	6.29	68.29	25.19
46	0.108	2.98	63.88	33.03

On Anderson's block of ground the tin ore is coarser in grainsize as shown in the table hereunder:

UPPER REACHES

Registered No.of Sample	Retained on %			Passed thro' %
	20 mesh	40 mesh	80 mesh	80 mesh
1013	NIL	33.33	55.95	10.72
1026	NIL	24.63	63.34	12.03
1038	0.27	30.27	57.83	11.63
1024	2.11	33.77	49.07	15.05
1012	1.224	22.04	60.408	16.328
1011	NIL	24.09	46.38	29.53

UPSTREAM DEPOSITS -

The beds of alluvium in Anderson's farm have been tested by sinking pits to bedrock. Here the average depth is 10 feet and the alluvium consists of 5 to 8 feey of sandy clay, 6 to 12 inches of drift sand, and 3 to 4 feet of gravel and boulders.

The tin ore content of the ground explored is shown in the subjoined table:-

(see next sheet)

Reg. No.	Over burden in ft.	Productive gravels in ft.	Depth of hole	Weight of concentrate oz.	Tin in concentrate %	Tin ore content in lb. per cub.yd.
1013	8.0	1.5	9.5	0.296	53.35	0.99
1026	5.0	5.0	10.0	0.601	60.25	1.40
1038	7.5	2.5	10.0	0.6525	57.10	0.80
1024	6.5	3.0	9.5	0.6684	56.35	1.20
1012	6.0	4.0	10.0	0.432	53.75	0.61
1021	9.0	3.0	12.0	0.292	53.45	0.50
	7.5	3.0	10.5			0.32
	8.5	3.5	12.0			0.47
	6.5	2.5	9.0			0.51
	6.5	4.0	10.5			0.72

The information contained in the foregoing table was obtained from shaft sunk on one side or the other of Groom River. It is reported that the boulder wash of the river channel is richer than that exposed in the shafts but the writer had not time nor the means at hand for the checking of the figures given in that report.

Holes sunk through the detrital materials close to the road show that the ground there is very poor. The richer ground is confined to a narrow strip, 2 to 4 chains wide, along the course of the stream.

THE TIN ORE VALUE OF THE PROPERTIES -

On the information obtained by boring and shaft sinking, as given in the tables herewith, it is possible to calculate to a fair degree of accuracy the tin ore content of the several areas. As regards value the first consideration is the definition of the critical line below which it is not possible to operate at a profit on the basis of present day conditions. The place of that line depends largely upon the method and scale of operations and the market price of tin. Until that line has been determined, it is considered inadvisable to attempt an estimate of value. All the other essential information is given in this report and the accompanying plan.

ECONOMIC CONSIDERATIONS -

The coarser and richer part of the gravels is deposited along a narrow zone at or near the middle of the valley bottom. The cover beds of this narrow belt at surface are almost clear of vegetation; but below the tailing bed are found many logs, and piled heaps of them in the gorges between basins. At such a place on Booth's farm, for instance, 10 out of 12 holes bottomed on logs lying under cover of 12 to 17 feet of mill tailing. Very few logs, however, were found in drilling the broader basin deposits.

The surficial bed of almost barren tailing forms the bulk of the materials of the basin deposits, and its removal presents a problem that may prove rather difficult of solution. Below this are the soil and drift sand beds, containing a little fine tin ore, overlying the productive beds of gravel and sand, which in turn rest upon a bedrock of slightly decomposed granite. Large stones constitute a small proportion only of the materials of the natural beds, therefore, the costs of removal and of sluicing should be low. The floor appears to have a gently undulating surface.

As regards the upper reaches the tailing cover is absent and its place in the section of alluvium is occupied by a stiff sandy clay which constitutes half of the bulk. Although the disintegration and removal of this barren sandy clay is not to be regarded lightly, the handling of the heavy boulders which constitute such a large proportion of the underlying productive gravels is a matter of much greater concern.

During six months of the year Groom River carries 8 to 12 sluice-heads of water. In summer the quantity is much lower, and in winter much higher. Floods are not infrequent during winter, and an occasional flood following a heavy storm comes during the dry seasons. The run-off is so quick that but for a regular rainfall the supply would be very erratic. Attention is directed to the necessity for making provision for the carry-off of flood waters. Although the stream is an aggrading one it has not reached its natural bed and is slow-flowing. It will be necessary therefore to raise the materials for sluicing and for dumping.

The areas may be conveniently divided into two mining groups and the deposits in each may be worked in conjunction provided that the water-supply is sufficient.

Generally the conditions for mining and transport are favourable.

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DIRECTOR OF MINES

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