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Grassy Scheelite Mine-King Is.
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GRASSY SCHEELITE MINE
KING ISLAND

KING ISLAND SCHEELITE LTD
by
H. Conder

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GRASSY SCHEELITE MINE, KING ISLAND.

This property is owned by the King Island Scheelite Development Company and consists of two leases No. 219P/M of 53 acres, and No. 220P/M of 218 acres, held under Mineral Lease from the Tasmanian Government at a rental of 5/- per acre per annum. There is also a Water Right on Grassy River.

The property is situated close to the sea-coast in the South-East corner of King Island. King Island itself is an island of considerable size - about 40 miles from North to South, and 16 miles across; situated in Bass Straits halfway between Victoria and the North-west corner of Tasmania.

The principal port of the Island is at Currie, on the West Coast, where there is a small harbour safe for ships of 400 or 500 tons burden, with good wharf facilities. From Currie, a good road extends to the Mine property, a distance of some 16 miles.

The sea-coast itself is fringed with sand dunes, Behind them the hills rise in a series of gentle slopes to a height of about 400 feet, which is the approximate level of plain country extending over this part of the Island. Nearly all the timber has been cleared in the vicinity, and the slopes are covered with a growth of grass, a circumstance which has given its name to the locality. The sea-coast itself curves round in a bay about four miles across, stretching from a projecting ridge of rock to the north, known as Bold Head to Jetty Point, about 1 mile south of the property. At this point there is shelter from the prevailing winds and a jetty was built by the Company, which formerly owned the mine. The jetty has been damaged by the sea, and with modern facilities for motor transport, it would be wiser to rely on road traffic rather than face the inconveniences of sea traffic with a harbour not wholly protected.

GEOLOGY.

The main feature of the geology is seen in the bold outcrops of granite which form projecting points along the sea-coast to the south and west of the property. The geology going north is concealed by the sand and recent alluvial deposits, until the summit of the hill is reached. Here outcrops of slates and sandstone occur, usually with flat dip, and on the south side of the Grassy River Valley a dense quartzite formation is displayed.

The formations at the Mine itself are very complex, and appear to be due partly to actual intrusions of rock material into the surrounding sedimentary rocks, partly to extensive alterations in those rocks by mineral bearing solution and vapours emanating from the cooling granite massif. This constitutes what is known as a "Contact Deposit", and in this case there is a physical disruption and crushing of the rock due to the intrusive action in addition to the chemical change, - in some cases most complete - in their nature.

The main intrusive rock is a variety of granite deficient in mica known as Aplite; this forms a definite dyke at one point in the property and narrow veins of it merging into quartz occur in other parts and in the cores of the bores. The solutions and vapours carry the Silica, the Calcium, the Iron, the Tungsten and various other elements, which ultimately turn the slates and sandstone into scheelite bearing garnet rock of every texture and consistency. It is unwise in formations of this character to expect regularity, though the dimensions may be extensive. The proximity of the granite, if the contact can be determined, is the most natural quarter in which to look for their development.

MINE WORKINGS.

Scheelite was first discovered on the sea shore close to an outcrop of green rock, possibly an altered slate which border to the South on Aplite, which again a few chains further on merges into granite. The ore traced up the hillside and garnet formations carrying the scheelite were opened up. After certain development work, they were considered payable, and ultimately nearly 70,000 tons were mined, partly by tunnels, partly by open cut, which on being crushed and concentrated, yield 589 tons of scheelite to the value of

£112,566. The collapse in the price of scheelite to 13/6d. per unit of Tungstic Acid led to the closing down of the property in 1920, when reserves were figured to amount to 50,000 tons.

The old tunnel workings have nearly all collapsed and surface soil has covered some of the quarry faces, but enough ore was left exposed to warrant a development campaign to prove the prospects of successfully re-opening the Mine.

Two distinct quarries were worked by the former Company, the west cut consisting of a long narrow excavation bearing west along the southern slope of the hillside, and the north cut working right into the rise of the hill. A tongue of rock was left and separates the Cuts. Prospecting shafts had been put down in advance of the quarry faces, and it was decided to open up three of these and to conduct a boring campaign to give some guide as to the distribution of the ore-bearing rock. The scheelite occurs in the Aplite and apparently, in most of the accompanying rocks, but the percentage increased with the mineralisation, and where the garnet predominates - especially in the more costly crystalline form, - the scheelite contents are expected to be the best. Garnet itself is a hard dark mineral consisting of silicates of Lime, Iron and Alumina.

The general conception of the distribution of the garnet scheelite deposits, was that it extended into the hill in flat beds of varying thickness, rising with the slope of the hill. Hence it shows massive on the West face of the North Cut, appears to pass through the "Tongue", and shows again in the South face of the West Cut. Underground it is explored by a tunnel still accessible, which goes West from the North Cut to connect with a shaft known as Vaudeau's, and then turns North under the ore showing in the North Cut.

It was decided to prove the extent of this ore in depth, and two parallel lines of three bores each, were laid out on a bearing about N. 22° E. and 120 feet apart. On each line two bores went down in the West Cut and one further South on the hillside. Their position is marked on the plan.

No. 6 was the southern-most one on the Eastern line, and was put down at an angle of 65° from the horizontal pointing northerly, and passed through clayey material for 40 feet, then quartzose and

slatey rock for another 20 feet: From there on to the bottom at 150 feet, it was ore-bearing for most of the way.

No. 5 bore was put down 120 feet North of No. 6, and from the West Cut level, about 20 feet lower, at its start. It was poor to 40 feet, some of it being in old workings. From 40 to 60 feet there was no core, and after that to 85 feet, the rock was garnet, carrying scheelite.

No. 4 Bore, 50 feet farther North, was sunk 83 feet on an angle of 45° from the horizontal, and after the first 10 feet, gave garnet rock carrying scheelite values. These bores indicate the extension of the garnet formation to a considerable depth at this part of the property.

In the second line of Bores, 120 feet West of the first, No. 1 Bore was put down in the West Cut in a direction about N. 22° E and at an angle of 45° from the horizontal, and carried to a depth of 163 feet. The first 28 feet gave no core, and from there to 80 feet the rock varies from slate and calcite to garnet rock. Results with water concentration were not promising, but assays reveal 2 feet of 1.68% ore at 50 feet, and some lower values on each side of this. It seems that a band of payable ore occurs at this horizon.

No. 2 Bore 30 feet South of No. 1 and also in the West Cut, was put down on the same bearing, and at an angle of 60° from the horizontal to a depth of 135 feet. So far only a limited number of assays have been done, but these indicate that much of the garnet rock passed through is of payable nature. From 13 to 17 feet results gave 3.07% and 2.35%. At 56 feet the assay was poor, giving 0.56% but at 80 feet the result was 1.60%. It seems probable that further assays here would extend considerably the dimensions of the payable ore.

No. 3 Bore South of the West Cut and on higher ground, put down on the same bearing at an angle of 65° from the horizontal to a depth of 143 feet, gave no solid core for the first 52 feet. From there on to 123 feet, the rock was very irregular, but the assay result at 60 feet was 5.56% and at 79 feet 2.70%, in each case over a section of 5 feet. The rock between the two assays was of similar character, and it seems probable that there is here a band of especially

good ore. At greater depth the slate rock comes in and there is less garnet rock.

No. 4 Prospecting Shaft is West and about 60 feet ahead of the West Cut, sunk 39 feet deep. After 16 feet of sandy rubble, it passed for over 20 feet through garnet rock. At the bottom a Drive was put out South about 16 feet, also in garnet rock. Two samples assayed from here gave just under 1% and the ore seems undoubtedly payable.

No. 2 Prospecting Shaft is just North West of the North Cut up on the hill. It carried rubble to 15 feet, followed by slatey rock to 28 feet and thence garnet rock carrying scheelite to the bottom at 37 feet. Two samples assayed from here gave an average of 1.45%, while the Tip itself averaged 0.71%. The ore here is clearly payable.

The faces of the North and West Cuts were sampled and 13 samples gave an average of 1.14% Tungstic Acid.

SUMMARY.

The position with regard to the ore reserves on the property is that the former Company extracted some 70,000 tons of ore from which good profits were made. When they ceased work they considered there were some 50,000 tons of reserves proved, while no limits had been reached in the extension of the ore-body. Recent work has been directed to checking up on the value and extent of the ore disclosed, and testing its limits in depth by means of bores.

A Cross-Section is enclosed showing the results secured from Bores 1, 2 and 3, and from the faces in the Cuts and such Drives as were accessible. The assay of low-grade scheelite ore is difficult and tedious, and in consequence this Report has been delayed, and only a limited number of samples has been assayed. Water concentration of the samples owing to the heavy character of the accompanying garnet has not been found reliable. Enough has, however, been done to show that a large ore-body exists here and that values are being maintained throughout it. It appears to be on the nature of a flat bed dipping at a small angle to the South and extending from No. 2 Prospecting Shaft down to Bore 3 at 70 feet. It would seem to show in Bore 2 at 15 feet but to have been missed by Bore 1, since for the first 30 feet there was no core. Indications are shown in Bores 1 and 2

of a parallel bed deeper down, and this fits in with the conclusions of the former Manager, but more information is required in regard to this.

The Cross-Section extends right up from Bore 3, 500 feet to No. 2 Shaft. The lateral extent as far as No. 4 Shaft would be about 400 feet, and no limit is disclosed in either case. The values obtained in these shafts are confirmed by those of the quarry faces and tunnels in between. To round off any estimates, it would be advisable to have more samples assayed, but it must be borne in mind that in this case, one is not trying out a new ore-body but the further extent of an ore-body from which a large tonnage has been secured and the working of which ceased only because of a most abnormal fall in the value of the product.

If further prospecting is desired, I should certainly advocate employing the magnetic method. This has been used in Russia and America to locate iron ores, and delicate instruments have been designed for such geophysical work, and were used at Renison Bell in Tasmania, and elsewhere in Australia. My compass was affected by local magnetism on the property, and this method should certainly be applicable.

Conditions for mining would be favorable. There is a large extent of ore above the level of the West Cut, and that could be worked on while preparations were being made and levels brought in to work the ore at greater depths. The West Cut is about 120 feet above sea level, and the hill slopes steeply, so that Open Cut work could probably be employed throughout.

CONCENTRATION.

Ordinary water concentration is applicable. The scheelite has a specific gravity of nearly 6. Ordinary rock comes between 2.5 and 3. The garnet rock has a specific gravity of 4.2. It is not easy to separate the garnet completely from the scheelite in water concentration, but it was found that if some of the garnet was allowed to remain with the scheelite and then separated magnetically, there was little loss of scheelite and a clean product could be secured.

Recently it has been found that the flotation process is applicable to scheelite, and this could be tried out on the Grassy ores.

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It is quite probable that it would fit in to re-treat the tailings and save the finer products.

COSTS.

The costs of the former Company were given as follows by Mr. H. Laver, in a paper on the Mine Practice:-

	s. d.
Ore Extraction	3. 4.61 per ton mined.
" Treatment	6. 7.19
Development	0. 3.02
Overburden	3. 6.29
General	<u>0. 4.17</u>
Total -	<u>14. 1.28</u>

These figures apply to the six months ending March 31st, 1920. The grade of ore was 0.67% Tungstic Acid. The grade of the concentrates was 69.6% and the recovery was 79.5%.

It should be quite possible to attain to or even improve on these costs. Wood has become scarce, but Diesel engines should lessen the cost of fuel. Labor is not so hard to secure or so aggressive as it was 15 years ago. Cost of some items has gone up, but mechanical appliances are better. It should be quite safe to figure on similar costs.

Transport conditions have improved immensely. Formerly there was virtually no road, while shipping charges in view of the danger and uncertainty of working from the Mine Jetty were excessive and service was irregular. Motor transport to Currie would be far cheaper in every way.

In any design of plant, it would seem advisable to be guided as far as can be ascertained, by the experience of the former Company, whose work seems to have been remarkably good. Their plant was designed for a weekly tonnage of 500. A plant designed for 300 tons per week with one shift, which could be extended to 500 per week on two shifts, would probably be most suited to the position. It is possible - even probable - that ore is there to enable work to proceed on a very large scale, but it would need an extensive development campaign to secure sufficient information to justify the erection of a plant on such a scale.

WATER SUPPLY.

This has an important bearing on the working. Formerly, it was pumped up from the Grassy River from sea level. This river carries a good supply of water all the year round, and has little fall for the last mile or so to the sea. Farther back there seems to be considerable fall. It would be advisable to ascertain at how high a level the water could be brought on to the mine. It could be delivered into a dam there which could be filling for the 24 hours. The overburden for the most part consists of sand and clay, which in places has slipped down into the workings. This material would be readily sluiced away, and if water was available at 100 or 150 feet above sea level, it could be pumped from that level on to the overburden, and would probably prove much the cheapest way of removing it. Much of the country is too rocky for race cutting, but light pipes could be used under small pressure at moderate cost.

ACCOMMODATION.

A certain expenditure would be necessary to provide camps for staff and workmen, but generally the surroundings are pleasant and healthy, and conditions are favorable to both work and existence.

CONCLUSIONS.

The conclusions arrived at are that there is a large body of payable scheelite ore on the property. The diamond drilling has shown that it extends to a considerable depth below the old workings, while the configuration of the country would enable it to be worked readily to this depth. The removal of overburden does not appear to be in any sense prohibitive, while the grade of ore seems to be well sustained in the present exposures. The general facilities in wayn of access, transport, etc., are far better today than formerly. There should be no difficulty in securing labor of reasonable quality and at standard rates. At present, the younger men on the Island work very hard for low wages at dairying. Water supply is satisfactory, and conditions generally are favorable. The concentration process was proved by the former owners and possibly could now be improved on by application of flotation methods to the slimes product. Climate and living conditions are good. Magnetic prospecting should be able to trace out the garnet rock beyond the present limitations.

I consider the information secured warrants the Company in proceeding with the development of the Mine, and the installation of machinery on a scale similar to that employed by the former owners.

(Signed) HARTWELL CONDER,

M.A. Cambs. A.R.S.M. London.

18th February, 1935.