COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.

MINERAL RESOURCES SURVEY.

REPORT No. 1946/6 .

(Plans Nos. 1339, 1340, 1341).

REPORT ON ASBESTOS DEPOSITS NEAR RENISON BELL TUNNEL, ZEEHAN DISTRICT, TASMANIA.
(HELD BY TASMANIAN ASBESTOS PTY. LTD.)

by

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Geologist.

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REPORT ON ASBESTOS DEPOSITS NEAR RENISON BELL TUNNEL, ZEEHAN DISTRICT, TASMANIA (HELD BY TASMANIAN ASBESTOS PTY. LTD.)

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1. INTRODUCTION.

In response to a request from Mr. W.H. Williams, Director of Mines, Tasmania, a geological survey was made of the asbestos deposits situated near the tunnel on the Emu Bay railway, 5 miles north-east of Zeehan, and held under lease by the Tasmanian Asbestos Pty. Ltd.

A discussion with Mr. Williams was held in Hobart prior to the survey. The operating company had applied for assistance including a geological survey. Mr. Williams had set out the following programme of investigations which he considered must be carried out before a comprehensive statement on the potentialities of the lease could be made. This programme was -

"1. A detailed survey of the deposit for the purpose of correlating the trend and sequence of asbestos-bearing serpentines.

2. A planned programme of prospecting and development work based on the survey to determine grades and tonnages of ore available for mining by opencut or underground practices or both.

3. An assessment of potential fibre grades and ore values in terms of extractability and market values.

4. Research in milling practice to determine extractability ratios, effective recoveries and fibre lengths.

5. Research into possible market utilization of fibre from the maximum extractable length down to dust fibre."

The geological survey and related investigations were concerned mainly with items 1, 2 and 3.

A survey plan was made available by the Company. It was drawn on a scale of 40 feet to one inch and covered approximately a quarter of the lease and showed the main open-cut workings, all underground workings, survey pegs and approximate ground contours above tram level at 10 feet intervals. Possession of this plan expedited the survey but the very steep slopes encountered everywhere on the lease made necessary a further survey by plane table and stadia alidade. The geological survey was commenced on the 21st and completed on the 29th November, 1945. Mr. L. Devlin, Surveyor of Mount Bischoff Mine carried out most of the instrumental work.

The main geological features of the lease were mapped on a scale of 100 feet to one inch. The area enclosing the main workings was mapped in more detail on a scale of 40 feet to 1 inch by means of the plane table set up over the company's survey pegs. The company's datum for reduced levels has been adopted for the attached plans.

Three plates are attached to this report.

Plate 1: Geological Map showing Asbestos Deposits near Emu Bay Railway Tunnel, Zeehan District; scale 100 feet to 1 inch.

Plate 2: Surface Plan of Main Asbestos-bearing Area, near Emu Bay Railway Tunnel, Zeehan District, scale 40 feet to 1 inch.

Plate 3: Plan showing Underground Workings and Effective Grades, Main Asbestos-bearing Area, near Emu Bay Railway Tunnel, Zeehan District; scale 40 feet to 1 inch.

Insets: Cross Sections AA', BB', CC', DD', EE', FF'.

2. HISTORY.

Chrysotile asbestos has been known to occur in this area for many years but it was not until fibre was disclosed in a cutting during the construction of the Renison Bell - Zeehan road in 1940 that any attention was paid to it as a possible source of commercial chrysotile. Prospecting work was undertaken by the Colonial Sugar Refining Co. in 1942. A company, Tasmanian Asbestos Pty. Ltd., was formed to work the deposits, and a mill was erected in 1942-1943. Ore was mined from several open cuts and later from developmental openings. Production of fibre commenced in 1943. Official production statistics recorded by the Department of Mines, Tasmania, are as follow:

	Tons	Value.
1943	18.25	£365
1944	102.79	£2,242
1945 (to the end of September)	231.28	£6,066.
Total:	352.32	£8,673

The Company launched an underground prospecting and developmental programme in 1945 and up to the end of November, some 1,630 feet had been completed. The programme was then curtailed pending consideration of future operations.

3. LOCATION, TOPOGRAPHY, ACCESS.

Tasmanian Asbestos Pty. Ltd. hold a square 80-acre lease with north-western corner approximately 150 feet south of the southern portal of the tunnel on the Emu Bay railway line between Renison Bell and Zeehan. The tunnel is approximately 5 miles by rail east-north-east from Zeehan.

The dominating topographic feature on the lease is a ridge which extends for 600 feet in an east-west direction, in the north-east portion of the lease, at an elevation of 400 feet above the railway line. The northern and eastern slopes of the ridge are very steep. To the south the steep initial slope gives place to two southerly trending ridges, the broad eastern one at an elevation of 350 feet above the railway level, and the sharp western one about 200 feet.

The Renison Bell - Zeehan road traverses the lease from north to south at 150 feet to 200 feet above railway level. The mill was erected at road level only 100 feet from the main road. Fibre is trucked by road to Zeehan railway station, and thence by rail to Burnie for shipment to Sydney.

4. GENERAL GEOLOGY.

In 1925 Mr. A. McIntosh Reid, of the Tasmanian Geological Survey, mapped a belt of serpentine and gabbro, up to a mile in width, trending east-north-east from the railway line for a distance of at least 2½ miles. The principal east-west ridge on the lease appears to be that marked "Serpentine Hill" on his map. It lies towards the western end of the belt of serpentine.

All outcrops on the lease can be referred to four rock types - sediments, gabbro, serpentine and hypersthenite.

The sediments occupy a large area north of the lease and extend into it to an average distance of 150 feet along the northern boundary. They comprise bedded shales, and weathered tuffaceous rocks belonging to the Dundas Series (see Plate 1). The contact with serpentine was mapped accurately in several places and constitutes almost a straight line striking due east. Approximately 100 feet north of the North-East open cut the contact is occupied by gossan, 12 feet wide, which carries some galena.

Coarse gabbro, fine gabbro and fine grained serpentinized rocks occupy a considerable area in the eastern and south-eastern portions of the lease.

The remainder of the lease, amounting to approximately one half, consists of serpentine and hypersthenite. The serpentine varies very considerably from place to place. Both crushed and massive varieties are found, the former usually grass green in colour, the latter from green to grey-green. The serpentine outcropping along the main east-west ridge is massive, tough, and, in places, speckled. Exposures are not continuous and portions of the area, shown as serpentine on the map, are inferred.

Hypersthenite forms the most conspicuous outcrops on the lease. It weathers to a rusty brown colour and, as it is much more resistant to weathering than the other rocks of the area, stands out as bold, brown outcrops. In fact, the existence of the prominent east-west ridge and of the sharp ridge near the mill is a direct result of the occurrence of hypersthenite in these two areas. Numerous large masses have rolled down the steep slopes and now form floaters resting on serpentine. They give an erroneous impression of the size and number of hypersthenite outcrops. In this area of strong relief it is a reasonable assumption that all important hypersthenite masses which intersect the surface have been discovered.

In a broken face the hypersthenite is black to slightly greenish black in colour. It is tough and massive. Thin sections examined under the microscope consisted almost entirely of hypersthene (or enstatite), altered to serpentine along fractures. The only other minerals present was magnetite in very small grains.

The field occurrence generally is peculiar. The rock does not, with very few exceptions, form continuous outcrops with definite boundaries. The normal occurrence is as 'boulders' or 'kernels', which may range from a foot to twenty feet or more in diameter, embedded in serpentine. There is, however, a definite segregation of the kernels within areas which have fairly well defined limits and these are shown on plate 1. Elsewhere the general mass of the serpentine is free from hypersthenite. The grouping of hypersthenite kernels and masses within definite areas strongly suggests that these areas were formerly hypersthenite of which the kernels are relics. It is possible that serpentine derived from hypersthenite would be distinct from the main serpentine of the area. Some investigation on this line was carried out, but results were inconclusive.

The most regular body of hypersthenite occupies a prominent ridge along the contact of the gabbro and serpentine

above the road in the southern part of the lease. South of the mill there is another large, fairly regular body. Straight line contacts with serpentine are noted elsewhere on the lease.

There appear to be only two possible explanations of the field relations between serpentine and hypersthenite - (1) that the hypersthenite kernels and masses are unaltered relics of an extensive area of an original rock which has elsewhere been serpentized, and (2) that the hypersthenite-bearing areas represent solid hypersthenite masses which intruded the serpentine as relatively small irregular dykes. All available evidence points to the latter as the correct explanation.

5. ECONOMIC GEOLOGY.

General: Chrysotile asbestos occurs as veins in serpentine and, to a lesser extent, hypersthenite. No veins are known in the gabbro and associated rocks, nor in the sedimentary series to the north.

The lease was examined alone and in company with the mine manager, and exposures of fibre-bearing rock were plotted. A few occurrences may have been missed, but they would be of minor importance only. After the survey had been completed, it was evident that a high percentage of the visible fibre was contained within a few areas of limited dimensions.

In some areas fibre-bearing rock is obviously restricted to definite areas which could be delimited easily on a map. In other areas, e.g. the No.4 cut orebody, fibre is so sparse that grouping of the several occurrences into an orebody is somewhat artificial.

Distribution of Orebodies: These fibre-bearing areas, of which nine have been mapped, are surface outcrops of orebodies. Results of underground development work and of surface mining confirm the surface mapping, i.e. that fibre is, in the main, restricted underground to definite sections which correspond with the surface occurrences.

The geological map on Plate 1 shows clearly the association, and general over-lapping, of fibre-bearing areas with hypersthenite areas. There is no important exception to this generalisation. Even the North-East orebody, in which no hypersthenite was encountered, has its western and southern limits determined by this rock.

Exposures in the open cuts reveal quite clearly the important part played by fracturing in the formation of ore. There is no doubt that the different responses of portions of the hypersthenite masses and adjacent serpentine to applied stresses has resulted in localised crushing and subsequent selective mineralisation. Whether mineralisation took place along definite zones of shearing could not be determined conclusively, but does not seem to be the case.

One is forced to the conclusion that the presence of hypersthenite was a pre-requisite to the formation of chrysotile and that mineralisation affected only fractured hypersthenite and the serpentine adjacent to it. This has an important bearing on the possibilities of locating new orebodies. A glance at Plate 1, on which hypersthenite areas are plotted, is sufficient to show that the areas in which chrysotile orebodies may outcrop are definitely limited in number and dimensions.

Distribution of Fibre within the Orebodies: The rocks within the orebodies comprise barren hypersthenite, fibre-bearing rock and barren serpentine, except in the North-East orebody, where hypersthenite is lacking.

The distribution of veins of fibre within the orebodies is highly erratic. Commonly a narrow zone of ore surrounds kernels of hypersthenite, which are themselves usually barren. Veins in this zone are sub-parallel to the margins of the kernel whether the latter is flatly lenticular or spherical. The greater part of the fibre is obtained from veins occupying fractures in the serpentine.

The shape of the kernels is a reflection of the fracture pattern developed in the mineralized serpentine. Where the fractures in the serpentine follow several different directions, and dips range from flat to vertical, the kernels are spherical or broadly elliptical. Where the fractures are sub-parallel in strike and dip, the kernels are flatly elliptical.

The actual distribution of concentrations of veins through the orebodies is generally highly irregular. In only one place has a regular shoot of ore of milling grade (5 to 6 per cent.) been discovered. This was an easterly trending vertical shoot located in the North-East orebody with a maximum length of 25 feet, vertical extent of 60 feet, average width of 5 feet and average grade of 5 per cent. It has been stoped out. All other shoots encountered have been much smaller, and the grade of ore generally well below milling grade, so that sorting was essential. Experience in mining has been that vein concentrations are not distributed regularly through the orebodies, nor are they individually large in extent.

Chrysotile Veins and Fibre Length: The asbestos is the chrysotile variety, chiefly of the cross-fibre type, although a very small amount of slip fibre has been found in places. The veins vary from a knife-edge up to an inch in thickness. Veins over half an inch thick are not common, and the great majority are less than one quarter of an inch. In many of the thicker veins the fibre is interrupted by flaws running parallel to the walls which reduce the length of the commercial fibre recovered.

The company has been unsuccessful in locating veins of long fibre chrysotile which could be hand-cobbed. All fibre is extracted by milling. The average length of the fibre recovered from the several open cuts and underground workings has been found to be practically constant, and the bagged fibre is rated on screen analysis as equivalent to grade 5D imported Canadian fibre, (i.e. 0/16 plus ½" mesh, ½/16 plus ¼" mesh minus ½" mesh, 10½/16 plus 10 mesh minus ¼" mesh, 5/16 minus 10 mesh). Quite an appreciable proportion of the fibre in the ore is too short to be recovered in the mill.

6. DESCRIPTION OF OREBODIES AND WORKINGS.

Surface mapping has shown that a high percentage of visible fibre is contained within nine separate areas, outside of which only occasional minor patches of fibre have been found. Most of the known occurrences are shown on Plate.1. The company has carried out mining and developmental work on the five most promising areas. The other areas are either too small or obviously too low grade to be worth attention.

General descriptions of the fiveprincipal orebodies are given below.

Hill Orebody: This outcropped on the crest of the ridge on which the mill is built. It has h proved length of 140 feet and width of 90 feet, strikes at 65 degrees and appears to dip steeply west. There is a probable narrow extension to the south for 100 feet. The orebody is divided into two sections by 25 feet of barren serpentine. All ore above R.L. 853, the level of the cracker in the mill, has been mined in the open cut and the maximum heightof the faces above this level is 16 feet. To the south and north barren serpentine cuts right across the line of strike. There is a well defined elongation of fibre areas, kernels and fractures on a bearing of 65 degrees.

The No. 4 Cut Orebody has been mined in No. 4 open cut. It consists of the usual mixture of serpentine, kernels and fibre-bearing serpentine. In the face, which was 39 feet high at the time of inspection, hypersthenite and serpentine were exposed to a height of 25 feet and the top 14 feet of the face was occupied by barren serpentine. An adit driven into the hill for 70 feet and short cross-cuts put out on either side passed through hypersthenite and serpentine all the way. To the east of these workings there are outcrops of hypersthenite and serpentine with a few isolated small patches of fibre showing. Average grade of this eastern area on the surface appears to be very low. The presence of fibre and hypersthenite throughout the length of the adit indicates a general flat dip of the hypersthenite body and of the ore.

No. 5 Cut Orebody: The orebody has been mined in No. 3 cut, No.5 cut, and a small cut below tram level. It is 300 feet long and up to 55 feet wide in the outcrop. Developmental work consists of an adit 135 feet long with 120 feet of cross-cutting and rising. An adit has also been driven from No. 3 cut for 215 feet, and a short cross-cut and drive put out. In No. 5 cut there is the usual mixture of hypersthenite, serpentine and fibre-bearing serpentine. Ore showing in the face at the time of inspection was low in grade and the thickness of barren serpentine overlying the ore was considerable. The east wall of the cut is serpentine and appears to constitute the eastern limit of the orebody. In the No. 3 cut, fibre could be seen in the orebody to a height of 16 feet above the floor of the cut. Above this point the face consisted chiefly of hypersthenite with only traces of fibre. The distribution of hypersthenite and fibre in the underground workings indicates that the hypersthenite mass and the orebody dip fairly flatly into the hill (see sections on plate 3).

No. 1 Cut Orebody appears to have small dimensions. Fibre-bearing rock extends on the surface for a short distance only to the east and west of the cut, and an adit driven south-west from the cut failed to locate ore. Very large kernels of hypersthenite are prominent.

North-East Orebody: The orebody has been open cut at tram level, and at a higher level, and a total of 815 feet of prospecting and developmental work carried out.

Distribution of ore in this area is so erratic that the grouping of the fibre occurrences into one orebody is a somewhat artificial one. It may be that there are two ore-bearing sections, but for purposes of open-cut mining they must be regarded as one. The limits to the orebody have been taken as the limits of fibre on the surface. Within these limits there are large areas with no fibre. Outside of these limits ore has been cut in the No.2 Bottom, Upper and Top adits, which may belong to one band up to 25 feet wide trending south-west parallel with the pyroxenite contact on the surface.

7. ESTIMATES OF GRADES.

Throughout this report grade of ore is expressed as 'effective grade', i.e. the percentage of fibre recoverable by the methods of mining and milling practised during 1945.

Mining practice consisted of breaking a face in open cuts or underground, hand-sorting ore to 5 or 6 per cent. grade for delivery to the bins, and dumping rejects at the mine. Between one-quarter and one-half of this rejected material was hard hypersthenite which was practically devoid of fibre. The remainder was serpentine which carried some 5D fibre possibly of the order of 1 per cent. or more. The only way of determining an approximate average grade of the rejects would be to crush bulk parcels. In the estimations of effective grade given below it has been assumed that reject material is barren, because it does not reach the mill.

The manager has carried out tests on mill efficiency, and estimates that for every five tons of fibre of 5D grade recovered, one ton of similar grade was lost and about three tons of fibre of 7D and lower grades were also lost. This implies an actual mill efficiency of approximately 55 per cent. It is questionable whether it would be profitable to instal and operate additional plant to improve the recovery of 5D fibre. The capital outlay and operating costs of plant which would be necessary to recover the finer fibre lost, the efficiency of the plant if installed, and the market, if any, for the fine fibre are all unknown factors. In the absence of information on these points the economic possibilities are assessed in terms of actual recoveries effected.

The distribution of fibre through the various orebodies is so irregular that the only effective way of sampling is to mill bulk parcels. Fortunately excellent records of mill crushings have been kept by the mine manager and these were made available.

About 6,141 tons of ore were put through the mill to the end of October, 1945, for a recovery of 360 tons of bagged fibre. This is equivalent to an average effective head value of 5.8 per cent. for ore delivered to the mill. For the first 2,200 tons milled the recovery was 4.7 per cent., but later rose to slightly above 6 per cent.

Mill Cut Orebody:

Mill Cut - 4,211 tons were mined for 1,762 tons of milling ore of assumed grade 4.7 per cent. Later 875 tons were mined selectively for 634 tons of milling ore of assumed grade 6.3 per cent. Effective grade was 2.4 per cent.

After the latter operation the company regarded as waste rock all material left standing above the level of the floor of the open cut. This would have to be mined as part of the orebody if an open cut were developed at a lower level. The quantity of waste rock left standing is estimated at 2,000 tons. Average effective grade of the orebody over an area of 140 feet by 90 feet at this level, is, therefore, 1.7 per cent.

No. 5 Cut Orebody:

No. 5 Cut - 1,854.5 tons were mined for 867.5 tons of ore of assumed grade 6.3 per cent; i.e. an effective grade of 2.9 per cent.

No. 3 Cut - 3,002 tons were mined for 357 tons of ore of assumed grade 5.8 per cent; i.e. an effective grade of 0.7 per cent.

No. 5 Adit Workings -835 tons were mined for 373 tons of milling ore of assumed grade 6.3 per cent; i.e. an effective grade of 2.8 per cent. Average grade in the adit was 3.5 per cent. and in the cross-cuts and rise 0.9 per cent.

No. 3 Adit Workings - (to limit of ore) - 160 tons mined for 40 tons of milling ore of assumed grade 6.3 per cent; i.e. an effective grade of 1.6 per cent.

An assessment of average effective grade for the orebody as a whole, within the limits shown on Plate 2, is difficult. A figure of 2.8 per cent. may be taken as an upper limit. If due weight is placed on the low grade of ore in No. 3 cut, and in the cross-cuts and rise from the adit, average grade is probably of the order of 1.8 per cent.

No. 4 Cut Orebody:

No. 4 Cut - 1,273.5 tons were mined for 543 tons milling ore of assumed grade 6.3 per cent; i.e. an effective grade of 2.7 per cent.

No. 4 Adit Workings - average effective grade approximated 1.5 per cent.

To the east of the adit the orebody has not been opened up.

No. 1 Cut Orebody:

No. 1 Cut - 2,450.5 tons were mined for 140.5 tons of milling ore of assumed grade 5.8 per cent; i.e. an effective grade of 0.3 per cent.

Large knobs of hypersthenite were left standing so that overall effective grade would be lower than this figure.

No. 1. Adit - No ore.

North-East Orebody:

Bottom Cut - 2,770 tons were mined for 919.5 tons of milling ore of assumed grade 6.3 per cent; i.e. an effective grade of 2.1 per cent.

Top Cut - 355 tons were mined for 45 tons of milling ore of assumed grade 6.3 per cent; i.e. an effective grade of 0.8 per cent.

The underground workings are not well placed for determination of the grade of open-cut ore. The No.2 First adit workings averaged 1.1 per cent. From the portal of No. 2 Bottom adit, 3 per cent. ore extends south for 20 feet. How far this ore extends west is not known, but it continues east of the adit for only a few feet. In the No. 2 Upper adit workings a shoot of ore of milling grade 20 feet long and 10 feet wide was intersected in the adit and driven on east and west. The ore was later stoped out and effective grade was probably about 5 per cent. In the No. 2 Top adit, apart fromoore in the initial cut, no ore was intersected for a distance of 30 feet south.

It is highly improbable that the grade of the block as a whole will exceed the average grade of the two open cuts, i.e. 1.9 per cent. Judging from the absence of fibre over large areas of the surface here, the grade will probably be very considerably lower than the above figure, possibly of the order of 4 per cent.

Outside the limits chosen for the North-East Orebody a band of ore of effective grade 1.5 per cent. and about 25 feet wide was cut in the No. 2 Bottom adit. It is separated from ore to the north by barren serpentine. If the ore cut in the No. 2 Upper and Top adits is part of the same band, its disposition would be vertical and grade approximately 1.5 per cent.

8. ESTIMATES OF ORE RESERVES.

Mill Cut Orebody: All ore has been removed from above mill level and there are no partly developed reserves.

No. 5 Cut Orebody: Partly developed reserves above tram level are estimated at 40,000 tons of possible effective grade 1.8 per cent.

No. 4 Cut Orebody: There are no developed reserves.

No. 1 Cut Orebody: Developed reserves are very small.

North-East Orebody: The block of ground within the limits shown on plates 2 and 3, comprises 35,000 tons to tram level. Average grade of this block will not exceed 1.9 per cent. and is possibly of the order of 1 per cent.

9. POSSIBLE EXTENSIONS OF ORE AND DEVELOPMENT PROGRAMME.

Geological mapping has shown that no orebodies will be located away from the hypersthenite bodies. Furthermore it is considered that all outcropping orebodies of possible commercial value have already been located. This does not preclude the possibility of locating orebodies which do not outcrop. Such almost certainly exist but, as there is no reason to expect the grade to be higher than those already discovered, they must be disregarded as potential sources of fibre.

Possibilities of adding to reserves can be looked for only in extensions of the already known orebodies. As the latter have very limited surface dimensions, extensions in depth can also be expected to be limited.

The Hill Cut Orebody may extend to a depth of 50 to 100 feet below bench level. Any ore mined from the orebody would have to be hoisted. If prospecting is undertaken, an adit should be driven at R.L.800 from co-ordinate position 160E/1100N on a bearing of 110°. If ore were intersected, drives could be put out along the middle of the orebody, short cross-cuts developed from these, and a rise put up to the surface through the orebody.

The No. 4 Cut Orebody: There is a possibility of developing ore to the south of No. 4 adit, mainly below tram level, although surface indications are anything but encouraging.

To prospect the orebody an adit should be driven due east at a point about 100 feet south of No. 4 adit and located near the bottom of the fibre-bearing area.

The No. 5 Cut Orebody appears to dip flatly into the hill. Development work such as the extension of both eastern cross-cuts from the No. 5 adit to the limits of ore, and rising from the cross-cuts, would define ore limits and grade of ore above tram level more definitely. Prospecting below tram level could best be accomplished by driving an adit cross-cut, 50 feet vertically below the tramline, on a bearing of 120 degrees from co-ordinate position approximately 640E/1450N.

North-East Orebody: A 70 foot adit driven from tram level midway between No. 2 Bottom adit and the No. 2 First Level is necessary to enable a more reliable assessment of grade of open-cutting ore.

Ore goes underfoot at tram level in the open cut area. An adit cross-cut driven directly below the open cut at a level 50 feet lower would prospect the continuation of ore in depth. Any ore located would be very expensive to mine as hill slopes are very steep and the overburden-ore ratio in an open cut would probably be very high.

Should any more development work be undertaken it would be advisable to seek geological advice on the course of further work after the initial adits had been driven.

10. ECONOMICS.

The economics of the mine are assessed below in terms of actual recoveries affected by the mining and milling methods practiced during 1945. As already indicated in section 7, the manager estimates that approximately 55 per cent. of the total fibre in the ore delivered to the bins is recovered. Approximately one quarter of the fibre lost in the tailings is of the same grade as the recovered fibre, i.e. 5D. The remainder varies from 7D grade to dust. This means that the recovery of grade 5D is about 80 per cent.

Canadian chrysotile of 5D grade is landed at Sydney at the present time for £25 per ton. Cost of transport from Zeehan to Sydney is £5 per ton, making value of fibre at Zeehan equal to £20 per ton.

On this basis milling ore of 6.3 per cent. effective grade would contain 25/- worth of recoverable fibre.

Operating costs in the mill are estimated by the Manager at £8 per ton of fibre recovered, or 10/- per ton of 6.3 per cent. ore.

That is, for profitable working, mining, handsorting and transport of milling ore must be carried out for 15/- per ton. Up to the end of November, 1945, the average ratio of waste rock to milling ore was between 39 and 40 per cent. That is, on ore with little overburden, between 2½ and 3 tons of rock had to be broken, sorted and transported for 15/-, or 5/- to 6/- per ton, to meet operating costs alone. This was not achieved.

Stoping is therefore out of the question on cost alone, apart from the fact that sorting could not be carried out effectively in stopes. The only possible method of mining is by open cuts.

The No. 5 Cut and North-East cut orebodies are the two most promising on the lease. Partly developed reserves in these two orebodies amount to 40,000 tons of effective grade possibly 1.9 per cent. and 35,000 tons of effective grade possibly 1 per cent. If the ore is mined in open cuts, a considerable amount of barren serpentine would have to be removed. The ratio of overburden to ore is estimated at between 1 to 1 and 2 to 1. Effective grade of ore-plus-overburden would, therefore, drop to possibly 0.9 per cent. and 0.5 per cent. equivalent to 3.2/- and 2/- per ton respectively.

Apart from the No.5 cut and North-East cut orebodies, the only two orebodies with any prospects of commercial ore are the Hill Cut orebody and the No. 4 Cut orebody. In the former, average effective grade of ore which may be developed below bench level is not likely to exceed 1.7 per cent. Necessary removal of waste rock would reduce effective grade to, 1.4 per cent at most, equivalent to 5.6/- per ton. It must be borne in mind that all milling ore won here would have to be hoisted. The No. 4 Cut orebody is very unlikely to develop better than the No. 5 Cut orebody.

The value per ton of ore in situ is so low that it is very unlikely that the orebodies could be worked at a profit, even if operations were carried out on a large scale. The total tonnage of fibre which could be recovered from all deposits on the lease is estimated at between 2,000 and 4,000 tons. It is obvious that potential reserves on the lease are far too small, and the possible life of the mine far too short, to warrant the introduction of a large mill and rock-moving equipment, which would be necessary to increase recovery and lower costs.

11. SUMMARY.

On the lease held by Tasmanian Asbestos Pty. Ltd. near the Emu Bay Railway Tunnel, Zeehan District, nine separate fibre-bearing orebodies have been located, in close association with hypersthenite bodies. Geological mapping has shown that the finding at the surface of other orebodies of possible commercial importance is unlikely.

The five most promising orebodies have been prospected and developed to some extent, and, at the same time, open cuts have been developed. The orebodies are shown to be small, the largest having outcrop dimensions of 300 feet by 55 feet. Overall effective grades are, in all instances, low, ranging between 0.3 per cent. and 1.8 per cent.

Partly developed reserves in the two most promising orebodies are 40,000 tons of possible effective grade 1.8 per cent. and 35,000 tons of possible effective grade 1 per cent. There are only two other orebodies on the lease with any commercial possibilities.

Open cut mining is the only feasible mining method to adopt, and this would entail the removal of large tonnages of barren overburden, which would lower effective grades to approximately 50 per cent. of the above figures.

The total possible reserves of recoverable fibre in all orebodies on the lease are estimated at between 2,000 and 4,000 tons.

A consideration of the economics of mining and milling shows that the mine cannot be made to operate at a profit on present scale of operation. The facts that individual orebodies are small in size and that overall possible reserves on the lease are very limited, preclude the possibility of operating on a larger scale.

CANBERRA.
6th February, 1946.

C.L. Knight.
Geologist.

PLATE I.

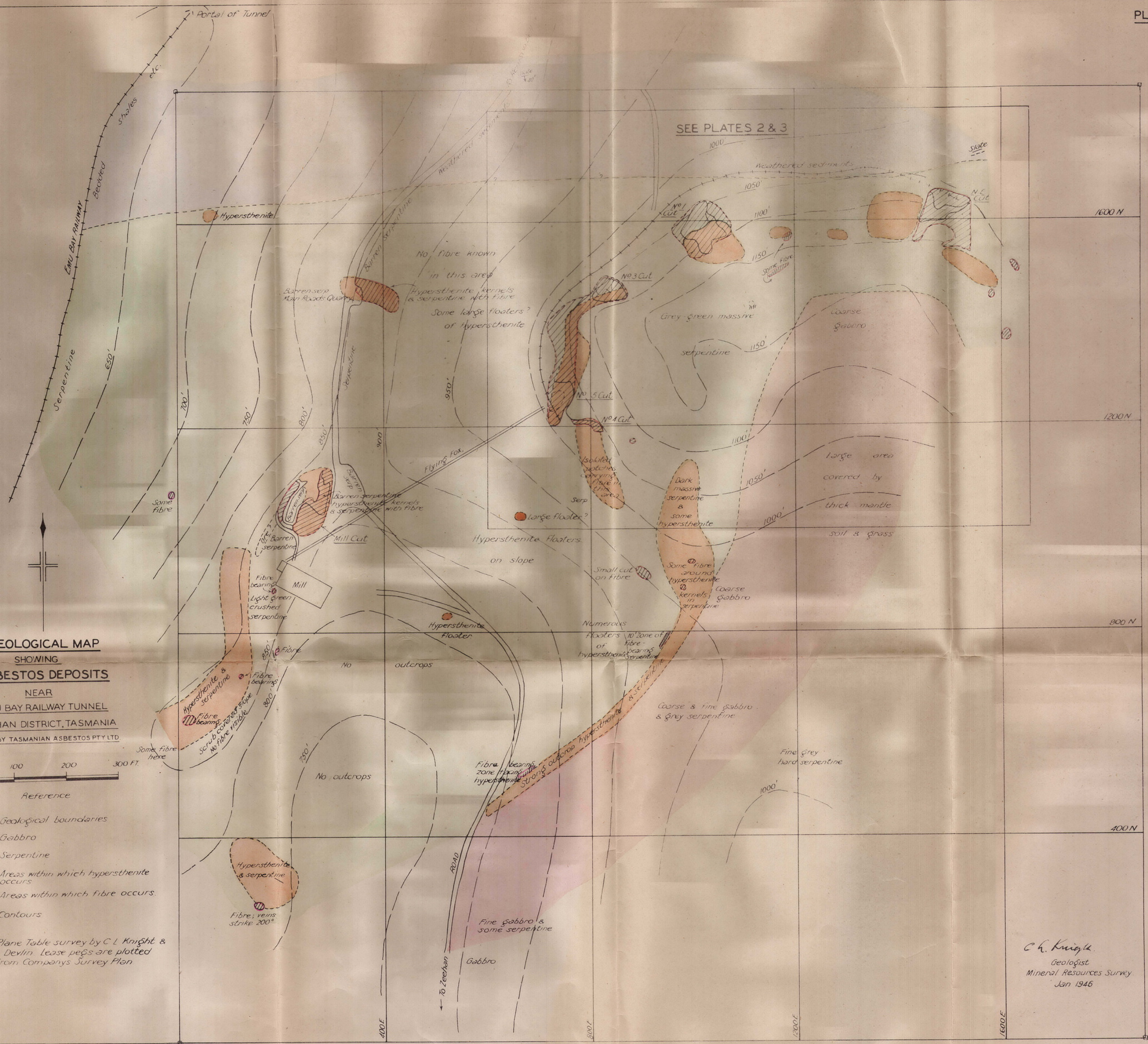
GEOLOGICAL MAP
SHOWING
ASBESTOS DEPOSITS
NEAR
EMU BAY RAILWAY TUNNEL
ZEEHAN DISTRICT, TASMANIA
HELD BY TASMANIAN ASBESTOS PTY LTD.

0 100 200 300 FT.

Reference

- Geological boundaries
- Gabbro
- Serpentine
- Areas within which hypersthenite occurs
- Areas within which fibre occurs.
- 150 Contours

Plane Table survey by C.L. Knight & L. Devlin. Lease pegs are plotted from Company's Survey Plan



C. L. Knight.
Geologist
Mineral Resources Survey
Jan 1946

1339

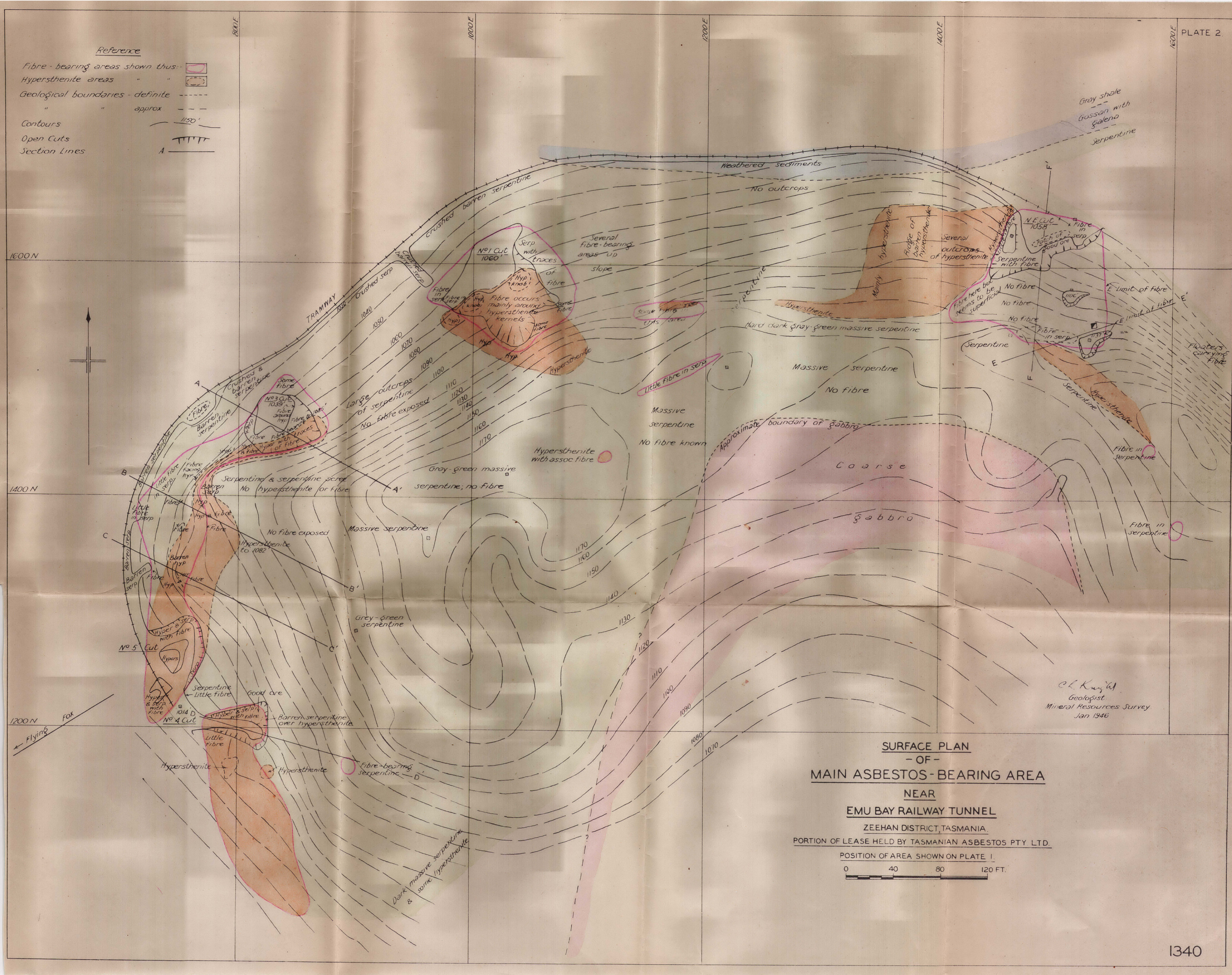


PLATE 2.
Reference
Fibre - bearing areas shown thus:-
Hypersthenite areas " "
Geological boundaries - definite
" " approx
Contours 1150'
Open Cuts
Section Lines A
800E
1000E
1200E
1400E
1600E
1600N
1400N
1200N
TRAMWAY
Crushed barren serpentine
Crushed serp
Weathered sediments
No outcrops
Gray shale
Gossan with galena
Serpentine
Nº 1 Cut 1060'
Serp with traces of fibre
Fibre occurs mainly around hypersthenite kernels
Hyp knob
Hypersthenite
Several fibre-bearing areas up slope
Mainly hypersthenite
Ridge of barren hypersthenite
Several outcrops of hypersthenite
N.E. Cut 1058'
Serpentine with fibre
Fibre in serp
No fibre
E. Limit of fibre
Hard dark gray-green massive serpentine
Little fibre in serp
Massive serpentine
No Fibre
Massive serpentine
No fibre known
Floaters carrying fibre
Approximate boundary of gabbro
Coarse
gabbro
Fibre in serpentine
Hypersthenite with assoc fibre
Crushed & barren serpentine
Nº 3 Cut 1039'
Some fibre
Large outcrops of serpentine
No fibre exposed
Barren serpentine
Gray-green massive serpentine; no fibre
Serpentine & serpentine scree
No hypersthenite or fibre
Barren serp
Little fibre in serp
No fibre exposed
Massive serpentine
Hypersthenite to 1082
Barren hyp
Barren serp
Hyper & serp with fibre
Nº 5 Cut
Serpentine Little fibre
Good ore
Nº 4 Cut
Barren serpentine over hypersthenite
Little fibre
Grey-green serpentine
Hypersthenite
Fibre-bearing serpentine
Dark massive serpentine & some hypersthenite
Flying Fox
C. L. Knight
Geologist
Mineral Resources Survey
Jan 1946
SURFACE PLAN
- OF -
MAIN ASBESTOS - BEARING AREA
NEAR
EMU BAY RAILWAY TUNNEL
ZEEHAN DISTRICT, TASMANIA.
PORTION OF LEASE HELD BY TASMANIAN ASBESTOS PTY. LTD.
POSITION OF AREA SHOWN ON PLATE I.
0 40 80 120 FT.
1340

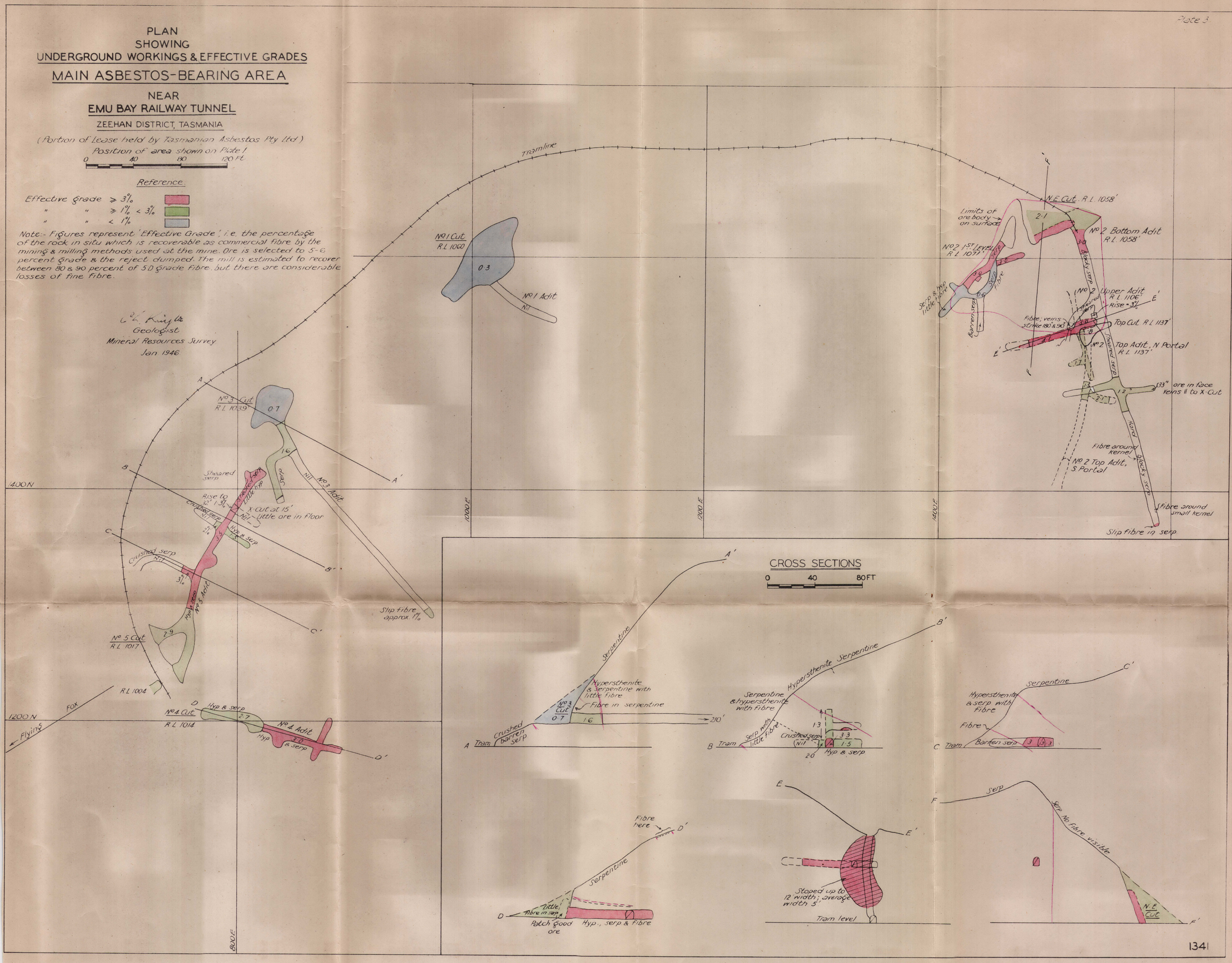


Plate 3
PLAN
SHOWING
UNDERGROUND WORKINGS & EFFECTIVE GRADES
MAIN ASBESTOS-BEARING AREA
NEAR
EMU BAY RAILWAY TUNNEL
ZEEHAN DISTRICT, TASMANIA
(Portion of Lease held by Tasmanian Asbestos Pty Ltd)
Position of area shown on Plate 1
0 40 80 120 Ft
Reference.
Effective Grade ≥ 3%
" " ≥ 1% < 3%
" " < 1%
Note:- Figures represent 'Effective Grade', i.e. the percentage of the rock in situ which is recoverable as commercial fibre by the mining & milling methods used at the mine. Ore is selected to 5-6 percent grade & the reject dumped. The mill is estimated to recover between 80 & 90 percent of 5.0 grade fibre, but there are considerable losses of fine fibre.
Geologist
Mineral Resources Survey
Jan 1946
Tramline
No 1 Cut
R.L 1060
0.3
No 1 Adit
Nil
No 3 Cut
R.L 1039'
0.7
1.6
No 3 Adit
Nil
Slip fibre approx. 1%
Sheared serp
Rise to 32' 1.3%
X-Cut at 15' little ore in floor
Crushed serp
Hyp & serp
Crushed serp
Nil
No 5 Adit
No 5 Cut
R.L 1017
2.9
R.L 1004
Fox
Flying
No 4 Cut
R.L 1014
Hyp & serp
2.7
No 4 Adit
3.0
Hyp & serp
400 N
1200 N
800 E
1000 E
1200 E
1400 E
N.E Cut. R.L 1058'
Limits of ore body on surface
2.1
No 2 Bottom Adit
R.L 1058'
No 2 1st LEVEL
R.L 1077'
Serp & Hyp little fibre
Barren serp
Fibre; veins strike 180 & 90
No 2 Upper Adit
R.L 1106'
Rise = 3%
Top Cut R.L 1137'
No 2 Top Adit, N Portal
R.L 1137'
Sheared serp
133" ore in face veins ll to X-Cut
1.2
Hard blocky serp
Fibre around kernel
No 2 Top Adit, S Portal
Fibre around small kernel
Slip fibre in serp
CROSS SECTIONS
0 40 80 FT
Serpentine
Hypersthenite & Serpentine with little fibre
No 3 Cut
0.7
1.6
Fibre in serpentine
210'
Crushed barren serp
Tram
Hypersthenite Serpentine
Serpentine & hypersthenite with fibre
Serp with little fibre
Crushed serp
Nil
2.0
1.3
3.3
1.5
Hyp & serp
Serpentine
Hypersthenite & serp with fibre
Fibre
Barren serp
Fibre here
Serpentine
Little fibre in serp
Patch good ore
Hyp., serp & fibre
Stoped up to 12' width; average width 5'
Tram level
Serp
Serp. No fibre visible
N.E Cut
A A' B B' C C' D D' E E' F F'
1341