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An Appraisal of the Economic Potential
of the
Beaconsfield Asbestos Occurrence,
Tasmania
for
Allstate Explorations N. L.

Sydney.
December 17, 1970

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I.

SUMMARY

The purpose of this report is to comment on the fibre occurrence in the Beaconsfield Area, Tasmania, and to recommend an exploration programme to determine, within the next field season, whether the prospect has any potential as an economic producer of asbestos.

Little evidence of fibre is exposed on the surface of the areas mapped to date.

Fibre has been revealed in two diamond drill holes that indicate an average fibre length of $1/16''$ to $3/16''$ with some veins at $1/4''$ as cross fibre and a high percentage of slip fibre.

As terms of reference, it is considered that an asbestos deposit in the Beaconsfield Area must have a minimum of 25 million tons of 4.5% fibre. To obtain this tonnage, the slip fibre must prove to be of economic value. The exploration programme suggested has this aim in view, though the tonnage figures mentioned are not to be considered binding.

Emphasis has been laid on the various tests that are necessary to determine the value of the actual fibre as it is thought that many geologists do not have a full appreciation of the value of the properties measured by the tests.

If the slip fibre does prove to be economic, further intensive exploration is justified.

If the slip fibre does not prove to be of economic value, then the area which is at present held is too small to contain an economic deposit and Allstate Exploration N. L. should investigate the possibilities of acquiring the area south and west of the area over which testing has been completed. It is known that cross fibre asbestos occurs in these areas. It is recommended that samples of cross fibre and drill core be selected as suggested in the report and milled in an established asbestos pilot plant. The plant of the Department of National Resources, Quebec City, Canada, is recommended.

It is considered that even if the slip fibre zones do not prove economic, a programme of trenching should be completed so as to ensure that there are no buried extensions or parallel occurrences of fibre beneath the alluvium which covers a high percentage of the area. This programme should be relatively inexpensive and it would examine all possibilities for fibre occurrence.

II.

INTRODUCTION

Allstate Explorations N. L. requested Watts, Griffis and McOuat (Australia) Pty. Limited to review the information available on the ultra-basic and chrysotile asbestos occurrences located in the Beaconsfield area located some 2 miles west of Beaconsfield township, 25 miles northwest of Launceston, Tasmania.

The purpose of this report is not to detail the geology of the area but to comment on the commercial possibilities of the asbestos occurrence and to recommend an exploration programme if a potentially economic deposit of asbestos fibre does exist. If the exploration does, in fact, indicate that a tonnage and grade capable of economic exploitation exists, then an intensive exploration programme would be required.

The evaluation of an occurrence of asbestos fibre is somewhat more complicated than the evaluation of a base metal deposit because, not only does the quantity of fibre present have a bearing on the economics of the deposit, but the inherent properties of the fibre itself are of paramount importance. These inherent properties vary greatly from one deposit to the next and, therefore, each deposit of asbestos has to be regarded as an individual entity.

This report will endeavour to outline what properties and characteristics of the fibre must be determined before the true value can be assessed and also to outline those points peculiar to asbestos which are not generally appreciated but which have a definite bearing on the value of any one deposit.

III.

GENERAL CONSIDERATIONS

The asbestos occurrence has been investigated and described by various geologists over a period of years and Allstate Explorations N. L. has completed some initial exploration in the form of geological mapping, ground magnetic surveys and diamond drilling.

The results of this work are summarized briefly.

(a) Geology

The area that has been investigated by Allstate Explorations N. L. covers

(c) Previous Exploration

The work that has been completed over the area of basic rocks has indicated the presence of chrysotile asbestos in the Beaconsfield area near Andersons Creek.

The asbestos occurs in the form of cross fibre veins and also as slip fibre. The slip fibre makes up a fair percentage of the rocks and about 60 percent of the total fibre. It should be noted that slip fibre has the same characteristics as cross fibre, except that the strength of the individual fibrils in the slip fibre is not as great as in the cross fibre. This fact means that the usual method for estimating grade, that is the Quebec Standard Test, cannot be used to determine grade and some other method, such as the strength unit test, is required. However, the value and uses of slip fibre is the same as cross fibre and an occurrence of these two forms of asbestos fibre can be considered as a unit.

The mapping completed indicates a zone roughly 2,000 feet long and 1,000 feet wide of serpentinized pyroxenite that may contain both slip and cross fibre. Two diamond drill holes have been drilled in this area and hole No. 4 has indicated the presence of fibre over an aggregate drill hole length of 800 feet. Of this length, about 220 feet contains cross fibre, the remaining length containing slip fibre. For some reason, which may be structural, the slip fibre is absent almost completely when cross fibre is present. The cross fibre content has been logged as high as 6% of the rock but the average is around 2%. The slip fibre reaches a maximum of 17% and has an average around 4% of the rock. These grades are visual estimates only and make no allowances for the minus 200 mesh content which will serve to increase the percentages.

The results from hole No. 5 are not yet available.

Little or no fibre is presently visible in the old quarry walls and this suggests the fibre may occur in "zones" within the serpentinized pyroxenite. The report by Taylor (P. 37 - 39) indicates fibre lengths of $\frac{1}{8}$ " to $\frac{3}{8}$ " and in one instance (at Jacksons Prospect) $\frac{1}{2}$ ". It is interesting to note that one observer, A. M. Reid, (Taylor, P. 37), stated that good cross vein chrysotile ... was passed through but the average was only $\frac{1}{4}$ ". To-day, an average of $\frac{1}{4}$ " fibre would be a rich deposit.

Generally, the fibre occurrence appears to be sporadic but it does not appear as though any attempt has been made to expose the bedrock at present buried beneath alluvium. Obviously, it is only in those areas where fibre outcropped that any serious prospecting has been completed.

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A ground magnetic survey completed over the mapped areas is somewhat inconclusive, though this may be because of the very widely spaced traverses and stations. Stations 400 feet apart may straddle completely a magnetic zone 200 feet wide.

(d) Terms of Reference

Asbestos can be mined either by open cut or underground methods and which method is used is determined chiefly by the mode of occurrence and the grade. It is difficult to put a limitation on any deposit of fibre but some form of target must be established, early in the exploration, towards which the planning of exploration must be geared. If the target is not attained after the planned exploration has been completed, then the position must be reviewed, and a new target, if still realistic, be established.

At the present time, it is considered that a minimum of 25,000,000 tons of available ore must be proved to support an economic open cut operation. The grade of the ground is more difficult to determine for the value is dependent on other factors besides volume of fibre but at this point in time the grade should be in the region of 4.5% fibre.

The capital requirement for an asbestos operation is predicated, to a large extent, on the rate of mining. A rough parallel can be drawn with the deposit at Woodsreef, N. S. W., which has a proven reserve of 27 million tons of 4.5% fibre with a potential of a further 50 million tons. The capital requirement to bring this property into production is around \$14,000,000 and roughly \$2,000,000 were spent on exploration. However, because of the relative isolation of Tasmania the capital requirement and exploration costs for establishing an economic operation would be higher - say around \$18,000,000.

These figures are not to be taken as definitive but are just to serve as an indication as to what must be aimed at. The final capital expenditure, etc., will always depend on what has been proved.

IV.

FIBRE EVALUATION

The value of an asbestos deposit can only be determined after the fibres contained in that deposit have themselves been evaluated. This contrasts with metal deposits where one normally deals with only the recoverable quantities of an element.

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The appraisal of fibre involves the measurement of many characteristics, the importance of each becoming more significant or less significant, depending upon the particular use for which the fibre is destined. All of these usually involve measurements of physical, as distinct from chemical, characteristics of the fibres. A most important point is that many of the generally accepted physical standards can be controlled and changed in a mill process.

Different experts place differing weights on the various physical tests used and on the results obtained. Frequently, a consumer's appraisal of a fibre will be considerably different from a producer's.

In the asbestos industry the tests described below are of importance.

(a) Quebec Standard Test - (QST)

This test is the world's most universally accepted method of measuring the length distribution of fibre and determining the dollar value. Canada's asbestos production is priced primarily on the basis of Quebec Standard Tests.

This test consists of placing a one pound sample of dry fibre in a Quebec Testing machine. This device consists of a nest of screens ($\frac{1}{2}$ inch, 4 mesh, 10 mesh, 35 mesh and pan) which are subjected to shaking for a specified time. The fibre remaining on each screen is weighed and the results reported in ounces.

At any given stage of fibre opening the results are reproducible, as is illustrated by the fact that the Quebec producers guarantee a minimum Quebec Standard Test.

The tendency of some fibres to "rope", particularly in the longer grades may on occasion reduce the reliability and/or reproducibility of the test.

A further point of interest regarding the reliability of the test is that the Quebec Standard Test machines, located at each producing plant, are checked by the Quebec Asbestos Mining Association through the testing of standard fibre samples.

The weakness of the test is that dust, grit and openness are not measured. Dust may adhere to long fibres as well as short. A given fibre product will have varying QST's as it is opened or fibrized. In addition, similar QST's may not have similar dust contents.

If a fibre is crudy or unopened, the bundles of fibre which are heavy and slender, may drive through into lower screens, whereas at a fully opened

state, some "diving" may still occur, but the probability is greater than fibres will "mat" and be trapped on higher screens than their true length justified. Grit, because of its weight, and smaller dimensions normally proceeds to the lower screens and thereby does not inflate the QST, but may inflate apparent recovery and lower desirability from a consumer's standpoint who wants a grit-free fibre.

The current producer's price list, based on Quebec Standard Tests, is shown in the Appendix. This price list is based upon a "Minimum Guaranteed Test". The Quebec producers also have agreed among themselves to a "Maximum Permissible Quebec Standard Test" which has been used for all Quebec Standard Test appraisals.

(b) Bauer-McNett Test

This is a wet test to measure the length distribution of the fibre. The test measures the percentage of a sample retained on 4, 14, 35, 100 and 200 mesh screens.

In essence, a fixed amount of fibre in a water slurry is swirled over and through a series of screens and baffles for a prescribed period of time. The weight of fibre retained on each screen is determined and the minus 200 mesh (dust) is calculated by difference.

The weakness of the test is that with crudy or only partially opened fibres, bundles of fibre and rock particles, being heavy, will sink into the slots for the longer fibres and will not overflow onto the screens where their real length would properly place them.

No widely accepted standards exist for this test. Some authorities place some significance on the cumulative plus 14 mesh. Considerable weight is given by some to the minus 200 mesh or dust content. This latter is much more easily determined by the wash test described later.

The general standards used for the plus 14 mesh and minus 200 mesh are as follows:-

	<u>+ 14 Mesh</u>	<u>- 200 Mesh</u>
Group 4	30% minimum	35% maximum
Group 5	15% minimum	50% maximum
Group 6	5% minimum	60% maximum
Group 7D	2-3% minimum	75% maximum

The weakness of the test is once again related to the degrees of openness of the fibres. As fibre is opened, the plus 14 mesh content goes down, owing to the opening of bundles which formerly would have reported with the longer portions, grit particles are broken up and fibre is broken along fracture planes.

The anomaly is, therefore, that the more crudy a fibre is, the higher would be its Bauer-McNett appraisal, yet the Quebec Standard Test and some strength ratings would be progressively lower and vice versa.

(c) Wash Test

This fast, inexpensive test is used to determine the amount of dust or minus 200 mesh content in a given fibre product.

A known weight of fibre is placed on a 200 mesh screen, washed and the minus 200 mesh content determined from the weights before and after washing.

As discussed under the Bauer-McNett and Strength Tests, the amount of fines is important when determining the real fibre volume and likely strength of a fibre product. Present sales specifications, as well as consumer requests, indicate the following tolerable ranges for minus 200 mesh.

	<u>- 200 Mesh</u>	
Group 4	20% minimum	35% maximum
Group 5	30% minimum	50% maximum
Group 6	50% minimum	60% maximum
Group 7	70% minimum	90% maximum

Some fibres currently sold exceed these limits, but only rarely.

It is considered that the wash test is one of the prime sources of data for fibre appraisal.

(d) Surface Area

This test is primarily used to determine the degree of openness of a fibre. The results are particularly useful when taken together with the minus 200 mesh readings.

The test is carried out by passing compressed air through a given

quantity of fibre enclosed in a standard cylinder. The surface area is determined from a measurement of the resistance met by the compressed air and is reported as square decimetres per gram or square centimetres per gram.

The industry has not established any fixed surface area requirement for particular grades. In general, the surface areas of fibres currently produced range from 6,000 to 16,000 cm²/gm. with the bulk of fibres lying between 8,000 and 14,000 cm²/gm.

In general, the higher the minus 200 mesh, the higher the surface area; the slower the filtration, the higher the surface area; and the higher the strength, the higher the surface area (up to fibre destruction). Obviously, therefore, a satisfactory surface area for any given fibre will depend upon a balance of these three considerations.

(e) Wet Volume

This test is used to determine the buoyancy in water of all grades of asbestos which is a further measure of the degree of openness and the content of grit and dust.

The test consists of placing a given quantity of fibre in water which is then shaken and the mixture allowed to settle. The level to which the fibre has settled, after a period of time, is then read in cubic centimetres.

In general, the more open the fibre, the higher the reading will be. A fibre with a high dust or grit content, at any Quebec Standard Test, will have a lower Wet Volume.

Consumers usually require wet volumes as follows:

Group 4	Not less than 1,000 c. c.
Group 5	Not less than 800 c. c.
Group 6	Not less than 600 c. c.
Group 7	Not less than 500 c. c.

(f) Strength Tests

The main purpose of adding asbestos fibres to a cement mix is to increase the shear resistance of the cement product and, consequently, to restrict the possibility of shattering.

In recent years, producers and consumers have been developing testing

procedures designed to measure this characteristic. The most widely accepted test is known as the Strength Unit Test. This test has been adopted by the Quebec Asbestos Mining Association.

The test consists of making plaques using a mix of Portland cement, silica and fibre, curing the plaques and subjecting them to shearing stress.

Fibre preparation consists of ball milling the fibres until they reach their "maximum strength potential" and then passing the fibre twice through a fibre disintegrator. For the Thetford district of Canada, where the test was developed, it has been found that 60 minutes of ball milling optimizes the strength a fibre will give to a cement mix.

It must be pointed out, however, that the ball milling requirement may vary considerably, depending upon the degree of crudiness and ease of opening a particular fibre.

The Strength Unit Test is variable, therefore, depending upon whether the fibre is fully opened (i. e. whether appropriate ball milling has been done) and upon the amount of dust.

No consideration is given to filtration rate which decreases as the fibre is opened. The test concerns itself only with strength, not necessarily optimum economics.

The strength a fibre will give to a cement mix is controlled by physical variables and also by the inherent maximum strength of the fibre. The main physical variable is the degree to which the fibre has been opened. This means that if mixed with cement in a crudy state, the bundles or "matches" of fibre will be few and scattered and will not create a felt or matting effect and will not be evenly distributed throughout the mix. Under shear, the bundles themselves may "slip" along the fibre fracture planes. These circumstances show how an apparent low strength reading would be obtained from a crudy fibre, as compared to a fully opened fibre. This suggests that some of the consumers' tests do not measure the maximum strength-giving potential of a fibre, but rather the strength "as received".

A second major item controlling the strength given to a fibre product is the amount of dust or minus 200 mesh content. When a consumer purchases a fibre product, he is really purchasing two items: dust and fibre. For example, in one ton of 6D fibre, the consumer will likely buy 1,000 pounds of dust (minus 200 mesh) and 1,000 pounds of clean fibre, with virtually all of the latter being shorter than $\frac{1}{4}$ inch. When

the purchaser buys one tone of a 4T grade, he usually buys 600 to 700 pounds of dust, and gets 1,400 to 1,300 pounds of clean fibre, all of which is shorter than $\frac{1}{2}$ inch.

A 6D fibre normally has about 60 to 70 strength units, while a 4T fibre has 70 to 100 strength units. The difference in strength is caused in large part by the difference in the minus 200 mesh content which cannot be considered as contributing significantly to the shear resisting strength of an asbestos - cement product. The fibre volume, in one case being 50 percent and in the other a minimum of 65 percent, is much the more important factor.

Some experts in the field argue that the plus 14 mesh content from a Bauer-McNett Test is very important. At a fully opened state, a long fibre should give a better strength than a shorter fibre. However, for example, in terms of a Group 5 fibre which may have 15 percent on the plus 14 mesh in a reasonably crudy state, the minute difference in length between 10 mesh and 14 mesh cannot be highly significant. This becomes more apparent when, as the fibre is opened, the plus 14 will go down and yet strength rating will rise.

Further, in an asbestos cement mix containing 15 percent fibre, only 15 percent of that fibre is greater than 14 mesh or 2.25 percent of the total mix. The length increment of this small amount of "longer" fibres cannot logically have the same impact as would a five to ten percent total variation in the minus 200 mesh content.

(g) Filtration

This test is of particular significance in the asbestos - cement products industry. The speed with which water can be drained or pressed out of a given fibre is measured. The measurement is usually expressed as the seconds of time it takes a given amount of water to drain through a given amount of fibre. Another form of measurement is to measure the volume of water that will pass through a fixed amount of fibre in a fixed period of time.

Factors which affect filtration are the inherent physical characteristics of the fibre, the degree of openness of the fibre and the amount and nature of the fines or minus 200 mesh.

Some fibres are harsh or needle-like, while others can be described as feathery. Obviously, water will drain faster through needles than through feathers. When a fibre is crudy, it can be considered to be somewhat like a pile of matches and, when opened, to a pile of wool. In an unopened or

crudy state, therefore, water has a much better chance to flow through the pile. In effect, the crudier or coarser the fibre bundles, the better or faster the filtration rate.

The higher the dust, fines or minus 200 mesh content, regardless of the nature of the fines, the greater will be the closing or slowing of the filtration rate. If the dust is highly talcose, as distinct from fine rock particles, it will likely have a large proportion of slimes, i. e. minus 325 mesh, and the effect of any dust will be greater and also will have a propensity to cling more to the fibres.

Filtration rate is extremely important to both consumer and producer. It affects the production rate which a consumer can obtain from a piece of equipment. The consumer must strike a balance between the filtration rate which goes down as a fibre is opened and the strength which rises with fibre opening. Frequently, a consumer will add amosite, another variety of asbestos, in order to improve his filtration and, on occasion, even organic materials when permissible, such as rice husks, peanut shells, etc.

As far as can be determined, no economic appraisal is used or, at least, widely accepted in the industry for filtration. Rather, a minimum is established below which a consumer's fibre processing productivity falls to unacceptable limits and the fibre then becomes unacceptable or the price is discounted.

(h) Magnetic Rating

This test is of particular importance to the electrical insulating industry where a high magnetic rating (meaning a theoretically high magnetite content; capable, therefore, of creating induction fields) is bad. It is also important for fibre to be used for finely finished interior cement products and in the floor tile industry where discolouration due to "rusting" or pitting is undesirable.

The test simply consists of comparing the electromagnetic effect of 10 grams of fibre with a known standard.

The average magnetic rating of fibres from the Thetford Mining District in Quebec is in the order of 4 to 5.

(i) Ro-Tap

This is a dry test which provides by sieve analysis the apparent length of asbestos fibres other than grades 1 - 3.

The Tyler Ro-Tap machine consists of a nest of screens mounted on a shaking unit which also receives roughly 150 taps per minute for a period of 10 to 30 minutes, depending upon the fibre group. Results are reported as the percentage retained on each screen.

Screens used vary with the fibre group but generally include the following mesh sizes: 4, 6, 8 or 10, 14, 20, 35 or 48, 65 or 100.

Some consumers consider the test as being significant, particularly in determining the grit content. Their concern is on the amount of material retained on the plus 48 mesh screen requesting:

Group 4	Not more than	3% on the + 48 mesh
Group 5		5%
Group 6		8%
Group 7		10%

The amount of material retained on the plus 48 mesh usually falls as fibre is opened.

(j) Colour

This test is of little importance in most asbestos uses. However, it can be important in certain fine finish cement products and when fibre is used in the plastic and floor tile trades, it only has significance for Groups 6 and 7.

Uniformity of colour is usually as important in these uses as the colour itself.

The test measures the amount of light reflected from a compressed disc of fibre using blue, green and amber filters. A pure "white" would have a colour reading of 100. The darker or dirtier the fibre, the lower the colour rating. A large content of grit or magnetite will lower the colour reading appreciably as does a reading taken on extremely crudy fibre.

The various tests applicable to the evaluation of asbestos fibre have been mentioned in some detail because not all geologists are fully aware of their importance. It is felt that a knowledge of the true value of a fibre is very important, even at the early stages of exploration.

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V.

FUTURE EXPLORATION

Discussion

In conducting an exploration programme over an occurrence of asbestos the ideal approach is to first grid the zone of ultrabasic and then to map the surface geology in detail. This work is usually followed by trenching over those areas that the mapping has indicated to be favourable for the formation of asbestos and to uncover continuations of these areas that are buried beneath alluvium.

The formation of asbestos appears to require the expulsion of iron in the form of magnetite and on some deposits, it is possible to delineate zones of asbestos formation by means of a ground vertical intensity magnetic survey. However, this is not always the case and each individual deposit has to be tested to see if this exploration method has any application.

At the present time, diamond drilling has shown the presence of fibre over a drill hole length of 800 feet or a horizontal width of 560 feet, assuming a vertical dip to the deposit. A width of this magnitude will support a mining operation to a vertical depth of 800 feet with a small ore to waste ratio. If it is assumed that the 560 feet width can be mined to a depth of 800 feet the fibre potential per horizontal foot would be:- (assuming a tonnage factor of 12.5 cubic feet to the ton)

$$\frac{560 \times 800}{12.5} = 35,000 \text{ tons}$$

Therefore, the strike requirement to establish a reserve of 25,000,000 tons would be approximately 700 feet. A strike length of this magnitude is not considerable as long as the width - depth dimensions are maintained.

There is one prime consideration that has a great influence on the preliminary calculation just given and that is the actual value of the slip fibre. If this fibre has no value, then the effective horizontal width of cross fibre-bearing rock is reduced to approximately 160 feet and the depth of mining would also be reduced to about 550 feet. Using the same calculations as previously, the strike length necessary for a commercial deposit, again assuming width - depth dimensions are maintained, would be 3,550 feet.

This kind of length is not available within the area tested by Allstate Explorations N. L. However, the map accompanying the report by Taylor indicates occurrences outside Allstate Exploration N. L.'s area which have

fibre visible and it would be advisable if these areas were visited. (This has already been completed). Taylor places a first priority on Area D, located just south of the area tested, and a third priority on Area C, also south of Allstate Exploration N. L. 's area. It would be advisable if Allstate Exploration N. L. could negotiate with the holders of the adjoining ground for the rights to explore and mine any asbestos located. Area E may also be included. (See Map No. 1).

It should be pointed out that a fibre length of 1/16" has a definite value as the trend in the asbestos industry has been to the use of the shorter grades of fibre (Group 7) (See Appendix I).

Recommended Exploration

1. Fibre Testing

In assessing the value of fibre a visual log can give only a partial answer because it is not known how a fibre will react to milling treatment, and what the minus 200 mesh content will be, etc. Therefore, it is considered essential that samples of the fibre be milled through a pilot plant and the standard QST tests carried out. This work should be completed on both the cross fibre and slip fibre in the diamond drill core and on selected grab samples from the No. 2 quarry dumps.

The drill core samples should be selected as follows:

Hole 4:

Sample 1	25 to 75 feet	(50)	Slip Fibre
2	115 to 175 feet	(60)	Cross Fibre
3	225 to 275 feet	(50)	Slip Fibre
4	275 to 340 feet	(65)	Slip Fibre
5	380 to 410 feet	(30)	Cross Fibre
6	350 to 620 feet	(70)	Slip Fibre

Hole 5:

Sample 7	110 to 160 feet	(50)	Slip Fibre
8	285 to 350 feet	(65)	Slip Fibre
9	405 to 440 feet	(35)	Cross Fibre
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<u>Dump:</u>	10	About 50 pounds	Cross Fibre
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Advice from Canada indicates that the Quebec Department of Mines is very busy and their policy is that Quebec producers have first preference, Canadian producers second preference, and then Australia. However, the work could be undertaken at overtime rates, which would be \$C.100.00 to \$C.150.00 per sample. It is considered that the slip fibre valuation will determine the economics of this deposit.

It is impossible, at this stage, to put a timing on the completion of the tests but it would probably take 6 months from date of shipment (by sea) to receipt of results - unless overtime work is requested and/or samples are shipped by air.

A preliminary cost for this work is estimated as follows:- (assume 3 lbs. per foot of core - total footage 475 feet)

Shipment by sea to Quebec City (say, 1,700 lbs.).		\$ 100
Shipment by air to Toronto (say, 1,700 lbs.).	3,750	3,750
Land transport, customs, insurance, etc., say, \$20.00/sample.		200
Testing at \$C.150.00/sample (\$A.135.00)		1,350
Liaison in Canada, say, 5 days at \$C.220.00/day (\$A.200.00).		1,000
		\$2,650
	<u>Total:</u>	\$2,650
	(By Air)	\$6,400

2. Trenching:

The only effective method for locating asbestos fibre is to actually expose the veins. In areas of alluvium the only way this can be done is by bulldozer trenches. It is considered that the possibility of extensions to the known occurrences or parallel or en echelon occurrences must not be overlooked and, therefore, it is recommended that trenches be cut across the serpentine. These trenches should be long and continuous and after bulldozing the floor should be cleared by air (or water) of all rubble and rock even if only a two foot channel is cleared. The final stage may require sweeping with brooms to clear the final pebbles and dust.

The extent of the trenching is shown on the accompanying map and calls for approximately 3,500 feet. An estimated cost for this work is as follows:-

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Bulldozer Hire	— 10 days at \$160.00/day	\$1,600
	Establishment (say)	500
Clearing	— Say, 2 men for 10 days at \$30.00/day	600
	Compressor hire — (for air clearing)	300
Logging	— Geologist and assistant (Allstate)	
	10 days at \$120.00/day	1,200
Mobilization		500
Supervision and Reporting		2,000
		<u>\$6,700</u>
		=====

The floor of the trenches should be logged geologically and also a fibre count completed. If the fibre count is done systematically, it will be possible to obtain some appreciation, in the field, as to the value. The fibre logs could also enable a "visual estimate in dollars" to be calculated.

The visual fibre evaluation is almost invariably below the "milled" value because of the fact that there is fibre in the rock that is not seen, and the visual log makes no allowance for the dust or - 200 mesh content that makes up a proportion of any fibre product. Therefore, a low visual percentage count is almost always up-graded by the milling of the same sample.

The procedure for fibre logging is to draw an imaginary line down the centre of the trench and each fibre vein that crosses this imaginary line is measured as to the length of the fibre and the angle to the axis of the core. The counts are done in five foot intervals. The reason for the logging in five foot intervals is that if the sum of the sixteenths is divided by 10, a rough indication of the percentage fibre is obtained.

For example, a section may be logged as follows:

2 veins at $1/16$	=	2 sixteenths
2 veins at $1/8$	=	4 sixteenths
1 vein at $3/16$	=	3 sixteenths
2 veins at $1/4$	=	8 sixteenths
1 vein at $5/16$	=	5 sixteenths

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A total of 22 sixteenths over a five foot interval represents roughly 2.2% fibre.

It is suggested that a table be made up as follows:

Interval	Length	Recovery	1/16	2/16	3/16	4/16	Core Angle	%
115 - 120	5	4.9	7	2	2	2	45	1.7
120 - 125	5	5.0	3	7	3		45	3.1
125 - 130	5	4.7	1	1			70	0.3

2.5 ?
2.6 ?

This table indicates, in some instances, the percentage of fibre and gives, also, at a swift glance, some indication as to the length distribution over a particular interval. This representation aids, to a large degree, in selecting samples of similar fibre distribution for detailed mill tests. There is no advantage in including a 20 foot section of long fibre with a 20 foot section of short — each section should be sampled, milled and evaluated separately.

The ground is logged wet or dry but usually dry and care must be taken to ensure that the fibre is the exact length, i. e. it may be a long fibre that has a parting so that, in effect, it is two lengths of shorter fibre.

The procedure to calculate the "visual estimate in dollars" or "visual dollar value" is somewhat complicated and difficult to put down on paper. This part of the evaluation which involves formulas and graphs is best explained by example.

3. Magnetic Survey

In some instances, there is a direct correlation between a high vertical magnetic intensity and the occurrence of fibre. The survey completed does not show any such correlation but in this case the distance between stations was 400 feet. It may be advisable to conduct a closer spaced survey in the area of the known occurrences of fibre to determine finally if there is any correlation. This work could be done at the same time as the trenching.

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The recommendation discussed above can be summarized as follows:

1. Attempt to acquire the areas south and west of the present area held in the advent that the slip fibre does not have a commercial value.
2. Send samples of the cross and slip fibre to Canada for testing.
3. Complete a trenching programme as indicated, together with a small but detailed magnetic survey over the known asbestos occurrences.

The costs of these programmes are justified in the light of the potential revealed by the surface investigations and diamond drilling.

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APPENDIX

PROJECTED ASBESTOS CONSUMPTION

To study broad historical trends and make future projections, the world market was divided into two broad markets, the North American market (Canada and the United States) and the Other market. The world market is defined as the total world excluding Russia and Communist China. There is a significant difference in the composition of these two markets which is apparent when one compares the historical apparent consumption of chrysotile asbestos by grade in these markets.

Table 2 was prepared to show growth rates for consumption of chrysotile asbestos and to formulate data for a base year (1967) from which projections of future consumption could be made.

Table 2 also shows the apparent consumption of amosite and crocidolite asbestos. Since this report is concerned with a chrysotile asbestos deposit, amosite and crocidolite have not been included in the projections. Although these two asbestos minerals are used in some of the same applications as chrysotile asbestos, their uses are much more highly specialized. Another important factor for which no allowance was made in Table 2 is changes in the level of producer and consumer inventories.

Table 3 shows historic growth rates as compared with several projections of growth rates for the different grades of fibre.

Projected chrysotile consumption, based on estimated growth rates for the North American and Other markets, is shown in Table 4. This Table indicates that world demand (excluding Russia and Communist China) for chrysotile asbestos fibre will grow at a compounded rate of 3.9%. The major growth area is in the cement grade fibres (Groups 4, 5 and 6) while the spinning fibres (Groups 1, 2 and 3) and shorts (Groups 7 and 8) show little or no growth. To meet this demand, chrysotile asbestos supply will have to be increased by 480,000 tons by 1972. The three possible sources of this supply are:

- (1) Expansion at producing mines.
- (2) Discovery and development of new deposits.
- (3) Increased exports from Asia.

TABLE 1

CANADIAN PRODUCER'S PRICE LIST

Canadian Standard	Minimum Guaranteed Test				Price Canadian Funds
4A	0.0	- 8.0	- 6.0	- 2.0	\$ 358.00
4D	0.0	- 7.0	- 6.0	- 3.0	241.00
4J	0.0	- 5.0	- 7.0	- 4.0	241.00
4K	0.0	- 4.0	- 9.0	- 3.0	236.00
4M	0.0	- 4.0	- 8.0	- 4.0	236.00
4T	0.0	- 2.0	- 10.0	- 4.0	211.50
5D	0.0	- 0.5	- 10.5	- 5.0	178.50
5K	0.0	- 0.0	- 12.0	- 4.0	178.50
5M	0.0	- 0.0	- 11.0	- 5.0	168.00
5R	0.0	- 0.0	- 10.0	- 6.0	152.00
6D	0.0	- 0.0	- 7.0	- 9.0	110.00
7D	0.0	- 0.0	- 5.0	- 11.0	91.50
7F	0.0	- 0.0	- 4.0	- 12.0	82.50
7H	0.0	- 0.0	- 3.0	- 13.0	70.50
7K	0.0	- 0.0	- 2.0	- 14.0	58.00
7M	0.0	- 0.0	- 1.0	- 15.0	52.00
7R	0.0	- 0.0	- 0.0	- 16.0	49.00
7T	0.0	- 0.0	- 0.0	- 16.0	47.00

These prices are f. o. b. eastern Canadian mine, per short ton, in carload quantities, effective during 1969.

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TABLE 2

ESTIMATED APPARENT HISTORICAL CONSUMPTION OF CHRYSOTILE ASBESTOS BY GRADE

	WORLD MARKET*			NORTH AMERICAN MARKET**			OTHER MARKET***		
	1962	1967	5-Year Compounded Annual Growth Rate	1962	1967	5-Year Compounded Annual Growth Rate	1962	1967	5-Year Compounded Annual Growth Rate
<u>CHRYSOTILE ASBESTOS:</u>									
Group 1, 2, 3,	102,000	123,000	3.8%	26,000	23,000	-2.5%	76,000	100,000	5.6%
4	491,000	619,000	4.7%	142,000	169,000	3.4%	349,000	450,000	5.3%
5	309,000	384,000	4.5%	67,000	82,000	4.1%	242,000	302,000	4.6%
6	324,000	385,000	3.5%	96,000	93,000	-0.7%	228,000	292,000	5.1%
Shorts	581,000	731,000	4.7%	389,000	428,000	2.0%	192,000	303,000	9.6%
TOTAL	1,807,000	2,242,000	4.4%	720,000	795,000	2.0%	1,087,000	1,447,000	5.9%
Crocidolite	134,000	148,000		20,000	13,000		114,000	135,000	
Amosite	75,000	94,000		18,000	16,000		57,000	78,000	

* The World Market is defined as the total world excluding Russia and Communist China.

** The North American Market is defined as Canada and the United States.

*** The Other Market is defined as consisting of the total world excluding Russia, Communist China, Canada and the United States.

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PROJECTED CONSUMPTION GROWTH RATES (1967-72)

	Historical (1962-67) Growth Rates		Estimated Growth Rates		Estimates Made By a Firm of U. S. Consultants*		Estimates Made Available by a large Canadian As- bestos Producer**	
	N. A. Market	OTHER Market	N. A. Market	OTHER Market	N. A. Market	OTHER Market	N. A. Market	OTHER Market
<u>FIBRE GRADE:</u>								
Groups 1, 2, 3	-2.5%	5.6%	Nil	Nil	-1.5%	2.8%	5.0%	2.0%
4	3.4	5.3	3.0	5.0	3.2	3.2	5.0	8.0
5	4.1	4.6	3.0	7.0	0.3	5.2	5.0	9.0
6	-0.7	5.1	2.0	7.0	1.7	6.7	5.0	10.0
7D)	-	-	-	-	2.2	1.6	5.0	4.0
)								
Shorts)	2.0	9.6	Nil	4.0	0.6	2.1	5.0	4.0

Sources:

* In a paper presented to the Toronto Society of Financial Analysts by Mr. W. W. Oughtred, president of Asbestos Corporation, several graphs illustrating future demand for Canadian asbestos were included. As indicated in the paper, these estimates were made by a well known firm of U. S. consultants. Although the projections were made in 1964, these graphs were used to calculate growth rates for the 5-year period 1967 to 1972.

** These growth rates are attributed to Canadian Johns-Manville Corporation.

TABLE 4

PROJECTED CHRYSOTILE CONSUMPTION BY GRADE

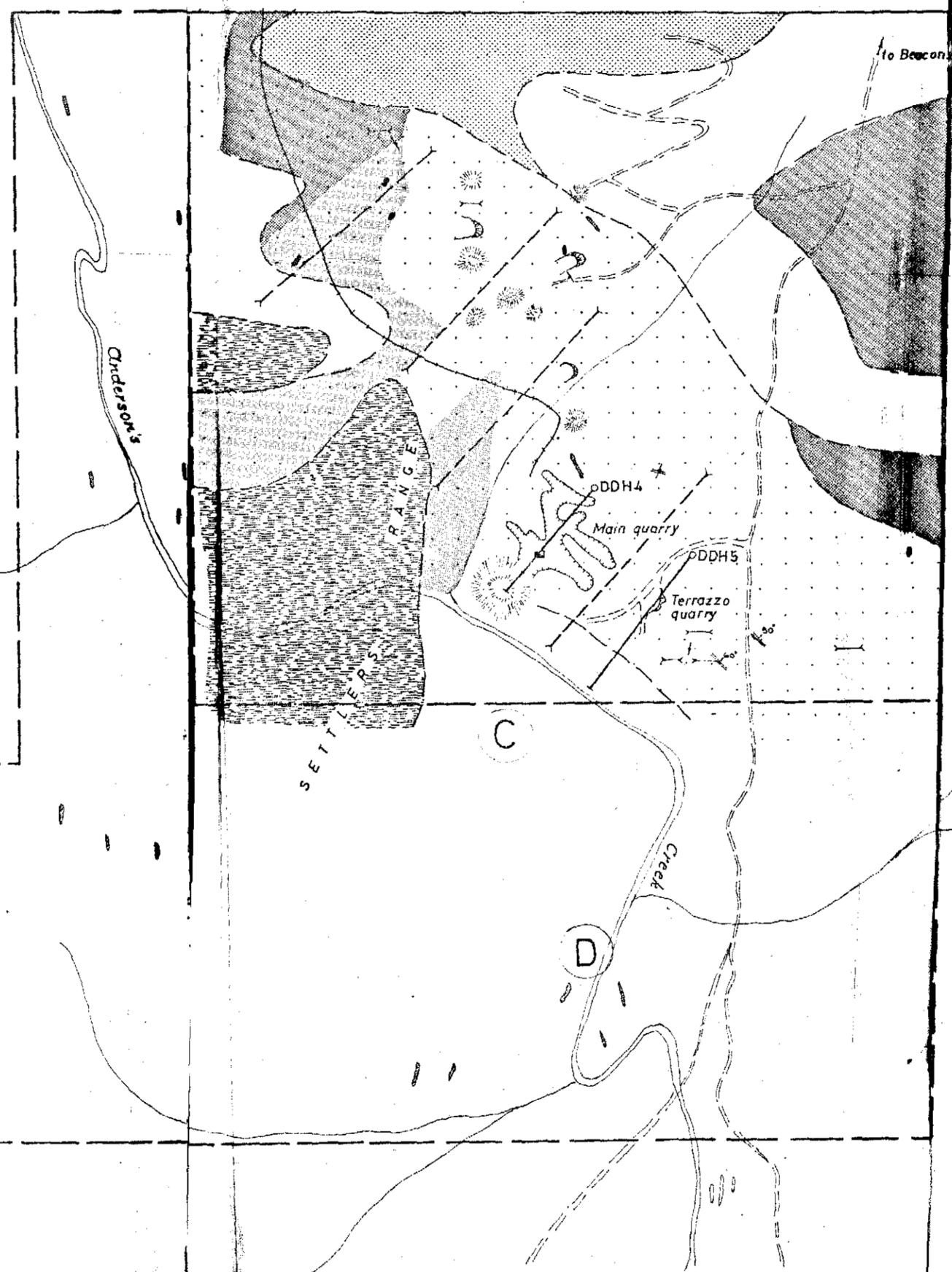
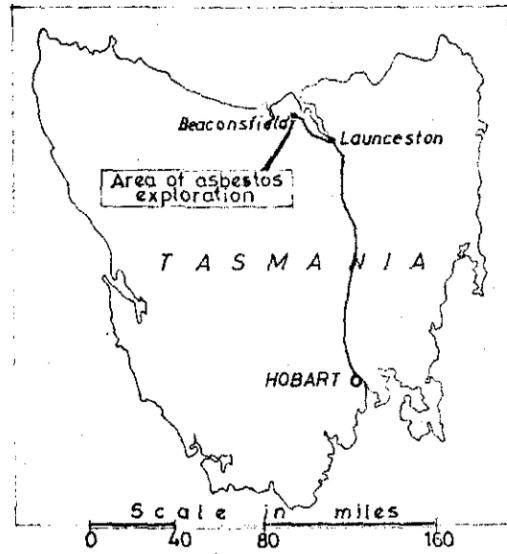
	Compounded Annual Growth Rates	Base Year 1967	1968	1969	1970	1971	1972
<u>NORTH AMERICAN MARKET</u>							
Groups 1, 2, 3	Nil	23,000	23,000	23,000	23,000	23,000	23,000
4	3%	169,000	174,000	179,000	184,000	190,000	196,000
5	3%	82,000	84,000	87,000	90,000	93,000	96,000
6	2%	93,000	95,000	97,000	99,000	101,000	103,000
Shorts	Nil	428,000	428,000	428,000	428,000	428,000	428,000
	1.2%	795,000	804,000	814,000	824,000	835,000	846,000
<u>OTHER MARKET</u>							
Groups 1, 2, 3	Nil	100,000	100,000	100,000	100,000	100,000	100,000
4	5%	450,000	472,000	496,000	521,000	547,000	574,000
5	7%	302,000	323,000	346,000	370,000	396,000	424,000
6	7%	292,000	312,000	334,000	357,000	382,000	409,000
Shorts	4%	303,000	315,000	328,000	341,000	355,000	369,000
	5.4%	1,447,000	1,522,000	1,604,000	1,689,000	1,780,000	1,876,000
<u>TOTAL WORLD MARKET</u>							
Groups 1, 2, 3	Nil	123,000	123,000	123,000	123,000	123,000	123,000
4	4.5%	619,000	646,000	675,000	705,000	737,000	770,000
5	6.2%	384,000	407,000	433,000	460,000	489,000	520,000
6	5.8%	385,000	407,000	431,000	456,000	483,000	512,000
Shorts	1.7%	731,000	748,000	769,000	783,000	797,000	811,000
	3.0%	2,242,000	2,326,000	2,418,000	2,513,000	2,615,000	2,722,000

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- LEGEND**
- Extensive areas of soil cover lacking outcrop
 - Tertiary (?) quartz gravels
 - Syenite
 - Serpentinized pyroxenite carbonated little or no obvious fibre.
 - Serpentinized pyroxenite with both slip and cross fibre.
 - Serpentinized pyroxenite obscured by soil cover.
 - Geological boundary.
 - Tramway.
 - Track or road.
 - Trench.
 - Dump.
 - Quarry.
 - Orientation of shear zone.
 - Trend of lithological layering often sub parallel to shearing.
 - Occurrences of asbestos per Taylor
 - Occurrences of asbestos mapped by Allstates Explorations N. L.
 - Diamond drill holes
 - Recommended trenches
 - Area to be taken up

WATTS, GRIFFIS AND McQUAT (AUSTRALIA) PTY. LIMITED CONSULTING GEOLOGISTS & ENGINEERS 1ST FLOOR - 56 PITT STREET, SYDNEY		
ALLSTATES EXPLORATIONS N. L. -North-west of Launceston Tasmania		
Asbestos Exploration Area		
SCALE: 1" = 500'	DATE: Dec. 70	DRAWING No.: 1301/1
DRAWN: J.B.	APPROVED:	