CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
http://www.azgs.az.gov
inquiries@azgs.az.gov

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JAC

THE ASBESTOS HILL - NORDENHAM STORY

Produce 1.55 M tons ore per yr.
15 - Dr 2 [illegible] product

[redacted]

general geology of Quebec.

Asbestos

ily down to a low of $94 on August 15, moved back up to $109.50 on August 20, then declined to current levels between $100 and $105. There are just about as many opinions as to whether the price of this elusive metal will continue to slide down or climb back up as there are 'experts' to make statements. The reasons for the slide are attributed to an improved dollar gain and investor profittaking. Also mentioned are the high interest rates and support for ending the two-tier gold system, which would permit central banks to trade their resources in the free market. The talk is that prices could go to the $85-90 range. On the otherhand, it is stated that prices would stay down only if there was a period without any monetary crisis....highly unlikely in these troubled times. Then, too, it is stated that the weak investors have been forced out of the market by the decline and that industrial demand is still strong." The London dealer market's price for gold early Monday morning (October 15, 1973) was $101.25; Haney & Harmon's base for pricing gold content of shipments and for making refining settlements was $102.25. Engelhard Minerals & Chemicals Corporation's buying price for gold was $102.25 and the selling price was $102.45.

SILVER:- The U.S. price (Handy & Harmon) for spot was $2.967; January 1974 $3.01; July 1974 $3.056, and September 1974 $3.068. Declining gold prices, switches back into currency, speculative profittaking, increase in Comex warehouse stocks have all contributed to keeping down the price of silver. Also, the large overhang of physical silver and the proposed sale of 117-million ounces of U.S. stockpile silver has had an impact on the price of silver.

ASBESTOS:- In a recent independent study of 100 asbestos workers, conducted in Gila County, Arizona, by Drs. Frank Prieser and Tom Jarbis, experts in pulmonary medicine and pathology, respectively, the conclusion was that "low iron chrysotile asbestos carries no hazzard of pulmonary carcinoma, mesothelioma, or emphysema." "The hazard of asbestos or silicoses is recognized as possible in extremely high dust concentrations, but this exposure is seldom experienced in present chrysotile asbestos milling operations in Arizona and never duplicated where the general public is concerned." The studies were prompted by a recent report by Dr. Irving Selikoff of the Mt. Sinai School of Medicine in New York City in which Dr. Selikoff stated that asbestos had definite links to lung cancer, asbestosis, and other lung diseases. According to D. W. Jaquay, president, Jaquays Mining Corporation, "Much of the recent asbestos scare publicity was misread by government regulating agencies." Jaquay points out, "In the Selikoff study, two forms of asbestos - amoside and crocidilite - which contain 40% iron, predominated as study sample." He also states that "by Dr. Selikoff's generalizations, a whole industry has been condemned."

PERSONAL ITEMS

SENATOR ALAN BIBLE:- (Nevada) announced his decision not to seek reelection when his current term of office expires. Bible has been a senator for 19 years and is currently a member of the Senate Committee on Interior and Insular Affairs and a member of its Minerals, Materials and Fuels Subcommittee. He also serves as chairman of Senate Small Business Committee and is a member of the Appropriations Committee. Nevada's mining industry will miss Senator Bible who has always been interested in problems of the mining fraternity.

Nevada News Letter 10/15/73

SOCIETY OF MINING ENGINEERS of AIME
345 EAST 47TH STREET, NEW YORK, N. Y. 10017

PREPRINT NUMBER
71-H-27

EVALUATION OF ASBESTOS DEPOSITS

H. K. Conn
Exploration Manager

E. L. Mann
Chief Geologist

Canadian Johns-Manville Co., Ltd.
Asbestos, Quebec, Canada

This paper is to be presented at the AIME CENTENNIAL ANNUAL MEETING - New York, New York - February 26 - March 4, 1971.

Permission is hereby given to publish with appropriate acknowledgments, excerpts or summaries not to exceed one-fourth of the entire text of the paper. Permission to print in more extended form subsequent to publication by the Institute must be obtained from the Secretary of the Society of Mining Engineers of AIME.

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PREPRINT AVAILABILITY LIST IS PUBLISHED PERIODICALLY IN MINING ENGINEERING.

SUMMARY:

This paper discusses briefly the evaluation of chrysotile asbestos deposits in ultramafic rocks. Such deposits are limited to serpentinized peridotite and/or dunites.

The purpose of any evaluation is to determine whether a deposit contains sufficient ore mineral to justify profitable exploitation. Dimensions of a mineral zone are established by conventional methods, such as mapping, ground magnetic surveys, diamond drilling or underground exploration. The value of the contained asbestos fibre is dependent on numerous physical properties such as fibre length, strength, flexibility, as well as the actual amount of fibre present. The determination of grade is difficult.

The Quebec Standard Test (Q.S.T.) is used to grade fibre according to the proportionate lengths of fibre present. A method of visual vein counting allows calculation of an approximate percent fibre together with a simulated Q.S.T.

Various drilling methods are discussed; diamond drilling is favored.

Bulk sampling is required to determine fibre quality.

Correlation of visual techniques and laboratory methods are often difficult. Reasons for any variance are discussed.

Underground bulk sampling of most potential ore zones is strongly recommended to confirm the viability of the property.

Evaluation of slip fibre deposits requires greater reliance on laboratory testing as visual methods are difficult to apply. Cross fibre has greater inherent strength.

INTRODUCTION:

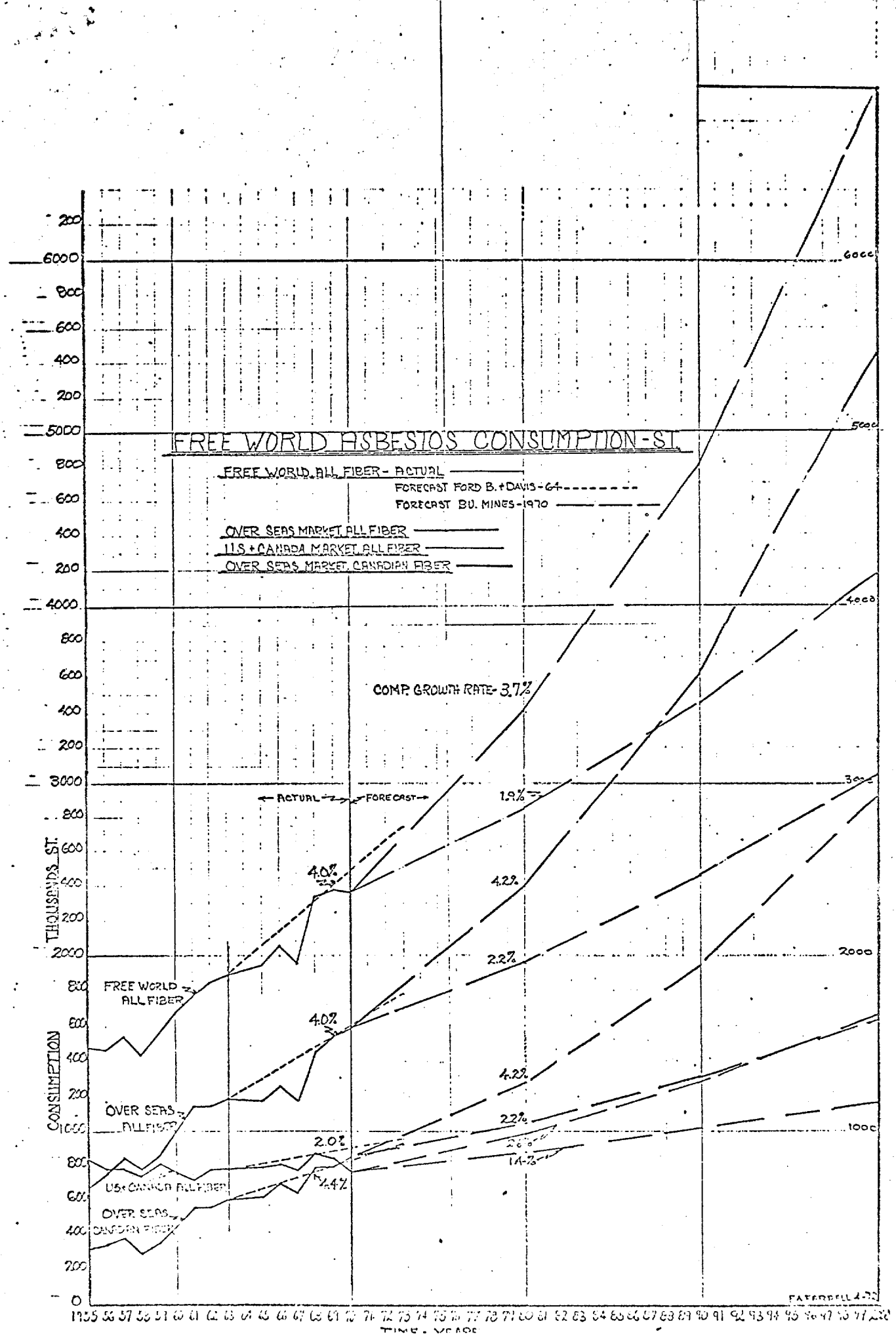
The occurrence of chrysotile is entirely restricted to serpentinized ultramafic rocks, apart from minor deposits of chrysotile associated with serpentinized dolomitic limestones and related rocks. This paper deals primarily with the evaluation of such chrysotile asbestos deposits in ultrabasic rocks;

4-24-72 JHC
Fiji Asbestos

Additional Asbestos Capacity 1970-1975

By 1975	Short Tons	Year
Asbestos Corporation, Ungava, Quebec	100,000	1973-4
Johns-Manville, Quebec	30,000	1971
Cassiar, British Colombia & Yukon	30,000	1972-3
Pacific Asbestos, Australia	70,000	1972-3
Brazil, Cana Brava	30,000	1972
Mexico, Oaxaca (pilot stage) slip fibre	40,000	1975
Colombia	40,000	1975
	340,000	
Russia	150,000	
Additional tonnage by 1975	490,000	
Consumption 1970	2,375,000	
TOTAL AVAILABLE 1975	2,865,000	
TOTAL REQUIRED 1975 at 3.6% Compound Growth	2,840,000	

By 1980		
Abitibi, Quebec - questionable economically	150,000	In exploration until 1976
McAdams, Quebec - Marginal slip fibre - questionable economically	100,000	In exploration until 1976
Greece - Slip fibre	70,000	
	320,000	
Additional possible tonnage by 1980	810,000	
Consumption in 1970	2,375,000	
TOTAL AVAILABLE in 1980	3,185,000	
TOTAL REQUIRED 19~~70~~ 80? at 3.5% Compound Growth	3,460,000	


FREE WORLD ASBESTOS CONSUMPTION - ST.
FREE WORLD ALL FIBER - ACTUAL
FORECAST FORD B. + DAVIS - 64
FORECAST BU. MINES - 1970
OVER SEAS MARKET ALL FIBER
U.S. + CANADA MARKET ALL FIBER
OVER SEAS MARKET CANADIAN FIBER
COMP. GROWTH RATE - 3.7%
ACTUAL
FORECAST
1.9%
4.0%
4.2%
2.2%
4.0%
4.2%
2.2%
2.0%
1.4%
1.4%
FREE WORLD ALL FIBER
OVER SEAS ALL FIBER
U.S. + CANADA ALL FIBER
OVER SEAS CANADIAN FIBER
THOUSANDS ST.
CONSUMPTION
TIME - YEARS
6000
5000
4000
3000
2000
1000
0

WLK
JCB
JRK

DEC 8 1971

EXPLORATION DEPT.

FIFTY CENTS

Northern Miner

r 2nd, 1971

Vol. 57, No. 37 (1251)

P O BOX 5747
TUCSON AZ 85703

[redacted]

* number of leading Canadian companies. * † calculated at 84c per ton of ore, with

J. H. C.

AUG 11 1971

COPY

EVALUATION OF ASBESTOS DEPOSITS

The initial step in the evaluation of asbestos deposits is to have the fibre examined as to its exact properties and quality, and, as in the case in many non-metallic minerals, specifications are often indefinite and hard to evaluate in specific terms, and the asbestos fibre from different deposits may vary greatly in physical characteristics. The important factors in grading asbestos fibre are fibre length, tensile strength, flexibility, sprinability, colour, chemical compsotion, cleaness of fibre, harshness or softness and porosity. A preliminary laboratory examination of sample material by experienced asbestos operators will indicate the quality of material and to what uses it is best suited.

Assuming that the quality of the fibre has been tested and approved, initial exploration will be carried out by surface work and/or diamond drilling to determine tonnage and grade. The former can be determined by standard methods of calculation used in any type of mineral deposit and need not be described here. Determination of grade differs and is calculated on a system established by asbestos operators with long experience in the industry. The estimation of grade is based on bulk sampling and on visual examination. The former follows standard practice for that type of sampling, but is limited in its application of exploration work due to overburden, inaccessibility, etc. The latter has a much wider application and is unique in method, which will be described below.

The uniform standard of classification of asbestos fibre into 9 grades has been agreed upon by the Canadian Asbestos producers. The procedure and classification are described by G.F. Jenkins (see "Industrial Minerals and Rocks" chapter 2, American Institute of Mining and Metallurgy 1949) as follows"

"Canadian asbestos fibers are graded within definite limits and production is controlled by means of the Quebec Standard Testing Machine, which has become the accepted measure of fibre length by which milled asbestos is sold. All grades except crudes, sand and gravels, are controlled by this standard. The machine consists of a nest of four rectangular cast-aluminum boxes clamped into a table that is shaken by an eccentric. The bottom box serves as a pan and the three superimposed sieves have screens of successively larger meshes. From the top, down, the mesh sizes are ½ in opening, 4 mesh and 10 mesh. All screens and dimensions are to exacting specifications.

To make a test, 16 oz. of asbestos is placed on the uppermost tray, which is then covered and tightly clamped. The machine

is started and allowed to run at 328 rpm. for exactly 600 revolutions, when it is stopped by an automatic device. At the end of this time, the asbestos remaining on each sieve is weighed and the test is recorded to the nearest tenth of an ounce.

The Canadian classification of chrysotile asbestos specifies the minimum shipping test for each grade; i.e., the minimum number of ounces of fibre there shall be on each of the upper screens, and the maximum there shall be in the pan. For convenience of designation, fibres have been divided into numbered groups and each group has been sub-divided into grades, identified by letter of the alphabet. Space does not permit an itemization of all the recognized grades, but, by way of explanation, in the following list of groups there are a number of grades, each with its minimum guaranteed test, under each group heading. In group No. 3, for example, there are five grades, the longest of which is 3F with a guaranteed test of 7-7-1-½-½ (i.e., ounces on screens of ½ in., 4 mesh, 10 mesh, and pan, respectively, the whole adding up to 16 oz.). The shortest grade in this group is 3Z with a test of 0-8-6-2.

Group No. 1 Crude No. 1 (3/4 in. staple and longer)
Group No. 2 Crude No. 2 (3/8 inch staple up to 3/4 in.)
Group No. 3 Textile and spinning fibres (testing 0-8-6-2 and over)
Group No. 4 Shingle fibres (testing below 0-8-6-2- and including 0-1-½-9-½-5)
Group No. 5 Paper fibres (testing below 0-1-½-0-½-5 and including 0-0-10-6)
Group No. 6 Waste, stucco, or plaster fibre (testing 0-0-7-9)
Group No. 7 Refuse or shorts (testing 0-0-5-11)
Group No. 8 Sand - a mill produce weighting less than 75 lb. and more than 35 lb. per cu. ft.
Group No. 9 Gravel and stone - a mill produce weighing more than 75 lb. per cu. ft."

The grade and percentage of fibre, and subsequently the value of a prospect, can be determined by two methods, milling and visual examination.

MILING:

The most exact, and the ultimate, test for quantity and grade of fibre is by milling - the per cent and grade can be accurately obtained by standard practice. This can be done properly on prospects where conditions of transporation, depth of overburden, etc. allow for systematic bulk sampling. Unfortunately these favourable conditions are seldom obtainable on prospects and other methods have to be used.

Assuming the percent and grade of fibre is obtained by milling, the value of the ore can be approximately estimated by' reference to current market quotations for the product obtained. Quotations for 1950 were as follows, the present price is slightly higher.

Group No. 1 - Crude No. 1	$960 to $1050.
Group No. 2 - Crude No. 2	492 to 550.
Group No. 3 - Spinning	232 to 475
Group No. 4 - Shingle	99 to 141
Group No. 5 - Paper stock	79 to 88
Group No. 6 - Stucco, plaster	58
Group No. 7 - Shorts	25 to 50

VISUAL EXAMINATION

This method is particularly adapted to the evaluation of prospects. The grade and percentage of ore are estimated by accurately measuring the width of cross-fibre veinlets exposed in the ore - this may be in diamond drill core or on rock surface. The veinlets are measured to the nearest sixteenth of an inch and the number in each size range recorded.

The percentage of fibre present can be directly calculated from the above tabulation. Standard practice in the asbestos industry is to measure 5-foot sections as a unit. Quick field calculation of percentage can be made by totalling all of the fibre interms of sixteenths and dividing by 10 (5 feet equals 960 sixteenths or approximately 1000). The angle of the fibre veinlets to that of the direction of the sample should be taken into consideration in determination of the percentage. Experience in the Theforo Asbestos area has shown that in the vertical drilling that most of the fibre is at 45 degrees to the core so that the sine of 45 degrees (.7071) is used as a correction figure.

Classification into grade of the visual examination can be made by reference to the screen sizes used in the Quebec Standard Testing Machine.

No. 1 Screen - Measured veinlets half inch or better
No. 2 Screen - Measured veinlets quarter inch to half
No. 3 Screen - Measured veinlets eighth inch to quarter
No. 4 (Pan) - Measured veinlets one sixteenth.

The number of sixteenths present in the sample for each grade is calculated from the tabulation. The amount of fibre present for each grade in the standard classification is directly proportional to the total standard sample of 16 ounces, as the number of sixteenth inch fibre for each grade is to the total number of sixteenths in the section sampled.

Long experience has enabled the operators to establish a series of price factors based on the standard grading system. These factors, as established in 1948 are as follows:

No. 1 Screen - No. ounces X $50.00
No. 2 Screen - No. ounces X $14.00
No. 3 Screen - No. ounces X $ 6.00
Pan - No. ounces X $ 1.40

The total gives the value of a ton of fibre - the percent of fibre in the rock has already been determined so that the value of the rock can be calculated. Since establishment of the price factors in 1948 there has been an increase in the asbestos industry - to compensate for this a factor of 1.37 is used for 1951 prices.

EXAMPLE CALCULATION FOR GRADE AND VALUE

HYPOTHETICAL ASBESTOS PROSPECT

FOOTAGE	1/16	1/8	3/16	¼	5/16	3/8	7/16	½	9/16	5/8	11/16	¾	%
100-105	7	1	2	1	1								2.4
105-110	10				2			2					2.8
110-115	6	4	2					1	2				4.6
115-120	8	4	1	1	2	2							4.5
120-125	6	5	6		1								3.9
125-130	14		2	2	2	2							5.0
30'	51 51/16	14 28/16	13 39/16	4 16/16	8 40/16	4 25/16	0	3 24/16	2 18/16	0	0	0	
Screen Clasification	Pan	10 mesh		4 mesh				2 mesh					totals
No. 1/16 Veins	51	67		80				42					240
Proportion oz. in 16 →	(3.4)	(4.5)		(5.3)				(2.8)					16
Valuation Factors 1948	(1.4)	(6.00)		(14.00)				(50.00)					
Value per ton Fibre	$4.76	+ $27.00	+	$74.20	+			$140.00	=			>	$245.96

$\frac{x}{16} = \frac{51}{240}$

EXAMPLE CALCULATIONS FOR GRADE AND VALUE (cont'd)

HYPOTHETICAL ASBESTOS PROSPECT

$$\text{Percent Fibre Present} - \frac{\text{Total 1/16 Fibre x 100}}{\text{Total 1/16 in sample}} = \frac{240 \times 100}{30 \times 12 \times 16} = \begin{array}{l} 4.16\% \\ \text{use } 4.0\% \end{array}$$

But assuming fibre outs sample at 45% = 4.0% .7071 - 5.6%

Value of Ore = 4% of \$245.96 = \$9.84 (1948 price)
or \$9.84 x 1.37 = \$13.45 per ton (1951 price)

Above fibre would be classed as (2.8 - 5.3 - 4.5 - 3.4)
or 3R or 3M - Spinning Fibre

S.P. Ogryzlo

September 1951.

ASARCO

LAKE ASBESTOS OF QUEBEC, LIMITED

SUBSIDIARY OF AMERICAN SMELTING AND REFINING COMPANY

P.O. BOX 608, BLACK LAKE, QUEBEC

TELEPHONE: (418) 423-4226
TELEGRAMS: LAQBESTOS BLACK LAKE
TELEX: 018-3219

Effective January 1, 1970

PRICE LIST #12

ASBESTOS FIBRE PRICES

FOR INLAND SHIPMENT TO CANADA AND UNITED STATES.
CARLOAD PRICES IN CANADIAN DOLLARS per ton of 2,000 lbs.
F.O.B. BLACK LAKE, QUEBEC.

CANCELLING ALL PREVIOUS LISTS

STANDARD GRADE DESIGNATION		GUARANTEED MINIMUM TEST	MINIMUM CARLOAD QUANTITY	FREIGHT CLASSIFI-CATION	PRICE PER TON OF 2,000 lbs.	STANDARD GRADE DESIGNATION	
No. 2 Crude			20 tons	Crude	$ 825.00	No. 2 Cruc	
3F	Fibre	10.5-3.9-1.3-0.3	" "	Fibre	650.00	3F	Fibr
3K	"	7-7-1.5-0.5	" "	"	551.00	3K	"
3R	"	4-7-4-1	" "	"	468.50	3R	"
3T	"	2-8-4-2	" "	"	425.50	3T	"
3Z	"	1-9-4-2	" "	"	396.50	3Z	"
4A	"	0-8-6-2	" "	"	368.50	4A	"
4D	"	0-7-6-3	" "	"	248.00	4D	"
4K	"	0-4-9-3	" "	"	243.00	4K	"
4M	"	0-4-8-4	" "	"	243.00	4M	"
4R	"	0-3-9-4	" "	"	227.00	4R	"
4T	"	0-2-10-4	" "	"	218.00	4T	"
4Z	"	0-1.5-9.5-5	" "	"	205.00	4Z	"
5D	"	0-0.5-10.5-5	" "	"	184.00	5D	"
5K	"	0-0-12-4	" "	"	184.00	5K	"
5M	"	0-0-11-5	" "	"	173.00	5M	"
5R	"	0-0-10-6	" "	"	156.50	5R	"
5Z	"	0-0-8.6-7.4	" "	"	135.00	5Z	"
6D	Waste	0-0-7-9	30 tons	Waste	113.30	6D	Wast
7D	Shorts	0-0-5-11	" "	Shorts	94.30	7D	Shor
7F	"	0-0-4-12	" "	"	85.00	7F	"
7H	"	0-0-3-13	" "	"	72.60	7H	"
7K	"	0-0-2-14	" "	"	59.70	7K	"
7M	"	0-0-1-15	" "	"	53.60	7M	"
7R	"	0-0-0-16	" "	"	50.50	7R	"
7T	"	0-0-0-16	" "	"	48.40	7T	"
7RF	Floats	no test	" "	Floats	52.00	7RF	Floa
7TF	Floats	no test	" "	Floats	52.00	7TF	Floa
8S		no test	" "		45.00	8S	

STANDARD PACKAGE 100 lbs. Prices for special packaging quoted on request.
Prices for LESS THAN CARLOAD LOTS quoted upon request.
All prices are net and subject to change without notice.
Fibre produced on other specifications. Prices on request.
All offers are made subject to prior sale and orders are accepted subject to our ability to deliv
Should any new Government taxes be imposed, they will be added to our invoices.
TERMS: 1% discount for payment 10 days after shipment or net 30 days.
FUNDS: Payment will be accepted in U.S. Dollar equivalent as invoiced.
Issued October 31, 1969
Form PL 1a Printed in Canada

ASARCO

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EXPLORATION DEPT.

European Exploration Division

R. B. Sprague
Director

J. H. C.
JUN 4 1976

May 21, 1976.

Memorandum to: R.L. Brown,
J.H. Courtright,
J.J. Merz

file

ASBESTOS

On April 30th I attended a talk on Asbestos given to the Association of Mining Analysts by Dr. Richard Gaze, Director of Cape Industries Ltd., Cape Industries being controlled by the Anglo-American group. They have three mines in Cape Province:

Penge Mine - the only producer of Amosite Asbestos with production of 100,000 tons of fibre per annum. No intention to increase this.

Kookast Pomfrey Mines produce 55,000 tons of crocidolite, or blue asbestos, per annum. Reserves of both Amosite and Crocidolite are sufficient to the end of the century and beyond.

World Production of Amosite and Crocidolite is 250,000 TPA against 4.5 million of Chrysotile. An estimated one third of production is from Russia.

Health Hazards

Recently there has been many published notices of the health hazard from use of asbestos. Crocidolite is considered to be much more dangerous than chrysotile. It has been used for insulation in the past and presents considerable dangers during demoliton of old buildings, boilers, etc. It is no longer allowed to be imported into the U.K.

Dr. Gaze claimed that under proper control conditions there is a minimal risk from asbestos and their miners and mill-men show no evidence of asbestosis or cancer.

.../Continued

Uses

50% of fibre is used in building and particularly in cement and pressure pipes. Very large need for construction uses in the "third world" but lack of finances to purchase the fibre. Asbestos pipe and sheet have a much lower energy requirement for manufacture than competing materials.

Cement sheets	32%
Pressure pipes	5%
Fire resistant boards	13%
Insulation	2%
Jointing and packing	7%
Friction material	10%
Textiles (fire resistant)	5%
Floor tiles	9%
Molded plastics	2%
Filler & etc.	15%
	100%

Prospects for the industry

Production is the main problem of the industry and a larger production is needed. This is likely to come from expansion at existing installations because the present cost of developing new mines is too high to risk. (Note: Dr. Gaze estimated development cost of Abitibi deposit at 200 million dollars against nearly 300 million in the Northern Miner.)

Substitutes

Glass fibre and all synthetics are attacked by alkali.
Cement continues to produce alkali for 50 years.
Asbestos fibre is completely inert to alkali.

R.B. Sprague

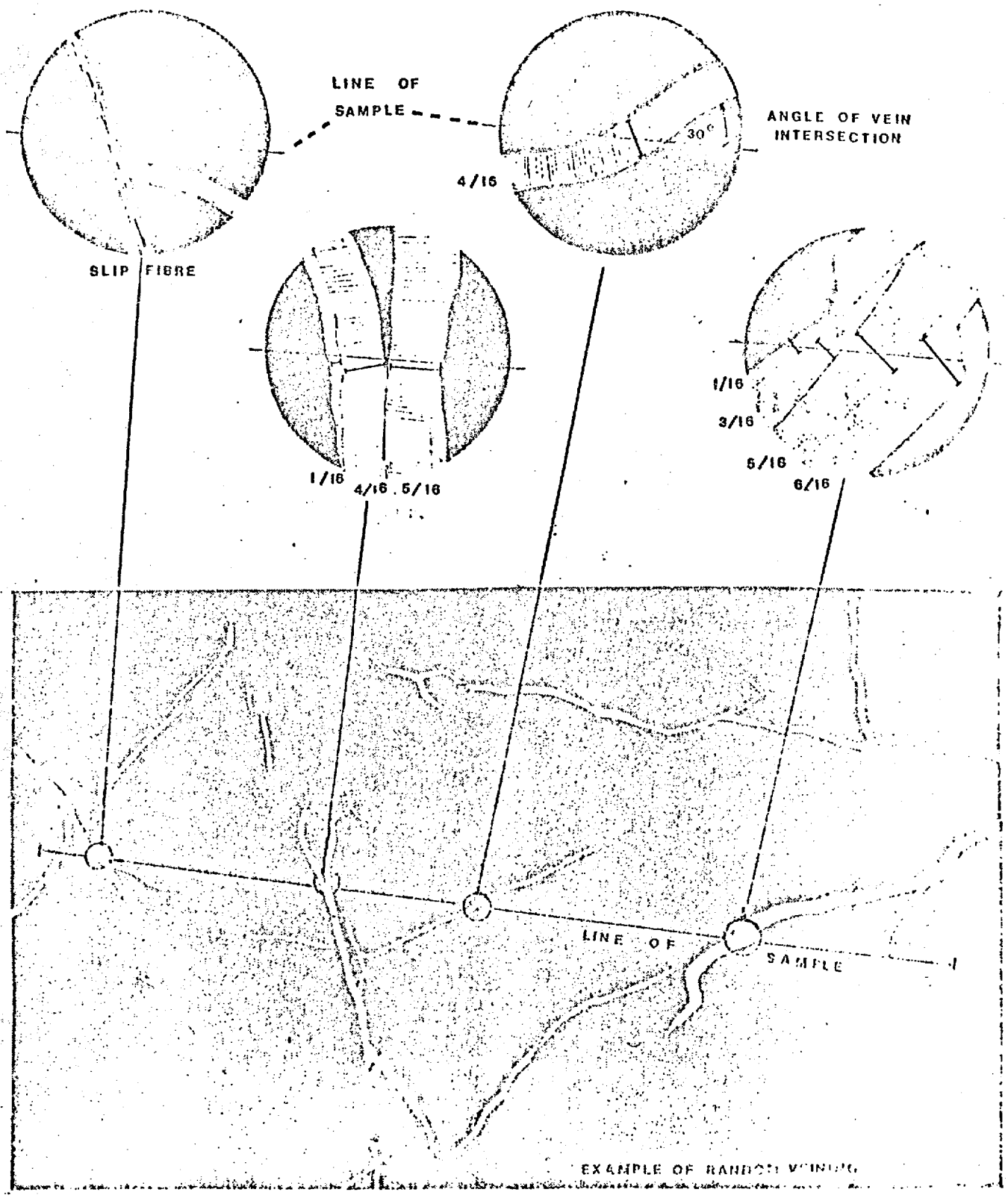
R.B. Sprague

LENGTH OF MEASUREMENT	LOCATION		DESCRIPTION
PHOTO / MAP			
AREA	BEARING	PLUNGE	
COLLECTOR	ELEVATION (highest)		
DATE	CO-ORDINATES		

SF- <1	Tally	Total No. 16ths	16ths in QST Group	Reduced to Total = 16 ozs.	Points per Group
1					
2					
3					
4					
5					
6					
7					
8					
9					
ZA № 2903		Total 16ths			

TOTAL POINTS	
FIBRE VALUE	
UNCORRECTED %	
AVERAGE <	COSECANT
% FIBRE	
ROCK VALUE	

TURNERS LTD. 31752*



APPENDIX II FIGURE 4 ILLUSTRATION OF FIBRE COUNTING SHOWING LINE OF SAMPLE AND MEASUREMENT OF FIBRE LENGTHS.

To Determine Fibre Value

Q.S.T. groups	1/2"	4M	10M	Pan	Total
Veins:	(1/2"+)	(1/4",5/16",) (3/8",7/16")	(1/8",) (3/16")	(1/16")	
No. of 1/16's at each group in sample	18	4	28	14	64
Reduced to total = 16	4.5	1.0	7.0	3.5	16
X Factor	100	40	10	1	
Evaluation Points	450	40	70	3.5	563.5

Fibre Value (From Graph, Figure 6, 1970 prices) $415

To Determine Percentage Fibre

$$\frac{\text{Total 1/16's of fibre}}{\text{Footage of sample x12x16}} \times 100 = \text{Uncorrected percentage}$$

$$\frac{64 \times 100}{25 \times 12 \times 16} = 1.31\%$$

$$\frac{1.31}{\sin 45^{o}} \text{ or } 1.31 \times \text{Cosecant } 45 = 1.31 \times 1.414 = 1.85\%$$

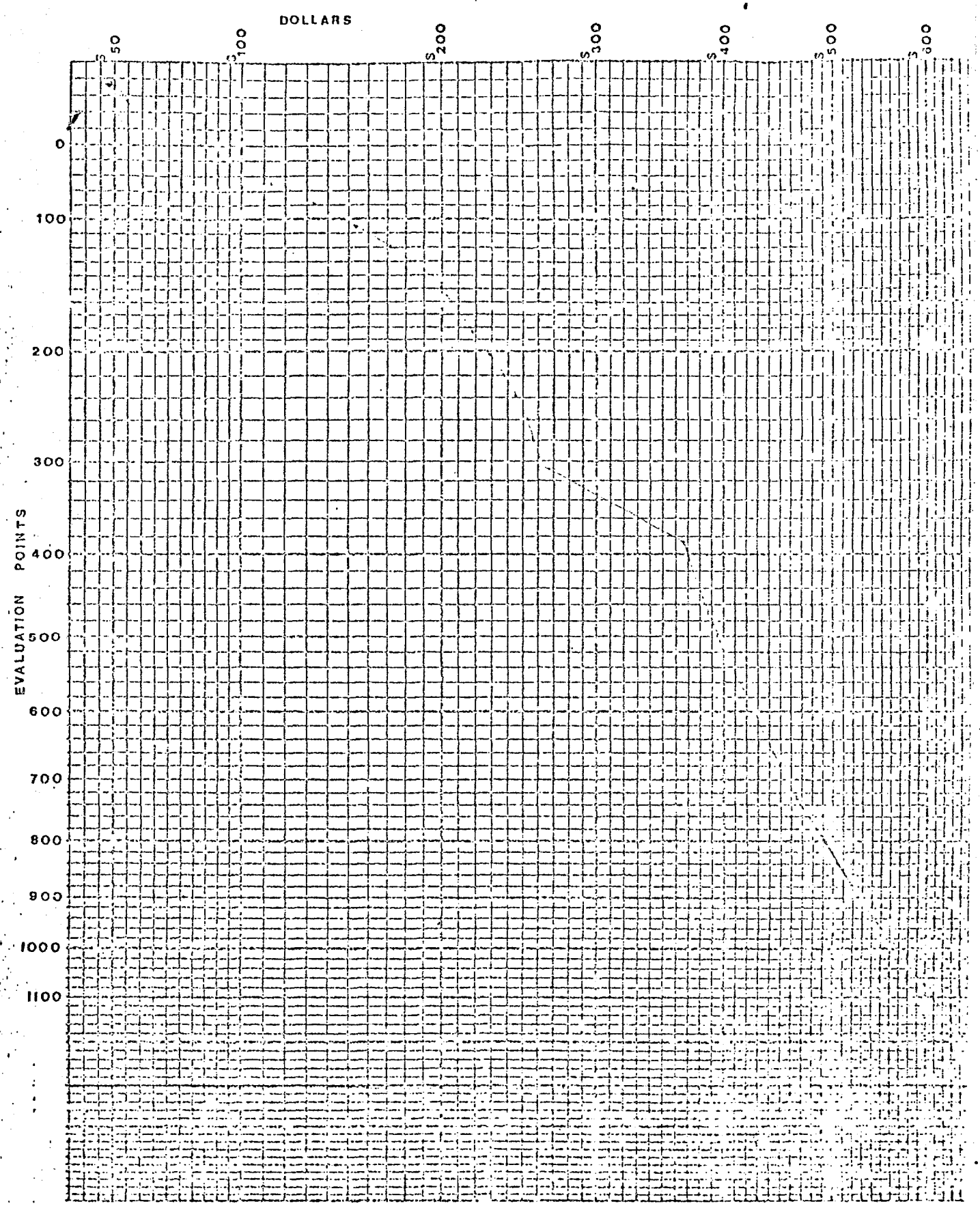
(45° is average angle between veins and line of traverse for random stockwork veining).

To Determine Rock Value

Fibre value x percentage fibre:

$$\frac{\$415 \times 1.85}{100} = \$7.66 \text{ per ton}$$

APPENDIX II FIGURE 5 SAMPLE OF CALCULATIONS, SAMPLE NO. ZA2144 FROM APPENDIX II, FIGURE 3.



APPENDIX II FIGURE 6 FIBRE VALUE CHART AT 1970 PRICES IN CANADIAN DOLLARS