86-133-15064

GEOLOGICAL ASSESSMENT REPORT

ON THE

CHRYS 2, 3, 4 CLAIMS

SERPENTINITE HOSTED ASBESTOS - TALC PROSPECT

REVELSTOKE MINING DIVISION
SOUTHEASTERN BRITISH COLUMBIA
NTS 82K/3W

LATITUDE: 50°45'
LONGITUDE: 117°56'

BY

C. GRAF, P.Eng.

3 APRIL 1986

TABLE OF CONTENTS

LIST OF FIGURES **FOLLOWING PAGE**

APPENDICES

LIST OF PHOTOS

SUMMARY

An altered ultrabasic sill intrudes Lardeau Group sediments on the northwest slope of Sproat Mountain, 33 km southeast of Revelstoke, B.C. It averages 100 m thick, is exposed across a width of 300 m, along a strike length of over 1 km, and dips east into the mountain for an undetermined distance.

The original body was an olivine-pyroxene dunite, or peridotite that has been completly altered into a serpentinized core surounded by a carbonatized (talc-magnesite) zone. The serpentine core is 550 m by 130 m in plan and contains abundant, fibrous chrysotile asbestos veinlets. The main fibre zone (>1% chrysotile) is 250 m long and 50 m wide in plan. It has been stripped, extensively trenched and diamond drilled by previous mining companies. Much of their drill core is stored on the property near the old cabin. A mill test by Cassiar Mining Ltd. on a sample collected in 1985 returned an assay of 3.67% Ax grade. This is a middle cement grade with a list price of $ 930.00/tonne.

The talc mineralization has not been extensively explored, except by one old pit that was dug near the cabin in the 1920's. The talc color varies from dark grey to pale green, and when pulverized is greyish-white. Where observed, it is generally intergrown with magnesite; however, undiscovered large deposits of pure talc may exist within the extensive zone of talc-magnesite alteration. A thorough prospecting and rock sampling program should be undertaken to evaluate the extent and quality of talc mineralization within the large carbonatized alteration zone. A preliminary XRD analysis by the BCDM on 2 samples collected in 1985 indicated talc content of 40% and 60%. Other minerals identified were magnesite, magnetite and chlorite.

The deposit is favourably located near major transportaton routes such as the Canadian Pacific Railroad and Trans-Canada Highway at Revelstoke 33 km north, and highway on the west side of Arrow Lake. Pulp and paper mills are located along the railroad at Kamloops 150 km west and Skookumchuck 250 km east of Revelstoke. A third pulp mill is located at Castlegar at the south end of Arrow Lake 175 km south, to which barging the talc may be feasible.

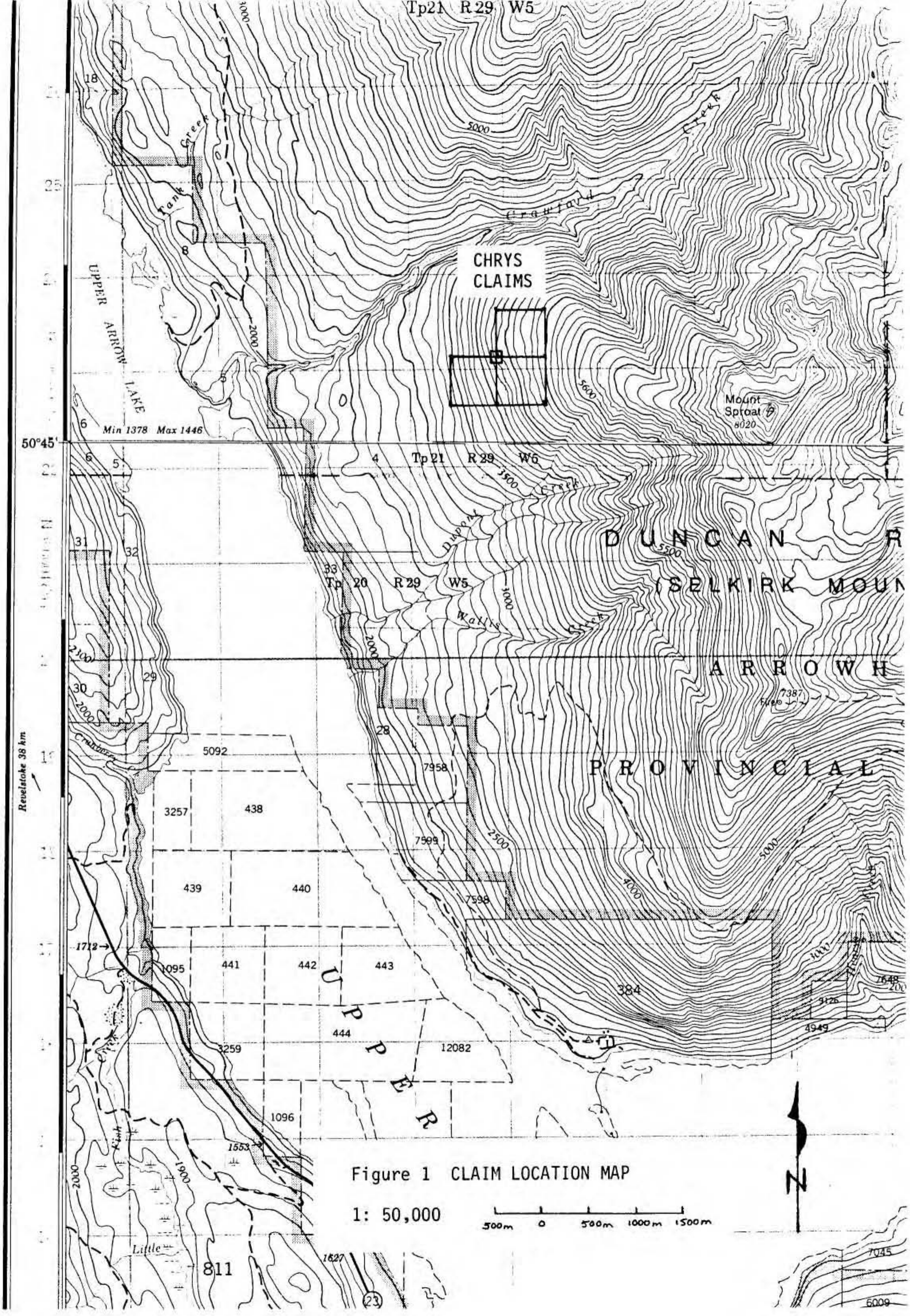

Figure 1 CLAIM LOCATION MAP

1: 50,000

PHOTO 1

AERIAL VIEW OF CHRYS CLAIMS SHOWING TRENCHES
ACROSS MAIN CHRYSOTILE ASBESTOS ZONE

PHOTO 2

LOOKING SOUTH ACROSS CHRYS CLAIMS #5 TRENCH.
GALENA BAY IS ON THE PENINSULA IN ARROW LAKE NEAR CENTRE OF PHOTO.

CLAIMS INFORMATION

The Chrys claims are located in the Revelstoke Mining District of British Columbia on Map Sheet NTS 82K/13W.

Claim Name	No. of Units	Record No.	Recording Date
Chrys 2	1	1800	15 Feb/84
Chrys 3	1	1801	15 Feb/84
Chrys 4	1	1802	15 Feb/84

The claims were grouped on February 11, 1986 as the Chrys Group (3 units).

LOCATION AND ACCESS

The Chrys claims are located on the northwest slope of Sproat Mountain which is situated 33 km southeast of Revelstoke on the east side of the Columbia River Valley. (Figure 1)

Elevations on the claims vary from 4000 feet to 5000 feet, and the topography is moderately sloped which allows relatively easy accessibility for exploration purposes. Vegetation is moderate to heavy and consists of mature fir and spruce trees with patches of willows and slide alder near streams and damp areas. There is sufficient water for drilling purposes throughout the claims. An overgrown access road 4 km long leads from the old town of Sidmouth on the edge of Upper Arrow Lake to the claims. Access is either by boat to Sidmouth and then on foot to the claims, or by helicopter. Both Okanagan Helicopters Ltd. and Highland Helicopters Ltd. have charter services in Revelstoke.

HISTORY AND PREVIOUS WORK

The Chrys claims are a relocation of an old property that was discovered in the early nineteen hundreds, and held by various individuals and companies from 1922 on, the most recent being Canadian Johns-Manville Co. Ltd. The latter company staked the showings in 1962 and held them continuously until declaring bankruptcy in 1982.

Dr. Bancroft visited the showings in 1921 and wrote a favorable description of both the talc and asbestos potential in GSC Summary Report, 1921, Pt.A.

In 1929, Dr. Gunning included a short discussion of the property in GSC Memoir 161, Geology of Lardeau Map Area.

In 1949, Dr. McCammon of the B.C. Dept. of Mines mapped the showings and published a short but comprehensive report in BCDM Annual Report 1950.

In 1964, at U.B.C., J. Kerr wrote a B.Ap.Sc. Thesis on the Geology of the Sproat Mountain Ultrabasic Intrusion. This work included thin section examination and identification of minerals in both the serpentinized and talc-carbonate zones.

The first recorded claims were staked in 1922 by Mr. Lauthers of Revelstoke who prospected and hand trenched the property for both talc and asbestos and eventually optioned it to Lardeau Mine Exploration Syndicate in 1928. This company sampled the asbestos showings and sent a 300 lb. sample to Ottawa for testing. (Appendix II) Poor economic conditons in 1929 made marketing of asbestos unfavorable and the claims again were allowed lapse.

The showings were re-staked in 1949 by Acme Asbestos Cement Ltd. of Vancouver, and a 524 lb. sample was shipped from a new showing to a B.C. Department of Mines Lab for testing (Appendix II). In 1950, Pacific Asbestos Corp. Ltd. was formed to develop the property. They built an access road and carried out 1015 feet of diamond drilling as well as some surface stripping. Western Asbestos and Development Ltd. continued the exploration program and diamond drilled 1,981 feet in 1953. They eventually dropped the claims in 1962, and Canadian Johns-Manville Co. Ltd. (CJM) immediately re-staked the prospect. This same year (1962) CJM carried out ground magnetometer and detailed geological mapping surveys over the entire claims area. (BCDM Assessment Reports 469, 470.) Although CJM subsequently carried out trenching, fibre counting and sampling, this work was not recorded and the claims were allowed to lapse in 1982.

In 1984 the prospect was re-staked by the writer in order to assess the talc, asbestos and precious metal potential. Rock samples were collected in order to analyze and assay them for quality and quantity of both asbestos and talc (Figure 4). Cassiar Asbestos Ltd. kindly assayed the chrysotile samples in their mine facilities at Cassiar, B.C. (Appendix I) and two talc samples were analyzed by XRD at the BCDM laboratory in Victoria. (Appendix IV.)

GEOLOGY

The main minerals of interest (talc and chrysotile asbestos) occur in serpentinized and carbonatized alteration zones within a sill-like body of ultrabasic peridotite which has intruded sedimentary rocks of the Early Paleozoic Lardeau Group. (Figure 3) Read (1977) in Regional Geology Map GSC O.F. #432 shows the Broadview Formation of the Lardeau Group to outcrop extensively on Sproat Mountain. Unfortunately, he has misplotted the location of the ultrabasic sill by placing it over 5 km northeast of its true position.

The sill is nearly conformable with bedding, varies in thickness from 35 m to 160 m, is over 300 m wide and strikes N-S for 1 km along the west limb of a broad, gently plunging syncline.

A unit of faintly banded impure grey-white to pinkish colored quartzite 50 m to 100 m thick forms the hanging wall of the sill, while schists and limestone occur along the footwall. Intrusive contacts generally show little deformation or alteration effects.

The ultrabasic rock is a highly altered peridotite or dunite, containing two distinct zones of alteration. The peripheral zone has been altered to

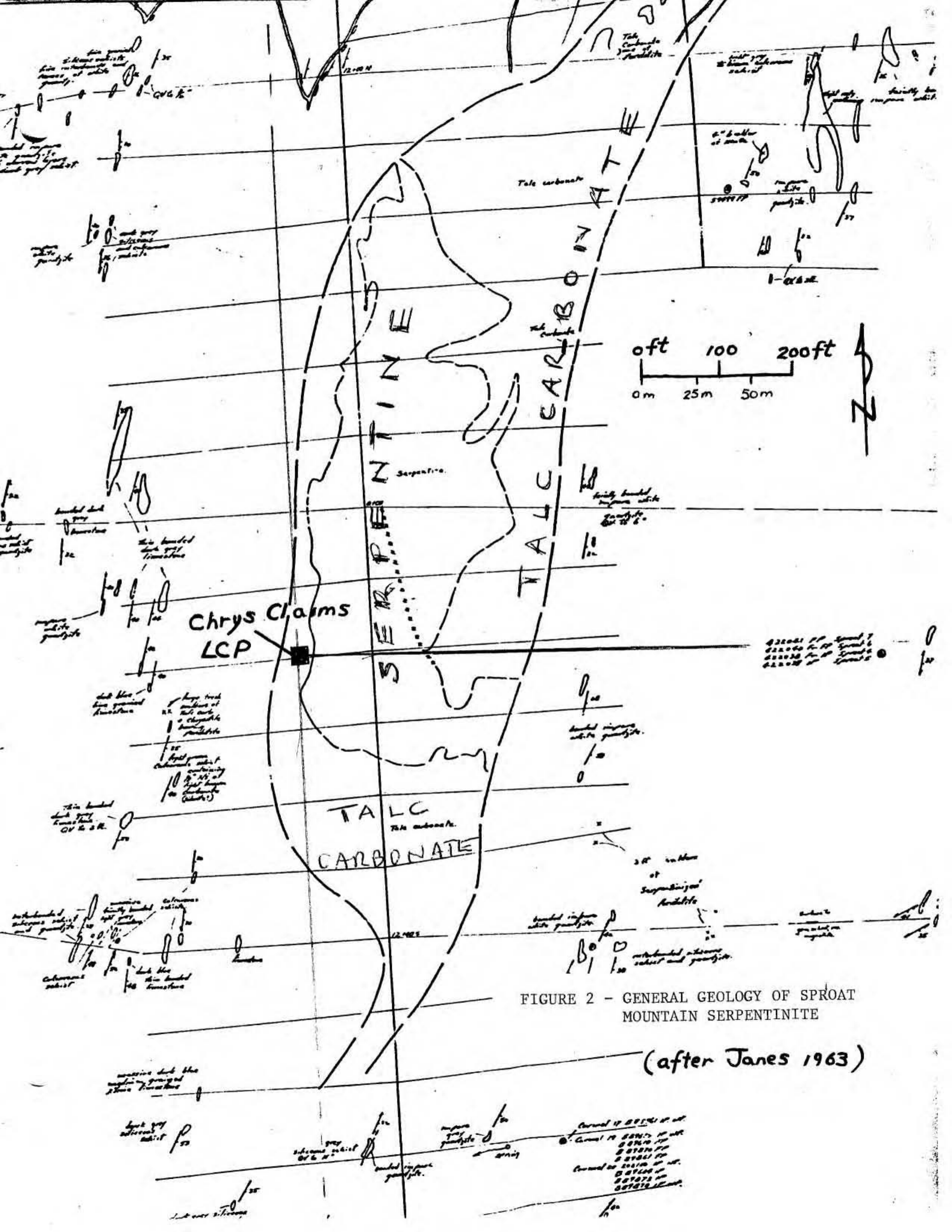

FIGURE 2 - GENERAL GEOLOGY OF SPROAT MOUNTAIN SERPENTINITE

(after Janes 1963)

original rock is believed to have been composed predominantly of olivine and pyroxene. (Kerr, 1964)

Rocks of both the talc-carbonate and serpentine zones appear mottled on fresh and weathered surfaces. This mottling is thought to be due to the presence of unaltered olivine in the serpentine, and is due to grains of black magnetite in white carbonate in the talc carbonate zone. Brown stain on weathered surfaces is due to the formation of iron oxide in the rock.

The distribution of minerals present in the ultrabasic rock was determined by Kerr 1964, as an average from observations in hand specimen, thin section and heavy mineral separation. The mineral distribution for the carbonatized and serpentinized zone is as follows:

1. **Serpentine Zone**

Serpentine (Antigorite and Chrysotile)	60%
Olivine	25%
Magnetite	10%
Carbonate (Magnesite)	Trace
Pyrrhotite	Trace
Biotite	Trace
Chromite	Trace

2. **Talc-Carbonate Zone**

Carbonate (Magnesite)	60%
Talc	30%
Magnetite	10%
Muscovite	Trace
Biotite	Trace
Chromite	Trace

Structure

The following is from Kerr 1964:

"The internal structure of the ultrabasic body is quite simple. The rock is highly sheared and fractured, which indicates that the intrusion has undergone high pressure. There are two prominent fracture trends, which may be related to the stress pattern developed during the Cordilleran uplift of Cretaceous period.

The large fractures along L5 + 50, from 1 + 00W to 0 + 50E were recorded as follows:

	Strike	Dip	Strike	Dip
	23°	80°W	310°	90'
	15°	74°W	325°	80°E
	15°	80°W	328°	85°E
	10°	90°	305°	90°
	5°	85°W	323°	85°W
	22°	83°W	295°	75°E
	37°	80°E	315°	85°E
	28°	90°		
	20°	75°W		
Average:	20°	85°	315°	90°

The two dominant directions of fractures were easily recognized in the field and are: 20° / 85°, 315°/ 90°.

The direction of maximum stress is found by bisecting the smallest angle between the prominent fracture directions. It may be noted that this angle is 65°, which is approximately the shearing angle of ultrabasic rock."

The sedimentary strata in the area comprise the southeast limb of a large fold, which strikes northeast-southwest. The stress system of the fractures in the ultrabasic corresponds to the stress system developed in the sediments during folding. It is therefore probable that fractures in the ultrabasics were caused by folding of the sedimentary rocks, and are thus of the same age.

Minor fractures in the ultrabasic appear to be randomly oriented. This may be the result of high order patterns developed from the same stress system, or the result of minor stress systems. The amount of fracturing is one of the main processes necessary to produce an asbestos orebody.

Alteration

Serpentinization

Serpentine is formed from alteration of olivine by addition of water and the following formula illustrates the basic chemical reaction.

Mg_2SiO_4 (olivine) + $H_2O \rightarrow H_2Mg_3SiO_6$ (Serpentine) + Heat

Magnetite occurs evenly distributed throughout the ultrabasic body. It is also believed to have formed at the time of serpentinization through the following chemical reaction:

$(Mg,Fe)_2SiO_4 + H_2O \rightarrow H_4Mg_3Si_2O_9 + Fe_3O_4$ (Magnetite) + Heat

It appears necessary to have pyroxene present to make either of the above two equations balance.

As there was no iron present in the olivine examined by Kerr, he believed that all the iron-rich olivine and pyroxene had been altered to serpentine, which if true, indicates that serpentine alteration may be considered complete.

Carbonatization and Talc Alteration

Talc carbonate may be formed as the result of one or two stages of alteration:

1. Olivine $\longrightarrow$ Talc + Magnesite
2. Olivine $\longrightarrow$ Serpentine $\rightarrow$ Talc + Magnesite

The basic chemical reaction is given by the following formula:

$$Mg_2SiO_4+H_2O+5CO_2 \longrightarrow H_2Mg_3Si_4O_{12}(talc)+5MgCO_3(Magnesite)+SiO^2$$

Iron-rich olivine would produce magnetite. It was very difficult for Kerr to determine the exact nature of alteration, as none of the original ultrabasic material was present. He believed that the process of alteration involved a serpentine stage, as there were replaced fibre veins present in the talc carbonate zone.

The percentage of magnetite is the same in the talc carbonate zone as in the serpentinized zone which indicates that very similar processes of magnetite formation were present in both zones.

Many ultrabasic bodies around the world have a peripheral talc carbonate zone, the origin of which has puzzled many geologists. There have been three theories proposed to explain its presence.

1. The carbonate was present in the original ultrabasic magma.
2. Carbon dioxide gases were present in the hydrothermal fluids at the time of chrysotile formation.
3. The ultrabasic body is in contact with limestone, and by process of ionic transfer, carbonate ions entered the ultrabasic body.

Kerr felt that theory #3 fits the origin of carbonate at Sproat Mountain, as limestone beds are in contact with the ultrabasic body. The large talc carbonate zone suggested that the extent of ionic transfer must have been very great.

Talc carbonate alteration involves escape of silica from the original olivines and pyroxenes. Therefore, alteration is basically an ionic exchange of carbonate and silica ions.

Kerr proposed two theories to explain migration and emplacment of silica ions observed in the Sproat Mountain sill through the reasoning outlined below:

1. Quartz veins are present in schists around the ultrabasic body. Silica, emanating from the carbonate alteration, possibly was emplaced in cleavage fractures of the schistose rocks.

2. The contact rock of the ultrabasic body is mainly limestone and a thick massive bed of pinkish-grey quartzite. Bands of carbonate in the quartzite indicate the possibility that the quartzite may have originally been limestone. By process of ionic transfer, the limestone may have been replaced by silica, to form quartzite.

Kerr summed up his thoughts on the relative timing of the intrusion and serpentinization of the intrusion in the quote below:

> "There has been much discussion as to the time that ultrabasic bodies become serpentinized: before or after intrusion. It is believed that the Sproat Mountain intrusion was emplaced in a serpentinized state. Only one observation supports this belief, so it is by no means conclusive. From petrographic studies, it was observed that the original ultrabasic material has undrgone a very complete and evenly distributed alteration. This suggests that the influence for alteration must have been very evenly distributed over the entire body. The only influence, that could be represented as such, is the gradual lowering of lithostatic pressure as the ultrabasic body rose from great depths. Therefore, it is assumed that the Sproat Mountain ultrabasic body was serpentinized during its ascent to the surface of the earth."

MINERALIZATION AND GEOCHEMISTRY

Three stream silt samples were taken from the south end of the main serpentinized zone in 1985 and analyzed for gold, silver, platinum (Figure 4). None of these samples indicated precious metal mineralization (Appendix III); however, further sampling would be needed to make a satisfactory evaluation. The main economic potential lies in the serpentinized (chrysotile asbestos) and talc-magnesite altered zones of the ultrabasic sill. Considerable magnetite occurs in the main serpentinized zone in places forming massive deposits of unknown dimensions. The presence of large amounts of magnetite is indicated by the magnetometer survey by C.J.M. (BCDM Assessment Report 4709). The magnetite distribution is widespread and the above-mentioned survey was not able to separate the serpentine and talc zones. Small amounts of chromite occur in both zones. Carbonates that show on weathering a considerable content of manganese occur in grey quartzites bordering a body of serpentine rock on the west slope of Sproat Mountain. The serpentine carries a certain amount of carbonate material, and manganese carbonates occur as local replacements or fissure fillings in the sedimentary formations on the east side of the serpentine belt.

Several small open-cuts have been made showing the character of the manganese ore. Samples taken form the surface were reported on as follows: "The material consists for the most part of granular, compact, greyish to pinkish carbonates of manganese, iron, calcium, and magnesium. These carbonates probably form isomorphous series. Some of them are near rhodochrosite in composition, others nearer to manganocalcite or manganosiderite. (Bancroft, 1921)

Asbestos

The main chrysotile asbestos fibre zone (>1%) was shown by C.J.M. to measure 250 m long by 75 m wide on surface, with its down dip dimension unknown. (Figure 3) This mineralized zone occurs along a local topographic high that would provide a low stripping ratio for open pit mining. It has been exposed along the entire 250 m length by fifteen cat and blast trenches which are spaced roughly 20 m apart along strike and vary from 10 m to 50 m in length.

Bulk samples were taken in 1927 and 1949 and tested at government laboratories. The 1949 sample (524 lb.) was found to contain 114 lb./ton fibre (5.7%) of Ay-Az group grade which would be suitable for asbestos board, tile,

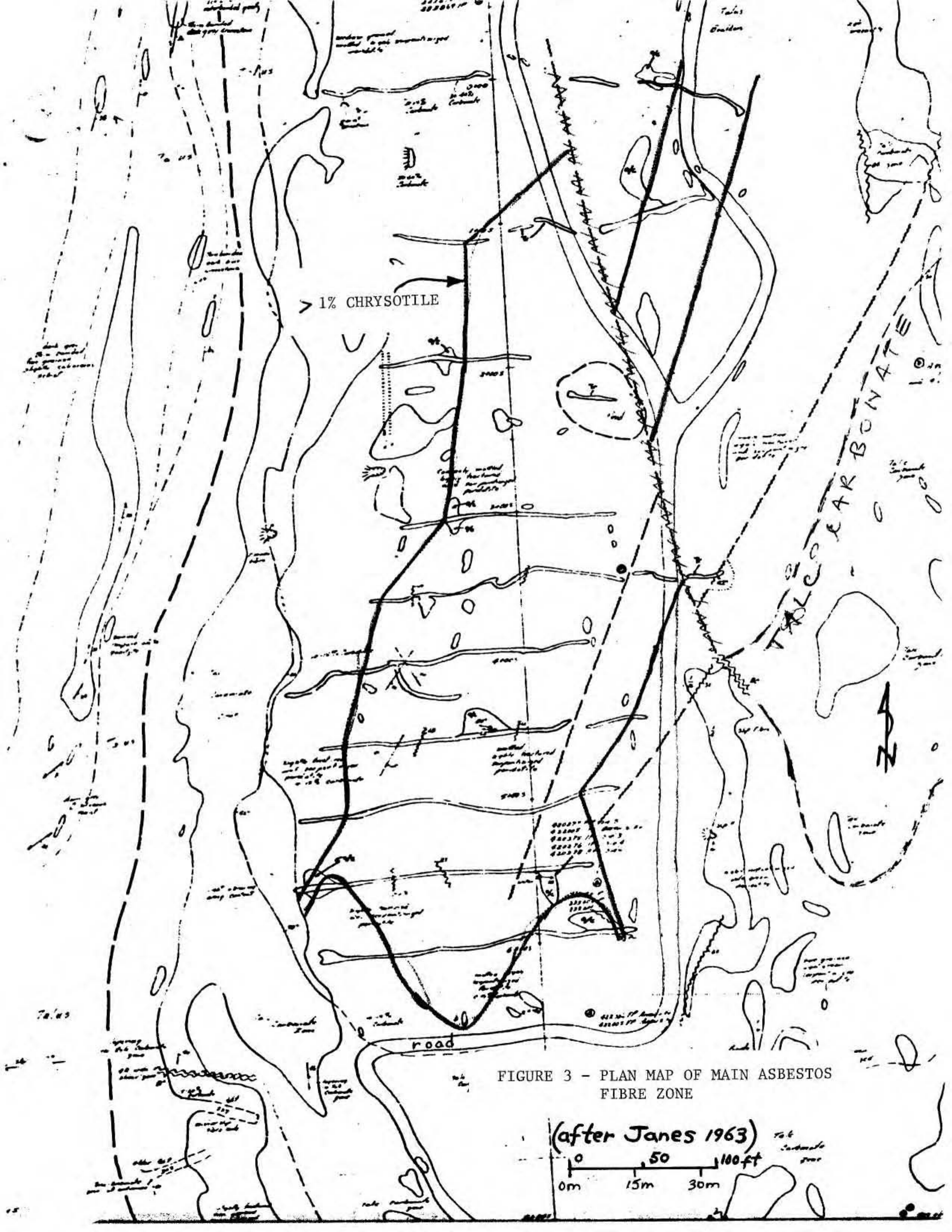

FIGURE 3 - PLAN MAP OF MAIN ASBESTOS FIBRE ZONE

shingles and paper stock (Appendix II). An assay of a composite of chrysotile bearing samples (9 kg) by Cassiar Mining in 1985 indicated a 3.67% AX middle cement grade product.

Asbestos occurs in the serpentinized core of the ultrabasic intrusion, in two forms. These are as cross fibre in fractures with fibres oriented normal to the walls and slip fibres in fractures oriented parallel to the walls.

Lateral movement of walls containing cross fibre gives rise to production of slip-fibre. Both types are of about the same abundance. Approximately 50% of the prominent fractures are filled with asbestos, and it is believed that the fractures controlled the replacement of serpentine by this material. A simple structural study was made by Kerr, and is quoted on Page 4 of this report.

The chrysotile asbestos mineralization was described by McCammon below:

> "Chrysotile asbestos occurs through the serpentine in cross-fibre veinlets and in slip-fibres along numerous small slips. The asbestos is bright yellow-green when fresh and silvery grey when weathered. It has a rather prickly, harsh feel in the mass, but fluffs up into a relatively soft white material. When fibres are fluffed up, they can be twisted into strong, tough threads.
>
> The cross-fibre veinlets occur erratically and run in all directions. It is not usual to see many veinlets close together. The veinlets vary in width from three-quarters of an inch down, the average being one-quarter of an inch or less. Most of the wider veinlets have an irregular central parting that is comonly lined with magnetite. The longest cross-fibres seen were seven-sixteenths of an inch long. The most numerous occurrences of veinlets were seen in the various open-cuts and in the serpentine bluffs northeast of Open-cut No. 5. The best section measured was in Open-cut No. 4 where, over a width of 30 inches, six veinlets gave a total width of eleven-sixteenths of an inch of asbestos.(Figure 4)

Slip-fibre asbestos is found along numerous slips and shears in the serpentine. It shows all gradations from massive serpentine through brittle grey to tough yellow-green material. A large part of it will fluff up to fibres that can be twisted into tough threads. Fibre lengths vary from 8 inches down, with an average of 3 inches or less. Considerable magnetite, magnesite, and some calcite sometimes accompany the slip-fibre asbestos.

As is usual with asbestos deposits, an estimate of the fibre content of the rock is difficult to make. A visual estimate would indicate between 1 and 3 per cent, with selected areas running higher."

Thin bands of magnetite crystals are commonly found in the asbestos veinlets, causing a discontinuity in fibre length, suggesting that the chrysotile minerals developed normal to fractures, and thus replaced serpentine. The magnetite represents the original fracture plane.

The following background discussion on chrysotile mineral growth is from Kerr:

"Chrysotile alteration occurs by recrystallization of antigorite in fractures or planes of weakness in the rock. The chemical composition of antigorite is similar to that of chrysotile. Alteration processes involve only recrystallization of the silicate structure. The presence of hydrothermal fluids is necessary, but they do not chemically combine with antigorite to form chrysotile. Movement of hydrothermal fluids is made possible by fractures in the rock. Thus chrysotile alteration is post fracture formation.

Two theories are proposed to explain the growth of chrysotile fibres in the fractures.

1. Hydrothermal fluids diffused into area of low rock pressure.

Antigorite then recrystallized to chrysotile in the area of diffusion.

2. Recrystallization commenced along the fracture walls, as hydrothermal fluids were introduced into fractures. As fibres formed, great pressures developed and pushed the walls apart.

Remnant crystals of olivine in chrysotile veinlets indicate that alteration of antigorite occurred around olivine. If the walls of fractures had been pushed apart by growing fibres, olivine crystals would not be present. Therefore, the first theory is the one most likely to explain the growth of fibres in serpentine at Sproat Mountain."

Talc

Extensive talc-magnesite mineralization occurs in a zone of carbonatization around the periphery of the ultrabasic intrusion, as is common in many ultrabasic bodies. An XRD analysis of two hand specimen samples in 1985 showed the main mineral components to be talc (40%-60%), magnesite, (0%-25%), chlorite, (5%-10%), and traces of magnetite, plagioclase, calcite, and amphibole (Appendix IV). Talc orebodies occur in similar geological settings in Quebec and Ontario.

Bakertalc Inc. produces talc and soapstone from an underground operation at South Bolton, Quebec, 95 km southeast of Montreal. Talc occurs as dykes and sills, associated with serpentine and magnesite, in Cambrian and Lower Ordovician schists. Ore is extracted at the Van Reet mine and is trucked 16 km south to the company's mill facilities at Highwater. It produces around 5,000 tpy of high quality floated material for use principally in the pulp and paper industry, and a similar tonnage of dry-milled talc used as an industrial filler in paints and plastics. In 1983, Bakertalc Inc. assessed the use of talc as a substitute for asbestos in an asbestos manufactued product. Successful tests resulted in increased sales in 1983.[1]

BSQ Talc Inc., near St.-Pierre-de-Broughton in Quebec, quarries two deposits associated with the Pennington dyke in Leeds and Thetford townships. Occurrences are associated with ultrabasic intrusives, peridotite-serpentinite, in quartz-carbonate-chlorite schists. BSQ Talc Inc. produces ground material containing nearly 70 per cent talc, which is used as a filler in joint cement, and auto-body compound, and as a dusting agent in asphalt roofing shingles and rubber protection.

Steetley Talc Limited, a division of Steetley Industries Limited, produces talc from an open-pit mine in Penhorwood Township, 70 km southwest of Timmins. Talc occurs in talc-magnesite deposits derived from the alteration of ultrabasic volcanic rocks. The ore is processed by flotation and fine-grinding. The talc is a high purity, platy material and it is used mainly in the pulp industry as a pitch control agent. Other markets are in paints, plastics, paper and cosmetics.

At Sproat Mountain the Talc-Magnesite zone varies from 15 m to 50 m wide and outcrops for over 1 km along strike (Figure 4). Talc appears to be generally intergrown throughout the carbonate zone; however, replaced chrysotile fibre veins in the zone indicate that talc magnesite is an alteration product of serpentine. The percentage of magnetite is the same in the talc-magnesite zone as in the serpentinized zone. The colour of talc varies from dark grey through various shades of green to pale green. When pulverized it is greyish white. In general, the talc is sheeted and has a schistose appearance; this is particularly noticeable in the old adit below Opencut No. 9. (McCammon, 1949). Magnesite in grains and veinlets up to 6 inches wide is scattered through the talc. In some places the magnesite has weathered out, leaving tiny ridges of talc which give the outcrop a rough, pitted surface. The contact between the talc and serpentine areas in the sill are gradational, but the gradation takes place within a few feet.

Relatively little exploration work has been carried out for talc in this ultrabasic intrusion. Bancroft (1921) mentions the talc mineralization and indicated that some "samples show material that would make a medium grade talcum powder or might be useful as a paper filler". Wilson (1926) visited the property when compiling a GSC volume on Talc Deposits in Canada, and described the property as

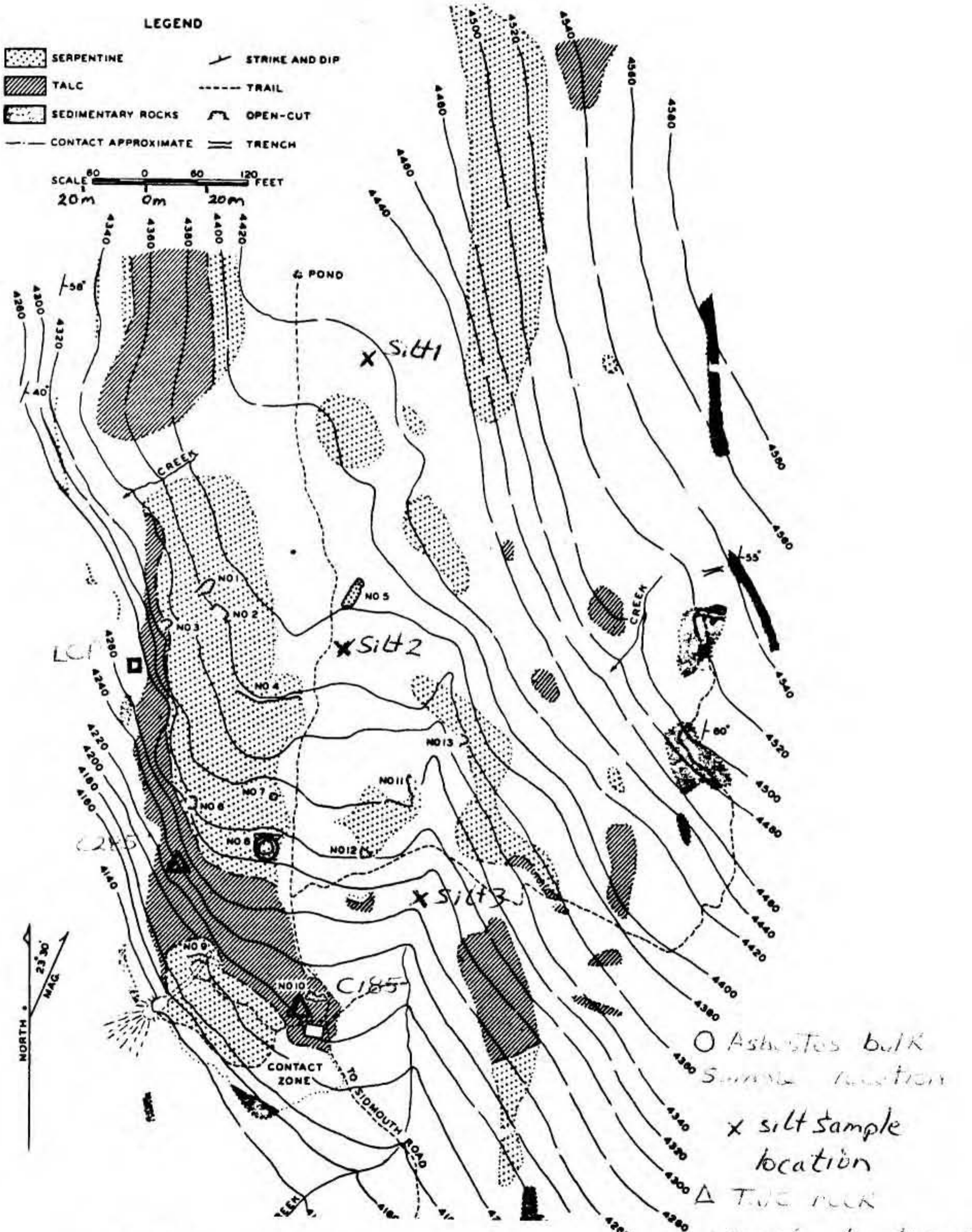

FIGURE 4 - SPROAT MOUNTAIN TALC MINERALIZATION

after M^c Cammon 1950

a "mass of serpentine, 800-1000 feet wide and 1/4 mile long that has been more or less transformed to talc thorughout its length". He goes on to say, "The largest zone of talc observed occupies the bottom of a pit 20 feet wide, 50 feet long and up to 6 feet deep. The material from the pit is a varigated greenish-grey talc schist ....under the microscope it is seen to consist of coarse grains of carbonate (probably magnesite), granular magnetite and fine micaceous talc. This talc is too dark to be ground for use as a talcum powder or other purposes for which a white color is essential, but should be satisfactory for the manufacture of roofing material or other products in which exceptional purity is not important. It would be especially useful in those materials where refractory qualities are required." He also felt that the talc was remarkably similar to that from the Eagle Claim on southern Vancouver Island.

Some uses and specifications for talc are given below:

Grades of talc are most frequently identified with the end use, such as ceramic, paint, roofing, insecticide, and paper. The important desirable properties include softness and smoothness, color, luster, high slip tendency, moisture content, oil and grease absorption, chemical inertness, fusion point, heat and electrical conductivity, high dielectric strength, and many others.

More specific requirements for talc in the above-mentioned end uses follow:

Ceramics - Uniform chemical and physical properties are required. Manganese and iron are objectionable, and for high-frequency insulators, no more than 0.5% CaO, 1.5% iron oxide, and 4% Al_2O_3 are usually tolerated.

Paints - Impurities that grind to colors other than white are highly objectionable. To yield the desired smooth paint film, at least 98.5% must pass a 325 mesh screen.

Roofing - A low-grade offcolor and impure talc is acceptable.

Insecticides - Requirements are chemical inertness with respect to toxicants, satisfactory bulk density, and low abrasive characteristics.

Rubber - Many synthetic rubbers use ground talc as fillers in their compounding formulations. Volume changes, amount of filler, and particle size all affect the stress-strain relationships of the product.

Paper - Requirements include chemical inertness, softness, freedom from grit, satisfactory ink acceptance, brightness, and dispersibility in water.

Cosmetic and Pharmaceuticals - Talc must be grit free, finely sized, chemically pure, and pleasing in color. For cosmetics, talc must have good dry slip characteristics.

As mentioned above, both color and purity are important characteristics of talc. They can be partially described by "brightness" which is a measure of reflectance in terms of percent compared with the reflectance of pure magnesium oxide as the standard 100%.

CONCLUSIONS

1. According to Kerr, the following evidence indicates that the Sproat Mountain ultrabasic sill was emplaced by intrusion as a solid body.

- There is very little evidence of thermal alteration of the country rocks.
- Marked variances of attitudes of the country rocks indicate high pressures at the time of intrusion.
- No xenoliths or foreign bodies are present in the ultrabasic body, such as are commonly found in magmatic intrusions.,
- The ultrabasic body is semi-conformable with bedding planes of the country rock and is best described as a sill.
- The talc carbonate and serpentinized zones are mineralogically distinct, possibly indicating that the original ultrabasic material underwent two separate phases of alteration.
- Replaced fibre veins in the talc carbonate zone indicate that talc carbonate is an alteration product of serpentine.
- Minor amounts of chromite are found in the ultrabasic body. Chromite is believed to be found only in bodies of intrusive nature.

2. There are two zones of alteration present in the ultrabasic body. The peripheral zone is highly carbonatized and the core zone is highly serpentinized. These zones represent two distinct phases of alteration of the original ultrabasic material which is believed to have been composed mainly of olivine, with minor amounts of pyroxene, chromite and magnetite.

3. The prominent fractures in the serpentinized zone constitute the main influence causing formation of asbestos in the ultrabasic sill and were developed in during tectonic activity in Cretaceous time. Hydrothermal fluids entering the fractures brought about the alteration of antigorite to chrysotile.

4. Preliminary assays of chrysotile samples indicate them to be ore grade material, while XRD analysis showed talc samples to contain too large a percentage of impurities to make a desirable product. It is thought, however, that further sampling would locate zones of purer talc.

5. The prospect is well situated regarding transportation, accessibility for mine development (open pit), and proximity to pulp and paper mills in British Columbia and the northwest U.S.A. The Trans Canada Highway and CPR mainline at Revelstoke are only 33 km north, with conections to pulp and paper mills at Kamloops 150 km west and Skookumchuck 250 km east. Also, a large pulp and paper mill is located 150 km south, near Castlegar, which is on Arrow Lake and may be serviced by barging.

RECOMMENDATIONS

1. Presently the prospects for the asbestos industry are bleak as the U.S. Environmental Protection Agency has recently recommended banning all use of asbestos in the U.S.A. This proposal, if enacted into law, will have a permanent negative effect on the entire industry as other countries will likely take similar positions in the future. It is therefore not recommended to further explore the asbestos showings at this time.

2. The precious metal contents in the three stream silt samples that were taken in 1985 were all low and did not indicate gold, silver or platinum mineralization. Although this limited amount of sampling is not conclusive, the remote chance that further work may locate anomalous precious metals, is not considered a priority worth following up at this time.

3. The possibility of discovering a significant talc deposit on the claims is good. The talc potential should be further explored by prospecting and comprehensive rock sampling. The rock samples should be tested by a capable laboratory, such as the Ontario Research Foundation, for various characteristics including brightness, flotation color, talc content, and amount of undesirable minerals and impurities. The brightness (% reflectance) and mineralogy would be determined by X-ray diffraction tests.

4. Cat trenching and drilling would be the next step to explore any significant zones of good quality talc that may be located as a result of the sampling program.

5. If a potential orebody of talc is located by drilling, the subsequent course of action should involve:

a) Ore Characterization (XRD) - what is the mineralogy and volume % of the ore (talc & magnesite +?). Does it contain asbestoform minerals, iron rich minerals or chlorite.

b) Beneficiation Testing - this is necessary to determine methods of treatment as well as provide samples of talc product for further characterization and evaluation studies. Brightness, mineralogy, chemistry, physical charcteristics and other market critical specifications will need to be generated in order to conduct market studies.

COST STATEMENT

Helicopter	$ 378.60
Motel & Meals	214.36
Truck Rental	204.67
Gas	71.50
Geochemical Analysis	44.55
Mill Test of Asbestos Samples	90.00
Salaries:	
Field, 2 days @ $250/day	500.00
Office, 3 days @ $250/day	750.00
Typing and photocopying	500.00
	$ 2,341.17

C. Graf, P.Eng.

BIBLIOGRAPHY

Bancroft, M.F., (1921)	G.S.C. Summary Report, Pt. A, pg. 111-112
Gunning, H.C. (1929)	G.S.C. Memoir 161, p. 112-113.
Janes, R.H. (1963)	Canadian Johns-Manville Co. Ld. Sproat Mountain Asbestos Prospect - General Geology for B.C.D.M. Assessment Report 469 - Magnetometer Survey, B.C.D.M., Assessment Report 470
Kerr, J. (1964)	Geology of Sproat Mountain Ultrabasic Intrusion, University of B.C., B.Ap.Sc., Thesis, 36 p.
McCammon, J.W. (1950)	B.C. Dept. of Mines Annual Report 1950 (pA214-217)
Plum, W. (1985)	Personal Communication, 1949 Diamond drill hole information
Read, P.B. (1976)	Geological Map of the Lardeau West Half Map Area GSC Open File Report #432
Wilson, M.E. (1926)	Talc Deposits of Canada Dept. of Mines Bulletin, p. 51

STATEMENT OF QUALIFICATIONS

1, Chris Graf, do hereby declare that:

(1) I graduated from the University of British Columbia, Vancouver, British Columbia in 1974 with a B.Ap.Sc. Degree in Geological Engineering.

(2) That I am a registered Professional Engineer in the Province of British Columbia.

(3) That I have practised my profession for ten years with numerous mining companies in British Columbia.

Chris Graf
1010 - 837 West Hastings Street
Vancouver, B.C.
V6C 1C4

APPENDIX I

REVELSTOKE ASBESTOS SAMPLE MILL TEST REPORT

BRINCO MINING LTD. , 1985

Brinco GROUP

INTER-OFFICE MEMORANDUM

To: R.S. Hewton

Date: July 10, 1985

From: I. Lyn

File No.

Subject: REVELSTOKE ASBESTOS

Copies:

The attached is a memo from B. Pratt describing test results and procedures for the Revelstoke Asbestos sample. The sample was treated a little more thoroughly than a dryer sample becaues the additional passes in Results Step 3 were done. Bill states this fibre would not normally be recovered. However, the first pass grade of 3.67% AX is considerably better than expected from visual examination of the samples.

AX is a middle cement grade and has a list price of ~~$1,100.00~~ 1030.00 per tonne.

Shelley Dunn

per: I. Lyn

IL/sd
attach.

BRINCO MINING LIMITED

INTER-OFFICE MEMORANDUM

To: G. Becket, Chief Engineer, Enrironmental — Date: June 27, 1985

From: B. Pratt, Lab. Supervisor — File No.:

Subject: REVELSTOKE ASCESTOS SAMPLE TESTING

Copies: S. Dyk, I. Lyn, File

Objective

1. Ian Lyn of Brinco Exploration department brought in a sample of asbestos ore for test milling. The sample comes from a property in the Revelstoke area.

Results:

1. The 4.4 kilogram sample was run through the test mill the same way we run a dryer sample (feed sample to our dry rock storage).

2. The 8, 18, and 30, mesh free and contained fibre passes resulted in 3.67% fibre of AX quality.

3. An additional combined 8, 18, 30 mesh pass had 2.05% fibre and the combined 40 mesh lifts had 2. 33% fibre. Historically, comparing dryer results to actual mill recoveries, we never recover the additional percentage fibre obtained from these lifts. We normally have a percent recovery that falls between the 18m FF/CF lifts and 30m FF/CF lifts.

4. The following is a summary of 8, 18, 30 mesh lifts compared to shipping standards.

	Bauer McNett					T & N Classifier						
Type	4	14	35	200	-200	7	14	25	50	200	-200	G.F.
Revelstoke #1	11	29	30	10	20	5	10	33	27	8	17	89
AX Shipping Specs.	8	34	25	11	22	3	14	32	20	12	19	86

Procedure:

1. The 4.4 kilogram sample was run on the test mill like a normal dryer sample.

2. That is, two comtained fibre passes with the hazemag crusher set at 1000 R.P.M. are run and the 8, 18, 30 mesh free and contained (FF/CF) lifts are collected separately. The overs from these two

passes are collected and run again with the hazemag crusher set at 1500 R.P.M. This time the 8, 18, 30 mesh lift material is combined as one sample. At the same time all the 40 mesh material is collected.

3. The fibre from each set of samples is then degritted and tested for quality.

4. Results of tests are entered into the computer and attached is the Test Mill report summary. Bauer McNett, T & N Classifier and percent recoveries are adjusted to a constant dust of 22%.

5. The overs and dust as well as unused fibre from testing is retained and available for inspection.

B. Pratt
Lab. Supervisor

BP/bc

CASSIAR RESOURCES LIMITED TEST MILL REPORT

Bauer McNett Results, Adjustment for dust

TM # 903-85
WEIGHT 4.4 Kg

SAMPLE TYPE
SAMPLE DETAILS

REV.*1
JUNE/85

LIFT MESH	LIFT WT g	% RECOVERY ACT	CUM	ADJ	CUM	S.A.	ACT BAUER McNETT 4	14	35	200	-200	ADJ BAUER McNETT 4	14	35	200	-200
8M FF/CF	22.2	0.50	0.50	0.43	0.43	4600	29	24	8	5	34	34	28	7	9	22
18M FF/CF	107.1	2.43	2.94	2.56	2.99	2000	9	36	31	6	18	9	34	33	2	22
30M FF/CF	32.1	0.73	3.67	0.76	3.74	2200	5	10	44	22	19	5	10	46	17	22
						AVERAGE	11	29	30	10	20	11	29	32	6	22
ADDITIONAL PASS																
8,18,30M COMB	90.2	2.05	2.05	1.58	1.58	4000	5	20	27	8	40	7	26	21	24	22
40M COMB	12.2	0.28	2.33	0.26	1.83	5600	1	4	10	57	28	1	4	9	64	22
						AVERAGE	5	18	25	13	39	6	23	19	30	22
						OVERALL AVERAGE	8	25	28	12	27	9	27	28	14	22

	FF	CF	FF+CF	ADD	TOTAL
ACT % REC	0.00	0.00	3.67	2.33	6.00
ADJ % REC	0.00	0.00	3.74	1.83	5.58

DATE

BRINCO MINING LIMITED

CASSIAR DIVISON

TEST MILL REPORT

Computer Estimated Grades, Double Adjustment

TM # 903-85
WEIGHT 4.4 Kg

SAMPLE TYPE
SAMPLE DETAILS

REV.*1
JUNE/85

LIFT MESH	LIFT WT g	% RECOVERY ACT	CUM	ADJ	CUM	S.A.	ACT T&N CLASSIFIER 7	14	25	50	200	-200	ADJ T&N CLASSIFIER 7	14	25	50	200	-200	G.F.
8M FF/CF	22.2	0.50	0.50	0.44	0.44	4600	39	14	8	4	4	33	45	16	9	4	4	22	118
18M FF/CF	107.1	2.43	2.94	2.67	3.10	2000	0	12	47	20	7	15	0	11	42	18	7	22	90
30M FF/CF	32.1	0.73	3.67	0.81	3.92	2200	0	0	7	65	16	13	0	0	6	58	14	22	68
						AVERAGE	5	10	33	27	8	17	5	9	31	25	8	22	89
ADDITIONAL PASS																			
8,18,30M COMB	90.2	2.05	2.05	1.79	1.79	4000	3	5	23	29	10	32	3	5	26	33	11	22	68
40M COMB	12.2	0.28	2.33	0.27	2.06	5600	0	0	0	32	45	24	0	0	0	32	46	22	50
						AVERAGE	2	4	20	29	14	31	2	4	22	33	17	22	
						OVERALL AVERAGE	4	8	28	28	10	22	4	8	28	28	10	22	81

	FF	CF	FF+CF	ADD	TOTAL
ACT % REC	0.00	0.00	3.67	2.33	6.00
ADJ % REC	0.00	0.00	3.92	2.06	5.98

Please charge now — or when moving on this box. Bill

TEST MILL LAB RESULTS

Test Mill # 903-85

Sample Type: REV. #1

Sample Period: June 85

Sample Weight: 4.4 Kg

Date T.M.: June 25

T. M. O.: AM

	Lift Mesh	8 Mef	18 Mef	20 Mef		8-18-30 cond	40 mit			
	Lift Wt.	49.6	260.9	101.0		273.9	31.3			
Degritting	Initial Wt. Gm.	~~49.5~~	~~63.5~~	~~101.1~~		~~67.5~~	~~31.4~~			
Degritting	Total Wt.. Gm.	49.2	63.1	100.4		67.1	31.2			
Degritting	Rock Gm.	27.2	37.2	68.5		45.0	19.0			
Degritting	Fibre Gm.	22.0	25.9	31.9		22.1	12.2			
Degritting	Fibre %	44.7	41.0	31.8		32.9	39.1			
S.A.	Rec'd	4600	2000	2200		4000	5600			
S.A.	Open	–	3800	4200		–	–			
S.	C.									
Bauer McNett	4* or 8	29	9	5		5	1			
Bauer McNett	14M	24	36	10		20	4			
Bauer McNett	35M	8	31	44		27	10			
Bauer McNett	200M	5	6	22		8	57			
Bauer McNett	-200M	34	18	19		40	28			
contamination	TYPE									
contamination	WT gm									

Please run Bauer McNetts on these also.
Bill.

Y.T.D. PRODUCTION RESULTS.

GRADE	BAUER MCNETT 4	14	35	200	−200	TYN CLASSIFIER 0.25	7	14	25	50	200	−200	G.F.
A65	75	8	4	4	9	36	21	15	8		10	10	183
AK	37	26	10	7	20		39	18	12	8	8	15	135
AX	8	34	26	11	21		3	14	34	20	11	18	89
AY	4	13	32	19	32		0	4	18	29	24	25	65
AZ	3	8	22	29	38		0	1	7	31	33	28	54

NOTE: A65 TOP SCREEN ON TYN CLASS. IS 0.25" AND THE 50 MESH SCREEN IS LEFT OUT. THE TOP SCREEN FOR ALL OTHER GRADES IS THE 7 MESH.

APPENDIX II

BULK SAMPLE TESTS OF SPROAT MOUNTAIN ASBESTOS

APPENDIX II

The Department of Mines at Otawa has twice done experimental work on samples from this deposit. The first test was done in 1927 on a 300 pound sample. The general conclusions arrived at by the test were as follows:

1. "The longer fibres, +2 and +4 mesh, are woody in texture, lacking in strength and could not be used for spinning, shingle, nor paper making. The only possible marketable products that could be produced from this class of fibre is cement stock, grading 0-0-5-11, and fine fibre containing a little sand, known as asbestic and used in the manufacture of finishing plaster."

2. The second test was run on a 524 pound sample in 1949. This sample was taken from new showings opened up in 1949 and gave better results. The fibre was found comparable to that produced in Quebec. A combination of screened products could be made equivalent per ton of sample to 114 pounds of fibre having a shipping test of 0.0-1.3-10.2-4.5 or a 4z grade. This would be good for paper stock or slightly below shingle stock and could be used for asbestos board, tile, and shingles.

Analyses of samples of slip and cross-fibre material, taken by the writer from Open cut No. 4 and analysed in the British Columbia Department of Mines Laboratory, are given below:

	SiO_2 %	MgO %	Al_2O_3 %	FeO %	H_2O+ %	H_2O- %	Fe_2O_3 %	MnO %
Cross fibre	40.84	45.25	0.90	0.30	9.95	0.74	2.20	0.07
Slip-fibre	30.61	39.84	0.98	0.38	20.22	1.40	6.09	0.58

References

1. Canada, Dept. of Mines, Mines Branch No. 711, Investigations in ore dressing and metallurgy, 1928, pp. 95, 96.

2. Bureau of Mines, Ottawa, Report of the Mineral Dressing and Metallurgy Laboratories, Investigation No. 2594, October, 1949.

APPENDIX III

GEOCHEMICAL ANALYSIS REPORT OF STREAM SILT SAMPLES

PHONE 980-5814

MIN-EN Laboratories Ltd.

Specialists in Mineral Environments

Corner 15th Street and Bewicke
705 WEST 15TH STREET
NORTH VANCOUVER, B.C.
CANADA V7M 1T2

ANALYTICAL PROCEDURES REPORT FOR ASSESSMENT WORK - PLATINUM, PALLADIUM, AND GOLD

Geochemical samples received for Platinum, Palladium, and Gold processed by Min-En Laboratories Ltd., at 705 W. 15th St., North Vancouver employing the following procedures.

After samples are prepared for analysis (grounded or sieved) a 30 gram subsample is weighed into crucibles and fluxed with Litharge and suitable flux material fire assayed down to the bead stage.

Then the bead is dissolved by Aqua Regia .

After cooling the sample solutions to room temperature they are made up to suitable volumes.

The solutions are analysed by computer operated Jarrell Ash 9000. Inductively Coupled Plasma Analyser.

Reports are given by the computer in parts per billion after the instrument is standardized with a suitable suite of standards.

MIN-EN Laboratories Ltd.

Specialists in Mineral Environments
705 WEST 15th STREET NORTH VANCOUVER, B.C. CANADA V7M 1T2

PHONE: (604) 980-5814 OR (604) 988-4524 TELEX: 04-352828

GEOCHEMICAL ANALYSIS CERTIFICATE

COMPANY: CHRIS GRAF
PROJECT:
ATTENTION: CHRIS GRAF

FILE: 5-234
DATE: JUNE 24/85.
TYPE: SOIL GEOCHEM

We hereby certify that the following are the results of the geochemical analysis made on 3 samples submitted.

SAMPLE NUMBER	AG PPM	AU-FIRE PPB	PT-FIRE PPB	PD-FIRE PPB	
CHRYS 1	1.4	19	2	5	Silt 1
CHRYS 2	1.2	2	40	4	Silt 2
CHRYS 3 40MESH	0.8	3	8	6	Silt 3

Certified by [signature]

APPENDIX IV

XRD ANALYSIS OF TALC SAMPLES

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

Parliament Buildings
Victoria
British Columbia
V8V 1X4

EXPO 86

April 18, 1986

Mr. Chris Graf,
Active Minerals Ltd.,
1013-837 West Hastings Street,
VANCOUVER, B.C.
V6C 1C4

Dear Chris:

RE: REVELSTOKE TALC SAMPLES

The talc - as you can see on the lab sheet - is definitely not a good quality mineral. Only a further study can tell if a product of industrial quality can be processed, i.e. if the grain size is such that the flotation can separate pure talc from chlorite (Fe source) and magnetite with magnesite. After that we can find out if the resulting talc meets the industry purity standards and if it is competitive with talc from Montana.

Yours truly,

Z.D. Hora,
Industrial Minerals Specialist

8 #/86-037

Province of British Columbia Ministry of Energy, Mines and Petroleum Resources

ANALYTICAL SERVICES REQUEST

Submitter: D. HORA
Number of samples: 2
Special instructions:
Project: Industrial minerals
Air photo:

Date submitted: April 2, 1986
Date required: within reason
Area: Revelstoke
Card 1 of 1
Priority:

Date started: April 4/86
Date reported: April 8/86
Chief Analyst: [signature]
PRINT CLEARLY (use dark pen or pencil)

	NTS	FLD NO	ZN	UTM E	UTM N	RXTYP	AG	S	PROPERTY	COMMENTS
1	82K/12W	C1-85		50°45'	117°56'	SRP	N	10 10	ASBESTOS GROUP	TALC SAMPLE XRD & CALCINE A PULP SAMPLE TO ~1000
2	82K/12W	C2-85		50°45'	117°56'	SRP	N	10 10	ASBESTOS GROUP	TALC SAMPLE - XRD & PULP CALCINATIO
3										
4										
5										
6										

	LAB NO	OXIDE C	OXIDE P	SPEC SQ	SPEC Q	XRD	MIN SEP	PR	PA	Au	Ag	Cu	Pb	Zn	Co	Ni	Mo	Cr	Hg	As	Sb	Ba	Sr
1	31638					X																	
2	31639					X																	
3																							
4																							
5																							
6																							

SPECTROGRAPHIC REPORT

1				Si	Al	Mg	Ca	Fe
	Pb	Cu	Zn	Mn	Ag	V	Ti	Ni
	Co	Na	K	W				
2				Si	Al	Mg	Ca	Fe
	Pb	Cu	Zn	Mn	Ag	V	Ti	Ni
	Co	Na	K	W				
3				Si	Al	Mg	Ca	Fe
	Pb	Cu	Zn	Mn	Ag	V	Ti	Ni
	Co	Na	K	W				
4				Si	Al	Mg	Ca	Fe
	Pb	Cu	Zn	Mn	Ag	V	Ti	Ni
	Co	Na	K	W				
5				Si	Al	Mg	Ca	Fe
	Pb	Cu	Zn	Mn	Ag	V	Ti	Ni
	Co	Na	K	W				
6				Si	Al	Mg	Ca	Fe
	Pb	Cu	Zn	Mn	Ag	V	Ti	Ni
	Co	Na	K	W				

X-RAY DIFFRACTION REPORT AND COMMENTS

LAB. NO.	FIELD NO.	MINERALOGY.
31638	C1-85	TALC (40-45%) ≳ MAGNESITE >> CHLORITE (5-10%) ≳ MAGNETITE ± trace AMPHIBOLE, PLAGIOCLASE and CALCITE.
31639	C2-85	TALC (60% ?) > MAGNESITE (≈25%) > CHLORITE (5-10%) ≳ MAGNETITE.

Calcined pulp of each sample are enclosed as requested. The colour is light brown

KEY

COLUMNS 28–31

UMFC	ultramafic	GRNS	greenstone	TRCT	trachyte	SKRN	skarn	SNDS	sandstone
ANDS	andesite	MNZN	monzonite	TUFF	tuff	GOUG	gouge	SHLE	shale
BSLT	basalt	OBSD	obsidian	AMPB	amphibolite	ARGL	argillite	SLSN	siltstone
CRBN	carbonatite	PNLT	phonolite	CLCC	calc-silicate	CHRT	chert	MRLZ	mineralization
DCIT	dacite	QZPP	quartz porphyry	GNSS	gneiss	COAL	coal	MVSP	massive sulphide
DORT	diorite	RYLT	rhyolite	MRBL	marble	DLMT	dolomite	DISS	disseminated
GBBR	gabbro	SRPN	serpentinite	PLLT	phyllite	LMSN	limestone	SCKK	stockwork
GRNT	granite	SNKN	shonkinite	SCST	schist	MARL	marl	VEIN	vein
GRDR	granodiorite	SYNT	syenite	HRFL	hornfels	QRTZ	quartzite	ALRZ	alteration

COLUMNS 32 – 33

04	Proterozoic	12	Cambrian	21	Mississippian	34	Jurassic		
05	Helikian	14	Ordovician	22	Pennsylvanian	36	Cretaceous		
06	Hadrynian	16	Silurian	24	Permian	40	Cenozoic		
10	Paleozoic	18	Devonian	30	Mesozoic	42	Tertiary		
11	Prot.–Paleozoic	20	Carboniferous	32	Triassic	44	Quaternary		
						50	Unknown		

COLUMN 34
SAMPLE TYPE

1 Single grab sample
2 Channel/chip
3 Composite sample
4 Drill core
5 Talus or transported
6 Soil
7 Silt
8 Other

COLUMN 35

% SULPHIDE	
0	<0.5
1	0.5–1
2	1–10
3	10–50
4	>50

COLUMNS 36 – 43
Mineral Inventory Number or property name

COLUMNS 44 – 80
Comments

ANALYTICAL METHOD

AA	ATOMIC ABSORPTION
AH	HYDRIDE GENERATION
FA	FIRE ASSAY
ES	EMMISSION SPEC
XR	X–RAY FLUORESCENCE
WC	WET CHEMICAL
CL	COLORIMETRIC
CV	COLD VAPOUR

SAMPLE PREPARATION

W	TUNGSTEN CARBIDE
C	CERAMIC
S	STEEL