ARIS SUMMARY SHEET

District Geologist, Nelson Off Confidential: 94.12.07

ASSESSMENT REPORT 23285 MINING DIVISION: Slocan

PROPERTY:	Duncan Lake				
LOCATION:	LAT	50 25 00	LONG	117 57 00	
	UTM	11	5585171	432504	
	NTS	082K07E			
CLAIM(S):	DLM 1-9				
OPERATOR(S):	Lawrence, E.A.				
AUTHOR(S):	Lawrence, E.A.				
REPORT YEAR:	1993, 45 Pages				
COMMODITIES SEARCHED FOR:	Talc,Soapstone				
KEYWORDS:	Index Formation,Dunites,Talc,Soapstone,Chlorite				
WORK DONE:	Geological,Physical				
	GEOL	125.0 ha			
		Map(s) - 3; Scale(s) - 1:5000,1:240			
	LSUR	3.7 km			
		Map(s) - 1; Scale(s) - 1:2500			
RELATED REPORTS:	18323,19924,21331				
MINFILE:	082KSE074				

SUMMARY REPORT

for work program

on

DUNCAN LAKE MINERALS PROPERTY

(formerly VALENTINE PROPERTY)

Duncan Lake Area

Slocan Mining Division B.C.

Latitude: 50° 25' Longitude: 117° 57'

by

E.A. LAWRENCE, P,Eng.

WESTBANK, B.C.

30 November 1993

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INTRODUCTION

The following report summarizes the work carried out, and the data obtained since the 1990 season.

Objectives

1. To develop and test stone-cutting equipment that would be suitable to a soapstone quarry.
2. To information that would increase confidence in the continuity of the talcose zones.
3. To rectify the property coverage and ownership by re-staking with the 2-post system.
4. To obtain more accurate survey data to locate the relative positions of the Bluff area in the north to the Randy area in the south.
5. To prepare a 1:5000 base plan with a 10m contour interal. And then to use this new base plan to produce a series of plans onto which geological, physical, and work data could be transferred.

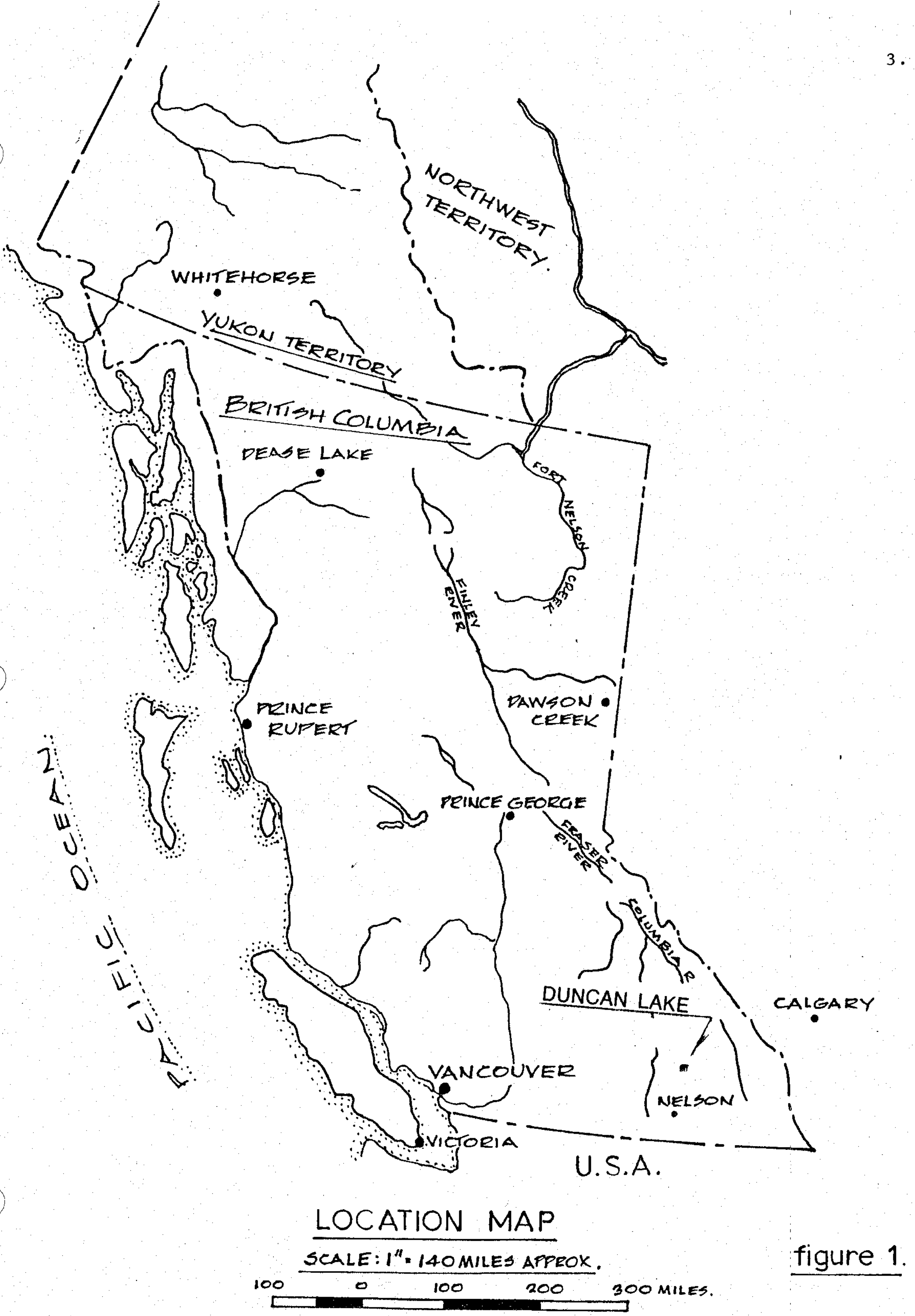
Work done

Testing of stone-cutting equipment was accomplished at the Randy quarry using a 'cutting-cable' system, and also a tungsten-carbide chain saw system.

Reconniassance mapping was carried out in the central part of the zone, and also to the south of North Creek on DLM 3 and 4. Stripping of the overburden from the low ridge where the Randy quarry is located, followed by washing, allowed geologic mapping to be done at a scale of 1:240. A sample of the black soapstone was analyzed by X-ray diffraction methods. The property situation changed substantially during 1991 with the 20-unit Valentine claim being allowed to lapse. Six 2-post claims were subsequently staked along the strike of the talcose zone to cover the area of interest previously held under the Valentine claim. 2-post claims were chosen because fewer claims are required to cover the zone of interest, thereby greatly reducing the cost of holding the ground.

A transit and chain survey was completed to close a loop covering the area from the central part of the property south to North Creek.
New 1:5000 plans were plotted using a recent Forestry contour plan, and also the new data obtained from the survey, geologic and physical work.

In general, the property continues to hold good potential as an industrial mineral producer. Work will continue to achieve this end.



LOCATION MAP

figure 1.

SUMMARY REPORT
DUNCAN LAKE MINERALS PROPERTY
DUNCAN LAKE AREA
SLOCAN MINING DIVISION BC

SUMMARY

This property consists of 12 2-post claims covering the near vertical talcose zones which trend north-westerly. The talcose zones contain material that has potential both for the carving stone market and the industrial talc market.

accepted
The most widely carving stone- referred to under the general term 'soapstone'- occurs in small dark pods in the shape of pea pods. It is found in two separate locations(See Figure 5). In both the Bluff area and the Randy area it consists of black fine-grained soapstone(at this property it is mostly chlorite with some talc). The pods are from 1.5 to 2.4 meters thick, 1.5 to 3.0 meters in depth, and in the order of 7.6 to 15 meters in length.

The industrial talc potential exists as 6 to 45 meter thick vertical bands with longitudinal continuity confirmed by close outcrops for up to 730 meters. Sufficient outcrop has been found in the Randy area to expect continuity for about 365 meters. The cenrtal area has less outcrop, but where it has been found, it is of similar talcose material. The over-all length of the talcose zones as indicated by presently known outcrops is about 3050 meters. They extend from the shore of Duncan Lake in the north, southeasterly to North Creek.

Non-destructive quarrying methods wre tested in 1991 in order to determine capital costs,operating costs, productivity and optimum equipment design for this type of quarry. Cbale-cutting and saw-cutting methods were evaluated. The cable method was determined to be impractical for this scale and type of deposit. The saw-cutting method, utilizing a chain saw with tungsten carbide teeth proved to be more efficient and cost effective. Improvements to the design of the power

unit and the boom suspension and maneuvering system would increase reliability and productivity.

Field work completed a survey started in 1991, establishing a closed loop for the south end of the zone. In 1993 the calculations were completed and the resulting plan aligned and coordinated with a recent BC Forest Service 1:5000 plan. With this data base, a new 1:5000, 10m contour interval base plan was prepared on which all new geologic and recent physical work was plotted.
New geologic data was obtained by detailed mapping of the Randy quarry area, and by reconnaissance mapping in the vicinity of DLM 3 and 4, and the DLM 7 area. X-ray diffraction determined that the black soapstone was composed mostly of chlorite.

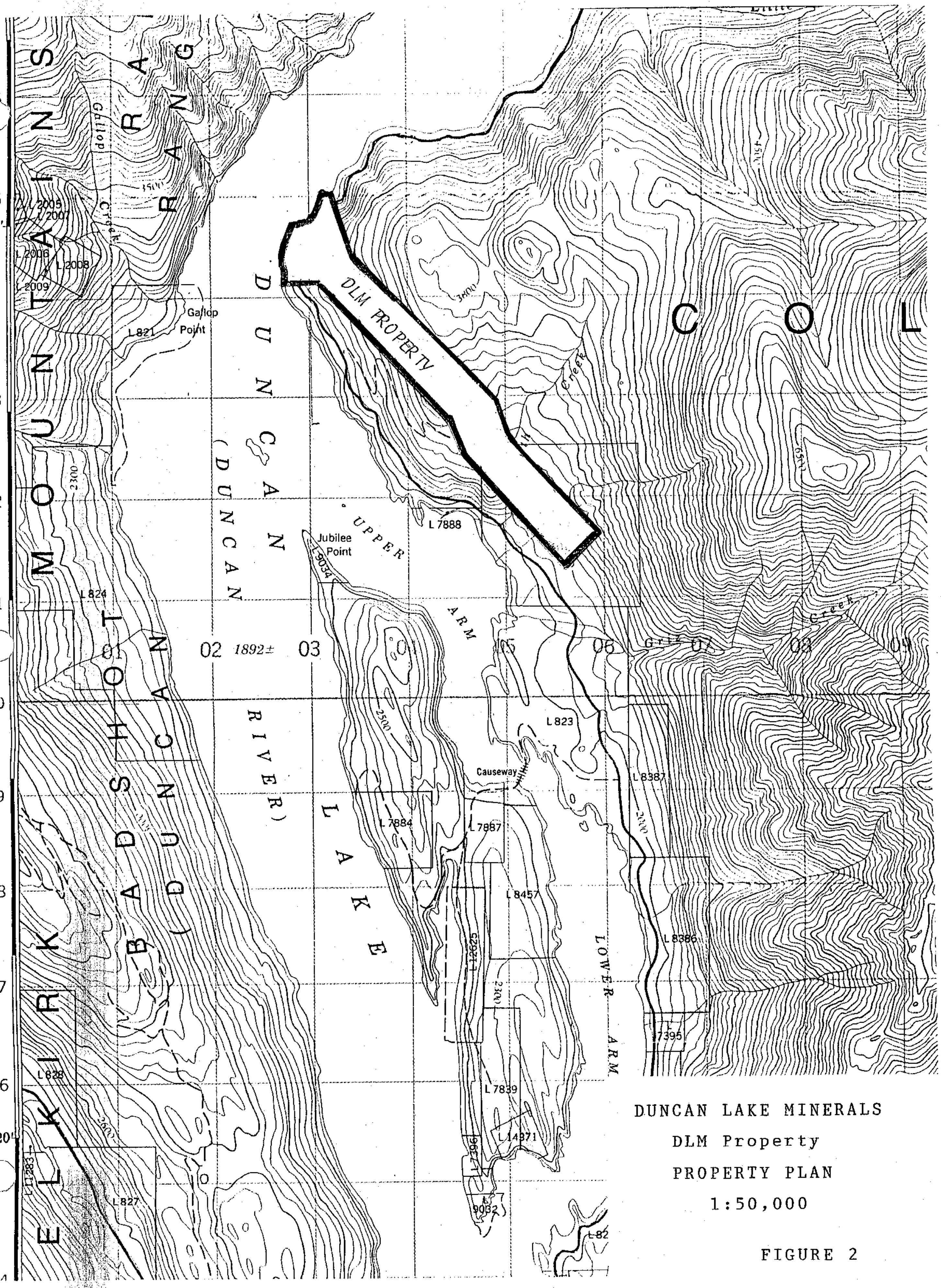
PROPERTY OWNERSHIP

The property now consists of twelve 2-post claims as shown in Figure 3. Current status is as follows:

CLAIM	OWNER	TENURE #	EXPIRY DATE
TED#1	E.A.LAWRENCE	256476	19 MAY 1997
TED#2	" "	257044	6 MAY 1995
DLM#1	" "	257064	10 JULY 1997
DLM#2	" "	257137	25 OCTOBER 1997
DLM#3	" "	257138	25 OCTOBER 1995
DLM#4	" "	257139	25 OCTOBER 1995
DLM#5	" "	306918	8 DECEMBER 1998
DLM#6	MARY SAVAGE	306919	8 DECEMBER 1996
DLM#7	" "	310028	4 JUNE 1996
DLM#8	" "	310029	4 JUNE 1996
DLM#9	" "	306921	8 DECEMBER 1996
DLM#10	" "	306922	8 DECEMBER 1996

PHYSIOGRAPHY

Duncan Lake is located in the north-south trending Purcell trench. The Purcell Mountains rise steeply to the east, some peaks reaching elevations of 10000 feet. The property is located on the steep slope of the valley, commencing at the east shore of Duncan Lake. Approximately 700 feet south of the lake a bench area of lower slope with some narrow flat sections extends to about 3000feet from the lake. From this point the slope steepens somewhat but is still easily traversed on foot. Vegetation consists mainly of thick young evergreens. Logging has removed most of the mature timber in the central area of the property. No creeks flow through the property. North Creek,the closest, is about 2500 feet south of the Randy Qarry.



DUNCAN LAKE MINERALS

DLM Property

PROPERTY PLAN

1:50,000

FIGURE 2

REGIONAL GEOLOGY

The Duncan Lake area contains complexly folded sedimentary and volcanic rocks in a low to medium grade of regional metamorphism. These rocks belong to the Hamill Group. Rare mafic dykes and amphibolite sills occur in the area. No plutonic rocks have been found in the area near the talcose zones.

See Figure 4.

GEOLOGY OF THE PROPERTY

The talcose zones of interest occur on the eastern limb of the Howser syncline, within schists of the Lower Index formation. Dips of the schistose rocks vary from vertical to steeply west in the map area. Three talcose zones were observed along the roadcut of the Bluff area. However, in the vicinity of the Randy quarry about 7000feet to the south, only one zone has been observed to date. This zone is significantly wider, up to 200 feet wide. With the data presently available these zones appear nearly parallel to the regional trend, however crosscutting features were reported by Fyles in Bulliten No. 49, 'Geology of the Duncan Lake area'. Petrographic work done in 1990 suggests that these talcose zones are in fact altered dunite dykes.

Figure 5 shows the geology in relation to topography and roads. The contours are derived from a 1:5000 Forestry plan with a 10m contour interval. A chain and transit ground survey was completed in the fall of 1992. Outcrops were tied to this survey by chain and compass methods.

Geologic mapping indicates that the Main zone has a reasonable degree of continuity for a strike length of over 10000 feet(3045m), from the Duncan Lake logging road on the shore of Duncan Lake to the Randy quarry near North Creek. Reconnaissance mapping confirmed the location of talcose material similar to that found in the Main zone, in outcrop found on DLM#6. Also, an outcrop similar to but not identical with the black soapstone found in the quarries (chlorite-talc

Figure 4

GEOLOGICAL MAP OF THE DUNCAN LAKE AREA

Geology by James T. Fyles 1960-1963

LEGEND

- GEOLOGICAL CONTACT — defined, approximate, assumed
- FAULT — defined, approximate, assumed
- ATTITUDE OF FOLIATION — prominent foliation planes undifferentiated — inclined, vertical
- ATTITUDE OF BEDDING — inclined, vertical
- ATTITUDE OF CLEAVAGE AND SCHISTOSITY — inclined, vertical
- Plunge of lineations and axes of minor folds
- Adit
- Prospect
- Marble quarry
- Main road
- Side road
- Trail
- Building

Scale 0 — 1 — 2 Miles

Contour interval 500 feet

LEGEND

Areas of little or no outcrop.

BROADVIEW FORMATION

6 Green and grey quartzite, greywacke, grit and fine grained mica schist.

JOWETT FORMATION

5 Fine grained green chlorite schist.

TRIUNE, AJAX, AND SHARON CREEK FORMATIONS

4 4c- dark grey to black argillite. 4b- massive grey quartzite. 4a- grey and black quartzite.

INDEX FORMATION

3 Interlayered fine grained green and grey schist, minor limestone and quartzite.

UPPER INDEX: mainly fine grained green schist.
3d- chlorite schist.
3c- green mica schist and garnet mica schist.

LOWER INDEX: mainly fine grained grey schist.
3b- grey and white limestone, brownish quartzite, minor green and grey schist.

3a Fine grained grey mica schist and garnet mica schist.

BADSHOT AND MOHICAN FORMATIONS

2 Grey and white crystalline limestone and dolomite and interlayered limestone and mica schist.

MARSH ADAMS FORMATION

1 Grey and brown micaceous quartzite, mica schist and white quartzite.

Amphibolite

To accompany B.C. Department of Mines and Petroleum Resources Bulletin 49, 1964 mixture), was found on DLM#4, south of North Creek. Petrography done on samples of the 'industrial talc' (buff mottled,medium grained) indicated that this material was derived from dunite dykes. Talc content ranged from 52 to 75%, magnesite content ranged from 21 to 47% Minor constituents such as chronite,chlorite, pyrite, magnetite and chalcopyrite accounts for about 2%. X-ray diffraction analyses done on the black soapstone by Berg of the Montana Bureau of Mines, shows it to be mostly fine-grained chlorite with a minor ammount of talc.See Appendix I. In its natural state it is a greyish-black colour, but polishes to a very fine black.

Figure 5 shows the geology on a scale of 1:5000. Figure 7 shows the quarry geology at a scale of 1:240.

LOCATION AND ACCESS

The property is accessible by a good all-weather logging road. This road branches east off Highway 31 immediately south of the Cooper Creek bridge, then carries on along the east shore of Duncan Lake. The'Bluff' area is located about the 28.5 km point. The Central (formerly referred to as the Upper area) area and the Randy area are accessed by the North Creek logging road which branches off the main road at about the 26.6km point. The Central area is reached by following the north trending road that braches off the North Creek road at the third switch-back. The Randy quarry is reached by branching to the left on the first road after the fifth switch back, see Figure 3.

PREVIOUS WORK

Earlier attempts to locate data from the exploration done in the '70s was unsuccessful. However in the summer of 1990 contact was made with Dennis Currie of Nelson,B.C., who was able to direct the author to Arnold Rennich of the Creston office of Imasco. Mr. Rennich confirmed that their company had done some work in the '70s, but unfortunately didn't have access to the reports.

It wasn't until 1987 that additional work was initiated on the property. In 1987, RPW Holdings, under the direction of the late Ted Savage of Taghum,B.C. removed asmall tonnage of black soapstone from the Bluff area. Selected samples were sent to soapstone sculptors in the Northwest Territories for their evaluation. In early 1988 the author carried out preliminary geological evaluation work. This initially involved a chain and compass survey to tie in the showings at the Bluff area with those at the Upper area. Vertical angles were carried in order to determine rough elevation differences between these showings.Geologic mapping followed at a scale of 1:1200 in the immediate area of the reconnaissance line. 11 short -0.30meter-holes were drilled throughout the map area to test for hardness beyond the surface weathering. With the light gas drill used, it was not possible to penetrate unless the rock was near the hardness of talc, thereby giving a simple means to differentiate between talc and schist. Detailed mapping at ascale of 1:120 was done on the Bluff area exposures from station A to station C. The exposures along the road in the vicinity of station A were cleaned up utilizing a back-hoe/frontend loader and a truck. Two loads were taken to Nelson for sorting, cleaning and sampling.

Hand-trenching on the Main zone at the Bluff area near station B was done to further expose a section of higher grade material. A few hundred pounds were removed for specimens samples and test work.

PREVIOUS WORK (continued)

In 1989 the author showed the property to an associate of a consulting firm that has had experience with industrial talc. Following this examination it was decided to obtain samples to determine if any serious contaminants exist that could cause marketing problems. The Main zone was targeted for this study in that more backgroundiformation was available on this zone. Cuttings were collected from 6 foot percussions holes, drilled to crosscut the formation. These were composited and analyzed for asbestos, and also were analyzed with whole rock ICP and 27-element ICP. In addition to the above, a large sample was obtained by drilling and blasting. This provided a fresher sample than was previously available. About 35 tons of rock was broken which yielded a number of good specimens, and a representative sample from the Bluff area of the Main zone. Two 6-foot holes were also drilled into an area of serpentine at the Bluff area, providing a good sample of cuttings from this material.

In addition to the Bluff area work, cuttings and a large rock sample were obtained from the old quarry near station x-8. The drilling and blasting in both areas also provided some good information on the feasibility of extracting soapstone using controlled blasting techniques.

A very rusty 15 inch band of sulphide, located beside the road near station X-10, was sampled and analyzed for gold. Only 5 ppb gold was detected. No harmful contaminants were detected in any of the other samples.

Quarrying for 'black'soapstone at both the Bluff and the Randy quarry in 1990 and 1991 resulted in much more exposure of this variety. This has resulted in abetter understanding of the shapes, continuity, internal variations and size range possibilities of the black soapstone, which in turn has helped to plan for future quarrying. Experience gained has helped design a more productive extraction method. A 9900 foot(3000m) transit-chain survey was carried out to tie together the various areas of the deposit.Field data was plot-

ted on 1:1200,1:2400, and 1:6000 scale plans.
A preliminary metallurgical flotation test confirmed that a 95% talc con can be produced with a simple process on the talcose material. Recovery was 59.24%. A byproduct grading 67% magnesite and 32% talc also was produced.

CURRENT WORK

Testing of two cutting techniques for quarrying soapstone were evaluated in 1991. This work established that the 'saw-cutting' method using a tungsten-carbide equipped chain,was a viable and practical way of quarrying in a deposit of this type and scale. A 3082m chain and transit survey, commenceing at the south end of the open survey completed in 1990, established a closed loop for the southern part of the property. This substantiated earlier plotting of out crops, and also tied in claim locations, physical work, and road locations. Calculations and plotting of this new data was completed in 1993. See Appendix II for survey calculation data, and Figure 6 for the plot of stations.New 1:5000 base plans with a 10m contour interval were prepared, using a more accurate and current data base. New survey data was also plotted on these plans. Previous geologic data was transferred to the new plans. Reconnaissance mapping on the DLM3 to 7 claims improved the confidence in previous projections. A new occurrence of chlorite similar to that found in the quarries was found on DLM#4

PROCEDURES

Quarrying

The method used in 1990 is described in detail in the authors 'Summary Report' dated 31 January 1991. The techniques to be described in this report are the 'Cable Method' and the 'Saw Method'.

Cable Method

In the cable method of cutting stone, the cable is in a continuous loop-similar to the band saw concept. The cutting action is achieved by the cable abrading the surface over which it is being drawn. In these trials, the loop was oriented horizontally so that two parallel cuts about 0.6m apart, could be done simultaneously.

Depending on the cable method being used, the loop can be formed either by joining the ends of a cable by a 'long-splice', or by using a connector. This is discussed in more detail later.

The main components of the cable method are:

a) a power unit to revolve the cable

b) a guiding system to guide the cable onto the power unit drive wheel

c) the cable

d) a tail-wheel assembly which anchors and guides the direction of cut

e) a tensioning system to maintain constant tension on the cable loop as it is drawn through the stone

(See Figure 8)

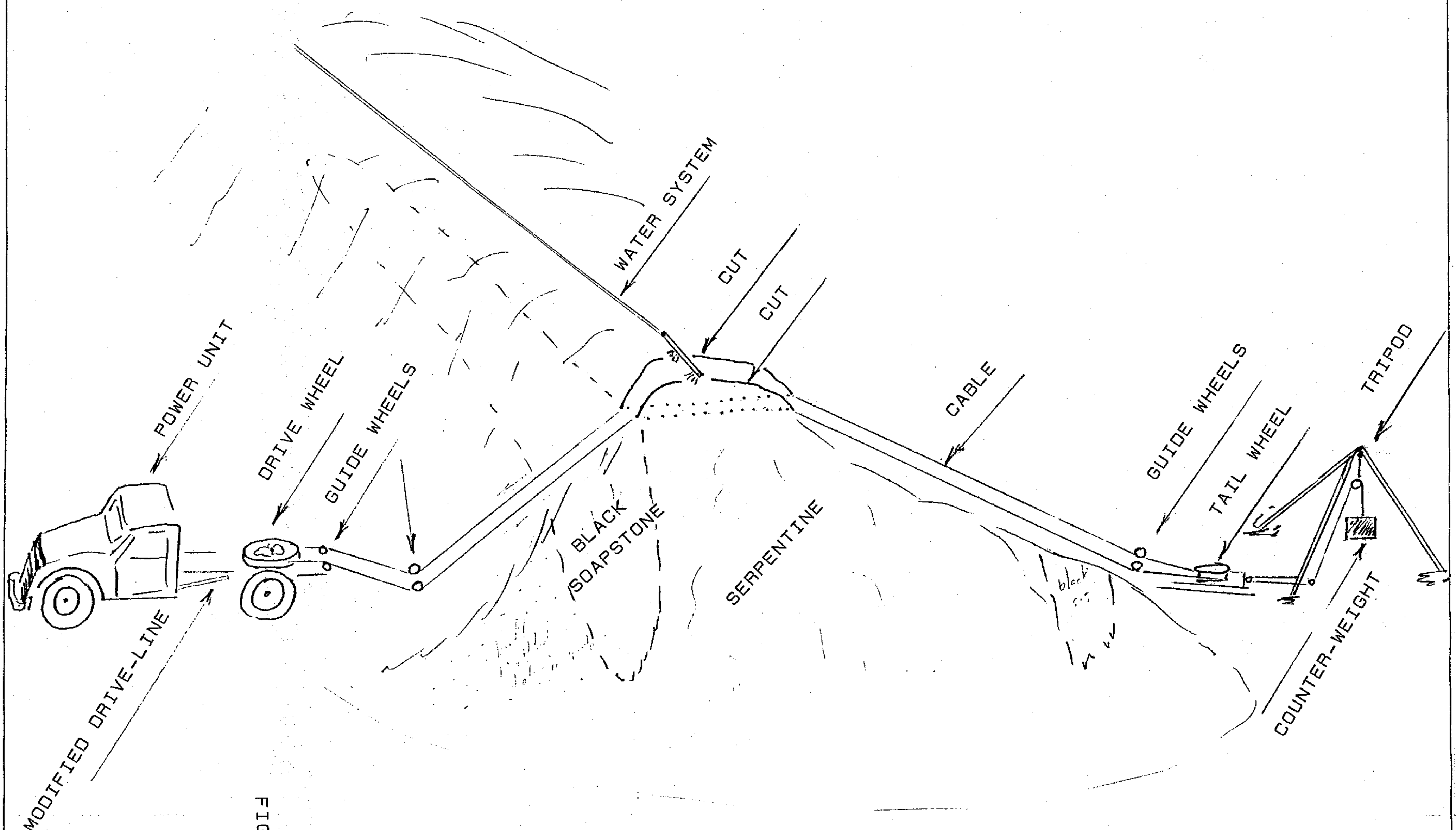


FIGURE 8

ISOMETRIC VIEW OF CABLE CUTTING SYSTEM

Power Unit

The power unit used to drive the test cables was a 1977 Toyota pick-up modified to accommodate a horizontally mounted drive wheel located above the rear axle . To do this, the pick-up box was removed, the driveshaft disconnected at the differential and relocated to connect to a vertically mounted differential. A Datsun 610 car differential was chosen for this application because the axle housing is very short (about 0.24m), and could be adapted easily to attach a 14 inch rim and tubeless tire inflated to about 5 psi.

(Figure 9 shows the schematics of this unit)

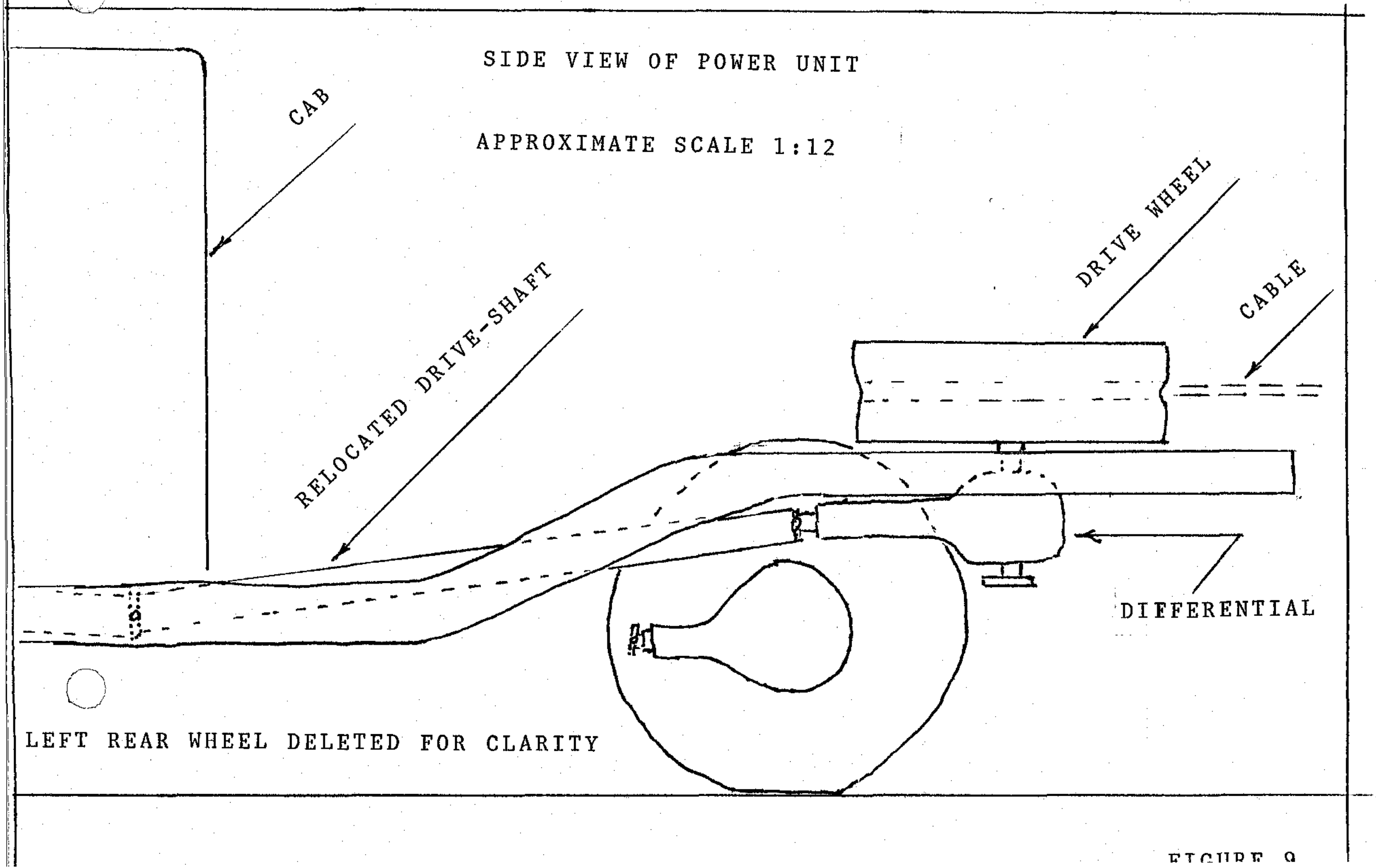


FIGURE 9

Power Unit (continued)

In this way the cable drive wheel was powered through the existing Toyota 4 speed transmission and drive shaft, giving a good range of cable speeds. The speedometer was utilized to set the trial speed, and the odometer and a watch were observed to record operating data necessary to evaluate the performance of the system.

Guiding systems and tensioning

Guiding the cable onto the drive wheel was found to be a very critical part of the system. An adjustable set of guide wheels was mounted close to the drive wheel and at the rear of the power unit to accomplish this. Improper feeding angle or location resulted in the cable slipping off the drive wheel causing delay and/or damage to the cable.

Alignment of the cable on the area to be cut was achieved by using a horizontally mounted 'tail-wheel'. Mounted on a sliding frame, the tail-wheel kept constant tension on the cable by a counterweight system . As the cable cut into the stone, the resulting slack was taken up by a counterweight tension of about 120lbs(54kg), applied to the moveable tail-wheel.

Once the power unit, the guide-wheels,the tail-wheel, and the tensioning systems were set up and aligned, trials were begun. To start a trial, it was necessary to cut a starting groove using hand tools, so that the cable wouldn't slip out of alignment.

The power unit would then be engaged at a very slow speed, to ensure that all components were functioning properly. Cable speed was then increased to about 700 feet/min(213mpm) for 5 to 10 minutes. If all was functioning well, the cable speed was increased to the regular operating speed of between 2000 and 2500fpm(609-725mpm). These speeds were set by observing the speedometer and using previously calculated values that were equivalent to given cable speeds.

Once the system was operating smoothly the following data was recorded:

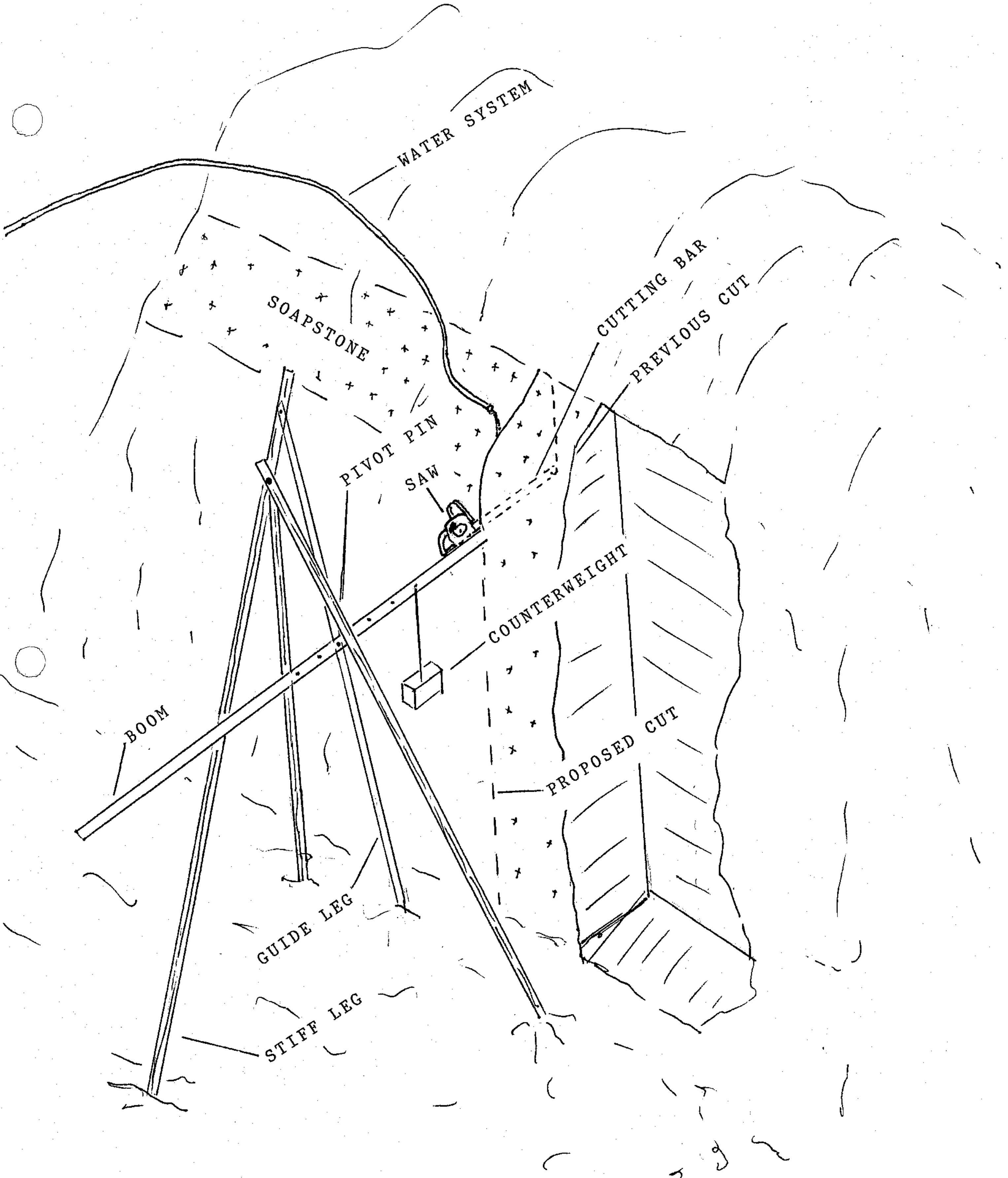
- i) start and stop times
- ii) start and stop odometer readings
- iii) gear selected in transmission
- iv) cutting depth to nearest mm
- v) counterweight loading
- vi) occasional monitoring of fuel pump pulse frequency in pulses per minute
- v) various power unit gauge readings

The same procedure was followed for the various cable variations evaluated.

PROCEDURES (CONT'D)

Saw Method

Two types of cutting chains were tested during the saw-method evaluations. One type had regular steel wood-cutting teeth, and the other had special tungsten-carbide teeth. The power unit was a heavy duty Stihl model 075 power saw with a 30 inch bar. This saw was mounted on a 5m long boom that pivoted about a horizontal axis-supported by a tripod- at a point about 2 m from the working face. With this configuration a vertical cut could be started at a maximum of about 4m above the quarry floor, and taken down to floor level. (See Figure 10)



DLM PROPERTY

SAW CUTTING SYSTEM

NO SCALE

2DEC93

FIGURE 10

The following components formed the 'saw-method' system:

i) power chain saw with 30 inch bar.(Stihl mod.075)

ii) chain compatible with the above saw and bar

iii) mounting boom for saw unit

iv) tripod for supporting boom

v) counter-weight system

vi) water supply system

vii) ladder for operator

To commence a test the tripod was set up with the two base legs about 1m from the working face. The horizontal pivoting was set at a height appropriate for the starting cut. The boom was then moved forward until the saw could cut to the required depth. The boom was then counter-weighted so that it was slightly heavy on the saw side of the pivot. The starting groove was smoothed as much as possible with a hammer and chisel. After the water was started, the operator climbed the ladder , started the saw and commenced to start the cut with the saw running at a fast idle. At this point only very light pressure was applied,until a smooth cut was established. Then engine speed was increased to about 2/3 full speed, and the counter-weight was adjusted until the down pressure at the saw was about 25lbs(11.4kg).

The trial was continued until it was completed, or until a problem developed. The following data was recorded:

i) start and stop times

ii) cutting pressure exerted on saw

iii) the area of the cut surface

iv) fuel consumption

v) condition of teeth at end of trial

The above procedure was used for each chain evaluated.

Surveying

The purpose for the survey was to confirm the relative location of the Randy area to the other areas of the property, to locate access roads more accurately, to establish more accurate elevations throughout the property,and to establish a closed survey loop for the south half of the property.

This was accomplished using the transit and chain method. Commencing at station X44(at the south end of a previous survey), a line was carried down the access roads to tie into station X17(located near the central area of the talcose zones), a distance of about 3082m. The results of this work was then plotted on a 1:2500 scale plan.

Replotting of Base Plans

The 1:2500 plan showing the survey data was reduced to 1:5000 scale, and the data transferred onto a 1:5000 contour plan.The 1:5000 contour plan was recently produced from current air photos, therefore it showed all recent roads and other current changes to the landscape. The contour interval of 10m was also a great improvement over the original plan. Using this new contour plan as a base, revised plans were prepared for geology, roads, quarries, claims, and other physical features.

Geological Mapping

Reconnaissance mapping along the new claim line of DLM 5,6 and 7 was carried out using compass and hip-chain for location method. Additional reconnaissance mapping was also carried out in the area south of North Creek, on the north end of DLM 4, and also the central part of DLM 3. The purpose of this work was to establish continuity of the talcose zones south of North Creek.

RESULTS

Cable Method

Two variations of the cable method were evaluated. The first described is the 'bare-cable' loop, the other is the 'cutter-cable' loop.

Bare-Cable Method

Two sizes of bare cable were tested, 1/8" and 5/16". The 1/8" cable was galvanized 'air craft' cable with 7X19 strand construction. The 5/16" cable was standard galvanized cable with a 7X19 strand construction. Both cables were satisfactory with respect to cutting rates and power requirements. However, the long-splice join proved to be a problem for both cables. Occasionally a strand at the end of the splice would work loose, and in time would be protruding several centimeters. This caused it to drag as it went through the cut, and eventually resulted in it jamming in the cut. This caused the cable to come off the drive wheel, or break. Once it broke there was no way to repair it on site. Failure of the long-splice occurred after 3 to 5 hours of operation, which is not satisfactory. The proposed cut was expected to take between 72 to 100 hours, and to be satisfactory, a cable should have a life of at least 500 hours.

Cutter-Cable Method

Following the negative results of the bare-cable trial, it was decided to try a modified version of the 'diamond-wire' concept used in marble, granite and other quarries. The procedure was identical with the bare-cable trials, except that the cable was different. Instead of only a bare cable, the cable was inserted through a series of circular tungsten carbide cutters, case hardened stabilizers, and small coil springs as shown in Figure 11. Various configurations of cutters, stabilizers and springs were tried, as shown in the figure. The components that made up a cutter-cable are as follows:

i) 1/8" stainless steel cable

ii) 3/8" tungsten carbide cutters (VC2 Grade)
-'rough cast', and 'ground' cutters were tried

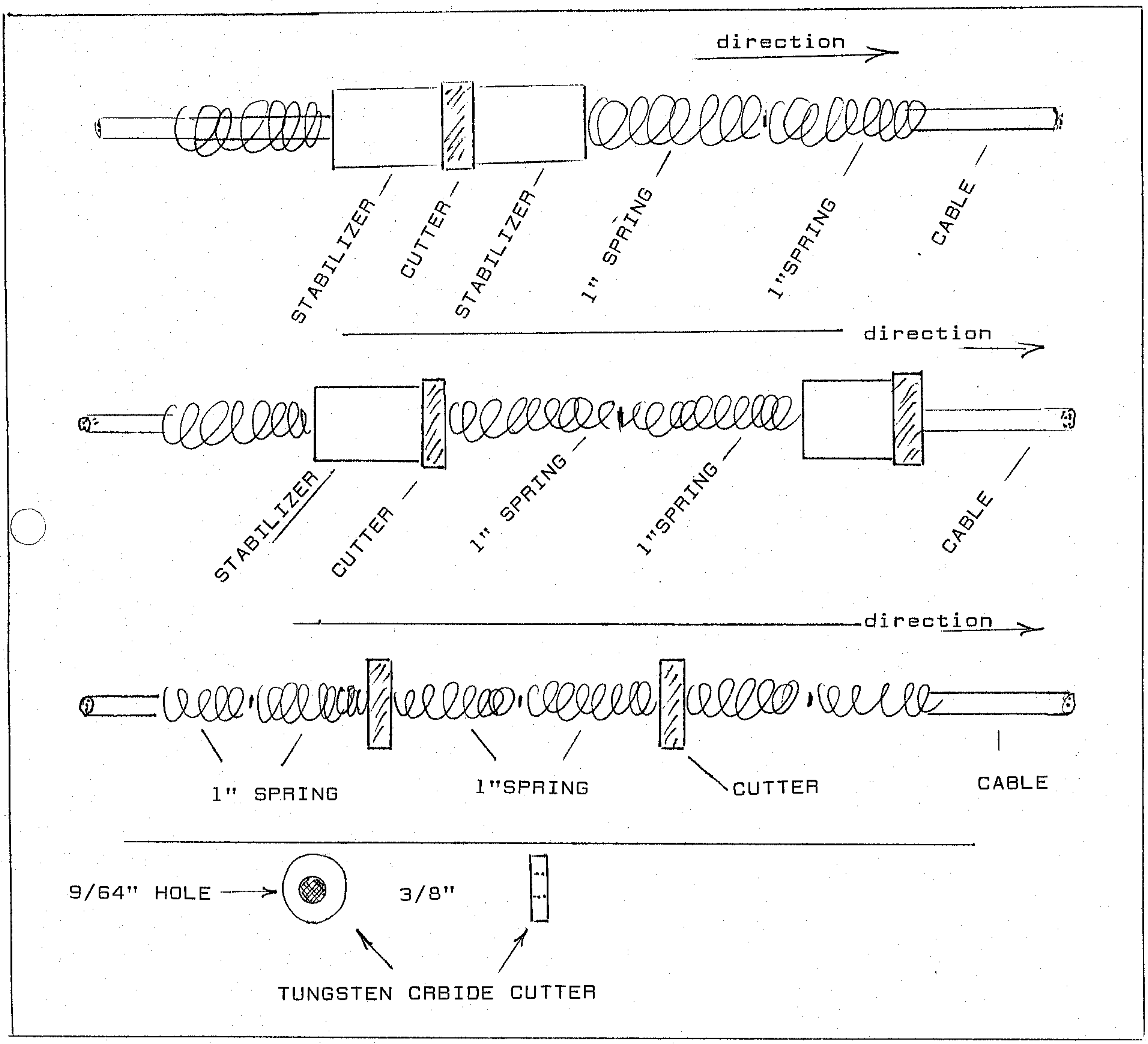
iii) 5/16"x3/4" case hardened, knurled steel stabilizers with a 9/64" hole

iv) 5/16"x3/4" mild steel connectors with a 9/64" hole

v) 5/16"x3/8" mild steel crimps with a 9/64" hole

iv) 5/16"x1" tempered steel coil springs

After all the cutters, stabilizers, crimps, and springs were assembled in the various configurations to be tried, the cable was formed into a loop by using one of the connectors. It was possible to use a connector larger than the cable in this case, as long as its diameter was less than those of the cutters. After installing, aligning and testing at low



DLM PROPERTY
CONFIGURATION
of
CUTTER CABLE

FIGURE 11

speed, the trial began. The speed at which the trials were run was 725 m per minute.

Compared to the 1/8" bare-cable, the width of cut was now 3/8", however, the cutting rate wasn't significantly lower. The operating characteristics of the cutter-cable were similar to those of the bare-cable. The drive wheel needed a slightly deeper groove, but other than that, all other components functioned favourably. After a few hours of operation the system was checked and it was apparent that the cable was being worn where it threaded through some of the cutters. After further operating time it became clear that wear was aggravated under the following conditions:

i) where ground cutters were used. This was due to the sharper edges of the hole.

ii) where insufficient pressure was used to compress the springs between crimps. This allowed the cutters to 'work' and 'chatter' on the cable.

iii) where no stabilizers were used. This allowed the cutters to tip, putting extra stress on the cable.

iv) where only one spring was used on either side of a crimp.

v) where lighter gauge springs were used. This permitted too much movement along the cable, resulting in increased abrasion.

Cable breakage became a problem after about 4 hours of operation. Breakage was always due to wear on the cable at the point where cutters were located.

It was noted that the cutting rate was almost doubled when no water was used. This may be due to the cutter 'floating' on the fluid water-cuttings mixture, thus not exerting as much pressure as when there was no water. However, cutting without water created a dust problem for the operator and the power unit.

<u>Saw Method (Regular steel teeth)</u>

Operation of all components were satisfactory, but it became evident after an hour or so of cutting that dulling of the teeth was significantly reducing the cutting rate.

Time was lost when it became necessary to shut down and sharpen the chain.

<u>Saw Method (Tungsten Carbide Teeth)</u>

Operation of all components was satisfactory. Cutting rate was about 50% higher as compared to the regular chain, even after being used for 24 hours. Cutting rate when used on the tripod and boom was about 3.5 square feet (0.325 square meters) per hour.

Sharpening of the tungsten carbide teeth was accomplished by grinding with a diamond-impregnated tool.

Tooth breakage was experienced in one situation where a veinlet of quartz was unknowingly encountered. The problem could have been minimized with more operator experience by not increasing cutting pressure when the cutting rate slowed as the teeth cut into the hard quartz. The increased pressure resulted in the teeth impacting into the quartz rather than abrading it. Tungsten carbide teeth of this type are not capable of this degree of stress.

Starting a heavy-duty chain saw while on a ladder is quite difficult and a little risky if the engine is hard to start. Some difficulty was also experienced with cuttings clogging the air filter on the engine. One engine was damaged due to cuttings getting past the filter.

<u>Surveying</u>

3082 meters of survey line, with 31 stations, was needed to complete the survey objective. This was done by continuing from existing survey station X44, along a more westerly course following the access roads where possible, and then tying in to station X17 of the previous survey. The closed loop thus formed was 4539m in length, with 58 stations. One long side shot was taken to tie in the North Creek road crossing and to pick up some topography in that area.

The survey notes were calculated, converted to metric, and plotted on a 1:2500 plan.

<u>Replotting of Base Plans</u>

Previous contours were derived from a 1:50000 topographic plan of the Duncan Lake area, prepared over 10 years ago. This plan didn't show any of the new roads, and had a contour interval of 30m. The new source plan was a 1:5000 contour plan with a 10m interval. It was prepared from photos flown in the late 1980's, and showed all current roads and other work. The new property plan is a 1:5000 contour plan, based on the above plan, and incorporating the new survey data. This new plan forms the base for the replotted geology, claims, roads and physical features plans.

Geological Mapping

Reconnaissance mapping along the claim line of DLM#6 and DLM#7 located several outcrops of talcose material in an area previously thought to be overburden. The rock found here is similar to the medium to coarse grained grey to buff type with rusty mottles found at both the Bluff and Randy areas, strengthening the concept that continuity of the talcose material exists from the most northerly, to the most southerly exposures on the property. No 'black' soapstone was found, but in view of the extensive overburden here,it cannot be concluded that it does not occur.

Reconnaissance mapping along the south end of DLM#4 and the central area of DLM#3 was also carried out. This work located a small outcrop of dark chloritic material that might be related to the 'black' soapstone found further north at the Randy quarry. This occurrence was in a small gully. About 152m further up the gully, black shale was found. It continued in the gully to the top of the slope where overburden formed a cover.

CONCLUSIONS

Cable Cutting

Quarrying soapstone from the Randy area of the deposit by the cable-cutting method, either 'bare' or with 'cutters', is not the most efficient alternative. If the area to be quarried was larger, it would be justified to use this type of cutting.

This test work did confirm that the power unit as designed was satisfactory. The guide and tensioning systems also proved to be satisfactory, and could be improved with little expense.

Of the two cable methods tested, only the 'cutter-cable' is worth further refining. Problems with the long-splice failing, indicates that this method doesn't warrant further effort, unless a better splicing technique can be found.

Saw Cutting Method

The saw cutting is very adaptable and is believed to be the most effective way of quarrying soapstone from a small irregular deposit such as this. This gas-engine powered saw is susceptible to premature wear due to fine cuttings entering the air intake. It is also awkward from an operating standpoint,where the operator must work off a ladder to start and operate the saw. However, these drawbacks don't detract from the fact that the tungsten carbide chain is an effective and relatively simple system to operate A good alternative would be to drive the cutting chain with a hydraulic motor fed by a 3 to 5hp hydraulic pump. This unit would be connected to the cutting unit with about 10m of hydraulic hose, thereby keeping the pump engine in an area free of cuttings. A longer bar (1.2m)would be equipped with narrower gauge teeth(3/8" instead of .404). The boom on which the cutting unit is mounted would be hydraulically controlled also.

Surveying

The recently completed survey work confirmed the relative locations of the north and south ends of the property. Location of most roads was also confirmed. A good network of survey stations is now available to tie in future work.

Replotting of Base Plans

With the additional survey work and the availability of a more recent 1:5000 contour plan, the quality of base plans for the property have been greatly improved. These plans will significantly augment future work to evaluate this property by providing a more detailed contour base, and by having more current road information readily available.

Geological Mapping

The reconnaissance mapping carried out provided more fill-in data to strengthen the concept that the talcose zones have good continuity from south to north on the property. In particular, because of overburden cover in the area around the initial posts of DLM#7, it was not previously possible to project the zones through this area with confidence. Mapping to the south of North Creek did not turn up much encouragement, but further work is still warranted after finding one outcrop of green chloritic rock west of the final posts of DLM#3.

STATEMENT OF COSTS

DUNCAN LAKE MINERALS PROPERTY

1993

CALCULATE,TABULATE& TYPE SURVEY DATA		$ 175
PREPARE SURVEY,CONTOUR, & GEOLOGICAL PLANS		350
PREPARE SUMMARY REPORT		413
TYPE & ASSEMBLE REPORT		50
PRINTS & PHOTOCOPIES		49
VEHICLE	60 miles@$0.25/m	15
OFFICE SUPPLIES		19
TELEPHONE		14
FEE		100
TOTAL		$1185

E.A. LAWRENCE,P.Eng.
6 DEC 93

COST SUMMARY

DUNCAN LAKE MINERALS PROPERTY

DUNCAN LAKE ,B.C.

	1991	1992	1993	TOTAL
PROPERTY MAINTENANCE	4693	2800	806	8299
CAPITAL COSTS	20889	0	0	20889
OPERATING EXPENSES	17690	2550	0	20240
TOTAL EXPENSES	43272	5350	806	49428

STATEMENT OF QUALIFICATIONS

I, E.A. Lawrence,P.Eng., of 3590 Wiig Road,Westbank,B.C.,

DO HEREBY CERTIFY

1) That I am a graduate of the University of British Columbia with a degree B.A.Sc. in Geological Engineering (1959).

2) That all of the technical field work carried out in 1991, 1992 and 1993 and included in this report,was done by me.

3) That I personally supervised all the non-technical work covered in this report.

4) That I am registered Professional Engineer in the Province of British Columbia.

E.A. Lawrence,B.A.Sc.,P.Eng.

Dated:

Westbank in the Province of British Columbia

this 21st day of December 1993.

REFERENCES

FYLES,J.T. (1964) Geology of the Duncan Lake Area,B.C. Department of Mines, Bulletin #49.

MACLEAN,M. (1987) Talc and pyrophyllite in B.C. B.C. Mineral Resources Division, open 1988-19

LAWRENCE,E.A. (1989) Geological Summary Report Valentine Property,Duncan Lake,B.C.

LAWRENCE,E.A. (1990) Geological Summary Report Valentine Property, Duncan Lake,B.C.

LAWRENCE,E.A. (1991) Summary Report Duncan Lake Minerals Property Duncan Lake B.C.

APPENDIX II

DUNCAN LAKE MINERALS

SURVEY STATION COORDINATES(METERS)

X	17	6095.70	6095.70
X	18	6015.75	6179.46
X	19	5976.04	6228.65
X	20	5912.01	6273.73
X	21	5878.05	6298.51
X	22	5706.37	6382.90
X	23	5659.19	6402.80
X	24	5624.20	6421.09
X	25	5579.18	6443.37
X	26	5539.47	6471.47
X	27	5476.41	6503.99
X	28	5456.08	6512.95
X	29	5428.77	6531.30
X	30	5393.69	6557.09
X	31	5331.15	6598.11
X	32	5297.65	6617.28
X	33	5199.63	6669.86
X	34	5167.45	6685.83
X	35	5027.95	6763.82
X	36	4939.07	6805.49
X	37	4910.94	6808.38
X	38	4882.05	6841.82
X	39	4850.50	6868.30
X	40	4798.05	6899.21
X	41	4761.99	6919.78
X	42	4701.95	6951.08
X	43	4674.98	6976.62
X	44	4530.60	7183.21
R	2	4462.11	7204.72
R	3	4444.22	7072.39
R	4	4411.37	7049.37
R	5	4544.53	6943.07

APPENDIX II (cont'd)

R	6	4582.53	6869.46
R	7	4664.67	6803.90
R	8	4634.13	6779.52
R	9	4497.80	6825.63
R	10	4500.67	6795.85
R	11	4583.17	6713.62
R	12	4744.41	6631.76
R	13	4793.39	6564.80
R	14	4944.80	6496.52
R	15	4993.63	6469.70
R	16	5055.62	6451.05
R	17	5124.63	6443.92
R	18	5207.50	6383.27
R	19	5287.02	6352.42
R	20	5332.09	6350.53
R	21	5346.94	6331.36
R	22	5480.58	6291.71
R	23	5552.91	6273.54
R	24	5583.02	6262.94
R	25	5687.78	6238.01
R	26	5799.45	6183.30
R	27	5827.95	6175.19
R	28	5893.42	6132.85
R	29	5943.74	6118.80
R	30	5989.30	6089.76
R	31	6034.29	6109.33

MONTANA BUREAU OF MINES AND GEOLOGY
MONTANA COLLEGE OF MINERAL SCIENCE AND TECHNOLOGY
BUTTE, MONTANA 59701
(406) 496-4180

January 22, 1993

Mr. Randy Zieber
656 Patterson Avenue
Kelowna, British Columbia V1Y 5C6

Dear Randy:

I have enclosed copies of the x-ray diffraction traces of the two specimens that you left with me. Both consist essentially entirely of chlorite with a trace of talc. The peaks on the x-ray diffraction traces caused by chlorite and talc are labelled. As you can see the dark green specimen produced more intense chlorite peaks than the black specimen. I then made a change in instrumental settings and ran the dark green specimen again. I think that the peaks are more intense for the dark green specimen because it is coarser grained. A coarser grained specimen should give more intense peaks because the larger grains will be more uniformly oriented. The black specimen is black because there are very small grains of a black mineral in the chlorite. There is some magnetite in this rock, but I am not sure if all of the black mineral in very small grains is magnetite.

Please don't hesitate to call me if you have any questions.

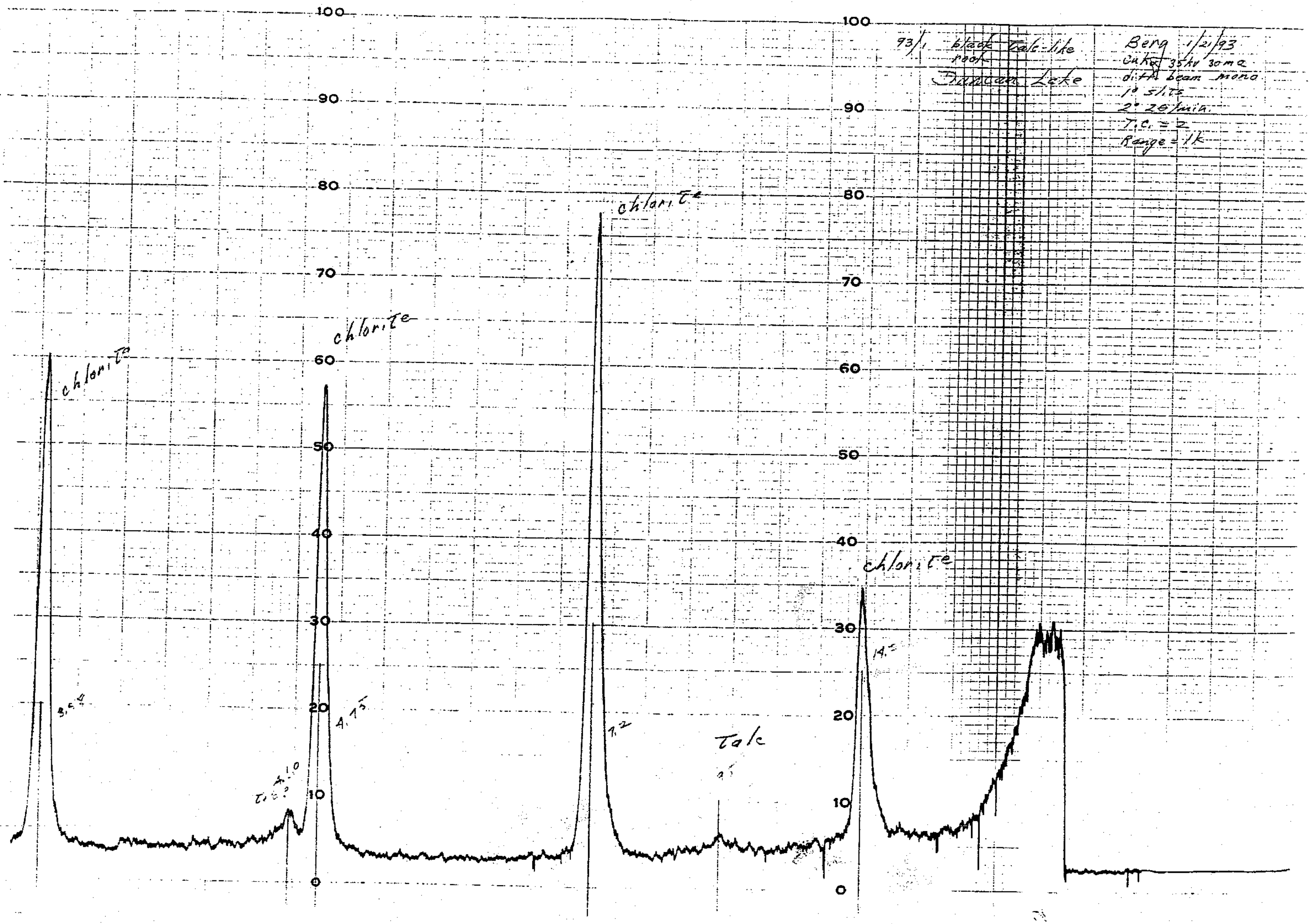
Sincerely,

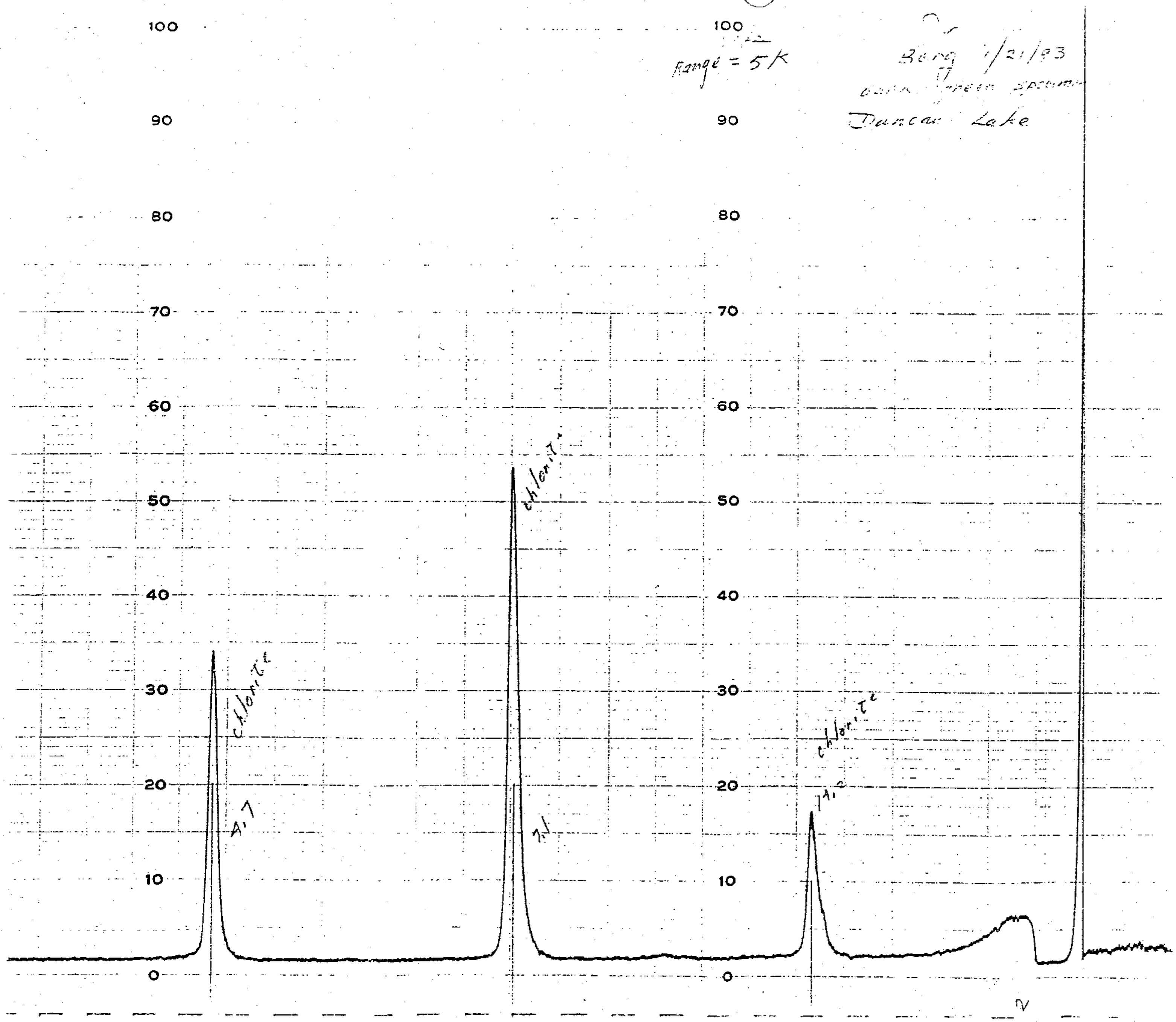
Dick

Richard B. Berg
Economic Geologist
(406) 496-4172

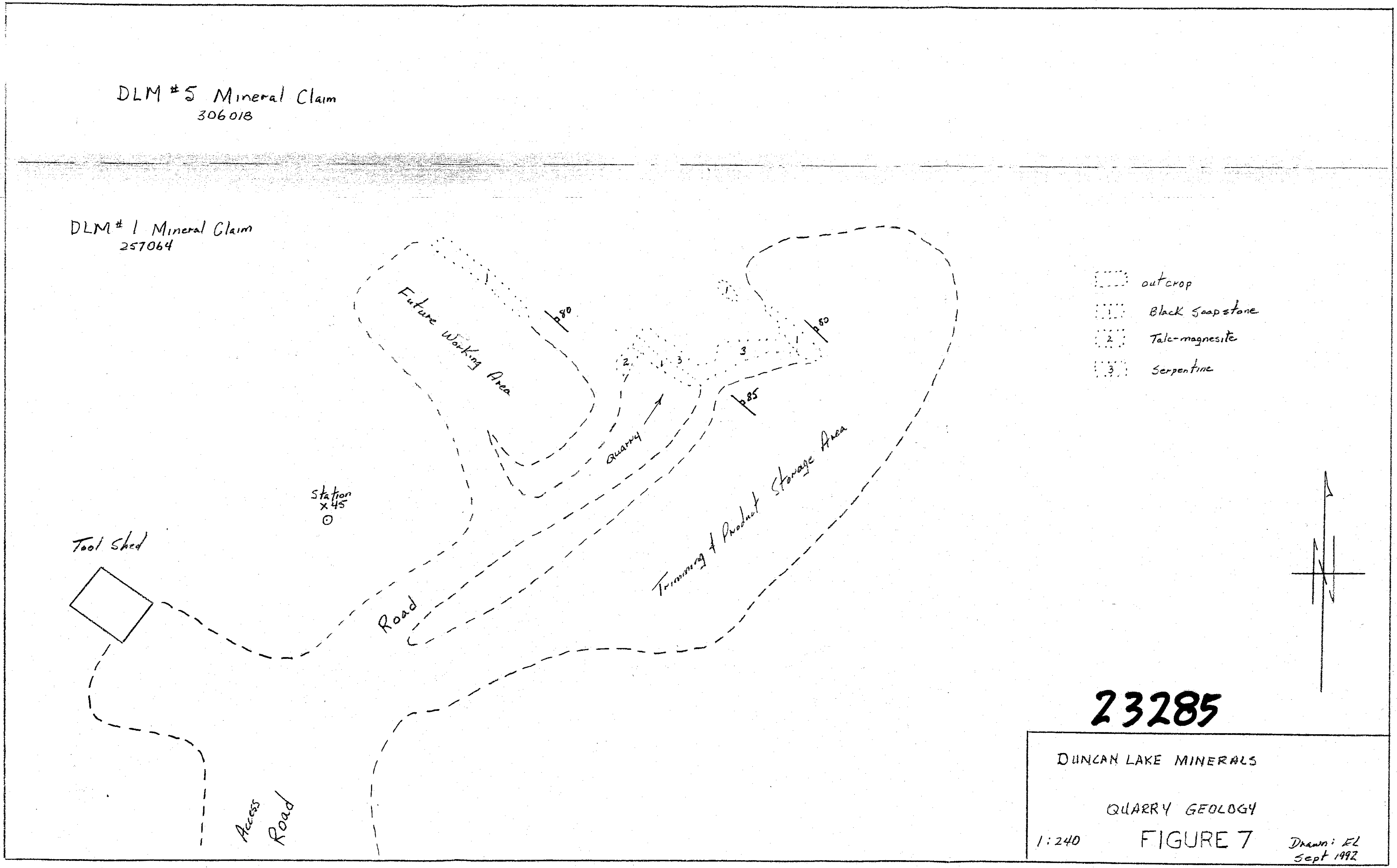
RBB:mt

Enclosure


93/1 black Talc-like rock
Duncan Lake
Berg 1/21/93
CuKα 35kv 30ma
diff. beam mono
1° slits
2° 2θ/min.
T.C. = 2
Range = 1k
chlorite
3.54
chlorite
4.15
4.0
Talc?
chlorite
7.2
Talc
chlorite
14.5
100
90
80
70
60
50
40
30
20
10
0



Range = 5K
Berg 1/21/93
Duncan Lake
chlorite
chlorite
chlorite
100
90
80
70
60
50
40
30
20
10
0



DLM #5 Mineral Claim
306018
DLM # 1 Mineral Claim
257064
Future Working Area
Quarry
Trimming & Product Storage Area
80
80
85
1
2
3
outcrop
Black Soapstone
Talc-magnesite
Serpentine
Station
x45
Tool Shed
Road
Access Road
N
23285
DUNCAN LAKE MINERALS
QUARRY GEOLOGY
1:240
FIGURE 7
Drawn: EL
Sept 1992

NORTH CREEK
DLM 4
257139
25 Oct 95
DLM 3
257138
25 Oct 95
DLM 2
257137
25 Oct 97
DLM 1
257064
10 July 97
DLM 5
306918
8 Dec 98
DLM 6
DLM 7
310028
4 June 96
DLM 8
310029
4 June 96
DLM 9
DLM 10
TED #1
256476
TED #2
North Creek Road
Duncan Lake Road
DUNCAN LAKE
GEOLOGICAL BRANCH
ASSESSMENT REPORT
23,285
DUNCAN LAKE MINERALS
SCALE: 1:5000
DATE: 1 Aug 93
APPROVED BY
DRAWN BY
CLAIMS
DRAWING NUMBER
FIGURE 3


NORTH CREEK
8000E
7000N
6000N
5000N
4000N
7000E
6000E
Talcose Zone
Schist
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
DUNCAN
LAKE
GEOLOGICAL BRANCH
ASSESSMENT REPORT
23,285
DUNCAN LAKE MINERALS
SCALE: 1:5000
APPROVED BY
DRAWN BY FAL
DATE: 1 Aug 93
TALCOSE ZONES
DRAWING NUMBER
FIGURE 5

GEOLOGICAL BRANCH ASSESSMENT REPORT

23,285

DUNCAN LAKE MINERALS		
SCALE: 1:2500	APPROVED BY	DRAWN BY EL
DATE: 2 Dec 93		
SURVEY PLAN - SOUTH AREA		
		DRAWING NUMBER FIGURE 6