82F/3E

002732 82F/SW-10

OFFICE OF THE CHIEF MINING ENGINEER

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF MINES
VICTORIA

Copy for the information of P. Freeland.

September 4th, 1942.

E. L. Longmore, Esq.,
General Manager,
Wartime Metals Corporation,
637 Craig Street West,
MONTREAL, Quebec.

Dear Mr. Longmore:

According to verbal and written instructions received, exploration work on the Emerald property has been pushed vigorously since August 17th, 1942, when the property was acquired by Wartime Metals Corporation. A certain amount of work has been necessary to improve existing facilities, but most of this is now accomplished, and work will be largely concentrated on exploration from now on.

Emphasis has necessarily been placed to date on exploration, but since production is now assured and the season is well advanced plans for bringing the property into production should be made and put into action at once, in order that there will not be excessive delays caused by bad weather. As it is a great deal of the necessary construction cannot be completed before winter conditions set in.

The accompanying progress report deals briefly then with the salient features of the property, of the ore positions, progress of work, and suggested plans for the future. It is intended to serve as a basis for calculations by Wartime Metals Corporation or by any permanent manager who might be selected.

A matter not dealt with in the report, because of insufficient data, is the question of custom ore in the Salmo district. In fact there are possibilities of custom ore in the Nelson district as a whole that should not be disregarded.

E. L. Longmore, Esq., September 4th, 1942.

The tungsten situation is so new that it will probably be next spring before definite data are obtainable, but it seems certain that some additional tonnage will be proved, capable of treatment but not in sufficient quantity to warrant another mill.

Two properties of major interest are under development, each of which may prove to be large enough to warrant erection of a milling plant at some future date. These are the Stewart Group, 12 miles north of Salmo, under development by Premier Gold Mining Co. Ltd., and the Molly, on Lost Creek, under development by the Consolidated Mining & Smelting Co. Ltd. In addition, there are prospects on Sheep Creek and Lost Creek that may produce some tungsten and molybdenum.

In the general district many quartz veins contain local concentrations of scheelite, none of which have proved to be commercial on a basis either of hand cobbing or of milling the entire vein. If there were a mill in the district certain shoots could be mined for shipment at a profit with or without hand sorting. Tonnage from such sources cannot be estimated at present.

It is my belief that the possibility of treating custom ore in the Emerald mill should be given due consideration. If such practice were decided upon and the fact made generally known, it would serve as an incentive to development in the general district that might be productive of a substantial amount of tungsten.

Yours very truly,

M. S. Hedley

For Wartime Metals Corporation,
Emerald Tungsten Project.

MSH/KS
Encs.

Emerald Report

Copy to Mr. Leuland

INDEX.

REPORT ON THE EMERALD TUNGSTEN PROPERTY, SOUTH OF SALMO, B. C.

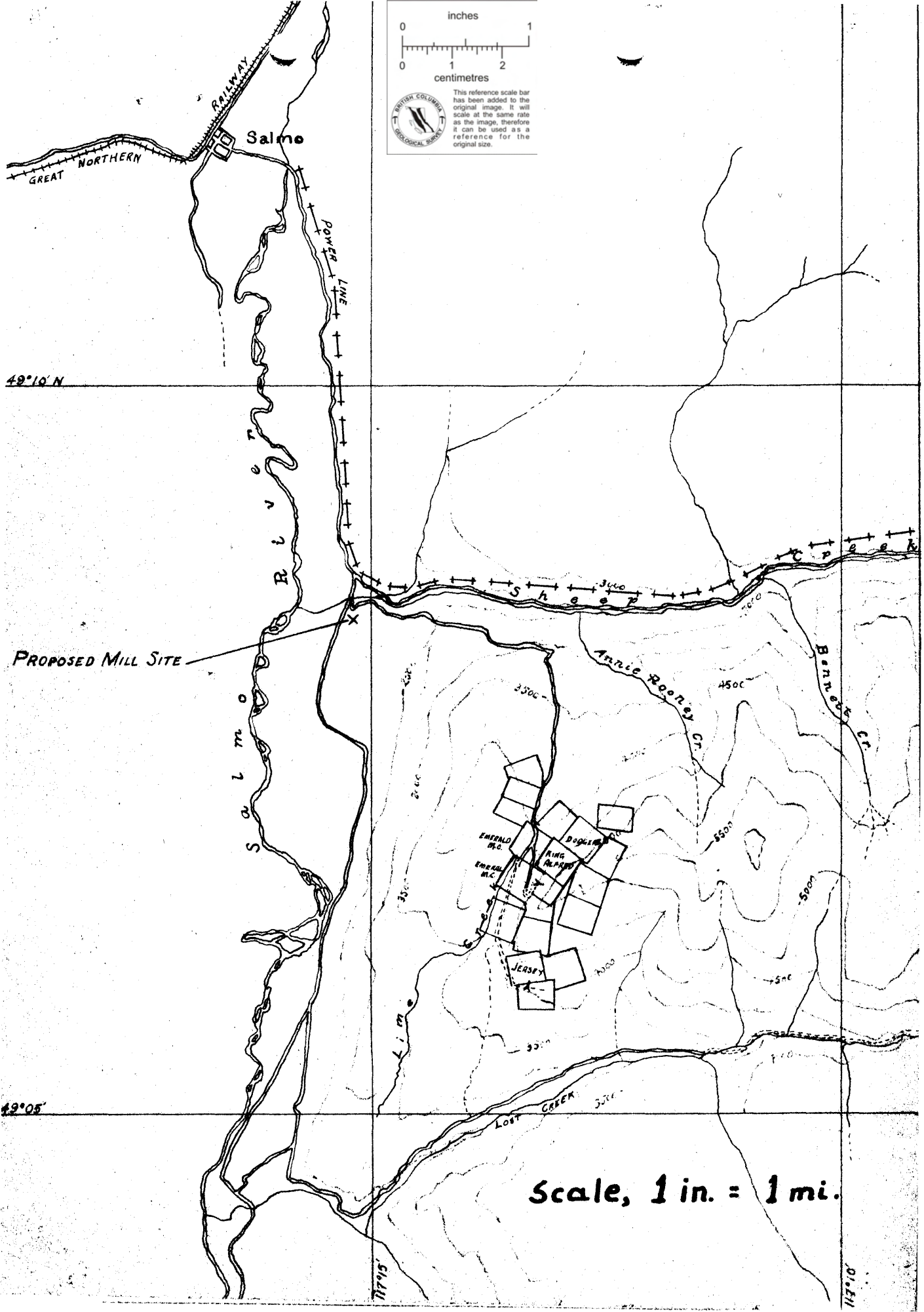
September 1st, 1942.

INTRODUCTION.

This is a progress report, bringing up to date the most important data concerning geology, tonnage estimates, progress of development and plans for further development.

Previous reports include one by R. J. Maconachie, of June, 1942, including a description of low-grade mineralization in bands of altered limestone, referred to as skarn. A report by the present writer, dated July 11th, outlines all that was then known of the principal scheelite-bearing zone. J. A. H. Paterson, of the Metals Controller's office, visited the property on July 26th and 27th and submitted a report of conditions at that time. F. C. Buckland, acting for the War Metals Advisory Committee, visited the property on August 1st and 2nd, and reported on it.

The Emerald property consists of Crown-granted claims long held by the Iron Mountain Limited, and was increased by four claims, recorded in July, lying immediately west of the Crown-grants. The ground covered lies east of Salmo River between Sheep Creek and Lost Creek (see Fig. 1, Fig. 2), on a westerly facing slope. The property is reached by a branch road 4 miles in length which leaves the Nelson-Nelway highway at a point 4 miles south of Salmo. Salmo, 27 miles by road southerly from Nelson, is on a branch line of the Great Northern Railway, running between Spokane and Nelson. An interswitch near Nelson provides connection with the Kettle Valley branch of the Canadian Pacific Railway.


inches
0
1
0
1
2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.
GREAT NORTHERN RAILWAY
Salmo
POWER LINE
Salmo River
49°10' N
PROPOSED MILL SITE
Sheep Creek
Annie Rooney Cr.
Bennett Cr.
EMERALD M.C.
DOUGLAS
KING ALFRED
EMERALD M.C.
JERSEY
Lime
LOST CREEK
49°05'
117°15'
Scale, 1 in. = 1 mi.

At intervals from 1907 to 1925 the Emerald produced about 20,000 tons of lead-zinc ore and concentrates from replacement deposits in limestone. In 1934 fire destroyed timber on and near the property below 4000 feet elevation. The fire destroyed the mill which had treated lead-zinc ore but left a number of log and frame buildings. A little hand work of an exploratory nature was done during the past few years, under the direction of Harold Lakes.

Early in 1942 bands of metamorphosed limestone, or skarn, were being prospected for molybdenite when low-grade disseminated scheelite was discovered in addition. On May 20th Harold Lakes discovered high-grade scheelite in several very old open-cuts along the granite contact immediately above the Jersey Road. Attention was at once focussed on this higher grade, Emerald zone, because it promised speedier production, and the low-grade skarn was not further prospected.

On August 17th the Emerald property was acquired by Wartime Metals Corporation and development work, which had progressed slowly, was at once intensified. At the same time facilities for work increased.

All effort to date has been directed toward the discovery and exploration of higher grade mineralization, capable of yielding important quantities of tungsten in the near future. The lower grade skarn bands are worthy of prospecting as they may well contain a very large tonnage of lower grade ore.

The work is being directed by M. S. Hedley, Mining Engineer, B. C. Department of Mines, and H. Sargent, Mining Engineer, has been acting in an advisory capacity since August 20th. Two field assistants employed by the Department are assisting in the technical work.

The old camp buildings, at about 4200 feet elevation, are still in use. These include four small log cabins, two log stables, a cookhouse, an office and a small cabin of frame construction. Equipment at the property in mid-August consisted of pipe rails and mine cars at the lead-zinc workings, small tools and camp equipment. At that time a dry was nearing construction, and has now been completed and equipped. The cookhouse had been enlarged in the early part of August. A building is being erected to serve temporarily as a bunkhouse accommodating about 24 men. This camp scarcely provides accommodation for men now employed at the property. The old buildings are unsuitable for permanent use, and would not provide satisfactory housing for the crew during winter weather.

ORE DEPOSITS.

In the writer's report of July 11th the geology of the property was discussed in some detail. The basic picture has not changed, so the details will not be repeated, at least no more than is necessary to describe the ore-bodies and the factors governing estimates of tonnage and plans for development.

Two bodies of Nelson granite intrude members of the Pend d'Oreille series, roughly along their strike, but as dykes rather than sills. The sediments dip eastward into the hillside above Lime Creek and at all the showings. These rocks are predominantly argillites and quartzitic argillites west of the granite bodies and include interbedded limestones and argillites between and immediately east of the granite bodies. Contact metamorphism is not marked except in certain horizons and zones that are, as a rule, scheelite-bearing.

REPORT ON THE EMERALD TUNGSTEN PROPERTY, SOUTH OF SALMO, B. C.

September 1st, 1942.

SUMMARY.

Disseminated scheelite mineralization on the old Emerald lead-zinc property follows the contacts of two granite bodies in a series of interbedded limestone and argillites. Additional low-grade scheelite and molybdenite occurs in bands of metamorphosed limestone, or skarn between the granite bodies.

The principal, or Emerald ore-zone, on which exploration has been concentrated, is known to be 1800 feet long. The northern section is 425 feet long, up to 50 feet wide, and bottoms at shallow depth. A reasonable estimate for this section gives 15,000 tons at a grade between 1.5 and 2.0 percent tungsten trioxide.

The southern section of the same zone is complex, containing bedded and some irregular replacements in a wedge of limestone lying above argillite and against granite. It is 1375 feet long and extends to a maximum depth of 140 feet. Three cross-sections have been outlined by diamond-drilling, with areas over minable widths of 2000, 670 and 1800 square feet, with grades of 1.0 percent tungsten trioxide or higher. A conservative estimate gives 50,000 tons minimum with a grade of 1.0 percent tungsten trioxide. A possible maximum tonnage figure cannot be set.

The Dodger ore-zone is no more than an interesting prospect, worthy of considerable development. A bedded zone 17 feet thick, as exposed in an old adit, averages 1.7% tungsten trioxide, but two nearby trenches are low in grade.

The low grade skarn bands, four or more in number, have not yet received attention beyond preliminary sampling of one section last June. This section, 60 feet long, averaged 0.15 percent tungsten trioxide across a width of 15 to 20 feet.

Exploration presents many possibilities for the discovery of scheelite, in extensions of known zones and in new areas, but a complete exploratory campaign cannot be finished this year.

Since the 17th of August, when the property was acquired by Wartime Metals Corporation the scale of work has been enlarged. Working facilities have been improved and expanded, and sufficient equipment has been obtained for a preliminary program of development.

A second diamond drill arrived on August 25th and is now operating on two shifts per day. A bulldozer will arrive next week, and a portable compressor unit is being installed. A permanent water supply for mine use has been ensured, and a pipe line is being laid. A good deal of slashing has been done on the Emerald ore-zone and a quantity of mine timber has been stacked for future use.

It is planned to continue and to extend this work. Diamond-drilling will continue and extensive stripping of both Emerald and Dodger zones will be undertaken. Sampling of the skarn bands on a systematic basis will start next week. Underground work will get underway immediately on the Emerald zone. Samples for mill testing will be obtained of the different ore

types from different parts of the property.

Exploration is not sufficiently well advanced to give positive figures of tonnage and grade for the Emerald ore-zone, but the estimate of 6500 tons is a minimum figure. This is a sufficient tonnage, at a grade of 1.0 percent tungsten trioxide, or better, to warrant production, and plans should now be made for installation of power and erection of a mill.

The season is now well advanced, and by September 15th fall rains may start. Permanent winter conditions will set in about October 15th in an average year, and permanent facilities at the mine should be at least partly completed by that date. Mill construction on the Salmo River can go forward until a later date.

The erection of a 100-ton mill is warranted. This should be designed to be flexible and capable of expansion. A site ½ mile south of the mouth of Sheep Creek seems advisable.

It is impossible to select a permanent aerial tramway location that will serve the property as a whole for some months, and while transportation of ore by tram is to be recommended haulage by truck should be considered for the present winter. The existing mine road is being repaired and in part relocated by the Public Works Department, and winter haulage over it should not be difficult. Adequate equipment for snow removal will have to be provided, and sufficient storage space made in the mill bins to withstand a tie up of a day or two at a time.

The cost of construction of an electric transmission line to the mine is estimated to be no more than $10,000. The cost of a line to the proposed millsite would be negligible.

It is considered that a mine camp to accommodate 60 men will be adequate. The cost of this camp, together with some expenditure on the existing camp to make it livable for 8 or 10 families, is estimated at $25,000.

Construction of a mine camp and of an electric power line should be started without delay, and plans should be made for mill construction.

Several bodies (four or more) of strongly altered limestone, or skarn, occur between the two bodies of granite, and contain small amounts of disseminated scheelite and molybdenite. The principal or Emerald zone follows the western contact of the southern granite body for a known length of 1800 feet and may extend an additional distance to the south; the northern termination of this zone is in a bay in the granite contact. A second zone, known as the Dodger, from its occurrence on the Dodger claim, is on the eastern side of the northern body of granite; it terminates in a bay in the granite contact.

Scheelite occurs as disseminated grains in areas and bands of alteration of contact type, in limestone and in granite. No grains are larger than the size of a pea, and most grains are 0.2 to 1.0 mm. in diameter. It is associated in the skarn with minerals such as diopside, vesuvianite, garnet and plagioclase, and with minor amounts of pyrrhotite and molybdenite. In the higher grade zones it is associated with biotite, actinolite and other silicate minerals, with pyrite, and typically with massive pyrrhotite and accessory pyrite and chalcopyrite. A very little molybdenite is seen, as well as minute amounts of other sulphides, including stibnite. A red, manganese-bearing silicate occurs locally.

The contact zones contain more or less quartz, and the granite itself has been strongly invaded by irregular quartz veins and masses. The limestone in the ore-zones is locally strongly silicified. Silicification, and local development of much pyrrhotite intergrown with actinolite and biotite, are diagnostic of the better grades of tungsten.

Mineralization is of the contact metamorphic type, and occurs in zones rather than in veins. The percentage of scheelite varies rather widely in an individual section, but is not "spotty" in the sense of high grade gold deposits; rather, scheelite of various concentrations occurs as streaks or smears within a zone, with no apparent, systematic rake. There are no significant gold values.

Skarn Bands.

The lowest band of skarn is about 20 feet in thickness. It is exposed at intervals for a length of about 4000 feet. Other bands, from 5 to about 15 feet in thickness, have an aggregate length of about 5000 feet. The bands dip into the hillside and angle downwards to the north. They all contain disseminated scheelite and molybdenite in small amounts, although local bands a foot or more in thickness are estimated to contain locally a large fraction of 1 percent tungsten trioxide. A section 60 feet in length on the lower and larger band, considered to be typical, was channel-sampled by Maconachie and found to assay 0.15 percent tungsten trioxide.

Visual estimations by means of the ultra-violet lamp has proved impossible, first because of the difficulty of assessing the importance of small, scattered grains and local concentrations and, second, because much of the molybdenite is altered to powellite, (calcium molybdate) the fluorescence of which so closely resembles that of scheelite in some instances that small grains cannot be determined with any degree of certainty.

The skarn bands may prove to be minable, all or in part, and could be productive of a large amount of tungsten, depending on percentages and costs. Surficial channelling of samples is not to be recommended, because

only bulk sampling can determine accurately the average percentages of both tungsten and molybdenum. Bulk sampling has not yet been attempted for lack of facilities, but will be started soon.

Emerald Zone.

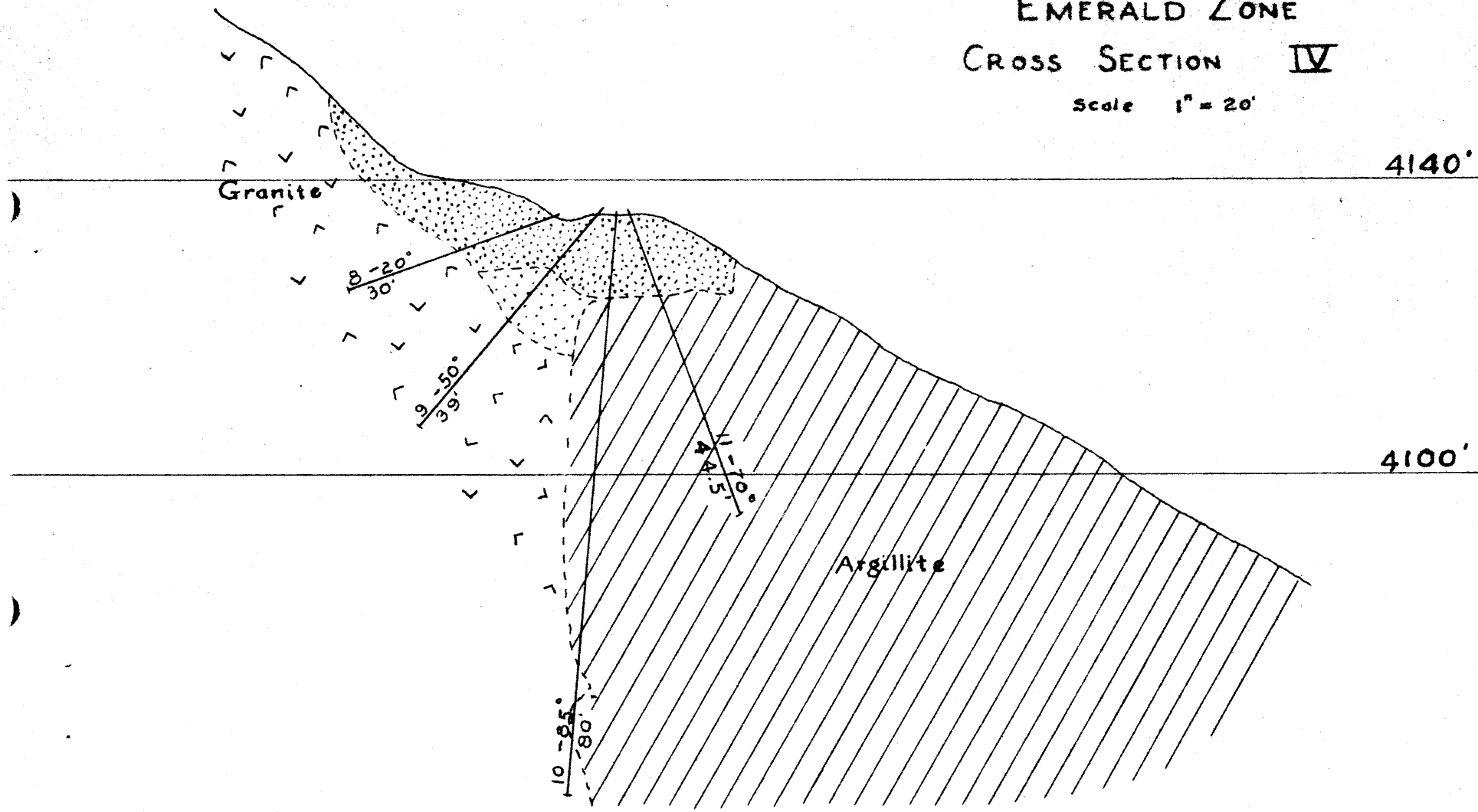
This zone is known to be 1800 feet long, with a probable extension to the south, judging from surface indications. It is divisible into a northern and southern section, separated by a small gulley that is the site of a postulated fault. North of this fault argillites are in contact with granite, and scheelite occurs in granite across a horizontal width of as much as 50 feet locally. South of the fault a wedge of limestone lies above the argillite and between that rock and the granite. It is presumed that the southern section has dropped relatively to the northern section, a distance of the order of 50 to 100 feet.

In the northern section scheelite is disseminated in granite which is more or less silicified and which contains apparently pod-like bodies of almost massive sulphide. The maximum horizontal width is about 50 feet, and in plan the ore-zone tapers at both ends in a total length of about 425 feet. The zone is not completely exposed, but a reasonable estimate of the surface area is 9000 square feet.

The grade of the northern section, at the surface, is on the whole higher than in other parts of the property. Assay figures are given on the accompanying detailed map, (Fig. 4) and on the basis of these an estimate of 2 to 3½ percent tungsten trioxide was made in July. The east-west trench south of Station 416 has been sampled three times, to give an average of 7.5, 5.9 and 5.6 percent tungsten trioxide, the lowest figure being my own,

inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

EMERALD ZONE
CROSS SECTION IV
Scale 1" = 20'

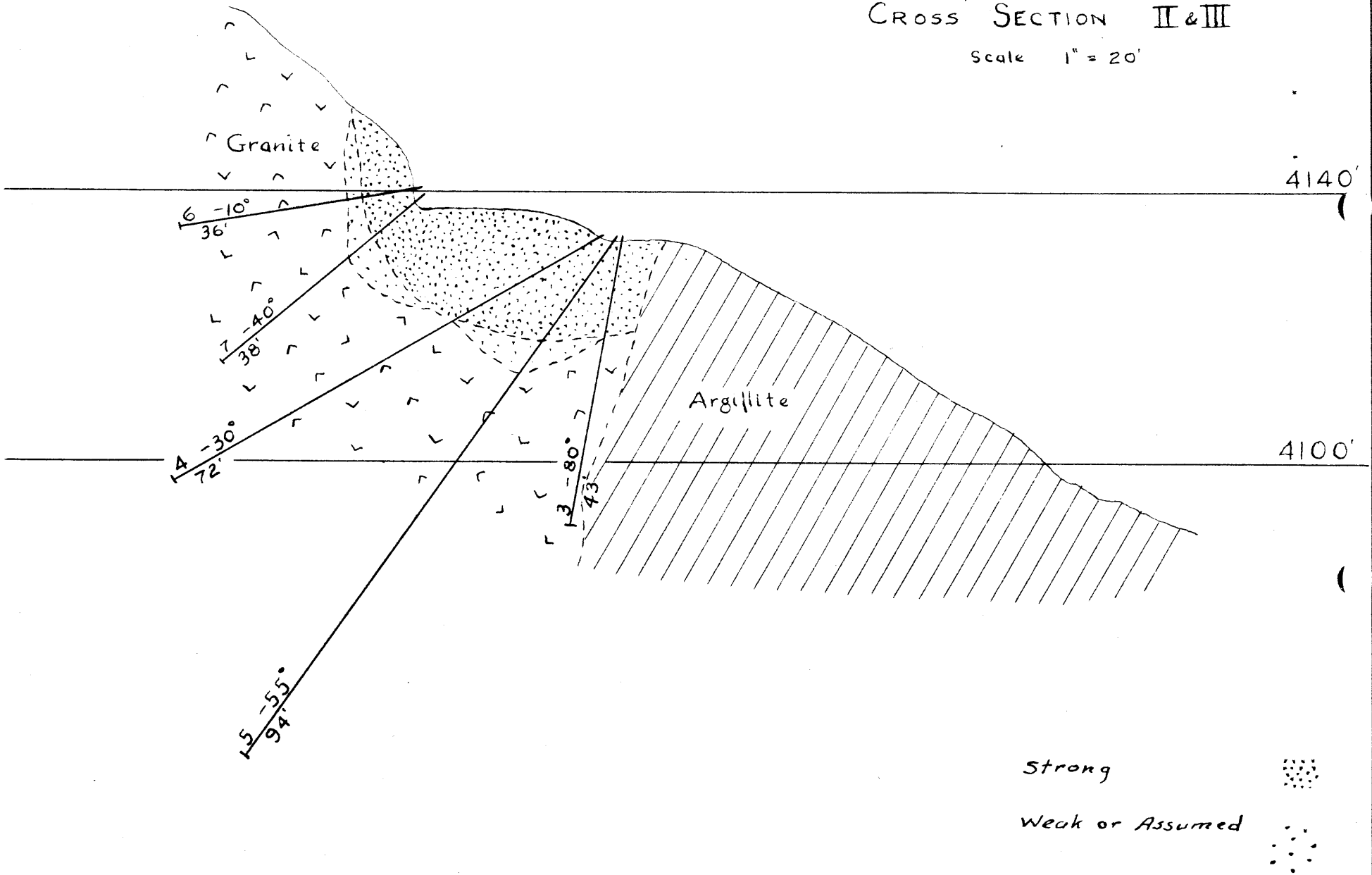


inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

EMERALD ZONE

CROSS SECTION II & III

Scale 1" = 20'



for a total sampled length of 34 feet across the zone. The north-south stripped area, 7.5 feet wide, averages 4.0 percent tungsten trioxide for a length of 50 feet.

Two diamond-drill holes near the south end intersected (at I) altered granite to a depth of 115 feet but no scheelite; the upper hole was 40 feet below the outcrop. Two sections were next drilled from the outcrop, 100 feet apart, at II, III and IV, and showed the ore-body to be only about 15 feet in depth. There is no apparent reason for the mineralization to cease, as it does, rather abruptly, but beyond the indicated limits no scheelite was encountered in any hole.

The ground at the surface is broken and partly oxidized, so that only fragments of core were recovered, and sludge recovery was also poor. Consequently it is impossible to determine the grade in these cross-sections. All that may be said is that the fragments of core were quite strongly mineralized except as shown on the accompanying sections. The northern cross-section is about 650 square feet in area, with an additional 150 square feet of lower grade (estimated at 0.5 percent tungsten trioxide); the southern cross-sectional area is 500 square feet.

On the basis of a surface area of 9000 square feet and of the two drilled sections, together with known values, no more than an estimate of tonnage and grade can be made. A reasonably close estimate, based on judgment as well as fact, is that there is 15,000 tons of material that will assay between 1.5 and 2.0 percent tungsten trioxide in the northern section.

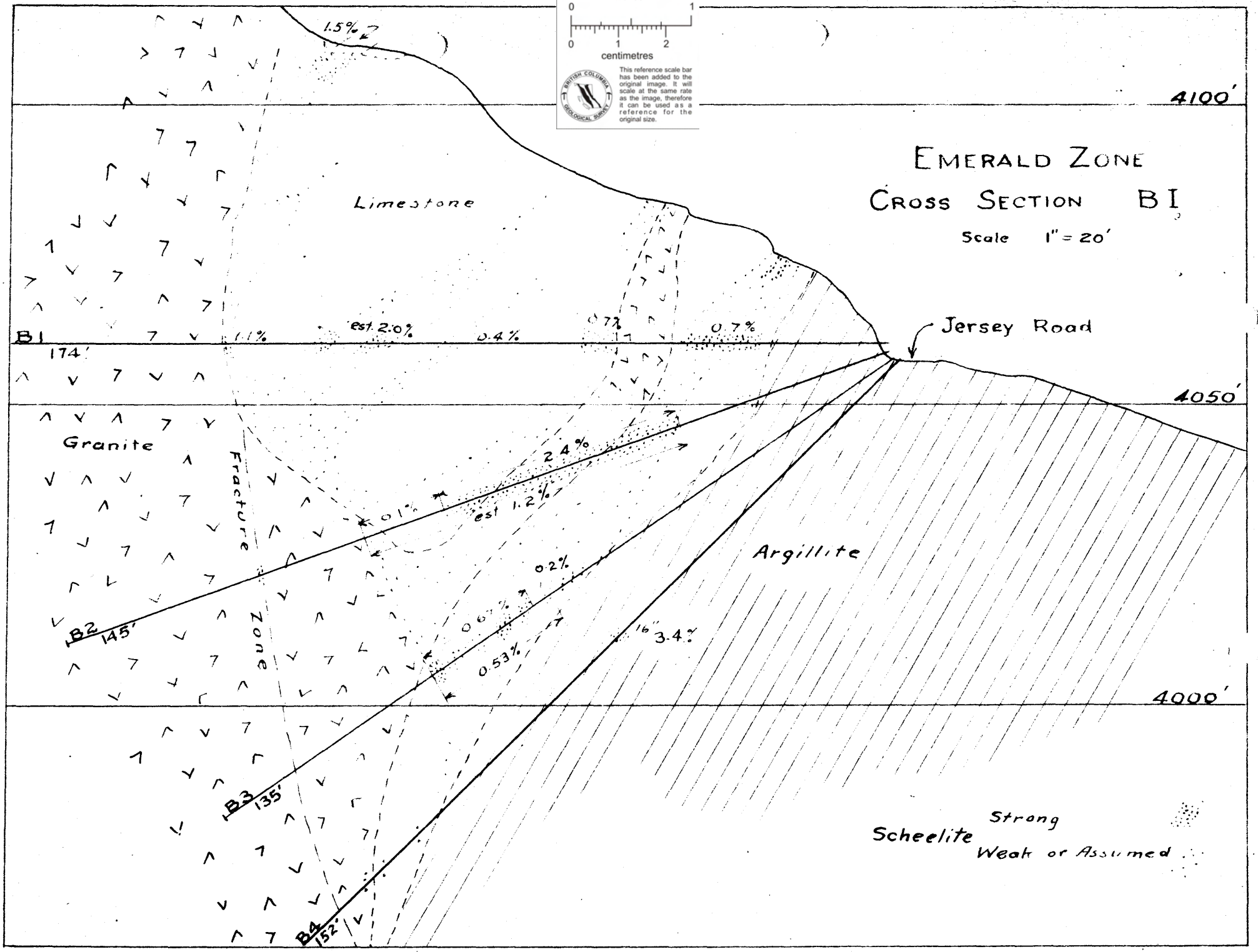
The southern section is more complicated. The detailed map and drilled cross-sections indicate, better than words, the presence of a triangular segment of limestone in contact with granite above argillite. The

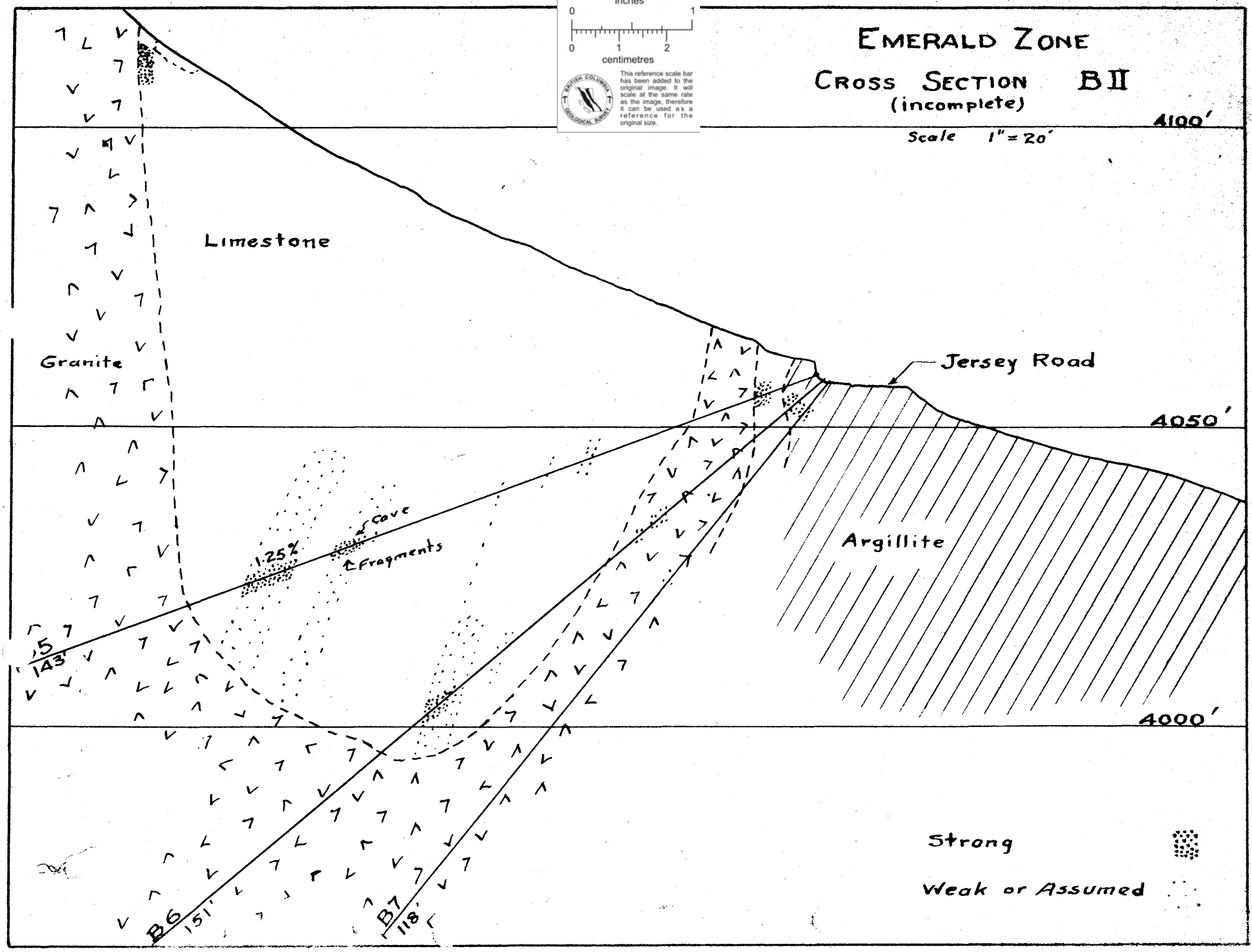
section is complicated by a granite dyke that branches from the main body at an acute angle and crosses the Jersey road. There is an east-west flange of granite, at the old adit, that does not wholly reach the surface of the ground. Several small outcrops of granite in the bed of Lime Creek (see general plan) represent dykes the attitude of only one of which is known. This dyke, about 20 feet wide, trends eastward, and contains strong scheelite mineralization in a cross-cutting zone about 30 feet west of the Jersey road. The southern section is 1375 feet long, from the gulley-fault to the above mentioned dyke. The maximum width across which bands of scheelite are known to occur is 140 feet. Mineralization follows the granite contact but is not restricted to it; rather, it occurs as bedded replacements in the limestone. The accompanying cross-sections show the general pattern of the replacement bodies; they are not exact, and a certain amount of supposition is necessary, as in the case of any mineralization of contact metamorphic type in limestone.

Mineralization has come from or through the granite, which is strongly silicified and bleached at and near the contact. Scheelite occurs in the granite only locally, however, to a distance of no more than a few feet from the contact, which in itself is in many instances not very clearly defined. Limestone, which appears to have been relativaly pure, has been replaced locally by silica and disseminated sulphide, and more characteristically by actinolite, biotite, pyrrhotite, pyrite, chalcopyrite, a little rhodonite (?) and traces of molybdenite. Diamond-drill cores show scheelite ranging in amounts represented by 0.1 to 9.5 percent tungsten trioxide within sections of material which are identical to the naked eye.

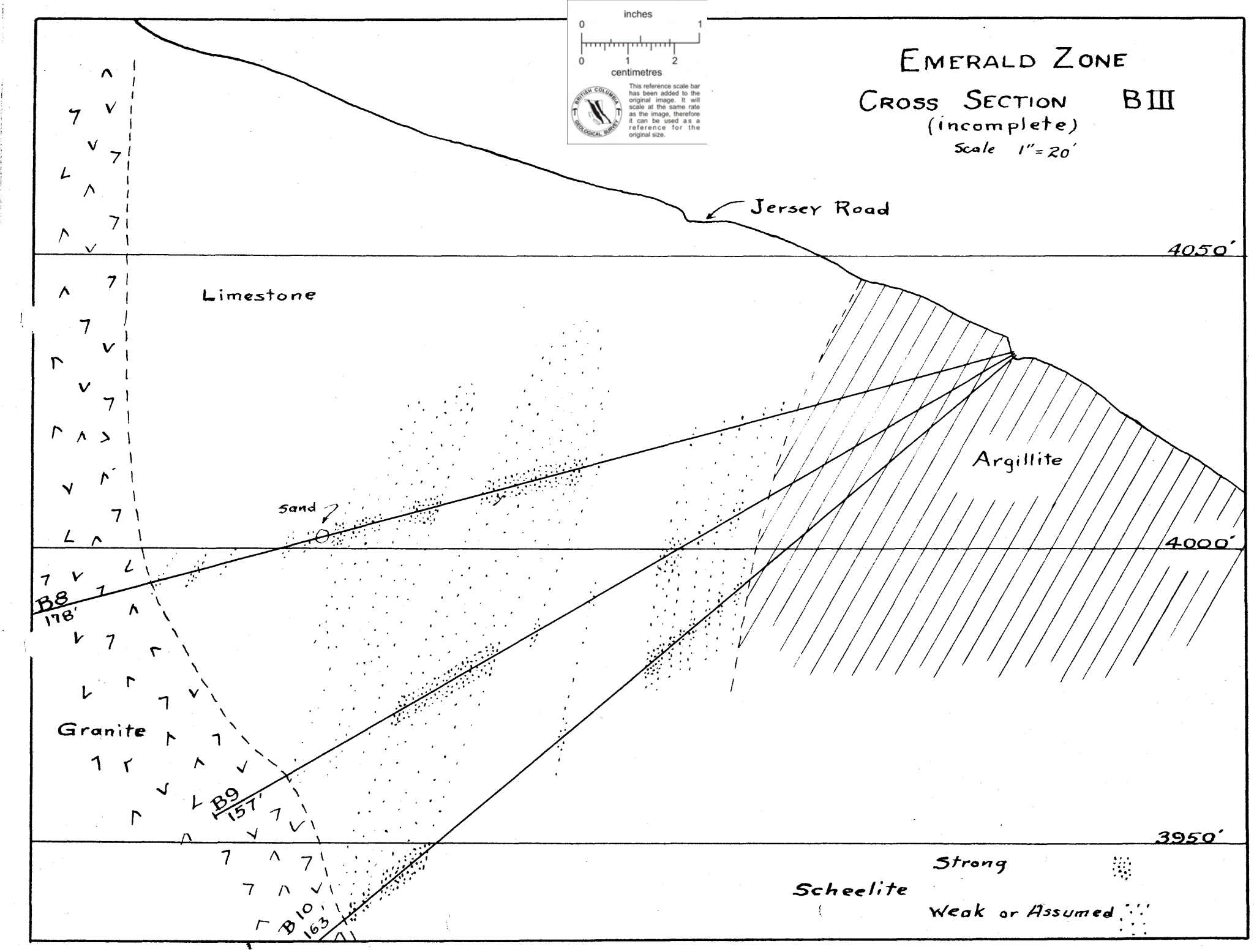
Stripping on the surface has been restricted to the vicinity of the old adit, where there is an irregularity in the granite contact produced by an east-west flange of granite that does not completely reach surface. Mineralization as stripped is related to the contact and to the bedding of the limestone, which is locally flat and contorted. One band of 1.0 percent tungsten trioxide is 5 feet wide by 20 feet long, as stripped, and another of about 2.0 percent tungsten trioxide is 10 feet wide by 40 feet long. The southernmost trench, above the adit, exposes 3.5 feet of quartz, assay 0.7 percent tungsten trioxide. Between this stripping and the gulley there is as much as 20 feet of boulder clay; this was stripped in part by bulldozer but no bedrock was reached when the bulldozer broke down. Positive indications of ore beneath this uncompleted stripping consist of well-mineralized boulders, and of one open-cut near Station 419. Mineralization in the southernmost open-cut (an old open-cut, partly obscured, within the granite dyke) is very strong over a width of perhaps 3 or 4 feet, and will be investigated further at an early date. At the present ore has been proved to a maximum depth of 140 feet below surface, or 120 feet below the level of the Jersey road. Tonnage calculations in the southern section of the Emerald zone cannot yet be made accurately. The cross-sections established by drilling must of necessity be idealized unless an undue number of holes are drilled. The cross-sections have purposely been widely spaced in order that the general pattern can be determined and also to indicate depth so that a lower tunnel-site can be selected as soon as possible. Further local stripping will be done to complete the cross-sections to the surface.

Cross-section B1 has an indicated area across minable widths of 2000 square feet, with an average content of 1.0 percent tungsten


EMERALD ZONE
CROSS SECTION B I
Scale 1" = 20'
4100'
4050'
4000'
Limestone
Granite
Argillite
Jersey Road
Fracture
Zone
B1
174'
B2
145'
B3
135'
B4
152'
1.5%
.11%
est 2.0%
0.4%
.7%
0.7%
2.4%
.01%
est 1.2%
0.2%
0.67%
0.53%
16"
3.4%
Strong
Scheelite
Weak or Assumed



inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.



inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

trioxide. Cross-section B11 has an indicated area of 670 square feet of about the same grade (an additional vertical hole from another setup will be needed to complete this section). Cross-section B111 is incomplete, but at the time of writing has an area of 1800 square feet across minable widths with an average content of about 1.5 percent tungsten trioxide. A cross-section started at C1, with another machine, is calculated to prove or disprove downward continuation of the ore in the adit; a band of mineralization has been encountered near the collar of the hole, but no tonnage can yet be assigned to it. This fourth cross-sectional area is not expected to be large.

It is impossible, on the basis of the above figures, to make more than a guess at the probable tonnage or grade. Individual assays to date would indicate the grade to be in the neighborhood of 1.0 to 1.5 percent tungsten trioxide. These are obviously scattered and fragmentary, but it is my belief that additional sampling will be in line with these figures. Tonnage can safely be placed at a minimum of 50,000 tons, which only requires an average cross-sectional area of about 400 square feet for the entire length of 1400 feet.

Dodger Zone.

An old adit on the Dodger claim is in strong sulphide mineralization in a bay in the northern body of granite. It passes diagonally across a bedded zone of strongly altered limestone, heavily impregnated with pyrrhotite and pyrite, similar in most respects to much of the mineralized southern section of the Emerald zone.

The interbedded limestones and argillites in t is section dip away from the granite contact at about 50 degrees for a length along the contact of about 1000 feet to the southern termination of the granite. There are no outcrops along this distance. Two trenches were dug 40 and 90 feet distant from the adit (see sketch, Fig. 5), and these furnish the only additional information concerning the occurrence in the adit.

The mineralized zone in the adit is 17 feet thick and dips about 50 degrees eastward. A composite sample, taken along one wall of the adit, averaged 1.7 percent tungsten trioxide. The first trench, 40 feet to the south, exposes a similar width of strongly altered limestone containing little sulphide and assaying about 0.2 percent tungsten trioxide; this, if the same zone as in the adit, is apparently offset by a fault. The second trench, 50 feet farther to the south, discloses two 3-foot bands and a nearby narrow band, and 20 feet to the east a band 17 feet in horizontal width, not completely exposed. The 3-foot bands assayed 0.7 and 1.85 percent tungsten trioxide, and the 17-foot band assayed 0.3 percent tungsten trioxide.

Continuity of and correlation between these showings is a matter for speculation until more work is done. The very strong showing in the adit is not apparently continuous; patches of strong mineralization do occur in the trenches but were not included in the samples, which were taken without study by the ultra-violet lamp. Possibly bulk sampling would have to be resorted to to obtain the true average. A good deal of surface work will have to be done in this section, where some faulting is known. No tonnage is developed yet.

Future Possibilities.

There is scope for several months of exploration on the property. It will be some time before the occurrence of scheelite is relatively well understood, and there are many possibilities which will have to be investigated.

(1) The skarn bands will have to be sampled, first across all exposed sections, and later stripped and further sampled if the first results warrant. Drilling to establish persistance at depth will have to be done to establish continuity of values at the surface, and some drilling should be done even if surface values are not economic. In the area between the two major granite bodies there are some dykes of granite, and it is quite possible that the mineralization of the skarn bands might improve considerably in some sections at depth, where it is presumed they are underlain by granite.

It will be impossible to complete more than the preliminary part of this work this year.

(2) The Emerald zone should be delimited by at least widely spaced diamond-drilling. When underground work is under way it will probably be more feasible to drill shorter holes with an underground machine. Testing of this zone must be extended to the south, and may be productive at least as far as the southern extremity of the granite body, where there are indications of scheelite.

Some deep drilling must be done on the actual contact, and adjacent to it, in the argillites. There are no outcrops between the

Jersey road and Lime Creek, and while the float is dominantly argillite it is believed there may be bands of calcareous material that would be favorable for scheelite mineralization. There might also be deeper bodies in the granite comparable in type to that of the northern section.

Some investigation might be made of the eastern granite contact, which is obscured. The northern margin of the same body is in a flatter, drift-covered area, where it is probable there are favorable sedimentary rocks. Some heavy stripping by bulldozer might then be attempted, although the chances of discovering ore are not known.

(3) The favorable zone on the Dodger claim, about 1000 feet long and 100 feet or more wide, should be stripped. Overburden is not excessively heavy. After stripping, diamond-drilling could be done, and also underground development from a site on the granite contact, about 50 feet below the present adit.

In the vicinity of the southern end of this granite body there are three zones 3 to 7 feet wide that contain sulphides and locally are mineralized with scheelite. These should be investigated as sources of low-grade ore at least, and it should be determined whether they contain ore of better grade at the granite contact.

(4) There is a third granite body on the Jersey claim, which extends southward, down the Lost Creek slope. Indications of scheelite are known in this section, and some prospecting should be done there next season.

The season is now so far advanced that only part of this exploratory program can be completed this year.

PROGRESS OF WORK.

The surface workings on the Emerald zone (Fig. 4) were all put in by the Iron Mountain Limited. No further stripping by hand on the Emerald zone has seemed advisable. A start was made by the former company to strip the northern part of the southern section by bulldozer, but the bulldozer broke down before any valuable work was accomplished. Diamond-drilling was done on the northern section by a local contractor and stopped about August 10th. A Boyles Brothers drilling outfit was brought in at about the same time and had drilled 815 feet by August 17th when Wartime Metals Corporation took over. A "dry" building was completed by the 17th but was not fitted. The crew up to that time consisted of 5 men and a foreman in addition to the diamond-drill crew.

Since taking over on August 17th the crew has been increased, work has been speeded up, and facilities are being increased and improved. A contract was at once let for a building to serve temporarily as a bunkhouse to house 24 men (this is now nearing completion). The "dry" was fitted with the necessary heating and plumbing, and is now in use. Water had been obtained for diamond-drilling from the old Emerald lead-zinc mine, but was insufficient for mine use as well. To increase the supply a dam has been installed near the portal to provide a storage of about 30,000 gallons. Pipe and rail were reclaimed from the workings before the adit was sealed off. A permanent line to supply water for mining purposes is being installed, and an emergency line for camp will be provided.

A second diamond-drilling outfit was obtained from Boyles Brothers on August 25th. This is at present operating on two shifts only, owing to scarcity of drillers. Drilling is proceeding at the rate of five machine-shifts per day.

The crew has been increased from five to fourteen men, the present capacity of the camp in addition to four drill runners and four helpers and three carpenter-contractors. The necessary engineering and office work is being done by my own and Mr. Sargent's assistants from the Provincial Department of Mines. Mr. Sargent is acting in an advisory capacity.

Work has been concentrated on getting the camp expanded and livable, since the summer has already broken. In addition to installing an adequate water supply for purposes of exploration and mining, timber and brush from a section 50 to 80 feet wide and 800 feet long on the Emerald zone has been cut and stacked for burning preparatory to stripping. All usable timber is being stacked for later use.

The mine road to the highway is being relocated in part and is being generally repaired by the Public Works Department.

Arrangements have been made for the renting of a bull-dozer to do much necessary stripping. A D7 machine will arrive next week. It will then be possible to outline both the Emerald and Dodger ore-zones at the surface with a reasonable degree of accuracy.

The present camp water supply system must be overhauled. Water is brought from a small creek by about $\frac{3}{4}$ miles of wooden pipe line that needs to be mended locally and put in shape generally before frosts set in. This will necessitate connecting the camp to the mine reservoir for a period of probably a week.

A small portable compressor has been rented so that sampling of the skarn bands can start. This should get under way in about a week. Bulk samples will be crushed and cut with a portable outfit.

Water for mining will be available in a week. Mining equipment and a compressor have just been obtained. Since permanent power will be electric, derived from the West Kootenay transmission line about 3 miles distant, a portable unit of 2-drill capacity has been rented with option to buy, and such a unit will be of service for a long time. Mining will get under way in a few days.

Planned exploration includes the following. Continued diamond-drilling with two machines on a 3-shift basis. Stripping for information, to be followed before snow flies by a complete stripping of the northern section of the Emerald zone. This will be necessary before this ore-body can be mined. A drift will be driven north from the old adit, to develop ore, obtain information, and procure large samples for mill tests. A similar sample will be obtained from the northern section.

Underground exploration and development of the southern part of the Emerald zone should be started soon. This will be done by driving one or more adit crosscuts from the steep hillside above Lime Creek, from which the mineralization will be explored by drifting. Diamond-drilling has already proved depth to 120 feet beneath the Jersey road on section B111, and a little more drilling will determine the best situation for an adit. Room for a permanent power plant, shop and dry will have to be provided at a convenient distance from such an adit portal, from which most of the southern section may be mined.

PROGRAM FOR PRODUCTION.

Tonnage estimates already given warrant the immediate erection of a mill. If the decision is made now production could start in January. There is an operating life of two years assured for a milling plant of 100 tons daily capacity. This should be considered as a first unit, as an increase in capacity may be warranted next spring, or possibly during the late winter, when additional ore may be developed on both Emerald and Dodger ore-zones as well as possible low-grade ore from the skarn bands.

It is expected that in early spring of next year it will be possible to estimate quite closely the tonnage possibilities on the Emerald property. It is impossible to do so this year, although a fairly close estimate of tonnage in the Emerald zone may be made.

The season is well advanced and already the summer is over. Weather conditions will not be bad until October 1st, and permanent snow is to be expected by October 15th. Outside construction is not impossible at the mine perhaps until December 1st, but efficiency is greatly impaired, and foundation work may be impossible after mid-October. Consequently, plans should be decided upon at once in order that the necessary buildings and installations will be well under way before winter sets in.

Mine Camp.

The present camp consists of seven very old log and frame shacks. In addition there have been built a dry and a bunkhouse to accommodate 24 men. Capacity of this camp is about 35 men under present conditions but

it cannot be transformed into a permanent camp. If the present site were used all the old buildings would have to be torn down.

A better site is available nearby, on the Jersey road. A new, permanent camp should be built there and the present camp can be turned over and modified at slight cost to accommodate 8 or 10 married men.

The permanent camp would consist of bunkhouse, mess house, office, dry and store houses. The office would accommodate the staff. A central steam heating plant is considered to be the most efficient. A capacity of 60 men is sufficient in view of the accommodation at the old (present) campsite.

The cost of this camp, including heating plant and water supply, is estimated to be $25,000.

Power.

A portable engine and compressor unit has been obtained for preliminary exploration and development. This outfit will be of great service for a considerable time, and may be even used indefinitely.

Permanent power will be electric, obtainable from the 60,000 volt transmission line on Sheep Creek of the West Kootenay Power and Light Company Limited. Cost of construction of a branch line will vary according to the route chosen and type of construction, but will be between $5000 and $10,000. Details of construction will be decided by the Power Company, as is customary in this district. There is a transformer station at the mouth of Sheep Creek.

Early requirements would be about 200 horsepower at the mine, but provision should be made for a substantial increase, to 500 horsepower or more.

There is available now an air compressor direct connected to a 175 HP motor, which could be bought advantageously. This would supply enough air for a vigorous campaign of development of the Emerald zone and also for mining from the northern ore-body.

Milling and Millsite.

Preliminary testing on various batches of ore from the Emerald zone has been done under B. C. War Metals Research Board, at the University of British Columbia in the past few months. A report is believed to be in course of preparation. This work has found and solved many of the milling problems. Recoveries of better than 80 percent are indicated. A combination of gravity and flotation milling will be required in order to obtain satisfactory recovery. A considerable part of the tungsten trioxide will be recovered as high grade concentrate. Part of the recovery will probably be as concentrate of lower grade, suitable for treatment in a chemical plant.

The ore position, and the mill testing already done, warrant immediate planning for production, say, by the end of January. Decisions concerning part of the flow sheet and some of the equipment could await the results of larger scale mill tests. Ore in quantity for larger scale test will be mined within a short time.

After considering transportation, water supply, topography and available power, a site on the east side of Salmo River Valley just south of Sheep Creek (Fig. 2) is recommended for the mill. This is just east of the Nelson-Nelway highway, approximately 4 miles by road from Salmo, and within ¼ mile of the 60,000 volt transmission line of the West Kootenay Power and Light Company

Limited. The slope rising from the flat valley bottom is suitable for mill construction and there is ample room for expansion. Water for milling can be obtained from Salmo River upstream from the mouth of Sheep Creek, thus avoiding the mill tailings carried by Sheep Creek. The wide flats along the river afford pondage for tailings. The highway skirts the bottom of the slope, and is paved for most of the 4 miles to the Great Northern Railway Siding at Salmo.

Expense for mill power line, tailings disposal and transportation between mill and railway will thus be at a minimum. Further advantages are that mill employees can readily live in Salmo, so no mill camp will be required, and the central site on the main highway will make it possible to haul ore from other properties to this site for customs milling, if conditions warrant.

Transportation from Mine to Mill.

The higher grade mineralization now indicated, from which early production would come, is found over a length of 1800 feet in the Emerald zone, and at the Dodger about ¾ mile northeasterly from the northern end of the Emerald zone. Such ore can be explored and mined through several shallow workings. The most economical manner of handling will be to truck the ore from the point of origin to the mill bins. Later if deep development restricts the number of mine openings an aerial tramway can be built from the proper point at the mine to the mill; at that time the most suitable position for the upper terminal would be determined more readily.

The branch road is now being improved by the Public Works Department. Maximum grade will be about 15 percent, and grade is in favor of loads from the mine to the mill. Further improvement, principally moderate widening and additional surfacing, would make the road suitable for hauling heavy loads. During winter, snow would have to be ploughed from the road, but with proper equipment no serious interruption of traffic need be feared. Ample mill bin capacity would guard against shut downs because of temporary blocking of the road. During the spring breakup traffic might have to be interrupted for a short period, but this would not remove the advantage of production during the proceeding months.

Tram construction presents no serious obstacles, but it is difficult to decide now upon a suitable site for the upper terminal. It may not be known before snow flies where to put the terminal to best advantage for the Emerald zone alone, and the Dodger zone may produce an important tonnage. If the skarn bands are brought into production at a later date the tramline construction should be designed for handling a larger tonnage from this source. Consequently, it seems wise to consider truck haulage for the present winter.

M. S. Hadley
Sept 4th. 1942