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THE WILBERFORCE RADIUM OCCURRENCE

(Fission M-Ltd)

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This report deals with an occurrence of radium ore near Wilberforce, Haliburton county, Ontario, upon which development work has recently been undertaken and which seems more likely to prove of commercial grade than any other deposit of radioactive minerals hitherto found in Canada. This occurrence is sometimes called the Richardson property, after Mr. W. M. Richardson, the discoverer.

Occurrences of radioactive minerals are not uncommon in eastern Canada, and a number are recorded in the literature. The earliest of such references is probably that in Geology of Canada, 1863, where is mentioned an occurrence of uraninite at Mamainse, on the east shore of Lake Superior. The mineral was first described by J. L. LeConte, in 1847, under the name of coracite, and was said to occur in a two-inch vein at the contact of trap and syenite. Search for this locality in recent years has proved unsuccessful. (

Obalski, in 1894, mentions ¹the occurrence of uraninite at a mica mine near Murray Bay, Quebec. In 1903, Obalski records ² tests made on this uraninite by Rutherford and the Curies, and the determination in it of the then newly-discovered element radium. In 1901, he mentions ³ the occurrence of uraninite at the Villeneuve mica mine, on the Lièvre river; and of samarskite at the Maisonneuve mica mine, in Berthier county.

Most of the earlier discoveries of radioactive and rare earth minerals in Canada were thus made in pegmatite dykes in Quebec province, where they were found during mica mining operations.

Later, other discoveries of these minerals were made in similar association in pegmatites worked for either mica or feldspar, both in Quebec and Ontario, and now the list of localities where radioactive minerals are known is a fairly large one. All of such occurrences however, are in normal granite pegmatites, the minerals being found usually disseminated irregularly and in small amount through the dyke mass or in small pocket zones in the dykes⁴.

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1. Report of Commissioner of Crown Lands, Province of Quebec. 1894 p.99
 2. Annual Report of Mining Operations in the Prov. of Quebec, 1903 pp65-68
 3. Mica in the Prov. of Quebec, Dept. Colonization and Mines Que. 1901, pp18-21
 4. For further information on the occurrence in Canada of radioactive minerals, see Geol. Surv. Canada, Sum.Rept. 1921, pt.D. pp. 51-70: Sum.Rept. 1923, pt. Cl. pp.6-20.

Up to the present the only occurrence of a radioactive mineral that it seemed possible might have commercial possibilities has been that of euxenite, which was found in some quantity in a feldspar quarry in South Sherbrooke township, Lanark county, Ontario in 1917. A small shipment of ore from this deposit was sent to the Mines Branch in 1919 for concentration tests and from it a few hundred pounds of concentrates were made; however, no attempt at commercial production was made by the owners. Euxenite is not particularly rich in uranium (7 to 9 per cent U_3O_8) and accordingly there is comparatively little market interest in it as a source of radium.

It should be noted that radioactive and rare earth minerals are not by any means peculiar to Canadian pegmatites. It is with this type of rock that such minerals are usually found associated the world over, and in some countries, notably in Norway and Sweden, as well as in India, Madagascar, and Tanganyika, pegmatites occur that are probably far richer in radioactive minerals than any found in this country prior to the Wilberforce discovery. However, except in Madagascar, no serious attempt at mining such pegmatites for their radium-bearing minerals has ever been made, though small amounts have been recovered during mica and feldspar mining operations. It is believed, however, that most of such material has found its way as specimens into mineralogical collections and not to have been used as a commercial source of radium. It does not appear likely, basing the belief on what appears to be the general world occurrence of pegmatitic radioactive minerals, that the ordinary run of pegmatites in Canada can be seriously regarded as a potential commercial source of radium ore.

The Richardson deposit, while associated with pegmatite, differs in several important respects from other recorded occurrences of such minerals, either in Canada or (as far as the writer is aware) in other countries (see page 11), and the amount of uraninite thus far obtained from small surface workings greatly exceeds that yielded by all Canadian mica and feldspar mines. The total quantity of uraninite, amounting to several hundred pounds, thus far taken from the property, and all obtained practically from the surface may be regarded as a promising indication that the occurrence will prove rich enough to work and, accordingly, it has seemed of interest to describe the main features of the deposit and the results of development to date.

The data presented are based on visits by the senior author to the property in August and November 1929, supplemented by information supplied by the operating company, The Ontario Radium Corporation, 539 Confederation Life Building, Toronto, and on the results of tests conducted by the Ore Dressing Division of the Mines Branch, at Ottawa, on a carload shipment of ore, R. K. Carnochan had charge of these tests, and the radioactive determinations on the concentrate samples were conducted by H. V. Ellsworth, of the Division of Mineralogy, Geological Survey. The chemical analyses of the concentrates

were made by R. A. Rogers, of the Ore Dressing Division, Mines Branch.

LOCATION AND TOPOGRAPHY

The deposit is situated on lots 4 and 5 in concession XXI of the township of Cardiff, Haliburton county, about 1½ miles east of the village of Wilberforce, on the Irondale, Bancroft and Ottawa branch of the Canadian National Railway. It lies one-half mile south of the Wilberforce-Bancroft road and of the railroad, on the north edge of the ridge bordering the valley through which the railroad runs. It can be reached by automobile from either the east or west, the distance by road from Toronto being about 150 miles and from Bancroft, 20 miles.

The Ontario Radium Corporation owns a total of 456 acres, comprising the above-mentioned lots and also lots, 4, 5, and 6 in concession XXII, immediately to the north.

Topographically, the region is one of medium relief. The altitude at the railroad, north of the deposits, is 1,200 feet, from which point southward the ground rises gently in a series of benches to an elevation of 1,500 feet at the main pit.

The overburden at the point of discovery is generally light, consisting of seldom over 20 inches of sandy or gravelly soil, and rock outcrops are abundant. The part of the property comprising the main discovery site has been burnt over and supports only a light growth of small timber.

A small lake occupies a depression on the second bench below the pits, being fed by springs issuing from the ridge. Several such springs have been located and are regarded by the company as assets of importance, since their water has been tested and found to be strongly radioactive, as is also the water of the lake.

HISTORY

The first discovery of radium ore in the Wilberforce district was made in 1922 by Mr. W. M. Richardson, a prospector and miner with Alaska and Yukon experience, who had come to Wilberforce in connection with the finds of molybdenite that had been made near that place and had taken up residence about one-half mile northwest of the site of the present operations. In the course of prospecting the district, Mr. Richardson found a heavy, black mineral in surface outcrops of pegmatite at different points on the property, and having obtained a sample of Joachimstal pitchblende, identified this mineral as uraninite. He, therefore took up the mining rights on lots 4 and 5 in concession XXI, and on lot 4 in concession XXII, and proceeded to open up a number of small prospect pits and trenches.

A sample of the uraninite sent by Mr. Richardson to Ledoux and Company, of New York, for assay was reported by them to contain 58.35 per cent of uranium oxide (U_3O_8), equivalent to a radium content of 147 milligrams of radium per ton.

Late in 1922, Dr. W. G. Miller visited the property and described it briefly in the Canadian Mining Journal of January 11, 1924.

In 1923, Mr. Charles Baycroft was engaged by a Toronto syndicate to make an examination and report on the deposit. Mr. Baycroft opened a 30-foot trench on one of the westerly outcrops, and from this sent a 200-pound sample to Dr. T. L. Walker, in Toronto. Concentration tests were run on this sample, and Dr. Walker furnished the following report:

In making a preliminary test on the ore, I found that the material coarser than 10 mesh did not lend itself to concentration. The finer material from 10 mesh down to fine sands, gave a fairly clean separation on the Wilfley table and apparently will give little trouble in concentration.

Values from electroscopic measurements on the head sample and concentrates were as follows:

	Milligrams of radium per short ton
Original heads.....	2.88
Concentrates-Through 10 mesh on 40 mesh	7.82
Through 40 mesh.....	5.70
Slimes.....	9.24

The above syndicate did not proceed with development, and except for further minor prospecting by Mr. Richardson, there was no other development until the present owners acquired the property in 1927.

In 1926 Dr. G. E. Richards, Director of the Department of Radiology, Toronto General Hospital, had visited the property and secured samples of the ore and spring waters. With respect to the latter, Dr. Richards reported that three samples of water taken at various points all showed distinct radioactivity.

In 1927, Mr. M. D. Kennedy made a report on the property to the present company, who in 1929 commenced their first development work. Up to this time, attention had mainly been focused on several outcrops of pegmatite that represented the points of original discovery of uraninite. Two of these outcrops

lie fairly close together on lot 5, concession XXI, while a third, upon which most work had been done, lies about 2,000 feet to the west of the above, on lot 4. Prospecting of the ground between these two points early in 1929 led to the discovery of a well-defined break or vein, quite distinct from anything found hitherto. It is upon this lead that attention has since been centred and upon which work is proceeding at the present time. All of the three shipments of ore made to the Mines Branch in 1929, and upon which tests were run, came from this vein.

In addition to shipping ore to the Mines Branch for test, the company has recently forwarded a large sample of picked uraninite to the Imperial Institute, in London. As a result, they have enlisted the interest and services of that body, and also of the British and General Radium Corporation, in the matter of further development and of marketing of products, or of the eventual extraction of radium from the ore. In the last connexion, the company are highly desirous that Canada should receive the fullest benefit from the possession of a domestic supply of this precious element. In the event, therefore, of their deposit proving commercial, they wish, if this be possible, to have the extraction done in this country, and the recovered radium made available for Canadian hospitals, etc.

GENERAL GEOLOGY OF AREA

The only detailed geological report on the Wilberforce district is that of Adams and Barlow, published in 1908.¹ No special mention is made in this report of the area immediately around the deposit under consideration, and at that time the only local occurrences of economic minerals known were a few small deposits of mica and phosphate.

The map (Figure 3) accompanying the report shows the site of the uraninite discoveries to consist of a narrow east-west band of sedimentary gneiss, much invaded by granite (pegmatite) dykes. A parallel belt of white crystalline limestone occupies the whole of the valley below the deposit to the north, the gneiss-limestone contact crossing the north half of lots 4 and 5. This contact probably is more or less parallel to the pegmatite with which the ore is associated and not far north of it. An area of several square miles immediately to the south and west of the gneiss band is left blank as to geology. Surrounding this area, lies a complex assemblage of bands and islands of crystalline limestone, amphibolite, gneiss, nepheline syenite, and granite, the latter in part massive and in part gneissic. A large batholith of granite is shown south of the deposit, its northern rim being about five miles distant. This

batholith connects by a narrow neck with a second mass of more gneissic granite lying to the northeast. From this, a tongue is shown extending westward to within about a mile of the property. The many areas of pegmatite shown invading the rocks adjacent to these granite masses are possibly genetically related to them, though this is only theory. The pegmatite with which the uraninite is associated contains little or no free quartz, and the same holds good for a number of other pegmatites examined by the writer in Cardiff and adjacent townships. In some instances these pegmatites cut, or are in close proximity to, areas of nepheline syenite, and for this reason, as well as on account of certain conspicuous peculiarities in mineral composition, the writer is inclined to view them as pegmatitic phases of syenite rather than of granite.

GEOLOGY OF DEPOSIT

With respect to the geology of the uraninite deposit itself, the following notes are based on an examination made by the writer in September, 1929, supplemented by information supplied in part by the owners and in part taken from Mr. Baycroft's report in 1924.

West Pit. Mr. Baycroft's report deals with that of the property where the first discovery of uraninite was made in 1922 and upon which most of the development work was done prior to 1929. At this point is situated the most westerly opening on the deposit, a narrow open-cut about 6 to 8 feet deep and 50 feet long, entirely in pegmatite. The cut is at right-angles to the strike of the pegmatite, which has an approximately east and west direction. The opening does not disclose either of the walls of the dyke, which, according to Mr. Baycroft's report, is about 350 feet wide.

The character of the pegmatite is generally uniform for the whole length of the cut. The rock consists essentially of a coarse-grained, buff-coloured feldspar, probably orthoclase, though no samples were taken for analysis. There are numerous irregular, miarolitic cavities, some of them of considerable size, their walls being lined with well-developed feldspar crystals. Free quartz is conspicuously absent from the rock. Here and there through the dyke mass occur masses and large crystals of magnetite, the most abundant metallic mineral. Small amounts of molybdenite and chalcopyrite also occur, as well as biotite mica and zircon. Only at one place in the east wall of the cut, is any uraninite now visible. At this point, there is a small mass of uraninite enclosed in feldspar, the latter carrying yellow and orange incrustations of uranium salts. According to the owners, however, considerable

disseminated uraninite was encountered when the cut was made. This would appear to be borne out by the tests made by Dr. Walker on the 200-pound sample from the opening sent to him by Mr. Baycroft. This sample is stated to be representative of 30 feet of the cut and to have yielded over one per cent of U_3O_8 .

East Pits. Several small pits have also been opened on outcrops of what is presumably the same pegmatite at a point about 2,000 feet east of the above opening. The rock here is essentially similar to that in the west cut, being a medium- to coarse grained syenite pegmatite; in one of the pits it contains considerable fluorite. Of interest is the occurrence in one of the exposures of a narrow stringer of fine-grained syenite porphyry cutting the pegmatite.

Small inclusions of uraninite are said to have been found in these easterly openings, but none were seen by the writer.

Middle Pit. This opening situated between the west and east pits represents the latest work done, and has been made on a discovery made in 1929. It lies 1,600 feet east of the west pit and 400 feet west of the easterly openings. Stripping operations were started here in the spring of 1929 on a small outcrop and have disclosed a well-defined lead that has been uncovered for a length of 150 feet. This lead is in pegmatite and parallels the strike of the dyke. Its full length has not yet been determined, but it outcrops again at a point 300 feet east of the stripping and is exposed there for a width of 12 feet. It can also be traced for a short distance west of the stripping, but appears to be pinching out in this direction. It is probably safe to assume a total length of at least 500 feet. The width is greatest at the east outcrop, where it measures 12 feet. At the stripping the greatest width is 8 feet and the average about 5 feet, though there are several narrow horses of pegmatite in the east end. The above measurements relate to the width between the outermost exposed walls. The gneiss country rock is only visible on the hanging-wall, the foot-wall being pegmatite. Insufficient stripping has been done on the foot-wall side to show whether any parallel leads exist, but this will be determined by the tunnel now being driven to tap the lead from a point 50 feet down the slope below the outcrop.

The dip of the lead at the surface is about 45 degrees south, or into the hill, steepening to 70 degrees at the bottom of a 20-foot pit sunk near the west end of the stripping.

The lead occurs in pegmatite at its contact with the enclosing gneiss and seems to have the character of a long-

itudinal, miarolitic cavity of unusual form and extent. Only a skin of pegmatite a few inches thick occurs on the gneiss hanging-wall (see Plate I A) and from its project numerous well-formed feldspar crystals up to 6 inches in length. The foot-wall of the lead, as far as is visible, is also pegmatite, but there has been insufficient stripping to give any idea of the total width of the dyke here.

The westerly 75 feet of stripping shows a single lead, 5 to 8 feet wide, (Plate I B) but for the remaining 75 feet the vein is split into four or five tongues of irregular width but ranging from 1 to 4 feet. These tongues are separated by narrow, 1- to 2-foot horses of gneiss and pegmatite, the walls of which are also lined with feldspar crystals (Plate II A). This part of the lead, therefore, represents a series of long, parallel miarolitic pockets or cavities, which toward the west run together into a single wider one. At the outcrop 300 feet east of the stripping, where there is 12 feet of lead exposed, there are no horses visible, the lead being uniform from wall to wall.

In its general character, the Richardson pegmatite resembles other pegmatitic bodies found in Cardiff and adjacent townships. As a type, these are quite distinct from the ordinary run of granite pegmatites so common in Eastern Canada and are apparently peculiar to the Wilberforce district. The writer is inclined to view them as syenite, rather than granite, pegmatites, and to regard them as genetically related either to the nepheline syenite of the region or to the large batholithic masses that occur in Cardiff and Monmouth townships. These latter, it is true, are shown on Adams' and Barlow's map as granite, but in their report the writers note that the rock is never rich in quartz and often grades over into syenite.

A notable occurrence of another such pegmatite is found about one mile east of the Richardson property, where there is a large development of purple fluorite, mixed with calcite, apatite, hornblende, etc.; this deposit was worked at one time for fluorite. On the southwest end of the Richardson property, also, several small prospect pits were opened some years ago on fluorite outcrops. Another occurrence lies about 10 miles to the southeast, in Faraday township, where cavities in pegmatite contain calcite and enormous crystals of black mica, as well as large apatite crystals and fluorite. The writer has examined several other such deposits in the region, all generally similar in type. Some of them carry small traces of radioactive minerals, but none are in any way comparable in this respect to the Richardson deposit.

In their general character, these pegmatites possess a marked similarity with the mica- and phosphate-bearing pyroxenites of the Ottawa district. These pyroxenites, which may be considered as basic counterparts of the Wilberforce syenite pegmatite, often contain large, irregular cavities lined with well-formed pyroxene crystals and carry a filling of calcite, in which are scattered large apatite and mica crystals; they do not yield radioactive minerals.

For the purpose of comparison, the principal characteristics of the two rock types are outlined below :-

BASIC TYPE

Locality.....Ottawa district.
Rock.....Pyroxenite pegmatite.
Character.....Medium- to coarse-grained rock in the form of irregular dykes and consisting mainly of grey to green pyroxene. Titanite and scapolite are common accessory constituents. Often contains large, irregular pockety cavities, lined with pyroxene crystals.
Mineral filling of cavities.....Pink calcite, in which lie free crystals of phlogopite mica and apatite, often of very large size.

ACID TYPE

Locality.....Wilberforce district.
Rock.....Syenite pegmatite.
Character.....Medium- to coarse-grained rock in the form of irregular dykes and consisting mainly of pinkish buff feldspar. Zircon is a common accessory mineral. Often contains large, irregular pockety cavities, lined with feldspar crystals.
Mineral filling of cavities.....White or pinkish calcite and dark purple fluorite, in which lie large crystals of apatite, biotite, mica, hornblende, magnetite, and uraninite.

The close structural similarity exhibited by these two rock types, and the fact that both often carry crystals of apatite and mica in a calcite filling of pockety cavities, provides strong evidence that the pyroxenites are of igneous, intrusive origin, rather than metamorphosed sediments as has often been believed.

The filling of the Richardson lead consists mainly of massive fluorite and calcite. Neither of these minerals was observed in the form of free crystals. Fluorite predominates in the greater part of the lead, but there are local enrichments of calcite, when the two minerals are present in about equal amounts: there is often an approach to banded structure. Scattered through this calcite-fluorite filling occur, in order of abundance, crystals of apatite, hornblende, magnetite, biotite, and uraninite.

At the outcrop, there has been considerable leaching of the calcite by surface waters, resulting in the formation of open cavities within the lead. These cavities contain a certain amount of dark reddish brown, earthy residue, and in this are often found loose crystals or lumps of uraninite.

From a search of the literature, the only recorded occurrence that in any way resembles geologically and mineralogically the Richardson orebody appears to be a deposit at Wölsendorf, in Bavaria. At the latter locality, dark purple, fetid fluorite is found in a lead with autunite, torbernite, and uranophane, all alteration products of pitchblende, traces of which also occur.

MINERALS OF THE DEPOSIT

Apatite. Apatite occurs in considerable amount as free crystals in the calcite-fluorite matrix. The crystals are sometimes of considerable size, ranging up to 30 pounds in weight. Several dozen loose individuals were taken by the writer from a small pocket, the calcite of which had been leached out by surface waters. The prism faces are well developed, but good terminations are rare, the ends of the crystals seeming to have been attacked and being pitted and rounded. There is apparently no development of compact, massive apatite.

The colour is usually brownish green to brown or yellow. Like the apatite of other smaller deposits in the district, and in contrast to that of most pyroxenite deposits, the mineral is clear and glassy and exceedingly brittle. Clear fragments of considerable size and without visible flaws can often be picked from broken crystals.

An interesting feature of the apatite of the Wilberforce district is that where crystals exhibit terminal faces there is always a conspicuous development of the basal plane. This is sometimes so pronounced that the crystals appear to have almost square ends. The basal plane is seldom, if ever, found on the pyroxenitic apatite of the Ottawa region.

Biotite. Biotite mica is stated to occur, sometimes in large plates, in the massive pegmatite of the west pit. It was not observed in noteworthy amount in the main, or middle pit.

Calcite. Calcite is one of the principal constituents of the lead. It is mostly rather fine-grained and has a faint pinkish colour. As in the pitchblende veins of Czechoslovakia, the colour deepens to a brownish red in close proximity to uraninite nodules or crystals, and thus dark-coloured calcite serves as an indicator for uraninite.

Feldspar. Feldspar, of a buff to reddish cast, is the principal constituent of the pegmatite with which the uraninite is associated. It is medium- to coarse-grained and probably is predominantly orthoclase (potash feldspar). There is possibly a certain amount of soda or limesoda feldspar also present, but no information on this point, based on analyses or microscopic examination, is available.

The walls of the miarolitic cavities in the pegmatite are lined with well-formed feldspar crystals which often attain a length of several inches. This mineral always forms part of the pegmatite proper and it is not found as free crystals in the calcite-fluorite filling of cavities, as are the apatite, hornblende, magnetite, etc.

Fluorite. As one of the principal constituents of the filling of cavities in the pegmatite, fluorite is possibly the most interesting gangue mineral present.

When fresh, its colour is always of a dark reddish purple to violet shade, deepening in close proximity to uraninite to almost black. In this respect, it resembles the fluorite of other deposits of radioactive minerals throughout the world, and it may be taken as established that the dark colour is due to radioactive emanations. The colour of all such fluorites fades on exposure to light and the mineral eventually becomes colourless.

When disseminated through calcite, the fluorite is in the form of small shapeless grains. It also forms bands or stringers and is then usually fine-textured to dense and compact. The last type is always found in close association with uraninite, and thus serves as an indicator for that mineral.

A peculiarity of such compact fluorite is that it gives off a strong odour when crushed or freshly-broken. This odour is of practical service to the workmen as an additional indication that they are breaking into a pocket of uraninite. The smell resembles that of ozone and is believed to be due to free fluorine.

The conspicuously dense texture and almost black colour of the fluorite accompanying the uraninite and the reddish colour assumed by the calcite in similar association, would prove a useful aid in preliminary rough-sorting of the ore enabling the rich material to be readily separated in the pit from the lower-grade or barren gangue.

Hornblende. Large, free crystals of hornblende, sometimes over 12 inches across, frequently occur in the calcite-fluorite filling of the main or middle lead.

Magnetite. Magnetite is fairly abundant, occurring as large crystals or irregular masses in miarolitic calcite-fluorite. It was observed in greatest amount in the west and middle pits.

It is frequently intergrown with uraninite, and sometimes also with apatite and hornblende.

Molybdenite. Small traces of molybdenite are stated to have been found in the massive pegmatite of the west pit.

Uraninite. This, as far as known, is the only radioactive mineral occurring in any important amount on the property. Small amounts of its alteration products, in the form of orange and yellow incrustations of uranium salts, as well as traces of torbernite, the copper uranium phosphate, are found in association with it, but these are hardly of commercial significance. Up to the present, none of the radioactive, rare earth minerals, not infrequently found in the ordinary granite pegmatites of eastern Canada, have been reported here.

The uraninite occurs as well-formed crystals and as nodular lumps. The crystals are often of unusual size, frequently measuring one inch or more across. They are of cubic habit, usually more or less modified by the octahedron. The lumps range from small individuals the size of a pea to masses weighing several pounds.

In the massive pegmatite of the west pit, the uraninite is stated to have been found chiefly associated with black mica and often enclosed in mica "books". Unlike its occurrence in the middle pit, it does not seem to occur here in miarolitic cavities.

In the lead of the middle pit, the uraninite crystals and masses occur scattered through the calcite-fluorite filling, apparently without any regular system, but, as noted above, always in close association with dark purple fluorite. The same distribution holds at the outcrop 300 feet east of the middle pit.

As regards the relative abundance of uraninite in the deposit, Mr. Baycroft's report states that a sample taken across 30 feet of pegmatite at the west pit yielded a little over one per cent U_3O_8 , equivalent to 28.56 pounds of uraninite per ton. The carload shipment sent to the Mines Branch, and representative of the ore of the middle lead, showed a recoverable uraninite content of 4.56 pounds per ton.

Two complete analyses of the uraninite have been made and are given below. The first is by E. W. Todd¹ and the second by H. V. Ellsworth.² Both analyses were made on selected, clean mineral, and it is interesting to note that they differ considerably in uranium content. The sample analysed by Ellsworth is noted by him to have consisted of severely altered material, to which fact is attributed the low UO_2 content as compared with that of the sample analysed by Todd. Much of the uraninite mined during 1929, and examined by the writer, was observed to be similarly altered, the outer portions both of crystals and lumps consisting of a blackish green earthy material soft enough to be readily rubbed off by the fingers. The alteration is especially pronounced in the uraninite taken from leached cavities in the lead and would seem to have been effected by surface waters. The uraninite broken out of fresh fluorite or calcite has a much fresher and more lustrous appearance and probably more nearly approaches in composition that analysed by Todd, which came from the massive pegmatite in the west pit. The specific gravity of the latter is given as 9.082. No figure is given by Ellsworth for the sample analysed by him, but determinations on two specimens - one a crystal and the other a massive lump - from the shipment sent to the Mines Branch in 1929 showed a mean of 8.83:

ANALYSES

I

UO ₂	45.18
UO ₃	24.90
ThO ₂	11.40
Ce ₂ O ₃ etc.	1.82
Y ₂ O ₃ , etc.	2.74
MgO	0.19
CaO	0.28
MnO	0.04
PbO	10.40
Fe ₂ O ₃	0.58
H ₂ O	0.61
SiO ₂	0.43
He	0.35
Total	<u>98.92</u>
Equivalent to U ₃ O ₈	69.71
Specific gravity =	9.082

1. Contributions to Canadian Mineralogy, University of Toronto Studies, 1924, p. 43.
2. Geol. Surv., Canada., Sum. Rept. 1923, Pt. CI, P.20.

II

H ₂ O at 100°C	1.49
H ₂ O above 100°C	0.11
Insoluble	0.67
SiO ₂	0.58
PbO	11.05
ThO ₂	13.56
UO ₂	13.55
UO ₃	52.04
Ce group oxides	1.85
Yt group oxides	1.24
Fe ₂ O ₃	0.47
Al ₂ O ₃	0.11
MnO	0.003
TiO ₂	0.001
CaO	0.25
MgO	0.07
CO ₂	0.67
SO ₄	0.58
P ₂ O ₅	0.04
F, alkalis	Present
Loss on ignition	<u>4.42</u>
Total	<u>98.33</u>
Equivalent to U ₃ O ₈	61.64
Specific gravity not stated.	

It may be noted, in passing, that the mineral uraninite is of scientific interest as enabling the geologic age of the rocks in which it occurs to be calculated from the contained lead-uranium ratio. Such calculations based on Todd's analysis show an age for the Wilberforce pegmatite of 1,239 million years. Ellsworth's analysis indicates 1,299 million years. The difference is possibly to be accounted for by the probability that altered uraninite may yield a somewhat higher lead ratio than fresh mineral from the same occurrence.

Zircon. Zircon is a minor rock-forming constituent of the pegmatite dyke, in which it occurs as small crystals measuring about 1/8 by 3/8 inch. It appears to have rather a zonal distribution, being quite abundant in some parts of the rock while not visibly present in others.

DEVELOPMENT WORK

Previous to 1929, the largest opening made for uraninite on the property was the west pit, a trench 50 feet long by 6 feet wide and about 6 to 8 feet deep. This was entirely in massive pegmatite containing scattered miarolitic cavities, and from it a few pounds of uraninite have been obtained.

Some distance south and west of this opening, there are several small pits, also in massive pegmatite, which were made in search of fluorite: these are not known to have yielded any uraninite.

The east pits consist of three or four small, shallow openings on outcrops of pegmatite, in which traces of uraninite are stated to have been found.

The middle pit, opened in 1929, is the most important working. It lies 400 feet west of the east pits and 1,600 feet east of the west trench, on the strike of a line joining these workings. Stripping of a light dirt cover has disclosed a well-defined east-west lead for a distance of 150 feet (Plate II B). This lead lies between pegmatite walls, and the calcite portion of its filling has been dissolved at the surface, resulting in the formation of abundant pockety cavities. It is widest at a point about 30 feet from the west end of the stripping, and here an inclined pit 6 feet square and 20 feet deep has been sunk on the dip. The width here is about 8 feet and the dip at the surface 50 degrees south, increasing to 70 degrees at the bottom of the pit. Lumps and crystals of uraninite were encountered from top to bottom of this pit, scattered through the calcite-fluorite filling and also loose in leached cavities in the latter.

The carload of ore sent to the Mines Branch in October 1929 was taken from the lead at a point a few feet east of the above pit. To secure this ore, the lead was worked from the surface to a maximum depth of 15 feet and over a length of 20 feet (see Plate I B). Horseshoes of pegmatite encountered were left in place, only vein filling being shipped.

It was originally intended to drive a tunnel into the hill from a point about 80 feet below the west pit, with the idea of cross-cutting the pegmatite and possibly striking other parallel leads. A start was made on this work but the results of surface operations at the middle pit proving so encouraging, it was decided to drive the tunnel from a point below this pit and about 50 feet down the hill from it. Work is now proceeding here, and provided that the dip of the ore-body remains constant, it is expected that the ore-body will be struck at about 90 feet. The tunnel will facilitate mining operations and provide drainage for the upper workings: it will also test the ground north of the main lead, about which nothing is known but in which it is thought other parallel leads possibly may occur.

The company has thus far installed no equipment on the property and only two or three men have been employed.

TESTS BY THE MINES BRANCH ORE DRESSING DIVISION

Three shipments of ore, in all, were received by the Mines Branch from the Ontario Radium Corporation.

The first shipment was received on July 9th, 1929, and consisted of two lots each containing 40 bags and weighing about 2,000 pounds. These lots were numbered 1 and 2 and were taken from the west and east ends, respectively, of the discovery, corresponding to the west and east pits as described in this paper.

The second shipment, received on August 22nd, 1929, consisted of a bag of 50 pounds of hand-picked uraninite, both lumps and crystals. This lot was numbered 3, and was taken from the main, or middle, pit as described in this paper.

The third shipment, received on November 12th, 1929, comprised 603 bags of ore, weighing 71,596 pounds, and one bag containing 80.5 pounds of hand-picked uraninite, in the form of lumps and crystals. This shipment, numbered lot 4, came, like lot number 3, from the middle pit, and is understood to be representative of the main lead on the property. The bag of clean uraninite is stated to have been picked out by hand during mining of the ore.

Considerable laboratory work was conducted on the material of these various shipments, but only the results of the large-scale test made on lot number 4 are given here, since this was the only shipment that could be considered properly representative of the ore and from which useful data from the commercial angle could be expected.

Lot No. 4

Character of Ore. The ore consisted of uraninite in a gangue of purple fluorite, calcite, apatite, magnetite, hornblende, biotite, mica, and feldspar. The relative abundance of the gangue minerals was approximately of the order indicated. Very little uraninite was visible. The hand-picked uraninite was mostly clean mineral and contained only a relatively small amount of adhering gangue.

Weights

	Pounds
Gross weight of 603 bags of milling ore, wet.	.71,595.5
Tare	1,205.0
	<hr/>
Net	70,390.5
Moisture at 1.786 per cent	1,257.0
	<hr/>
Net weight of milling ore, dry	69,133.5
Ore not milled, dry	89.5
	<hr/>
Total ore milled, dry	69,044.0
Milling ore received, dry	69,133.5
Hand-picked uraninite, dry	80.5
	<hr/>
Total ore received, dry	69,214.0

TREATMENT OF MILLING ORE

The ore was crushed in a gyratory and Symons disk crusher and then screened on a 12-mesh Newaygo screen. The plus 12-mesh was crushed in a small set of rolls in closed circuit with the screen. A head sample was taken from the minus 12-mesh.

The balance of the minus 12-mesh was classified in a Richards launder classifier into three sizes. The coarsest size was tabled on a large Wilfley table; the medium size on a one-quarter size Butchart table; and the finest size was first thickened in a Callow cone and then tabled on a one-quarter size Wilfley table. Each of the three tables made a magnetite-uraninite concentrate.

The table concentrates were dried and run separately over an Ullrich magnetic machine, using a very low current in order to lift only magnetite. The magnetic products were very clean magnetite and the non-magnetic were mostly fluorite with some uraninite.

The Ullrich non-magnetic products were re-tabled separately and good uraninite concentrates were obtained.

RESULTS (WEIGHT OF ORE MILLED: 69,044 POUNDS)

Tabling

	Pounds
Coarse table concentrates	1,702
Medium table concentrates	160
Fine table concentrates	<u>42</u>
Total	<u>1,904</u>

Magnetic Separation of Table Concentrates

	Pounds
Coarse Ullrich non-magnetic product	245.0
Medium Ullrich non-magnetic product	42.0
Fine Ullrich non-magnetic product	<u>16.5</u>
Total	<u>303.5</u>

Re-Tabling of Ullrich Non-Magnetic Products

	Pounds
Coarse table concentrates	79.0
Medium table concentrates	4.31
Fine table concentrates	<u>1.31</u>
Total	<u>84.62</u>

These concentrates were analysed for U_3O_8 with the following results:-

Product	Weight	U_3O_8	U_3O_8
	Pounds	Per cent	Pounds
Coarse	79.0	44.44	35.11
Medium	4.31	52.62	2.27
Fine	1.31	56.14	0.74
Total	84.62	45.05	38.12

The above concentrates were recovered from 69,044 pounds of ore. From the total of 69,133.5 pounds of milling ore received, there would have been recovered 84.73 pounds of concentrates. From the total ore received = 69,133.5 pounds of milling ore plus 80.5 pounds of hand-picked uraninite = 69,214 pounds, there would be recovered by milling 84.73 pounds of concentrates. Therefore, from one ton of ore there would be obtained by milling:

Concentrates from Milling Ore, per Ton

Weight	U_3O_8	U_3O_8
Pounds	Per cent	Pounds
2.448	45.05	1.103

TREATMENT OF HAND-PICKED ORE

The hand-picked uraninite was re-picked, and from the 80.5 pounds received, 64.75 pounds of clean uraninite was obtained. The residue of 15.75 pounds was crushed in a small set of rolls to all pass 20-mesh and was screened on 40 and 100. Each of the three sizes obtained was tabled on a small Wilfley table. The table concentrates were dried and run through the Ullrich machine to remove magnetite. Very clean uraninite concentrates were obtained in this way.

Results (Weight of ore treated: 80.5 pounds)

Picking

	Pounds
Hand-picked uraninite received	80.50
Re-picked clean uraninite	64.75
	<hr/>
Residue	15.75
	<hr/>

Magnetic Separation of Residue

	Pounds
-20 / 40 Ullrich non-magnetic product	3.69
-40 / 100 Ullrich non-magnetic product	2.92
-100 Ullrich non-magnetic product	1.80
	<hr/>
Total	8.41
	<hr/>

The concentrates obtained were analysed for U_3O_8 with the results shown below. No analysis for U_3O_8 was made on the re-picked uraninite, but it was assumed to run 69.0 per cent. This figure was obtained by considering it to be 95 per cent clean and to contain 72.44 per cent U_3O_8 , this being the content of a clean piece of uraninite from the same property analysed by Dr. Ellsworth. The assumed figure is probably nearly the actual, since it is reasonable to suppose that the re-picked uraninite would be slightly higher in U_3O_8 than the best concentrate obtained; that is, rather better than 67.48 per cent, which was the value obtained for the coarse Ullrich product:

Product	Weight	U_3O_8	
		Per cent	Pounds
-20 / 40	3.69	67.48	2.49
-40 / 100	2.92	67.28	1.96
-100	1.80	67.32	1.21
Re-picked	64.75	69.00	44.68
	<hr/>		
Total	73.16	68.81	50.34
	<hr/>		

The above products were obtained from 69,214 pounds of ore, equivalent, per ton of ore, to:

Concentrates from Hand-Picked Ore, per Ton

Weight	U ₃ O ₈	U ₃ O ₈
	Per cent	Pounds
2-114 pounds	68.81	1.454

Total Recoveries, per Ton of Ore

From	Weight	U ₃ O ₈	U ₃ O ₈
	Pounds	Pounds	Pounds
Milling ore	2.448	45.05	1.103
Hand-picked ore	2.114	68.81	1.454
Total	4.562	56.05	2.557

The uranium content of the concentrates from one ton of ore would be:

$$2.557 \times 0.8481 = 2.169 \text{ pounds.}$$

The amount of radium contained in the concentrates from one ton of ore would be:

$$\frac{2.169 \times 453.59 \times 1,000 \times 3.3}{10,000,000} = 0.3247 \text{ milligram.}^1$$

At \$70 per milligram, the value of the radium contained in the concentrates from one ton of ore would be \$22.73.

CONCLUSIONS

The ore is easily concentrated and the concentrates obtained are of good grade.

The tests showed a value of \$22.73 for the radium contained in the concentrates obtained from one ton of ore. Whether the ore is commercial will depend on the tonnage available; cost of mining and milling; cost of chemical treatment of the uraninite concentrates; amount of loss of uranium and radium in treatment; and the price obtainable for the refined products.

Commercial Possibilities

The results of the work thus far conducted on the property, particularly that done during 1929, which has proved the existence of a well-defined, uraninite-bearing lead believed to be at least 500 feet long, and in places 10 to 12 feet wide, cannot but be considered as encouraging, as far as a supply of ore is concerned. While little can be said at this juncture regarding the probable downward persistence of this ore-body, the fact that it appears to represent a marginal deposit along a large pegmatite body, of which it forms an integral part and to which it is genetically related, suggests that it very possibly extends to a considerable depth. Being of miarolitic character, it bears a striking resemblance to the pyroxenitic calcite-apatite-mica bodies of the Ottawa region, some of which have been mined to depths of over 500 feet without exhaustion. Such bodies are, however, often pronouncedly pockety and pinch and swell very irregularly.

From the angle of development, the deposit enjoys the advantage of being situated close to rail and on a surface that could hardly be bettered for easy and cheap mining. Lying along the brow of a ridge sloping almost directly from the outcrop, it is so placed that in the event of a mill being built, ore would fall into the bins by gravity. There is a hydro-electric power site capable of producing 500 h.p. within two miles of the property.

The ore, as shown by the large-scale test made by the Mines Branch, is easily crushed and concentrated and only limited mill equipment, consisting of crusher, rolls, classifier and tables, is required to make a uraninite-magnetite concentrate. This can be readily treated on a magnetic separator, with the production of a uraninite tailing that,

on re-tabling, yields a clean product.

1 Note: The factor used $\frac{3.3}{10,000,000}$ is based on a radium content in uranium of 3.3 parts in 10 million.

Authorities differ as to the exact figure.

In addition to the radium value, there is the value of the uranium. The value of the associated thorium is problematical, since the world's supply of this element is believed to be supplied entirely from treatment of the mineral monazite, large supplies of which are available. The value of the thorium oxide content in 1 ton of the pure uraninite, based on the current market price of 64 cents, per lb. is \$160, or 36 cents per ton of ore.

Market for Radium and Uranium and World Supply Radium

The world demand for radium for therapeutic purposes continues to be as insistent as ever and can hardly be met owing to the extraordinarily small supply and the high price demanded. According to the latest volume of *Mineral Industry*, the price quoted in the United States during 1928 was \$70,000 per gramme. The same figure appeared throughout 1929 in the market quotations of *Engineering and Mining Journal*.

Outside of its use in surgery and therapy, for which it is chiefly in demand, radium has also been employed to a considerable extent as an ingredient of luminous paint, used principally on the dials of instruments and watches. For this purpose it is mixed with specially prepared crystalline zinc sulphide, in the proportion of 0.1 to 0.25 milligram of radium to 1 gramme of the sulphide. Owing to the attendant danger to workpeople employed in using such paint, which danger has recently received considerable publicity by actions for damages in the United States courts, efforts have been made to have its use prohibited by law, and it is likely that action along such lines will be taken in all countries. A satisfactory substitute for radium for the above purpose has been found in mesothorium.

While no exact figures are available, it has been recently stated¹ that the total world supply of radium existing and available for therapeutic purposes is only 300 grammes, or a little over half a pound.

Most of the supply is now obtained from deposits in the Belgian Congo, which are operated by the Union Minière du Haut Katanga, the ore being shipped to Belgium for the extraction of the radium. In 1928, this company reported a production of 40 grammes which was double the amount produced in 1926. It is stated that the Belgian works are being enlarged to care for a further increased output, the Union having adequate supplies of ore at their mines to produce on a much larger scale. Considerable secrecy seems to have attended this company's operations, and it has incurred much criticism on the score of maintaining a radium monopoly and charging exorbitant prices, out of all proportion to the cost of production, for a substance whose chief usefulness consists in the alleviation of human suffering. In a recent press article² the Union has come out on its own defence and has endeavoured to show that since 1923, when it came into active production, it has repeatedly lowered its prices, and that it is due to its entry into the field that the former high price of \$120,000 per gramme, which obtained when the United States was the principal producer, has been reduced to the present level.

¹ Die Umschau, December 21st, 1929

² Montreal Star, December 16th, 1929

Prior to 1921, most of the radium production was supplied by American companies extracting the element from carnotite ore mined in Colorado and Utah; this ore was worked primarily for its vanadium content, the radium being recovered as a by-product. Owing to its low grade (about 2 to 5 per cent U_3O_8), as compared with uraninite (60 to 90 per cent U_3O_8), production has gradually fallen off and in 1928 no radium was isolated in the United States.

In Czechoslovakia, the present radium production is stated to be at the rate of about 3 grammes per year. It is obtained from pitchblende, the same mineral that occurs in the Belgian Congo, and of which the Wilberforce ore is a crystallized variety. It was in this ore that the element radium was first detected by the Curies, and prior to the development of carnotite mining in the United States, Czechoslovakia was the world's most important source of radium ore.

The total present annual world production of radium is thus practically confined to the Belgian Congo output of 40 grammes and the 3 grammes produced by Czechoslovakia. Allowing for a further small production from unrecorded sources, it would seem that the total world production is under 50 grammes per year.

Deposits of radium-bearing minerals are known in a number of other countries, including Portugal, South Australia, Mexico, Madagascar, Transvaal, Cape Province, Russian Turkestan, England (Cornwall), etc. Development work has been conducted in some cases, but it is not known that any of the deposits have been shown to be rich enough to work under existing market conditions.

It has recently been reported that investigation of pitchblende deposits in the Transvaal, north of Johannesburg, has shown the existence of ore in commercial quantities and it has even been stated that an annual production of 25 grammes of radium may be expected from this source. The report, however, lacks official corroboration. It was also stated in 1929 that an English company had been formed to take over certain Czechoslovakian occurrences, and the Cornish and South Australian deposits. The Turkestan occurrences, which have produced small amounts of ore, are now being further investigated by the Russian Government.

The Katanga uraninite deposits in the Belgian Congo are at the present moment by far the most important occurrence of radium-bearing minerals known. They seem capable of a greatly-increased output and exercise complete control of the market. It is held, however, that every effort should be made to discover sources of radium within the Empire, and the results of the work now proceeding on the occurrence with which this paper deals will, therefore, be awaited with much interest.

The present situation with respect to radium has recently been reviewed by R.B. Moore.¹ Professor Moore notes that between 1915 and 1917 work of the U.S. Bureau of Mines on the extraction of radium from American carnotite ore showed that the element could be isolated from material carrying only between 2 and 3 per cent U_3O_8 at a cost of about \$40 per milligram. Treating high-grade pitchblende running 40 per cent, or better, U_3O_8 , he estimates the cost

¹ Mining and Metallurgy, February, 1930, pp. 91-2.

of extraction from Congo ore at not over \$10 per milligram, and a total cost of \$15 to \$18 per milligram to cover mining and extraction.

Professor Moore states that the amount of radium element extracted to date from American carnotite ore is almost 200 grammes. Of this quantity, a large proportion was used for war purposes and a considerable amount, also in luminous paint, so that probably less than 50 grammes out of the 200 grammes produced is presently efficiently available for cancer treatment.

Professor Moore's estimate of the total world supply of radium now available for medical purposes is about 250 grammes, which, at an estimated average price paid of \$90,000 per gramme, represents the colossal sum of over \$22,000,000 as the value of a little over half a pound of material.

Canada, in 1926, imported radium to the value of \$38,902; in 1927, \$21,118; and in 1928, \$17,590.

Uranium

The trade in uranium and uranium compounds is small and it is difficult to obtain figures. Most of the supply of the element is marketed in the form of the oxide or other salts, principally the nitrate or sulphate, or as ammonium or sodium uranate.

In the form of the metal, uranium finds its principal use as ferrouanium, an alloy employed, either alone or in conjunction with tungsten, for hardening and toughening steel. Uranium carbide has been used to a limited extent as a pyrophoric agent and as a catalyst in the manufacture of ammonia.

Various uranium salts are used in the porcelain and glass industries to impart a yellow, opalescent colour. In the textile trade, such salts find employment as mordants in silk, wool, and calico printing; and in the dye industry, in conjunction with potassium ferrocyanide, to produce brown shades. Uranyl nitrate and acetate are employed as reagents in the chemical laboratory. Uranium salts are also used in photography.

As regards the world production of uranium, statistics are reported in such various terms as to be comparatively useless in many cases as the basis of a market survey. However, the bulk of the supply may be taken as derived from the Belgian Congo and Czechoslovakia. In 1928, Belgium reported exports of uranium oxide (presumably all produced from Congo ores) totalling 84 long tons; and Czechoslovakia, a production of 19 long tons. France, in 1927, reported exports of 18 long cwt. of uranium oxide and other uranium

salts, presumably produced from imported ore, possibly from Portugal or Madagascar. The above 1928 figures show a total of 104 long tons of uranium compounds traded in.

Countries reporting a production or exports of uranium minerals in recent years include Portugal, with exports of 529 long tons in 1926, and 296 tons in 1927; Madagascar, with a production of 5 tons in 1926; and Russia; with a production of 35 tons in 1926 and 53 tons in 1927. The United States reported a small production of a few tons in 1928.

The Portuguese ore is believed to carry principally the minerals torbernite and autunite, which are, respectively, the phosphate of copper and uranium and of calcium and uranium. These minerals usually occur as alteration products of pitchblende. The Madagascar shipments consisted chiefly of the minerals euxenite and betafite, which are complex compounds of the rare earths and uranium. The Russian production is presumed to consist entirely of tyuyamunite, a uranovanadate of calcium, akin to carnotite, mined in Turkestan and treated at the Russian Government radium extraction plant at Kame. The United States output was made up of carnotite, a compound of vanadium, uranium, and potassium oxides, and torbernite and autunite, the first mined in Colorado and Utah and the latter in New Mexico.

The commercial importance of the minerals mentioned above as either a present or a potential source of uranium is small, and they could hardly be considered as capable of supplying any large amount of the element unless found in deposits much richer than any yet known. The same holds good for the many known occurrences of pegmatitic uranium-rare earth minerals throughout the world, and thus the market for uranium will almost certainly continue to be supplied in the main from deposits of pitchblende (uraninite).

In 1928, imports of uranium oxide and salts of uranium into the United States totalled 165,378 pounds, valued at \$145,557. These figures show a very large increase - nearly 100,000 pounds in quantity and over \$86,000 in value - over those for 1927.

Summary

There exists on the Richardson property near Wilberforce, Cardiff township, Ont., a deposit of radium-bearing ore larger than anything of the kind hitherto known in Canada, and on which development work done during 1929 suggests has commercial possibilities.

The ore is uraninite (the crystallized form of pitchblende) disseminated in the form of large crystals and lumps in a lead of calcite and fluorite, which also carries large crystals of apatite. This lead is believed to have a length of at least 500 feet, and its width ranges from 5 to 12 feet.

The deposit is well situated in respect both to ease of mining and to transportation. The ore is soft and easily crushed; and concentration is readily effected by tabling, followed by magnetic separation of the associated magnetite and re-tabling of the uraninite tailing. Much of the contained uraninite, also, can be recovered by hand-picking of the crude ore.

Tests by the Mines Branch on a carload shipment of ore showed that 1 gramme of radium, worth at the current market price \$70,000, would be recoverable from the concentrates obtained from 3,422 tons of ore, allowing a loss of 10 per cent in chemical treatment. The U_{3O_8} content of the concentrates obtained from 1 ton of ore was 2.56 pounds.

Uraninite is the richest ore of radium known and is the material from which the bulk of the world's supply of this element has been obtained. Similar ore is being mined at the present time in the Belgian Congo and in Czechoslovakia and is treated chemically for the isolation of the contained radium.

The present world supply of radium (in the form of radium salts) is stated to be about 300 grammes, and this amount is being increased at the rate of probably less than 50 grammes annually.



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OFFER
OF
COMMON CAPITAL SHARES

200,000 Shares at \$1.00 per Share
(Payable in Canadian Funds)

FISSION MINES LIMITED

(NO PERSONAL LIABILITY)

CAPITALIZATION

Authorized	3,000,000 shares
(Without nominal or par value)	
Outstanding	1,344,947 shares
(1,075,000 shares deposited in escrow)	
Unissued	1,655,053 shares

In view of the Company being a Canadian Corporation, and its officers, and six of its seven Directors, residents of Canada, it may be difficult or impossible for American investors to enforce liability under the Securities Act of 1933 should cause for such action at any time arise. The Company knows of no provision of law in the United States or Canada which, by its terms, subjects the Company, its non-resident directors and officers, and non-resident experts therein named to the jurisdiction of the Courts of the United States. However, Dr. W. A. Klann, one of the Directors, is a resident of the United States and as such is subject to liability under the Securities Act of 1933.

	Total	Per Unit
Price to public	\$200,000.00	\$1.00
Underwriting discounts and commissions	50,000.00	.25
(See notation below)		
Proceeds to registrant	150,000.00	.75

(The above prices and amounts are Canadian Funds)

The price of \$1.00 per share (Canadian Funds) is essentially arbitrary and there is no established market for the registrant Company's shares in the United States or Canada.

Under the Company's registration with the Ontario Securities Commission, the Company may accept, through its officers only, applications from the public for shares. Sales of the Company's shares heretofore made were as follows:

	Price to Public		Proceeds to Company		Commission to Officers	
	Unit	Total	Unit	Total	Unit	Total
167,000 shares	50¢	\$83,500.00	40¢	\$66,800.00	10¢	\$16,700.00
85,935 shares	1.00	85,935.00	80¢	68,748.00	20¢	17,187.00
{ 12 shares }	50¢	6.00	50¢	6.00	....	.....
{ incorporators }						

NOTE: The amounts per unit with respect to the second line of the above table apply to present sales in Canada by Officers of the Company.

Detail of the commission to officers as above-noted is as follows:

R. L. Saunby, \$19,993.00; W. R. Willard, \$2,007.00; F. Birkenhead, \$6,141.00; H. G. Pitt, \$5,746.00.

The Underwriter is not committed to purchase all or any of the shares comprising the offering.

Notation re Underwriter's Commission, etc.

The registrant Company has undertaken to pay the Underwriter the sum of \$5,000.00 (Canadian Funds) to assist in defraying distribution expenses of the offering, such payment to be limited to 25% of the initial proceeds. The registrant has also agreed to give the Underwriter first refusal on any further financing.

CANADIAN FOREIGN EXCHANGE CONTROL

The registrant Company and the Underwriter have undertaken to comply with all the requirements and regulations of the Canadian Foreign Exchange Control Board in respect to purchases of these securities by American purchasers thereof. Full detailed information in respect to these regulations and requirements are set forth on pages 10 and 11 herein.

Rate of Exchange — Canadian and U.S.A. Funds
(Important to American Purchasers)

Canadian and American dollars are at par in Canada under control of the Canadian Foreign Exchange Control Board. However, American investors may, by purchasing Canadian funds for payment of the shares, enjoy the benefits of the current United States open market rate of exchange (where Canadian dollars are presently at approximately 7½% discount.) This would, in effect, proportionately reduce the offering price of the shares. If the American purchaser pays for the shares in U.S. funds, no benefit, whatsoever, accrues to either the registrant Company or the Underwriter as Canadian Foreign Exchange Board regulations require American Funds to be sold to the Board at par in Canadian dollars.

MARK DANIELS & COMPANY

Underwriters

371 Bay Street

Toronto, Ontario, Canada

THESE SECURITIES HAVE NOT BEEN APPROVED OR DISAPPROVED BY THE SECURITIES AND EXCHANGE COMMISSION NOR HAS THE COMMISSION PASSED UPON THE ACCURACY OR THE ADEQUACY OF THIS PROSPECTUS. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENCE.

DATED MARCH 9, 1949.

FISSION MINES LIMITED

(NO PERSONAL LIABILITY)

OFFICERS AND DIRECTORS

1st Vice-President and Director
Roy Langford Saunby
Company Manager
Apartment 3, 10 Humber Blvd.
Toronto, Canada

President and Director
William Roy Willard
Barrister and Solicitor
155 Roncesvalles Ave.
Toronto, Canada

2nd Vice-President and Director
Horace George Pitt
Mining Superintendent
Wilberforce
Ontario, Canada

Secretary-Treasurer and Director
Fred Birkenhead
Manufacturer
458 Ossington Avenue
Toronto, Canada

Director
Fred Willmot Birkenhead
Manufacturer
458 Ossington Avenue
Toronto, Canada

Director
Sidney Grenville Davies
Commercial Traveller
129 Marion Street
Toronto, Canada

Director
William Alfred Klann
Physician and Surgeon
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Head Office
1 Roncesvalles Avenue
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Mine Office
Wilberforce
Ontario, Canada

Registrar and Transfer Agents
National Trust Company
Toronto, Canada

Agent for Service in the United States
Dr. W. A. Klann
136 South Street, Wellington, Ohio, U.S.A.

FISSION MINES LIMITED

INTRODUCTORY

The purpose of the Company is to conduct further exploration and development of its properties on which Uraninite (uranium oxide) and Fluorspar (fluorite) deposits have been encountered in surface exploration, particulars of which are set forth herein under the caption "Geology." Uraninite and Fluorite are urgently sought minerals, having a world demand and ready market for commercial grade production.

URANINITE (Uranium oxide)

This mineral is used as a source of uranium in nuclear research and development of atomic energy in all its phases. In Canada the production of this as well as other radio-active minerals, is subject to government regulations. Government agencies purchase all concentrates of the mineral at an established basic price of \$2.75 per pound of contained Uranium oxide, 10% grade refinement, minimum.

FLUORSPAR (Fluorite)

Chemically known as Calcium Fluoride (CaF_2), has many industrial uses and is used to some extent in nuclear research and atomic energy development. Its derivative Fluorine, the most active of all the elements, came into prominence during World War II, the former problems, in respect to its preparation and use having been overcome in military development and research in atomic energy.

HISTORY

Only lots 4 and 5 of Concession 21 now a part of the Company's main property (described in detail under "Properties"), have any historical background. The remainder of the main properties and the mining claims which have been acquired since the company's organization have not been explored or developed to the knowledge of the registrant.

Lots 4 and 5 were acquired in 1919 by one William M. Richardson, a prospector and in 1922 he is reported to have made the original Uraninite discovery. While prospecting for Molybdenite in the area he found a heavy black mineral in surface outcrops of Pegmatite at different points on the property and identified the mineral as Uraninite. A limited amount of surface exploration was performed by him and in October 1927 this portion of the property was acquired by Ontario Radium Corporation Limited. Somewhat more intensive development of Pegmatite outcrops on Lot 5 were apparently undertaken as well as underground work consisting of an adit with associated drifts and raises. From these workings, some test shipments of ore were forwarded to the Canadian Government Bureau of Mines for test of radio-active properties.

In November, 1931, the property was acquired by International Radium and Resources Limited which held it until May, 1937, when it was acquired by Wilberforce Minerals Limited. No record of the work conducted by the aforesaid companies is available, the former company having been wound up about February 1934, when Suburban Homes Limited purchased the properties and subsequently sold it to the Lands and Mines Development Syndicate, promoters of the registrant Company. This syndicate conducted extensive prospecting and surface exploration prior to formation of the registrant company in September 1946. The registrant has no knowledge of when actual operations by the former owners were suspended nor the reason for such suspensions. The property, in its known history, being patented land, can never have been open for staking.

During all of the early work the property was explored essentially as a radium prospect and while the abundance of Fluorspar in the veins was recognized, its commercial importance and supply demand at that time was negligible in comparison to the present world demand in the steel and chemical industries. The possibilities of the property as a producer of Fluorite were therefore, not formerly explored.

Exploration and development of the registrant Company's properties to date has revealed deposits of both Uraninite and Fluorspar ores but the extent, quantity or average grade have not as yet been established. The indicated length and width of the zones and assay results obtained in respect to the Fluorite deposits suggest that the deposits may be of sufficient quantity and grade to render them of commercial importance from a production point of view. However, the commercial aspects of the Fluorite deposits can actually be determined only by further exploration.

The available sample-assay data relative to uranium mineralization are as yet of too meager a nature to provide conclusive information as to the uranium possibilities of the property. The uranium deposits, so far encountered, could be commercially mined only as a by-product of possible commercial production of fluorite. On the other hand, further exploration of the property may possibly establish deposits of uraninite of sufficient quantity and grade as to provide a profitable operation independent of any possible fluorite production.

PROPERTIES

All of the Company's properties are registered in the name of the Company and are free of any encumbrance by lien or mortgage.

The registrant company's main and original property consists of four contiguous parcels of land, comprising approximately 350 acres, situate in Cardiff Township, Haliburton County, Province of Ontario, Canada, more particularly described as follows:

Lot 4	—	Concession 21
Lot 5	—	Concession 21
Lot 6	—	Concession 21
Lot 7	—	Concession 21 (North half only)

The above parcels are held by the Company in fee simple and are subject to local township tax rates.

In addition the registrant Company also holds fifty (50) mining claims aggregating approximately twenty-five hundred (2,500) acres, all situate in the northern section of the Township of Cardiff, Haliburton County, Province of Ontario, Canada, more particularly described hereunder:

A group of seven (7) contiguous claims, consisting of approximately 350 acres, immediately adjoining the main property and numbered as follows:

FISSION MINES LIMITED

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RE: PROPOSED FURTHER OFFERING

If the development, which the within offering is designed to finance, proves to be successful, the registrant proposes to grant to Mark Daniels & Co. an option to purchase a further 200,000 shares at \$1.70 per share for sale in the United States at \$2.00 per share, subject to registration under The Securities Act of 1933. No such option has been granted as yet and no dates or amounts set for payment thereunder but it has been arranged that, of the net proceeds, \$5,000.00 will be paid to Mark Daniels & Co. to defray advertising and promotional expenses.

The use of a "step-up price" carries with it the implication of a foundation for the subsequent rise in price in offerings of the registrant's shares. In the case of the registrant there exists no reasonable basis for the contemplated doubling of the price in a subsequent offering of the subject shares or for increasing the price in any amount, especially since the present offering at \$1.00 per share "is essentially arbitrary and there is no established market for the registrant's securities in the U.S. or Canada."

The "step-up price" mechanism is used to make stock offerings more readily saleable by offering securities at the current price and mentioning to prospective purchasers that soon it will be more expensive to purchase the subject shares because an increasing worth in assets justifies the increase in price, when in fact no foundation for such increase in worth exists. In the case of the registrant, there is no reasonable basis at this time for assuming any increase in the worth of the assets.

Increase in price lends itself to the argument that investment of original money and the application thereof in carrying out the program outlined in the prospectus, that will result in increase in worth, when in fact in cases of this kind, particularly in the registrant's case, values cannot be fixed in advance of results solely obtainable from further development of the property.

GENERAL INFORMATION

The registrant Company was organized and incorporated under the laws of the Province of Ontario, Canada, on September 6th, 1946.

The Company has no operating history and the offering price of \$1.00 per share is based solely on future possibilities, as to which no representation is made. The registrant company's properties are in the exploratory stage without proven or probable ore and in the event that the planned work results in the development of sufficient amounts of ore the present financing will have to be supplemented by further substantial financing before productive operations can be conducted.

There is no firm commitment for the shares offered and no assurance that sufficient funds will be raised to carry out the purpose of the financing, namely, to obtain funds for future exploratory development work. In the event that the present offering in the United States is not fully subscribed and the estimated proceeds are not received, such amounts as are subscribed will not be returned to the subscribers but retained by the Company and will be applied to the general program as outlined on pages 6 and 7 herein.

Messrs. Willard, Saunby and Birkenhead, promoters of the Company originally acquired the main property for an initial cost of \$7,000.00 and subsequently expended some \$28,000.00 on engineering, development and equipment, making a total cost of \$35,000.00.

The consideration paid by the Company for its main and original property, namely 1,000,000 shares of no par value stock and \$15,000.00 in cash, was purely arbitrary, not arrived at by valuation, nor determined by the report of an expert, but fixed and approved by the Board of Directors who were the direct and/or indirect representatives of the promoters. The investing public, giving effect to the proposed offering, as well as shares previously sold, will therefore have provided approximately 94% of the gross cash invested in the undertaking and will control only approximately 29% of the voting control shares. By virtue of the same fact, the investing public's ratio of voting control would be proportionately increased if, as, and when each further issue of treasury shares are sold in any subsequent public offering. After the present financing, Messrs. Willard, Saunby and Birkenhead, promoters of the registrant will still own and control 863,569 shares of common stock, or 56% of the outstanding capital. Based on the proposed offering (which of course does not represent a market value) this represents a potential, although unrealized, profit of \$863,000.00 to the promoters in addition to \$15,000.00 less the total net cost of the property to them of some \$35,000.00 as stated above.

A quorum for a shareholders meeting consists of three or more shareholders, represented in person or by proxy, each owning at least one share, two of which must be present in person.

E.O. 3797 to E.O. 3802 (both inclusive) and E.O. 3771.

A further group of forty (40) contiguous claims consisting of approximately two thousand (2,000) acres, within about one mile distance south and east of the Company's main property, and numbered as follows:

E.O. 3719 and E.O. 3720
E.O. 3769 and E.O. 3770
E.O. 3772 and E.O. 3773
E.O. 3822 to E.O. 3827 (both inclusive)
E.O. 3837 to E.O. 3849 (both inclusive)
E.O. 3873 to E.O. 3878 (both inclusive)
E.O. 3879 to E.O. 3887 (both inclusive)

One single claim, consisting of approximately fifty (50) acres immediately west of the main property, No. E.O. 3803.

Two adjoining claims, consisting of approximately one hundred (100) acres, immediately east of the main property, Nos. E.O. 3558 and E.O. 3559. ^{WCS}

All of the aforesaid mining claims are held in the name of the Company under Miner's License A. 22060.

The condition of title involves the carrying out of a minimum of 40 days' work per claim per year for the first five years followed by a nominal patenting fee. The required assessment work, however, does not necessarily have to be conducted each successive year but the aggregate of the minimum requirements may be completed at any time prior to the year in which it is due to be done. Money expended on the property for development purposes other than surface work, such as diamond drilling, geophysical survey, etc., is recognized as completed assessment work and is computed on a ratio of one day's assessment work for every \$5.00 so expended. The assessment work required to be carried out does not necessarily have to be done on each individual claim but can be conducted on any one or more claims held on the one Miner's License (and forming a contiguous group), and be credited pro-rata to the individual claims comprising the group. Upon completion of the required assessment work the claims may then be patented upon payment to the Department of Mines, Province of Ontario, of the sum of \$2.50 per acre of the ground involved. Whereupon, the registrant Company will receive clear title in perpetuity to the property, subject only to the payment of nominal yearly taxes under the local Township or county rates. Of the work required the Company has already completed 2,074 days' work and the following work will be required to be completed in the years specified at an estimated cost of \$5.00 per work day: 1948 — 1,166 days; 1949 — 1,680 days; 1950 — 1,680 days; 1951 — 1,600 days; 1952 — 600 days.

Failure to complete the required assessment work, as detailed above, in respect to any claim or claims, would subject such claim or claims open for staking by others. This is true, however, only in respect to the unpatented claims held by the Company.

In addition the Company holds the full mining and mineral rights on thirty-three parcels of land consisting of five separate groups, each comprising contiguous lots aggregating approximately thirty-two hundred acres situate in the southern portion of Harcourt Township, Haliburton County, Province of Ontario, all within a radius of about fifteen miles of the Company's main property and more particularly described as follows:

Lots	Concession
5 to 9 inclusive	5
4 to 8 "	4
4	3
5	1
30 to 32 "	3
29 to 32 "	4
28 to 32 "	5
29 to 33 "	6
20	3
21	3 (north half only)
23 and 24	3 (south three quarters of each only)

The aforesaid mineral rights are owned by the Company and no assessment work taxes, or further payment is or will be due or payable in respect thereto.

All of the registrant company's properties are located in Haliburton County, Province of Ontario. The main property is situate about three miles from the Town of Wilberforce, Ontario, the supply point for the district, on the Canadian National Railway. The property is about 134 miles by rail, and about 140 miles by several highways, from the City of Toronto. In general, the property is about 100 miles due north of the City of Rochester, N.Y.

Adequate water is available for mining purposes, as well as an abundance of timber for construction purposes.

The main highway of the district extends from the property to the Town of Wilberforce.

GENERAL GEOLOGY AND STRUCTURE

The area is underlain by Precambrian intrusives and sediments. A narrow belt of limestone of the Hastings-Grenville series is found in the valley in which the railroad has been built; the gneiss-limestone contact crosses the north halves of Lots 4 and 5 (each of which has an east-west width of 1,320 feet), and thence, west of the property, trends in a north-south direction. The ore bodies outcrop as irregularly shaped vein or dikes in the granite-gneiss and striking in a general northeasterly direction roughly parallel with the gneiss-limestone contact. To the south and east is a complex assemblage of gneiss, granite and amphibolite.

The uraninite in association with the fluorite deposits occurs in a series of roughly parallel, long, narrow, vein-shaped bodies having, as so far exposed, a general trend about north 65 degrees east magnetic and a general dip of about 30 to 35 degrees to the southeast. These vein-shaped bodies pinch and swell varying from a few inches to 12 feet or perhaps slightly more in width. The vein-like bodies are composed chiefly of interbanded, strongly sheared calcite and purple fluorite with minor amounts of feldspar, hornblende, apatite, and magnetite. In some places crystals of such typical pegmatite mineral as uraninite, allanite, zircon, molybdenite and titanite occur. The uraninite-bearing bodies thus have to a considerable degree the form and character of veins, but also contain minerals characteristic of pegmatites. They may, therefore, be referred to for convenience as pegmatitic vein-dykes. In this connection P.R. 1948-8 of the Ontario Department of Mines states as follows:

"Owing to the erratic character of the pegmatites, continuity of width, length or depth cannot be expected for any considerable distance. Mining operations would, therefore, require the removal of numerous, relatively disconnected, small lenses and pods."

The origin of the ore is obscure. Whether the bodies represent fracture fillings, a true vein system, or replacement bodies in pegmatized limestone has not been established, but the mineralization of the wall rock and the mineral assemblage within the vein-dykes suggest that they were formed from the residual solutions of a magma containing an excess of calcium carbonate.

The chief mineral of economic importance, as revealed by development, is fluorspar. Preliminary test work has shown that satisfactory recovery of fluorite as acid or metallurgical grade product may be expected from the ore exposed in the main pit of Vein 3 and it is reasonable to expect that this also applies to the ore from Zone 1.

Fluorite is found in Zone 1 and Zone 3, which are roughly parallel, running about 550 feet apart; between these zones are numerous dykes that have not been investigated. Apparently, the two zones originated from a common source. There is also the possibility that the two so-called zones are in reality one zone, with definite relationship at depth but with ore-bodies differing in the relative proportions of the minerals.

The fluorite is in most occurrences mixed with calcite while in some it is found in the syenite. The most conspicuous bodies contain an interbanded or intergrown mixture of white calcite and purple fluorite. The grain size in the strongly-sheared vein-like bodies of Zone 1 is generally smaller than in the pockets of Zone 3.

The fluorite of the veins varies from transparent and colourless to sub-opaque and purplish black, a translucent light purple being the most common. The deep purple fluorite emits a stronger odour when shattered, this odour being due to free fluorine.

The deep colour and the presence of free fluorine indicate a change in the molecular structure of the fluorine; this change is apparently caused by the radiations from the radio-active minerals in proximity with the fluorite. Wherever uraninite was observed all the fluorite adjacent to it was dark and fetid.

When the purple fluorite of the calcite-fluorite intergrowth, such as is found in Vein No. 3, is exposed to light the colour fades. Thus on the dumps and surface exposures most of the fluorite has been bleached and where it is fine-grained can be distinguished from calcite with difficulty.

Associated with the fluorite-calcite and in the syenite adjacent to it in Zone 1 isolated crystals and masses of uraninite occur. These may be considered a valuable by-product from the treatment of the fluorite-ore. No radio-active minerals were identified in Zone 3. The results of preliminary ore-dressing tests on the ore from Zone 1 to determine the value of the recoverable radio-active minerals are inconclusive, and a mill-test will be required to determine the method of treatment and the probable recovery.

The fluorite ore occurs as irregular pods or vein-like bodies with their long axis parallel with the foliation of the country rock. The ore bodies are usually in pegmatite dikes which follow the regional strike and dip. That is, they strike north-easterly and dip 30 to 35 degrees to the south east. The mineralized dikes are in the northwest margin of a mass of granite; the gneisses are probably largely sedimentary. The gneiss swings in a broad arc to the north east; to the west is the Grenville sediment-gneiss contact.

The uraninite is found as well-defined crystals (cubes and modifications thereof) and as irregular nodules, from pin-point size to one-inch, or even larger chiefly in the syenite of the hanging and foot walls of Vein No. 1 and also, though less abundantly, in the calcite-fluorite vein filling of this vein. No radio-active mineral has been identified in the calcite-fluorite ore from Vein 3. Insufficient work has been performed to date to determine the extent and grade of the ore-bodies, and while outcrops occur across the entire width of the main property, no definite continuity of the showings has been established.

Mill tests of the ore conducted by Nepheline Products Limited, Lakefield, Ontario, have determined that satisfactory recovery of at least 98.6% of the fluorite as acid and metallurgical grade product may be expected by either froth-flotation or a method involving sink-and-float and froth flotation. The uraninite slimes badly in crushing and has not been concentrated satisfactorily by any of the procedures investigated:—wet tabling, jigging, magnetic separation and selective froth-flotation. Mechanical concentration based on the difference in the specific gravities of the minerals appeared to offer some promise of success and should be investigated further. Since the uranium content of the bulk shipments was only 0.12 per cent or less it was extremely difficult to obtain a metallurgical balance by analysis of the products. A pilot-plant test will be required to determine grade and recovery.

SURFACE EXPLORATION AND DIAMOND-DRILLING

ZONE 1

Thirty-six pits and trenches have been examined in this zone, from the original discovery pit (No. 1) in Lot 4, northeasterly from about 3,000 feet to the eastern boundary of Lot 6.

Most of the work in this zone has been done in the "Richardson Pit" near the water tower, in Lot 5. Previous owners have driven an adit, and drifted from it; no work is being done at present.

The Fluorite is mixed with calcite in highly sheared, vein-like bodies penetrating pegmatite dikes, striking northeasterly and dipping 30 to 35 degrees to the southeast in conformity with the regional strike and dip of the Precambrian gneiss. The grain size of the fluorite is variable, from massive pieces several inches in sections to microscopic.

The ore-bodies occur as pods or lenses that follow, in a general way, the line of strike of the regional structure. In some instances they terminate abruptly, in others they fade into the adjacent syenite. It is believed that the development work has established the continuity of the ore zone but has not established the continuity of Vein 1 or any other vein for a distance exceeding 400 feet. At the same time, the very fact that ore does occur in this manner suggests the possibility that additional lenses will be located in this zone. A number of bodies similar to that exposed in the Richardson pit would provide ore for a successful mining operation; a continuous ore body is desirable, but not essential for profitable operation.

The relationship of the ore occurrence in the Bycroft pit to that in the Richardson pit has not been established, nor has it been determined whether the fluorite-calcite showing in the large pit 200 feet east of the Richardson pit is a continuation of vein 1, of vein 2, or of even a third vein in this zone.

There is a gap in the area of zone 1 covered by swamp. This gap extends for about 500 feet easterly from a point 550 feet east of the Richardson pit.

There is a good showing in the pit east of the swamp with a 14-foot intersection in Hole 4 beneath it that contains, by assay, 19.4 per cent CaF₂. The outcrop of the fluorite-bearing dike has been traced for 60 feet northeast of this pit.

The presence of ore-bearing vein-dikes in this zone has been established for a length of 500 feet, with widths ranging from a few inches to over 12 feet of calcite fluorite and syenite hanging and foot-walls. The width of such outcroppings are not necessarily indicative of ore development underground. For example, the width of outcrops in No. 21 pit was less than 2 feet yet at depth of 10 feet a true width of 7 feet of calcite fluorite was exposed.

A total of 15 diamond-drill holes were put down on this zone, 7 shallow holes averaging 100 feet in depth and 8 deep holes ranging from 294 feet to 801 feet, all of which were drilled at 45 to 55 degrees to intersect the ore at depth. These indicated the existence underground of the ore of the same general characteristics and conditions as shown in surface pits and trenches.

Commercial ore was intersected in shallow holes 4A and 9A. The former cut a core length of 14 feet assaying 19.4% calcite fluorite and the latter cut a core length of 7 feet assaying 27.5% calcite fluorite.

In the deep holes this zone is indicated at depth over a length of approximately 500 feet. An average core length of 6 feet, having a fluorite content of 22.6% has been recovered from deep holes 1B, 3B and 4BB, indicating a body of approximately 200 feet in length along the strike of the zone.

ZONE 3

Outcrops have not been sufficiently explored in this zone to establish any continuity but (deep) diamond drill hole 6B has indicated the extension of the zone for a distance of 700 feet southwestward from the main pit on the surface which, of course, may not necessarily be one vein.

Thirty-five diamond-drill holes were drilled on this zone, 29 of which were shallow ranging from 66 feet to 205 feet and 6 deep series ranging from 294 feet to 801 feet for the purpose of intersecting both No. 1 and No. 3 zones.

Core intersections in the shallow holes established a continuity of this ore-zone underground for approximately 450 feet in length, the main calcite-fluorite intersections varying in width from 2 feet to 19 feet. Hole 13A revealed a core-length of 7.3 feet assaying 30.2% calcium fluoride; Hole 15A (46 feet to the west) showed a core-length of 18.8 feet assaying 26.8% calcium-fluoride. Hole 16A (78 feet south) intersected a core length of 8.4 feet assaying 34.6% calcium-fluoride; all three showing at a vertical depth of approximately 50 feet.

Deep holes in this zone, at depths ranging from 175 feet to 225 feet, revealed ore averaging 22.1% calcium-fluoride over an average width of 5.5 feet confirming the results obtained in the shallow-drilling.

In the course of the drilling in this zone presence of additional lenses of ore was indicated. These may prove to be independent of both of the known zones. This possibility was indicated in deep holes 1B, 2B and 5B where at a vertical depth of about 100 feet, core averaging 28.5% calcium-fluoride was intersected over a comparatively uniform width of 3.9 feet.

Further surface exploration and diamond-drilling will be required on both zones to determine whether further underground development be warranted and whether deposits be sufficient size and grade to afford profitable commercial production.

UNDERGROUND

Underground work has been confined to Zone 1. On lot 5, below the Richardson pit an adit about 500 feet long driven by former operators runs in a southeast direction, entering the northwest face of the hill about 50 feet below the crest. About 180 feet in from the portal (measurements from an iron stake driven into the ground at portal) two drifts were driven from the adit, one about 200 feet to the southwest, the other 60 feet northeast. From the northeast drift a raise opens to the surface; this was apparently the location of the original shaft put down by Ontario Radium Corporation in 1929. From the southwest drift two stopes open to the surface; the smaller one, nearer the adit, is plugged with broken rock.

The original shaft was apparently sunk to follow the fluorite exposed in the Richardson pit. In the adits this lense is split into several minor lenses, the largest of which is about 3 feet in thickness.

About 300 feet in from the portal two short drifts have been cut, trending east and west. From the west drift a raise followed the dip of a narrow calcite-fluorite vein to the surface. The walls of this raise are mostly feldspar.

Near the end of the adit a two-compartment shaft, 50 feet deep, opens to the surface. The timbers of the shaft will require replacement.

DIAMOND DRILLING

Over 11,000 feet of diamond-drilling has been completed on the Company's main property.

SURFACE EXPLORATION

Some 1,700 feet of pitting and trenching has been effected on the main property by former operators and the registrant company. In addition assessment work comprising surface exploration of the Company's unpatented mining claims has been conducted.

PROGRAMME

The registrant plans to conduct approximately 12,500 feet of diamond drilling for the purpose of proving the ore deposition already indicated.

Surface improvements are to include the erection of complete camp and mining buildings, and the construction of adequate facilities to allow for extensive development and exploration of the property.

In addition, extensive surface exploration of the Company's mining claims is planned to be undertaken immediately.

The registrant company will receive a net amount of \$150,000.00 (Canadian Funds) from the sale of 200,000 shares of its capital stock under the proposed offering and it is intended that these funds will be expended for the following purposes in the amounts and priority as set forth hereunder;

No. 1	— A fund to be provided for expenditure in advertising, publicity and distributing expenses of this offering, to be expended by payment to the Underwriter, Mark Daniels & Company, as and when required in varying amounts at their written request, not to exceed ..	\$ 5,000.00
No. 2	— To provide for liquidation of sundry accounts payable and current liabilities approximately ..	5,500.00
No. 3	— To provide for the liquidation of current loans payable, plus accrued interest, approximately ..	16,500.00
No. 4	— To provide for a proposed 12,500 feet of diamond drilling for the purpose of proving the ore-deposition already indicated on the main property, estimated at an overall cost of \$4.00 per foot ..	50,000.00
No. 5	— To provide for exploration of the Company's mining claims as required under the condition of title, estimated at ..	16,000.00
No. 6	— To provide for the purchase of sundry small tools and mining equipment, estimated at ...	2,000.00
No. 7	— To provide for the construction and complete equipment of 3 bunk-houses to accommodate 30 men each, estimated at ..	15,000.00
No. 8	— To provide for the construction and complete equipment of cookhouse for 105 men, estimated at ..	6,000.00
No. 9	— To provide for the purchase of air-compressor, air-hose, drill steel and drills, estimated at ..	8,000.00
No. 10	— To provide for the purchase of air and water lines, each approximately 600 feet, estimated at ..	500.00
No. 11	— To provide for the construction and complete equipment of a blacksmith and machine shop, estimated at ..	8,000.00
No. 12	— To provide for the driving of a further adit for an estimated distance of 100 feet to intersect No. 1 Vein on the 100 foot level, estimated at ..	4,000.00
No. 13	— To provide for Head Office administrative expenses, including stenographic and accounting, estimated at ..	9,500.00
No. 14	— To provide for engineering consultant fees and expenses, estimated ..	4,000.00
		<u>\$150,000.00</u>

The above estimates of expenditure have been approximated as closely as possible but the actual expenditures during operations insofar as specific amounts and priority of dispersal is concerned, must be governed to some extent by unforeseen circumstances. It can readily be understood, that in any project of the nature of that of the registrant Company, for the benefit of economical expediency, it may be found necessary to carry out several of the operations concurrently regardless of their priority as outlined herein. This condition may also be true in regard to the actual amounts provided for each purpose. However, the registrant Company undertakes that any over-expenditure, which will be permitted only in the case of Items 4 to 12, inclusive, will be offset by reductions of similar amounts in other development expenditures. In the event that the full proceeds provided for under this offering are not available, proportionate reductions will be effected in each item where feasible, to allow for any deficiency in the ratio already estimated. This cannot be undertaken in the case of Item 1, however, because while the full amount of the estimate may not be expended, it will not be possible to ascertain the final result of the offering until after at least a portion of the item has already been expended.

Since the Underwriter is not committed to purchase any of the shares to be offered and, since he may make purchases in blocks of only 5,000 shares each, it is possible in the event that less than 27,000 shares are taken down by him, only 75% of the proceeds will be available for Company purposes as provided under the terms of the agreement with the Underwriter in respect thereto. If, however, the total numbers of shares offered are sold, the amount of money, viz.: \$5,000.00 proposed to be paid to the underwriter to defray promotional expenses will amount to only two and one-half per cent of the gross amount of the proposed offering.

UNDERWRITING

Mark Daniels, 371 Bay Street, Toronto, Canada, a registered Broker under the United States Securities and Exchange Commission, the Ontario Securities Commission, and the State of New York, holds an option to purchase 200,000 shares of the registrant company's capital stock without nominal or par value at or for the price of 75¢ per share. He proposes selling the shares so optioned to the public at \$1.00 per share (Canadian Funds), which allows for a gross profit or spread of 25¢ per share, representing 25% of the selling price. In the event of his appointing United States registered Brokers to assist in the distribution, he proposes to allow them an equitable proportion of the profit which may accrue to him as stated herein. Pending the effectiveness of the registration of the securities no arrangement has been or will be made or entered into by Mark Daniels with any distributing Brokers. In the event that any arrangements are entered into with dealers, sub-dealers, or agents, in connection with the distribution of the securities being registered, the registrant company will file a post-effective amendment to the registration statement furnishing the required information and exhibits with respect to such arrangements. No offering will be made by such person or persons until the post-effective amendment has become effective.

There is no material relationship between Mark Daniels, the optionee and the registrant Company.

Shares of the within offering will be offered to the public by subscription.

The terms of the option agreement requires Mark Daniels to purchase and pay for a minimum of 50,000 shares within 45 days after the effective date of the within registration statement and to purchase and pay for the balance of the option amounting to 150,000 shares as follows:

A further 50,000 shares within 75 days of the effective date of the registration statement, a further 100,000 shares within 105 days of the effective date of the registration statement.

CANADIAN FOREIGN EXCHANGE CONTROL REQUIREMENTS

The control of foreign funds in and out of Canada is covered by the regulations of the Foreign Exchange Control Board, particularly by the definitions contained in Section 2 and the terms of Sections 3, 5, 6, 7 and 8 of the present regulations of the Foreign Exchange Control Board.

The regulations are subject to change from time to time but the following summary sets forth certain of the basic regulations and practices now in effect which may apply to American investors in Canadian share securities. For further detailed information United States residents may consult their own bank or broker or communicate with the Foreign Exchange Control Board, Ottawa, Canada.

In the regulations and control of securities transactions, a distinction is drawn by the Canadian Foreign Exchange Control regulations between transactions by residents of Canada and transactions by non-residents. The term "non-resident" includes a resident of the United States or of other countries in North and South America, exclusive of Canada and Newfoundland. Residents are subject to control in respect of all types of financial transactions. Non-residents, however, are generally subject to control only with respect to transactions with residents, in which case the governing consideration is usually the circumstances under which residents are permitted to enter into such transactions.

Non-residents may, without a permit, purchase Canadian domestic securities from residents for immediate payment of their value in either Canadian dollars or United States Dollars. Hence, an American investor who purchases shares of the registrant in the public offering and pays therefor in either Canadian or United States Dollars requires no permit to effect such purchase.

Non-residents may also, without a permit, purchase from or sell to other non-residents Canadian domestic securities either outside Canada or in Canada through the medium of a Canadian Investment dealer. A non-resident who purchases a Canadian domestic security from a non-resident seller possess the same rights with respect to dividends and distribution in liquidation as the seller. A non-resident, however, who purchases a Canadian domestic security from a non-resident seller, does not succeed to all of the rights of the seller in respect to such security. Such non-resident purchaser may resell the shares to a resident only in the circumstances described in the subsequent paragraphs under this heading of the Prospectus. Export and import licenses are granted to non-residents in all cases where it is necessary to move securities to or from Canada for the purpose of effecting change of registration.

Non-residents may sell securities in Canada to residents only in the following circumstances:

1. Where the transaction is effected through a Canadian investment dealer and the proceeds of sale are simultaneously reinvested by the non-residents in Canadian domestic securities having a maturity of not less than three years, or of not less than the maturity of the securities sold if the latter is less than 3 years, provided such securities are not issued or guaranteed by the Dominion of Canada or one of the Provincial governments.
2. Where the transaction is effected through a Canadian investment dealer and consists of the sale of Canadian domestic securities which the non-resident has previously purchased in Canada from a resident for cash. A permit is necessary but will readily be granted if the previous purchase of the securities being sold has been recorded with the Canadian Foreign Exchange Control Board.
3. Where the proceeds of the securities are being applied to reduce a debit balance with a Canadian investment dealer applicable to the particular securities sold. A permit from the Canadian Foreign Exchange Control Board is necessary but will readily be granted.

Licenses for the import of securities into Canada by residents or non-residents are granted by the Canadian Foreign Exchange Control Board where such securities are being imported in connection with transactions in Canada which are permitted by the Board.

The registrant hereby undertakes to report to the Canadian Foreign Exchange Control Board all shares sold to non-residents in the public offering and the receipt of United States funds in payment therefor. As to all shares purchased by non-residents from the registrant in the public offering, the Canadian Foreign Exchange Control Board, under subdivision 2 above, will grant to such purchaser a permit for the resale of said shares to a resident, provided that such sale is effected through a Canadian investment dealer.

Upon the obtaining of such a permit such shares may be sold in Canada and the proceeds of such sale may be exported to the non-resident. Such proceeds, however, are payable to the United States seller in Canadian Funds and can be converted into American Funds only through the unofficial open market where the Canadian dollar is at present at a discount. The Underwriter, Mark Daniels, will be acting in the capacity of Principal in the sale of the shares covered by this registration. It is the present intention of the registrant and its underwriter that the sale of the securities will be executed in the following mechanical operation: The underwriter shall remit the net proceeds of all sales, less the 25% commission, directly to the registrant or to the registrant's bank for the account of the registrant. The registrant will then deliver the appropriate certificates, registered in the name of the individual purchasers. All such transactions will be recorded with the Foreign Exchange Control Board to enable the purchaser to obtain the full advantage of the appropriate regulations of the control Board, particularly with reference to the subdivision 2 set forth above.

As to shares purchased by non-residents other than shares purchased in Canada from the registrant for cash (such shares subsequently purchased from an American investor) it should be noted that the regulations do not permit the resale of such securities to residents of Canada except in the circumstances set forth in subdivisions 1, 2 and 3 above. Where the shares held by a non-resident have not previously been purchased in Canada from a resident for cash, they may be resold to a resident only through a Canadian investment dealer and only if the proceeds are simultaneously re-invested by the non-resident in a Canadian domestic security of the prescribed maturity or are applied to the reduction of a debit balance with a Canadian investment dealer applicable to the particular shares sold.

In other words, the regulations do not permit the export from Canada of the proceeds of the sales of shares by a non-resident to a resident unless such shares were previously purchased by such non-resident in Canada for cash.

Canadian stockbrokers, investment dealers, banks and other financial institutions are conversant with the requirements of the Canadian Foreign Exchange Control Board and will make applications for any necessary permits or licenses on behalf of their clients.

The present general policy of the Canadian Foreign Exchange Control Board will permit the export to American investors of distributions in liquidation by a corporation like the registrant.

Any dividend payable to United States residents, under present Canadian regulations, will be subject to a 15% tax deduction.

The issued stock will be registered with the Canadian Foreign Exchange Control Board on a new investment so as to facilitate the return of the American dollars to American investors who may desire to liquidate their holdings.

Upon each declaration of dividends by the registrant it will be necessary for the registrant to apply to the Canadian Foreign Exchange Control Board for a permit to pay dividends to shareholders who are non-residents of Canada. It is the registrant's intention and it undertakes to make such application for a permit each time a dividend is declared. Such dividends may be transferred to United States shareholders at the official rate.

If at any time the underwriter should decide to make any appointment of sub-dealers or agents, who would be underwriters within the meaning of the Securities Act, in connection with the distribution of the securities being registered, the registrant will file a post-effective amendment to the registration statement and the prospectus, furnishing the required information and exhibit material with respect to such persons and the revised method of the offering. Under no circumstances will any offering be made by any such person until the post-effective amendment shall become effective. Likewise, the registrant, if any sub-dealers or agents should be appointed, will by a post-effective amendment amend this particular heading of the prospectus to cover any possible effect of such appointment on the rights of the American investors under the regulations of the Canadian Control Board.

FINANCIAL STATEMENT

As of December 31st, 1948

STATEMENT OF ASSETS AND CAPITALIZED EXPENSES

Current Assets:

Cash on hand and bank balances	\$ 1,959.27
Accounts receivable	347.58
Unemployment Insurance Stamps (on hand)	5.68
Toronto Hydro Deposit (refunded)	24.00
Securities (at current market value)	1,000.00
(\$1,000 Dominion of Canada Bond deposited with Ontario Securities Commission.)	
Total Current Assets	\$ 3,336.53

Other Assets and Capitalized Expenses:

Materials and supplies on hand	4,284.58
(As valued by Company Officials)	
Mining Properties —	
Cash Consideration	16,450.00
Other Consideration	1,045,000 shares
Expenses in Claim stakings	850.00
Plant and Equipment at cost	1,531.59
Other consideration	17,000 shares
Buildings	20,000 shares
Lumber	10,000 shares
Exploration and Development cost	80,665.79
Head Office and Administrative Costs	30,031.81
Deferred charges	57.20
Furniture and Fixtures (Head Office)	490.22
Organization expenses	3,614.44
Total Assets	\$141,312.16

NOTE: Of the cash and share consideration paid for mining properties, as shown above, the promoters of the Company received \$15,000.00 in cash and 1,000,000 shares. Details of the transaction are set forth in the registrant Company's Prospectus and in Item 9 of the Registration Statement filed with the Securities and Exchange Commission, Washington, D.C.

Under the terms of the option agreement covering the shares to be offered under the within registration statement, Mark Daniels, the Optionee, shall not be obliged to take up all or any of the said options as set forth herein at any one time, but may take up and pay for lots of 5,000 shares or more at any time during the currency of such option.

If Mark Daniels fails to exercise the said option or any of them on or before the dates specified in the option, neither the options or the rights of the optionee thereunder shall terminate until fifteen days after the registrant Company has given Mark Daniels notice of its intentions to terminate this agreement insofar as the options remaining unexercised are concerned; provided that, if Mark Daniels, within the said fifteen day period, exercises the option or options in respect to which he is in default, the terms of the agreement shall continue in full force and effect in respect to the remaining unexercised option, otherwise, this agreement shall terminate, with the right on the part of the registrant Company to sell or otherwise dispose of the shares not taken up under the said agreement; and in the event of such termination no liability or obligation shall rest upon the registrant company under this agreement.

The registrant company has further agreed to give the Underwriter, Mark Daniels & Company, first refusal on any further financing of the Company.

STATUTORY INFORMATION

The registrant Company has an authorized capital of 3,000,000 shares without nominal or par value.

The Company's shares have no par value but a stated value is determined by the price per share which the Company receive for its shares. In the case of this offering the Company receives 75 cents per share which constitutes the stated value of the shares being offered. As and when additional treasury shares are subsequently sold they will assume a stated value of the price at which the Company receives payment for such shares.

1,344,947 shares are outstanding, of which 1,092,000 shares were issued in the acquisition of the Company's properties and equipment. Of these, 1,075,000 shares are deposited in escrow with the National Trust Company Limited, Toronto, Canada, under the terms of a pooling agreement, subject, however, to the release of the final 710,650 shares by the Ontario Securities Commission and the Directors of the registrant Company. While no specific date for release of these shares or definite period of escrow has been set, it is the policy of the Ontario Securities Commission not to permit any release of vendor's shares from escrow until such time as their release can have no detrimental effect on the financing of the Company's treasury. None of the shares so escrowed have been released or are intended to be released insofar as the proposed offering is concerned.

All of the shares now outstanding are fully paid and non-assessable and the shares comprising the within offering will, upon payment of the offering price, be issued fully paid and non-assessable to the purchasers thereof.

All of the registrant Company's shares are of one common class and enjoy common and equal rights in voting, dividend and liquidation, but are not redeemable and have no preemptive rights. The Company's By-laws provide in effect.

1. that the annual meeting of shareholders of the Company shall be held at the Head Office of the Company during the months of September in each year or at such other time and place in the Province of Ontario as the Directors may decide;
2. that no public notice or advertisement of shareholder's meeting is required and a notice placed in the mails 10 days prior to the date of meeting is deemed proper notice;
3. that the Board of Directors is not required to mail annual reports to shareholders prior to any meeting or at any other time.

Under the existing by-laws of the Company, the Board of Directors is permitted, without first obtaining the consent of shareholders, to hypothecate or pledge any part or all of the assets of the registrant Company as security for borrowed money for the purpose of the Company. However, the Company may not sell or dispose of the undertaking or property of the company, or any part thereof as an entirety, without a vote of the shareholders present or represented by proxy at a general meeting duly called for consideration of the matter and holding not less than two-thirds of the issued capital stock being first obtained.

The Company may authorize additional stock for the acquisition of the property or other purposes by a vote of two-thirds of the stock present at a meeting of stockholders where a quorum consists of not less than three stockholders each owning only one share.

William Roy Willard, Barrister, Solicitor, etc., with offices at 155 Roncesvalles Avenue, Toronto, Canada, Counsel for the Company has passed on the legality of the securities being registered.

PROMOTION OF COMPANY AND PROPERTY PURCHASE

William Roy Willard, Director and President of the registrant company, Roy Langford Saunby, Director and Vice-President of the registrant company, and Fred Birkenhead, Director and Secretary-Treasurer of the registrant company, operating as a private syndicate under the name of Lands & Mines Development Syndicate, transferred to the registrant Company under Agreement dated September 16, 1946, certain four (4) parcels of land which now comprise the registrant company's main properties. In consideration of the transfer the registrant company paid the said Syndicate the sum of Fifteen Thousand (\$15,000.00) Dollars in cash and allotted and issued to the aforementioned One Million (1,000,000) fully paid and non-assessable shares of its capital stock. The cost of the property to Lands and Mines Development Syndicate amounted to Seven Thousand (\$7,000.00) Dollars which, the syndicate paid to the original owners when it purchased the property in August 1943. In addition to this original cost the Syndicate expended over Twenty-eight Thousand (\$28,000.00) Dollars on the property from 1943 to 1946 in prospecting exploration, engineering expense and cost of sundry equipment.

Horace George Pitt, Director and Vice-President of the registrant, in his professional capacity and experience in practical mining and geology, was employed by Lands & Mines Development Syndicate and upon organization of the registrant Company, Messrs. Willard, Saunby and Birkenhead allotted and issued to Pitt 150,604 shares of the registrant (owned by them) in consideration of his services and assistance. Mr. Pitt has been active in the organization of Lead-Ura Mines Limited incorporated in Ontario about July 1948 but has not been connected in the promotion of any other Company. Subsequent to incorporation some preliminary development work was carried on by Lead-Ura Mines Limited but operations are now suspended pending completion of further financing.

Mr. Pitt for the past three years has been engaged in practical mining and prospecting work prior to which he was employed in the Engineering Branch of the United States Army. Previous to the recent war he was several years engaged in mining development and exploration work.

By resolution of the Board of Directors, 50,000 shares of the registrant Company's capital stock was allotted and issued to Arnold Pitt, 712 Scarlett Road, Toronto, Canada, in consideration of his transfer to the Company of six (6) mining claims (Nos. E.O. 3822 to E.O. 3827 inclusive) and in further consideration for his advice and assistance in his professional capacity of Physicist Chemist, relative to radio-active minerals and other complex chemical problems.

Under agreement dated September 26, 1946, one J. C. Mangan, Wilberforce, Ontario, Canada, sold, assigned and transferred to the registrant full and complete mining and mineral rights on thirty-three parcels of land as described in Page 4 herein, in consideration of which the Registrant Company paid to the said J. C. Mangan the sum of Fourteen Hundred and Fifty Dollars (\$1,450.00) in cash and allotted and issued to him Forty Thousand (40,000) shares of its capital stock.

By further resolution of the Board of Directors an additional Two Thousand (2,000) shares were allotted and issued to the said J. C. Mangan in lieu of cash for the purchase of one diamond drill and accessories, and the transfer of mine mining claims to the company which are in those detailed herein under "Properties."

The aggregate total of the shares issued for property and equipment as aforesaid amounts to 1,092,000 shares, of which 1,075,000 shares are deposited in escrow under agreement with the National Trust Company, Toronto, Canada. Of the escrowed shares 710,650 shares are held subject to the release only on authority of Ontario Securities Commission. The balance of the escrowed shares may be assigned or sold in "escrow" subject to the conditions of the said agreement, but remain in the custody of the said National Trust Company.

A total of 17,000 shares only have been released free of escrow in the following persons aforementioned:

To:	Horace George Pitt	5,000 shares
	J. C. Mangan	10,000 shares
	J. C. Mangan	2,000 shares

None of the shares so escrowed have been released or are intended to be released insofar as the proposed offering is concerned.

Roy Langford Saunby, Director and Vice-President of the registrant company, as Managing Director, is on a fixed salary of \$10,000 per annum, which was passed by resolution of the Board of Directors on October 21, 1946. Since the incorporation of the Company he has been paid the sum of \$22,104.75 as at December 31, 1948.

Horace George Pitt, Director and Vice-President of the registrant Company was on a salary of \$150.00 per week from the incorporation of the Company until January 18, 1948 during which time he received a total of \$10,650.00. As at the aforesaid date his salary was discontinued, and no reinstatement in respect to such salary is contemplated or proposed.

With the above exceptions no salaries or other remuneration whatsoever has been received, directly or indirectly, from the registrant Company by any promoter, officer or director of the registrant company, or by any other person having a material relationship with the registrant company, nor is such salary or remuneration contemplated or intended.

Messrs. W. R. Willard, R. L. Saunby, and Fred Birkenhead, President, Vice-President and Secretary, respectively, of the registrant company have had no mining experience prior to their operation of the registrant company and its predecessor Lands and Mines Development Syndicate and none of them has promoted or assisted in the promotion of any mining companies heretofore.

The following profit has accrued to the undernoted officers and Directors through the sale of Treasury Shares:

R. L. Saunby	\$19,993.00
W. R. Willard	2,007.00
Fred Birkenhead	6,141.00
H. G. Pitt	5,746.00

PRINCIPAL SHAREHOLDERS

As of December 31, 1948

COL. A. Name and Address	COL. B. Title of Class	COL. C. Securities owned both of record & beneficially		COL. D. Securities Owned of record but not owned beneficially		COL. E. Securities owned benefi- cially but not owned of record	
		Amount	Percent	Amount	Percent	Amount	Percent
Fred Birkenhead	Common	294,303	21.9	Nil	....	Nil	....
458 Ossington Ave., Toronto, Canada.							
F. W. Birkenhead	Common	51	.003	Nil	....	Nil	....
458 Ossington Ave., Toronto, Canada.							
John C. Mangan	Common	33,900	2.5	Nil	....	Nil	....
Wilberforce, Ontario, Canada.							
Arnold Pitt	Common	50,001	3.7	Nil	....	Nil	....
710 Scarlett Rd., Toronto, Canada.							
Roy Langford Saunby	Common	286,133	21.2	Nil	....	Nil	....
10 Humber Blvd., Toronto, Canada.							
William Roy Willard	Common	283,133	21.	Nil	....	Nil	....
155 Roncesvalles Ave., Toronto, Canada.							
Horace George Pitt	Common	109,607	8.1	Nil	....	Nil	....
Wilberforce, Ontario, Canada.							
Mark Daniels	Common	Nil	....	Nil	....	Nil	....
14 Crestview Rd., Toronto, Canada.							
Dr. Wm. A. Klann	Common	23,000	1.7	Nil	....	12,000	.89
136 South St., Wellington, Ohio.							
Sidney G. Davies	Common	Nil	....	Nil	....	2,500	.17
129 Marion St., Toronto, Canada.							

FISSION MINES LIMITED

(NO PERSONAL LIABILITY)

STATEMENT OF LIABILITIES

As of December 31st, 1948

Current Liabilities:

Accounts Payable	\$	280.19
Income Tax Deductions		200.50
Amounts due to promoters and others:		
H. C. Pitt (Vice-President) — Sundry expenses		180.09
Total Current Liabilities	\$	660.78

Other Liabilities:

Amounts due (not current) to promoters and others:		
W. R. Willard (President) — Cash loan	\$	7,675.00
Accrued interest		364.45
R. L. Saunby (Vice-President) — Cash loan		7,425.00
Accrued interest		354.69
F. Birkenhead (Secretary-Treasurer) — Cash loan		1,000.00
Accrued interest		33.02
Total Liabilities	\$	17,512.94

STATEMENT OF CAPITAL SHARES

As of January 31st, 1949

(a)	(1) Authorized (common)		3,000,000 shares
	(2) Issued		1,344,947 shares
	(3) Re-acquired		Nil
	(4) Outstanding:		
	Free	269,947	
	Escrowed	1,075,000	
		1,344,947	1,344,947 shares
	(5) Reserved for option		200,000 shares
(b)	(1) Issued for Cash		252,947 shares
	(Net proceeds to registrant — \$135,554.00.)		
	(2) Issued for service		Nil
	(3) Issued for mining properties		1,045,000 shares
	(4) Issued for plant and equipment		47,000 shares
(c)	There are no shares subscribed for but unissued.		
(d)	The shares are non-assessable.		
(e)	No shares have been issued subject to liability of further call.		
(f)	No shares have been forfeited for any reason.		
(g)	No discounts or commissions have been incurred in the issuance of capital shares.		

Statement of Securities

The registrant Company has no securities other than the shares described herein.

FISSION MINES LIMITED

(NO PERSONAL LIABILITY)

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

As of February 29th, 1948

(For period September 6, 1946, to end of first fiscal year as above)

RECEIPTS

Sale of securities	\$101,070.00
167,000 shares at 40 Cents per share	
12 shares at 50 Cents per share	
42,830 shares at 80 Cents per share	
Loans from Directors	16,100.00
Sundry advances from Directors	673.76
Interest on Investments	26.25
Revenue from sundry sales of Cordwood	142.25
Total Receipts	<u><u>\$118,012.26</u></u>

DISBURSEMENTS

Commissions, etc., in connection of securities sales	Nil
Legal and accounting fees	454.45
Engineer's and Geologists' fees and expenses	1,775.94
Purchase of Equipment	1,531.59
Purchase of supplies and materials	7,681.64
Salaries of Directors and Officers	19,911.20
Managing-Director	\$ 9,261.20
Mine Superintendent	10,650.00
Other Salaries and Wages	18,699.14
Surface developments costs	10,637.67
Assaying and sampling	4,268.24
Diamond-drilling	21,574.65
Sundry general expenses at property	2,316.98
Insurance, etc.	1,539.40
Licenses, Government fees and taxes	763.80
Travelling expenses	1,405.82
Transfer agent and registrar fees	617.39
Head Office rent	1,404.45
General expenses	1,224.00
Organization expenses	3,614.44
Property purchase	16,450.00
Mining claim staking costs	850.00
Total Disbursements	<u><u>\$116,720.80</u></u>
Net increase in cash during period	\$ 1,291.46
Cash and cash items balance at beginning of period	Nil
Cash and cash items balance at end of period	<u><u>\$ 1,291.46</u></u>

FISSION MINES LIMITED

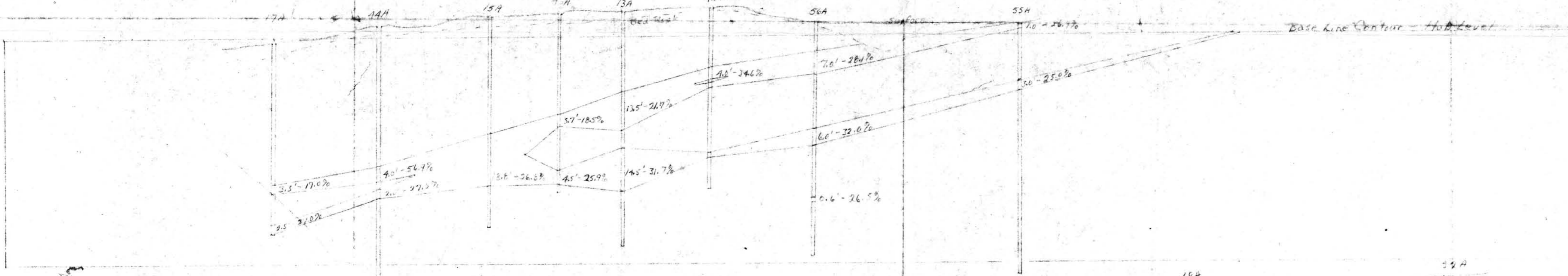
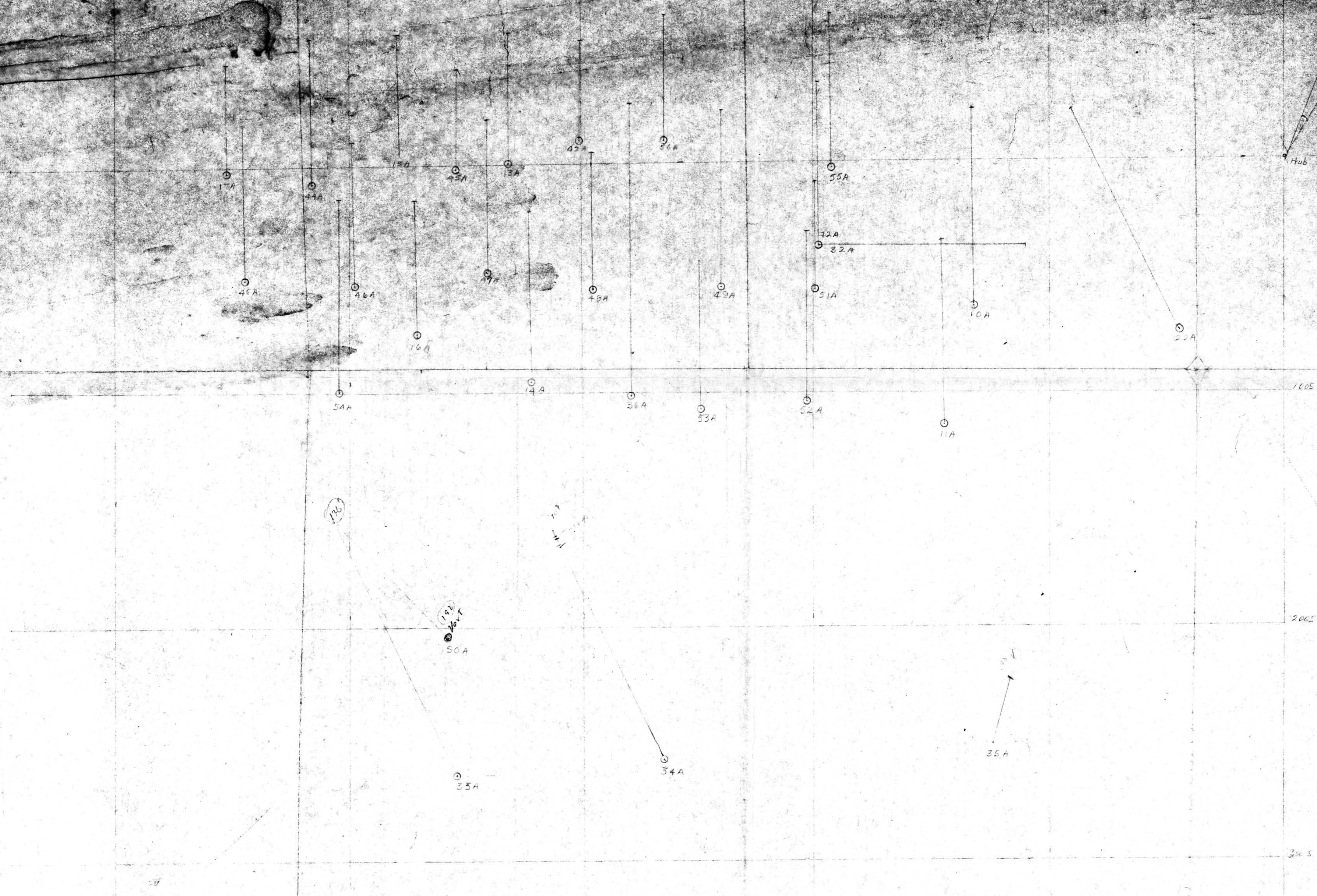
(NO PERSONAL LIABILITY)

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
For period February 29th, 1948 to January 31st, 1949**RECEIPTS**

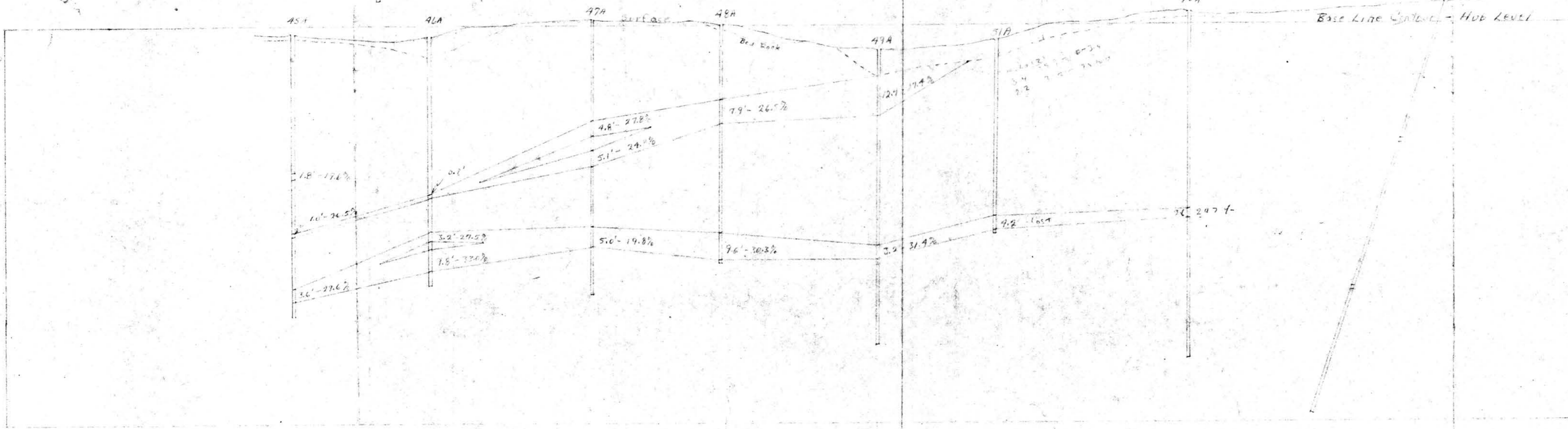
Sale of Securities	\$ 34,484.00
(43,105 shares at 80 Cents per share)	
Interest on investments	17.50
Rent Received from Head Office and Sub-tenants	800.00
Total Receipts	\$ 35,301.50

DISBURSEMENTS

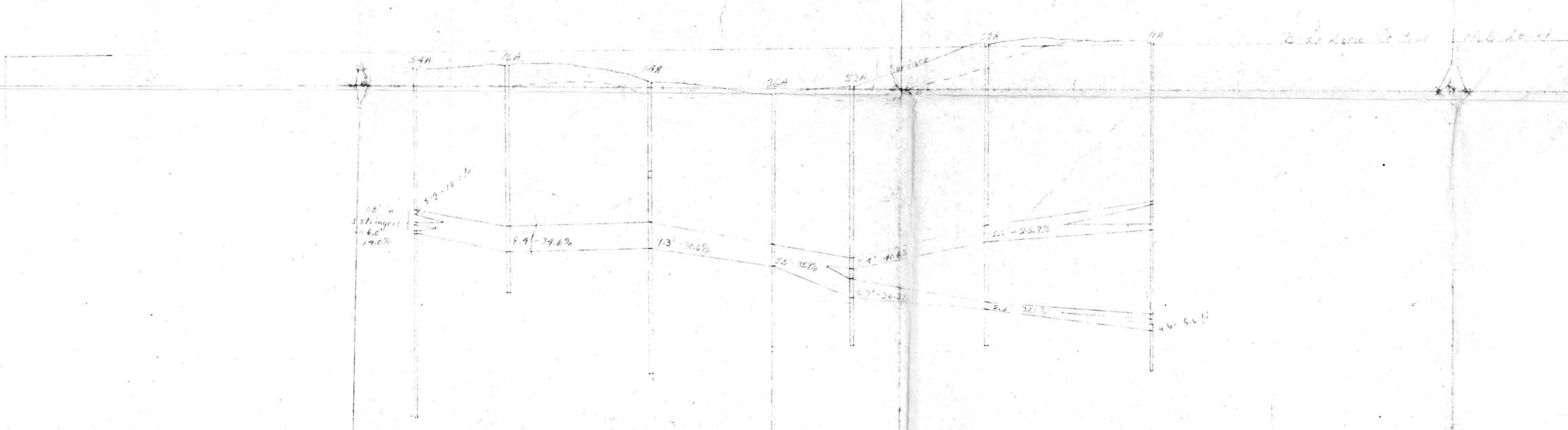
Legal and Accounting Fees	\$ 175.00
Engineers' and Geologists' fees and expenses	2,260.00
Purchase of Equipment	938.50
Purchase of supplies and material	1,028.36
Salaries of Directors and Officers:	
Managing Director	12,843.55
Other Salaries and Wages	3,029.84
Surface developments costs	7,245.36
Assaying and sampling	5.25
Sundry General expenses, etc.	412.42
Insurance, etc.	214.11
Licenses, Government Fees and taxes	2,136.43
Transfer agent and registrar fees	864.90
Head Office Rent	1,450.00
General Expenses	536.30
Repayment of Director's Advances	493.67
Total Disbursements	\$ 33,633.69
Net Increase in cash during period	\$ 1,667.81
Cash and cash items balance at beginning of period	1,291.46
Cash and cash items balance at end of period	2,959.27



PROFILE IN PLANE OF D.D. HOLES
ON OR NEAR BASE LINE



PROFILE IN PLANE OF D.D. HOLES
50' SOUTH OF BASE LINE



PROFILE IN PLANE OF D.D. HOLES
100' SOUTH OF BASE LINE

TOLLON & CO. LIMITED
 PLAN AND PROFILES OF
 DIAMOND DRILL HOLES - ZONE 3
 U.S. COMMISSION, IRL. LABEL 1749
 SCALE 1" = 25' DEPT. 1749 - 100' SOUTH

MOSEY

CON XXI



LOT 5

LOT 6

FISSION MINES LTD.

CARDIFF TWP. HALIBURTON COUNTY

Scale: 1" = 100'

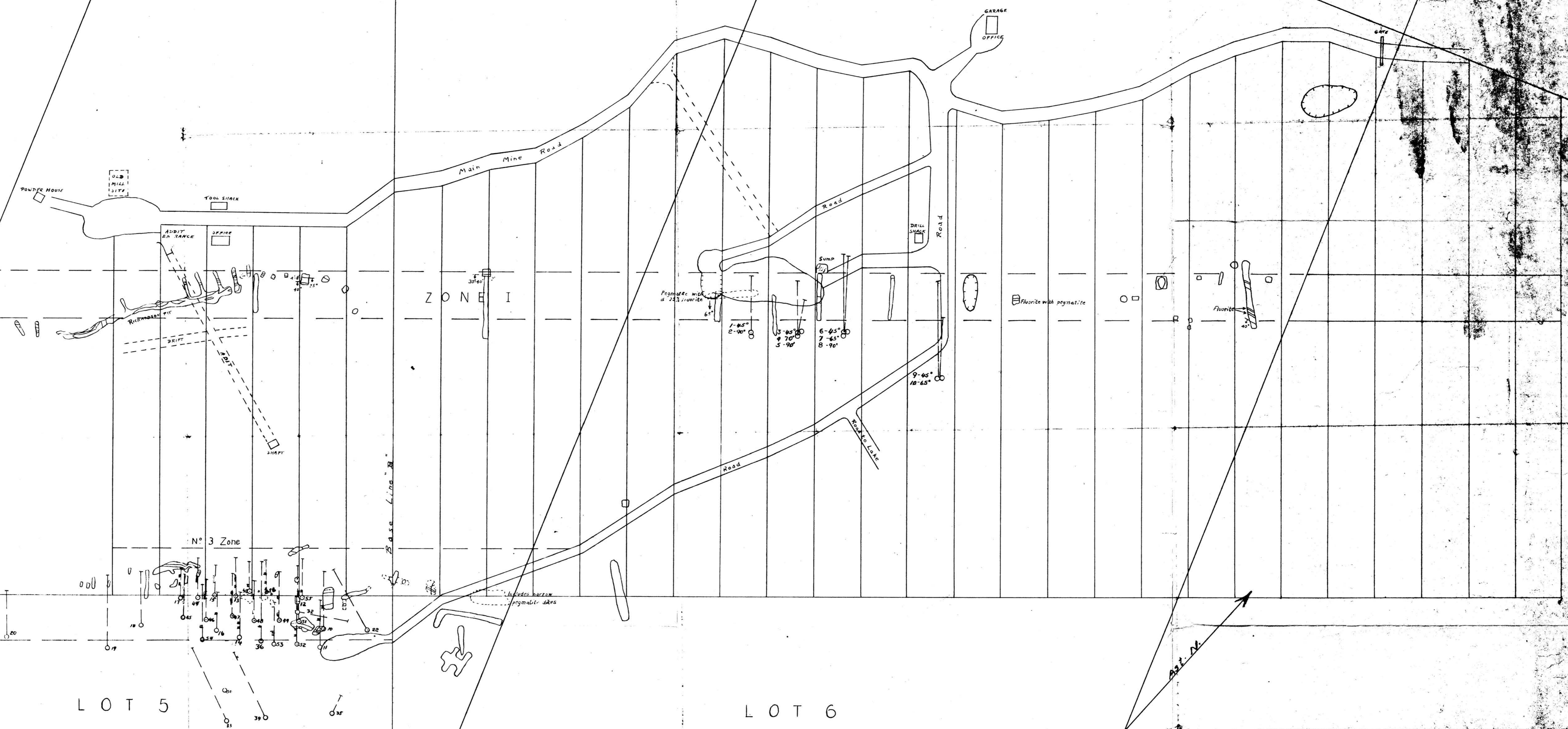
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CON XXI



FISSION MINES LTD
 Surface Plan
 CARDIFF TWP. HALIBURTON CO. ONT.

SCALE: 1" = 100'

