MAR 19690007: NORTHEASTERN ALBERTA

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PRELIMINARY REPORT

ON

QUARTZ MINERAL EXPLORATION PERMIT NO. 31

N.E. ALBERTA

PREPARED FOR:

LEDO MINES LTD.

by: [redacted]

ORHAN BAYKAL, P. Eng., P. Geol.

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INTRODUCTION:

This preliminary report on Quartz Mineral Exploration Permit No. 31, has been written for the purpose of outlining the geological setting and mineralogical possibilities of this property held by Ledo Mines Ltd.

To this end, geological data that were available on this permit and about this area in general have been carefully scrutinized. Informations pertaining mostly to uranium accumulation, particularly in the Beaverlodge Lake district, have been critically analyzed and compared with the radioactive occurences present within the present map-area. The other minerals, such as molybdemum and arsenopyrite, present within this permit have also been taken into consideration.

RECOMMENDATIONS:

The presence of radioactive occurences associated with intense faulting and mylonitization indicate that Quartz Mineral Exploration Permit No. 31, warrants a detailed field study in conjunction with an airborne radiometric survey.

If satisfactory results are obtained from the above two surveys, a systematic drilling programme may be recommended. At this present stage and prior to undertaking a more expensive exploration, a detailed field work along with some trenching and a radiometric survey of the permit area can be recommended.

The cost of the above programme is estimated to be between $10,000 and $15,000.

LOCATION AND ACCESSIBILITY:

The property is located in the Potts Lake area, N.E. Alberta. It is about 72 miles north-northeast of Fort Chipewyan, Alberta, 65 miles west-northwest of Uranium City, Saskatchewan, and 43 miles southeast of Fort Smith, N.W.T., (Figure 1).

Due to the lack of roads, the only means of access into the area is by means of aircrafts on floats during the summer and ski-equipped planes during the winter months. Planes for this purpose can be secured either from Fort Smith, N.W.T., or from Uranium City, Saskatchewan. Within the property, there are numerous lakes large enough to provide easy landing facilities (Figure 2).

PHYSIOGRAPHY:

Rolling dome shaped hills rise about 350 to 400 feet above the surrounding land which has an average elevation of 950 feet above sea level. The topography seems to follow the foliation and structural features of the

area which, in general, have a northerly trend.

The area occupied by Quartz Permit No. 31, has been heavily glaciated, is poorly drained and contains several large lakes such as Potts, Camsell and Waheback Lakes. The permit is also dotted by numerous small lakes. The lakes have a structurally controlled northerly trend which indicate that they may either occupy the erosional lows of the fault zones or may be formed by the glacial till damming of the depressions following these fault trends.

PREVIOUS ACTIVITIES IN THE AREA:

The demand for uranium has created a flurry of staking in the northeastern portion of Alberta where the setting is quite similar to that of the Beaverlodge Lake, Saskatchewan, district. However, only a limited amount of systematic exploration has been carried out in this area. A certain amount of holes have, apparently, been drilled by McIntyre - Porcupine. The result obtained from their exploratory work is not known.

Within this present permit area, no exploration has been undertaken except for the geological mapping made by the Research Council of Alberta.

PROPERTY:

Quartz Mineral Exploration Permit No. 31 contains about 36,480 acres consisting of the areas described below (Figures 1 and 2):

Quartzite - Biotite Schist:

The quartzite and biotite schist present in this area, because of their lithologic features, have been correlated with the quartzite and schist found in the Crackingstone Peninsula. Consequently, in this report, those rock units have, accordingly been considered the oldest rock types. Furthermore, since both types of rocks appear to be either interbedded or gradational with each other, they have been, in the geological map, incorporated into one unit (Figure 2).

The quartzite varies from pure to arkosic quartztie to greywacke or to banded ferruginous quartzite. The pure quartzite consist of white, fine to medium size quartz grains imbedded in a white siliceous matrix. It grades laterally and vertically into the impure varicolored quartzite. This last variety may consist of green quartzite, containing up to 10% chromium mica, of pink to grey arkosic quartzite or of greyish grewacke. This impure quartzite contains about 60 to 80 percent quartz and feldspar, 15 to 35 percent biotite and chlorite and some minor amounts of garnet, epidote and amphibole.

The ferruginous variety consist mostly of quartzite interbedded with bands of hematite and limonite which occur along the bedding planes. The impregnation of the quartzite by the iron minerals through fracture planes and/or joint planes also cause the quartzite to be ferruginous.

The biotite schist is intimately associated with the quartzite. This rock unit grades laterally and vertically into the quartzite. The biotite schist is dark grey to brown and contains layers and/or patches of

quartz and feldspar. With the biotite schist, chlorite and sericite schists are found in minor amounts.

The amphibolite is found associated with both types of rocks.

Gneissic Rocks:

The gneissic rocks underly about 50% of the map-area. This complex and very heterogeneous rock unit consists of paragneiss, and orthogneiss biotite granite gneiss, hornblende granite gneiss, paragneiss.

The most common gneissic rock is the medium-grained, pink to red to grey, biotite granite gneiss. The pink and the red varieties are the most predominent ones. This granite gneiss is composed principally of layers of granitic materials such as feldspar and quartz alternating with dark brown to black mafic bands giving to the rock the banded gneissic appearance. Within it bands or lenses of other types of rocks, such as metasedimentary rocks, amphibolite, biotite granite gneiss and hornblende granite gneiss, are also present. Gradations are common between the above types of rocks.

The hornblende granite gneiss occurs as small bodies within the biotite granite gneiss and the paragneiss. This rock unit consists of granitic materials composed of white to pink feldspar and quartz banded with layers of hornblende and biotite whose crystals are aligned in the direction of the foliation and/or gneissosity. The alternating mafic layers are ½ to 2 inches thick and are composed of dark green minerals consisting principally of hornblende and biotite. The intervening

granitic layers are medium-grained and have a granoblastic texture.

The metasedimentary gneissic rocks consist of orthogneiss and paragneiss. In many instances, it is hard to differentiate between the types.

The paragneiss found in this area has not been fully described. East of the map area, in Saskatchewan, the paragneiss consists of quartz, microcline and albite or of albite, microcline and quartz with biotite and hornblende. The rock is well banded by layers of mafic minerals. The lighter colored and the mafic rocks have a tendency of grading into each other along the strike. Similarly, both the acid and basic paragneiss (orthogneiss?) also grades, along the strike, from one phase into the other.

Granite:

The granitic rocks are in general younger than the previously described rock units. Large granite bodies are found mostly west of the subject permit. Within the area of interest, the granite, which consists of biotite and leucocratic granite, occurs as small bodies in relatively isolated areas.

The biotite granite is reddish to pink, medium-grained and contains red to pink to white feldspar, quartz and biotite. Locally it contains also muscovite and hornblende. This granite grades into the megacrystic and leucocratic granite.

The megacrystic granite contains quartz, potash and plagioclase

feldspar almost in equal amount and about 8 percent biotite. The feldspar red to pink to white in color, forms large megcrystic crystals which vary in size from ¼ inch to ½ inch. The above crystals are imbedded in a medium-grained, massive to foliated matrix.

The leucocratic granite occurs as small bodies in the south-eastern portion of the permit area. It consists of medium to coarse-grained, red to pink, generally massive granite. The quartz and feldspar crystals are about of equal size and the content of mafic minerals is about 3 percent. The contact of the leucogranite with the enclosing rocks, either within this map-area or in Saskatchewan, is sharp and well defined. This granite is thought to be formed by metasomatism. It occurs generally in massive form which may either be cut or may contain patches of metasedimentary rocks, granite gneiss and amphibolite.

Amphibolite:

The amphibolite, mostly blackish to dark green in color, is associated with all of the above described rock units. It occurs either as sill-like bands or as 10 to 30 feet wide lenses. It may be either massive or gneissic.

The amphibolite may be either of sedimentary or igneous origin. The origin is often hard to detect unless lateral and/or vertical grading into sedimentary rocks take place. The amphibolite of sedimentary origin usually contains quartz grains and as the amount of quartz increase the amphibolite grades into quartzite. On the other hand, the amphibolite of intrusive origin occurs either in sill-like form or cut across the bedding planes of the original sedimentary rocks.

The major constituents of the amphibolite are hornblende and feldspar. Biotite chlorite, epidote and quartz are also found in minor amounts. The crystal size varies from fine to coarse.

Mylonitization:

Katamorphism has been very prevalent within the subject permit. This dynamic metamorphism, due to faulting, has created intense mylonitization. The mylonitized zones, as it is in the western boundary of the permit area may be as much as a mile wide. However, in most cases, the average width varies from 1/3 to 1/2 mile.

The mylonite, depending on the type of rock in which it occurs, varies in color from green to black, to pink, to red. The hornblende cataclastic rock is green and gneissic and the matrix is fine grained.

The mylonite of the gneissic rocks is pink to red and foliated.

Quartz Veins:

Quartz veins do not occur frequently within the map-area. A thin milky quartz vein is reported to occur in Sec. 4, Twp. 124, Rge. 2 W4.

STRUCTURAL GEOLOGY:

The permit area has been very highly folded and faulted. The trend of the major faults appear to be north-south. Consequently, the alignment of the mylonitized zones and topographical features follows the same direction.

Three major faults, running N-S, are present within the area of interest. The most westerly fault, fault F-1, extends from Sec. 18, Twp. 123, Rge. 3 W4 to Sec. 31, Twp. 124, Rge 3 W4. The presence of this fault has been postulated on the basis of the intense mylonitization that has taken place in this area and by the north-south trend of the mylonitized zone.

The second major fault, F-2, is at least 16 miles long and extends from south of Potts Lake (Sec. 5, Twp. 123, Rge. 3 W4) to Ashton Lake (Sec. 24, Twp. 125, Rge. 3 W4).

The third major fault, F-3, is located in the eastern portion of the map-area and has about the same magnitude as F-2 and extends from Sec. 9, Twp. 123, Rge. 2 W4, to Sec. 20, Twp. 125, Rge. 2 W4.

The major faults are associated mostly with highly mylonitized and brecciated zones. Physiographically, the presence of the faults can also be inferred by the presence of pronounced gullies and depressions located along the strike of the fault zone. This trend, in many cases, can be easily followed.

Associated with the major faults, are the cross-fractures and minor faults which have been formed by the differential displacement of the faulted blocks along the major faults. The cross-faults extend diagonally across from one major fault to another and have, approximately, a southwest-northeast trend. The strike of the minor faults, such as the faulting seen south of Whalebalck Lake, are generally haphazard. They may have been caused either by the major faults or the cross-faults.

The relative movement of the faulted blocks located on each side of the faults and along the major or cross-faults could not be ascertained. However, in Saskatchewan, most of the faults are normal faults having generally a northeast strike and a steep southeast dip. The block east of the fault had a relative downward movement with respect to the block located west of the fault. The same type of movement may possibly take place in this area.

ECONOMIC GEOLOGY:

Different type of minerals, such as uranium, molybdemum and arsenopyrite have been reported to occur within the map-area. Considering this district as a whole, uranium may be the most potential mineral.

Several radioactive areas occur, either within the permit area or within the immediate vicinity of it. The radioactive areas found within the permit area are located in Sec. 21, and 33, Twp. 123, Rge. 3 W4, and Sec. 18 and 31, Twp. 124, Rge. 3 W4 and the others are found within the SW¼ and NE¼, Sec. 28, Twp. 123, Rge. 2 W4. The radioactivities in Sec. 33, Twp. 123, Rge. 3 W4, and Sec. 18 and 31, Twp. 124, Rge. 3 W4 were within the quartzite, the others were found to occur within the gneissic rocks.

The setting, the strength north of the level of radioactivity of the above radioactive areas have been defined. The radioactivity may be due to the presence of uranium along a fault plane or within a pegmatite intrusion. Consequently, a proper interpretation of the shows will be hard to make without a detailed field analysis.

According to the geological map (Figure 2) the shows located in Sec. 31, Twp. 124, Rge. 3 W4, appear to be related to fault F-1. With the data at hand and as stated above, the other radioactive areas can not be spatially related to any fault pattern.

East of the map-area, in the Beaverlodge Lake district, the presence of uranium or radioactive areas and the accumulation of uranium ores have been related to the following set of conditions:

1. A development of suitable voids to contain and act as a receptacle for the incoming mineralized hydrothermal solution. This is accomplished by the development of brecciation and open fracturing. Brecciation and related features are best developed either at the intersection of the major faults or along subsidiary fractures and foldings related to the major faults. The open fractures are caused by the relative movements of the blocks on each side of the major faults.

2. Intense granitization and high content of mafic minerals in the invaded zones.

3. The ability of the hydrothermal solutions to migrate and circulate along fracture zones, giving rise to a concentration of uranium minerals in features outlined above. The hydrothermal invasion commonly causes also deposition of red hematite along with calcite and feldspar.

Within the permit area, many of the above requirements seem to be present. However, they have to be qualified in order to properly interpret

and estimate the potentiallity of the area. The faulting and the type of fracturing (tight and open) has to be studied in the field to adequately define the possibilities of the radioactive areas found within the subject permit. In conjunction with the field study, some trenching and an airborne radiometric survey, which may precede the field work, may prove to be advantageous.

The other type of minerals found within the subject permit are molybdemun and arsepnopyrite.

One molybdenum show has been found within the permit and this occurence is located in the SW¼, Sec. 29, Twp. 123, Rge. 3 W4. The arsenopyrite, located in Sec. 21, Twp. 123, Rge. 3 W4, consists of a 3 foot wide massive concentration of the mineral within a siliceous, chloritic metasedimentary band.

The presence of several pronounced gossans has also been reported to occur within the metasedimentary rocks in the vicinity of Potts and Boudin Lakes.

SUMMARY:

The area covered by the Quartz Mineral Exploration Permit No. 31 has been studied geologically and in terms of its mineralogical possibilities.

Several radioactive areas occur within the permit. The conditions that have been responsible for the accumulation of uranium ore has been outlined for the purpose of assessing the geological and structural setting

and estimate the potentiallity of the area. The faulting and the type of fracturing (tight or open) has to be studied in the field to adequately define the possibilities of the radioactive areas found within the subject permit. In conjunction with the field study, some trenching and an airborne radiometric survey, whichmmay precede the field work, may prove to be advantageous.

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The area covered by the Quartz Mineral Exploration Permit No. 31 has been studied geologically and in terms of its mineralogical possibilities.

Several radioactive areas occur within the permit. The conditions that have been responsible for the accumulation of uranium ore has been outlined for the purpose of assessing the geological and structural setting

of the area. Consequently, it has been stated that the extensive faulting, fracturing, mylonitization and brecciation present within this area along with the radioactive occurences indicate that Permit No. 31 has several of the requirements that are responsible for the concentration of uranium ore. However, a field study associated with some trenching and an airborne radiometric survey should be carried out in order to adequately interpret this area and define its possibilities.

Upon satisfactory completion of the above programme, further recommendations can be made with respect to future exploratory work that needs to be undertaken in this area.

[redacted]

February, 1969

ORHAN BAYKAL, P. Eng., P. Geol.

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I, Orhan Baykal of [redacted], Calgary, Alberta, certify that I am a graduate of Michigan Technological University holding a B. Sc. degree in Mining Engineering, and a graduate of the University of Michigan holding a M. Sc. degree in Geology.

I am a registered member of the Association of Professional Engineers of Alberta holding Professional Engineer and Professional Geologist certificates and a non-resident registered member of the Association of Professional Engineers of the Province of British Columbia.

I have no interest direct or otherwise in this property nor do I expect to receive any such interest.

My report on this property is based on my knowledge of this district in general and on the studies and interpretation of available geological publications.

[redacted]

ORHAN BAYKAL, P. Eng., P. Geol.

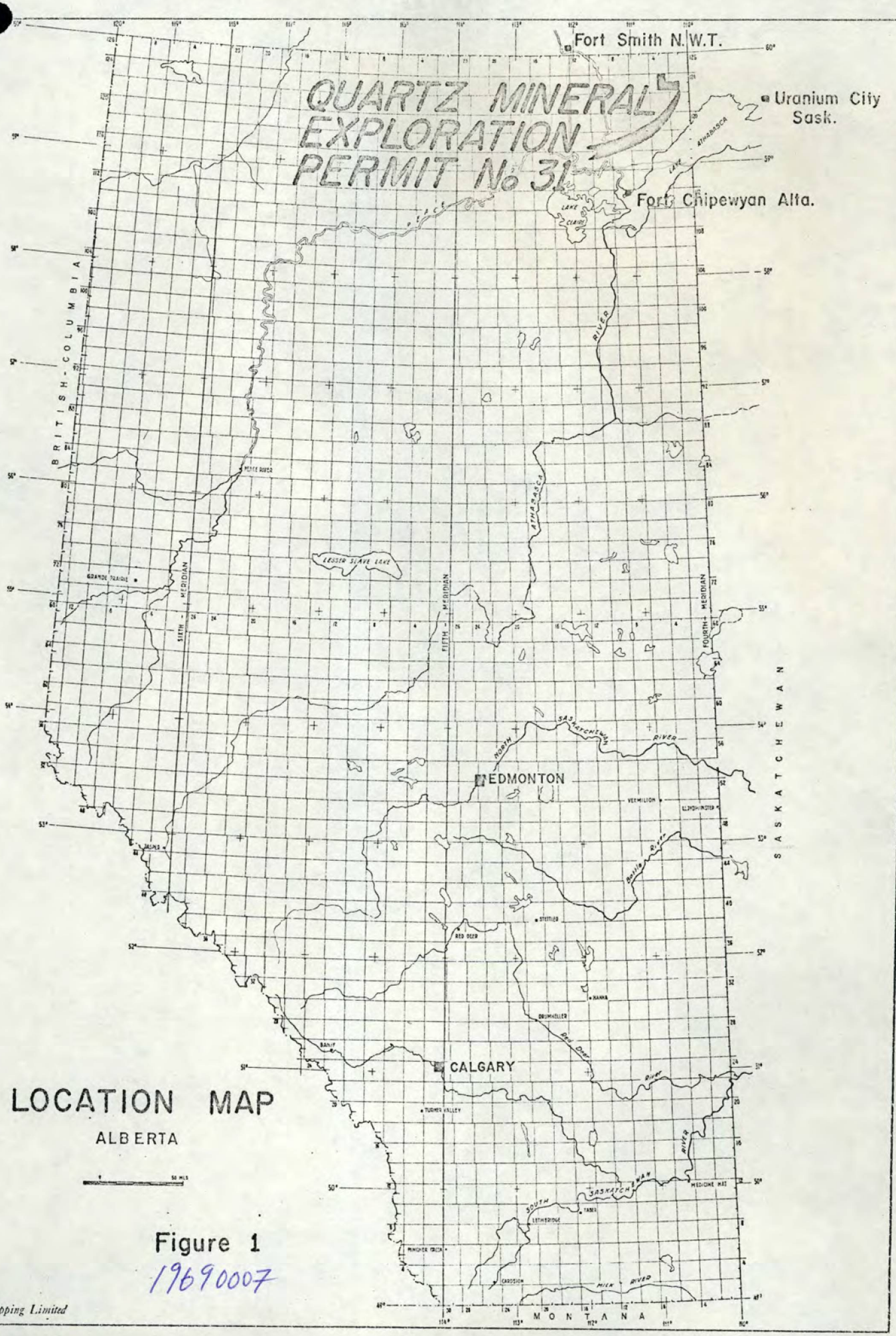

Figure 1

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Carter Mapping Limited

QUARTZ MINERAL EXPLORATION PERMIT No. 31

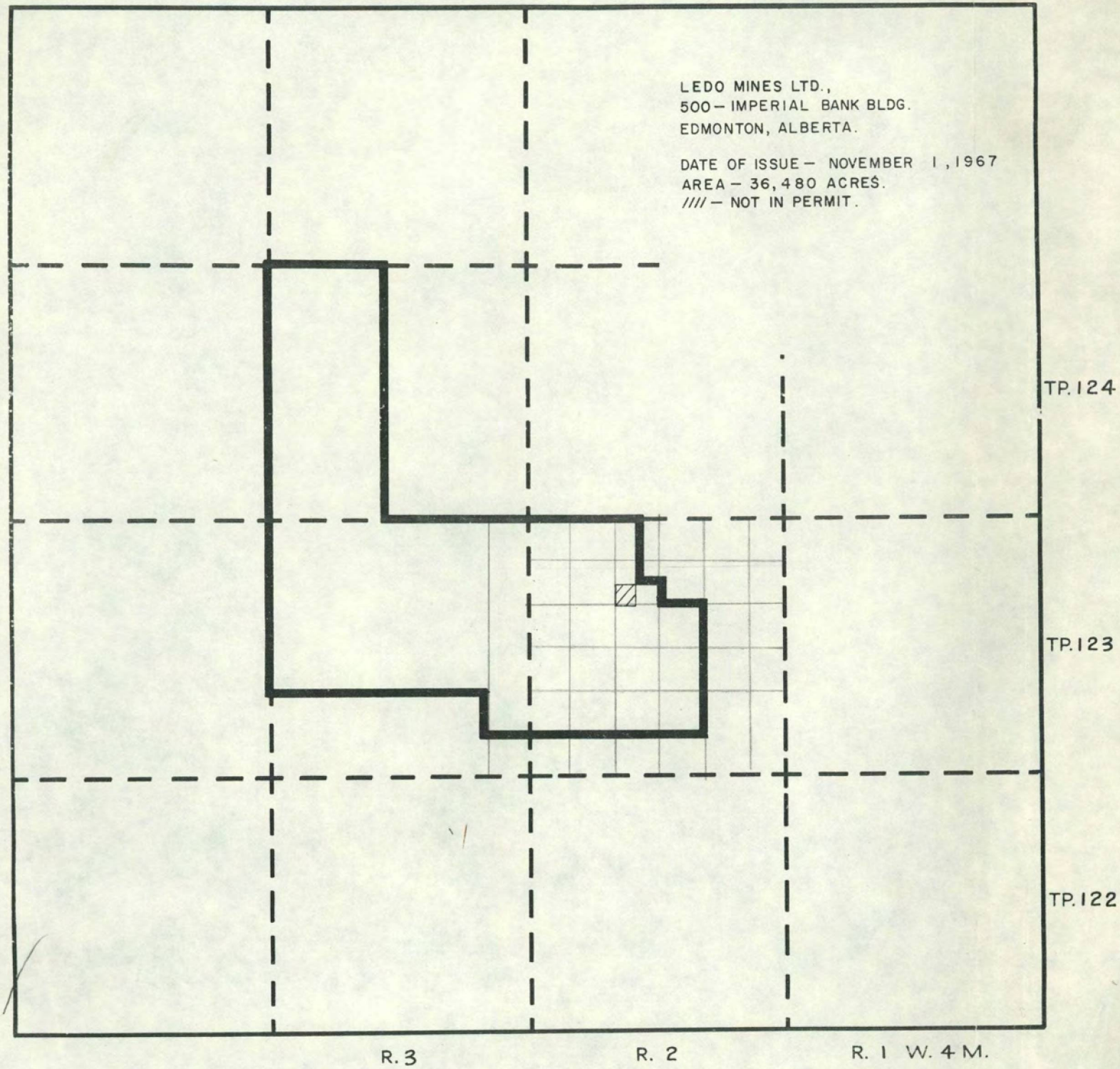

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Figure 2

GENERALIZED GEOLOGICAL MAP
OF
QUARTZ EXPLORATION PERMIT #31
N.E. Alberta
BY
ORHAN BAYKAL P.Geol. P.Eng. DATE:- FEB. 1969

Scale :- 2 Inches = 1 Mile

LEGEND

PROTROREZOIC

- Q.V. — Quartz Vein
- Granite : Biotite granite, megacrystic biotite granite, leucogranite, mylonite, amphibolite
- TAZIN GROUP EQUIVALENT
- Gneissic rocks; Biotite and hornblende granite gneisses, paragneiss, orthogneiss, mylonite, amphibolite
- Quartzite : Biotite shist, mylonite, amphibolite
- C.A. — Covered Area
- Mylonitized Area

Geological Boundary
Defined, Approximate

Schistosity
Defined, dip known, dip vertical, assumed

Fault
Defined, approximate, assumed.

Mineral Occurence :-
- Radioactive R
- Molydenite Mo
- Arsenopyrite Asp

Boundary of Land

Geology After J.D. Godfrey.

Figure 2

Twp. 124

Twp. 123

CHARLES LAKE
POTTS LAKE
POTTS LAKE
LAKE
Camsell Lake
Whaleback Lake
ST. Agnes Lake
Ells Lake
Alexander Lake

Rge. 3
Rge. 2 W4M