# MAR 19690047: NORTHEASTERN ALBERTA

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# REPORT ON QUARTZ MINERAL PERMIT 139,

# IN THE PROVINCE OF ALBERTA

for

SLEK INVESTMENTS

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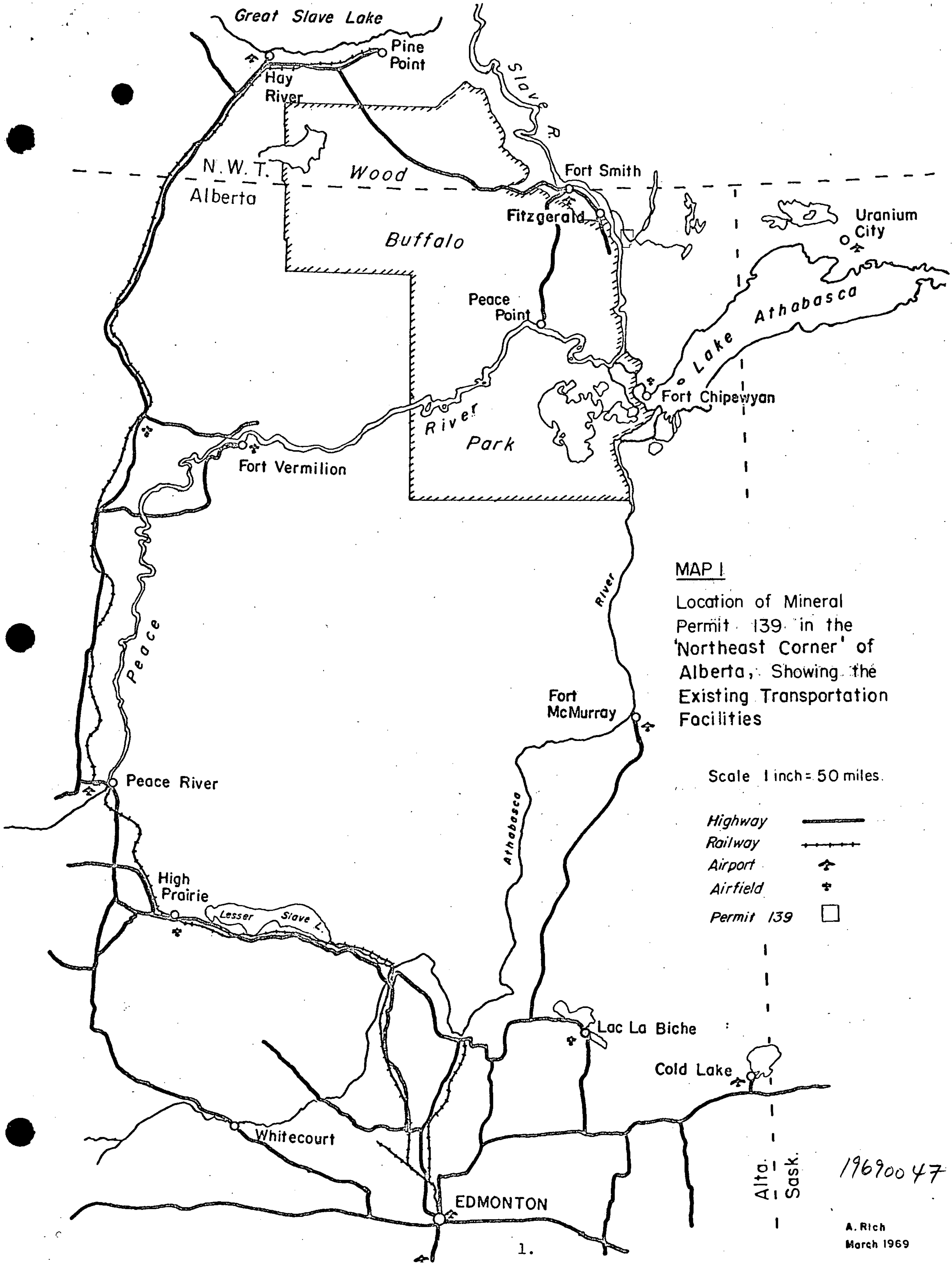

Great Slave Lake
Pine Point
Hay River
Slave R.
Fort Smith
N.W.T.
Alberta
Wood
Buffalo
River
Park
Fitzgerald
Uranium City
Lake Athabasca
Peace Point
Fort Chipewyan
Fort Vermilion
Peace
River
Fort McMurray
Athabasca
Peace River
High Prairie
Lesser Slave L.
Lac La Biche
Cold Lake
Whitecourt
EDMONTON
Alta.
Sask.
MAP I
Location of Mineral Permit 139 in the 'Northeast Corner' of Alberta, Showing the Existing Transportation Facilities
Scale 1 inch = 50 miles.
Highway
Railway
Airport
Airfield
Permit 139
A. Rich
March 1969

19690047

## INTRODUCTION

Quartz Mineral Exploration Permit 139 is situated in the Northeast Corner of Alberta. The permit has an area of 19,840 acres (31 square miles). The permit was taken to cover favourable structures where uranium mineralization is likely to occur.

## LOCATION AND ACCESSIBILITY

Permit 139 lies about 25 miles southeast of Fort Smith at a latitude of about 59° 40'N and a longtitude of 111° 20'W. The permit is bounded on the southwest by the Slave River. The Dog River transects the permit area.

Numerous lakes within the permit area provide easy access to float equipped aircraft based in Fort Smith (distance of about 25 miles), Fort Chipewyan (65 miles) and Uranium City (90 miles). The Dog River and the Slave River are navigible by canoe from Fort Fitzgerald to the permit (15 miles). All the ground is accessible by foot from camps located on the various lakes or the rivers.

## GEOLOGY

### General

The Northeast Corner of Alberta is underlain by Precambrian metamorphic and igneous rocks. Metamorphic grades vary regionally and extend through the range from greenschist to granulite facies. Most of the igneous rocks have been metamorphosed to some extent. The rocks are Tazin equivalents and vary in age from about 1800 to 2200 million years (Baadsgaard [2]).

The major structural features of the precambrian of NE Alberta and NW-Saskatchewan are given on Map 2. This is a compilation based on published reports by the following governmental offices : Research Council of Alberta, Geological Survey of Canada and the Saskatchewan Department of Mineral Resources. An aerial photographic interpretation of smaller scale features is given by Godfrey [4].

Mylonites are developed along the Warren and Allan Faults. The mylonites of the Allan fault occur in bands over a width of several miles where mapped by Godfrey. This mylonite zone may be the most prominent in this sector of the Canadian Shield. The Allan fault strikes almost due south through the centre of the Northeast Corner toward Lake Athabasca, where it possibly changes strike to a NE-SW direction. It can be traced north to the vicinity of Great Slave Lake. The Athabasca system of faults can be projected along strike toward Fort Chipewyan and may merge with the Allan Fault in that area. The displacement on the Allan fault is believed to be largely strike slip. The east side of the Allan fault is believed to have moved north relative to the west side. The Warren fault strikes NE-SW and merges with the Allan fault to the north, in the N.W. Territories. The strike of the southwestward extension of the Warren fault is not known.

Four major sets of faults are apparent in the Northeast Corner. The strike directions are NW-SE, NE-SW, E-W and N-S. Those striking NW-SE are more apparent in the northeast part of the area. They have an apparent displacement which is left handed and are believed to be tensional. They are probably the result of the same stress field which caused the displacement on the Allan fault. Due to a lack of detailed mapping it is not possible to say whether the NE-SW are mainly left or right handed faults. This second set is believed to be related to movement on the Allan fault. Both the NW-SE and the NE-SW faults may therefore be approximately contemporaneous with the Allan fault. The E-W faults are later than the Allan fault and may not be caused by the same stress field.

With the possible exception of the latest granites, all rock types are strongly folded. Folding is mainly isoclinal. Some uranium deposits appear to be localized along the noses of folds. These may have occupied dilatencies resulting from the folding of alternately competent and incompetent lithologies (saddle reefs).

## Genesis of the Uranium Deposits

Several possible sources for the uranium are outlined below:-

1. Late granites - uranium deposited by magmatic hydrothermal fluids.
2. Surrounding rocks - derived through metamorphism and transported by hydrothermal fluids, or leached and transported by meteoric waters.

3. Mylonites - Derived from the mylonites during their formation by a process of leaching of the fine grained cataclastic material.

4. Combinations of the above.

Whichever initial source is favoured, the uranium appears to have been remobilized several times and localized in favourable open structures. Although most of the deposits in the Uranium City area occur in the approx. 2000 m.y. old Tazin rocks, a few vein type deposits of pitchblende do occur in the younger Martin rocks (approx. 1850 m.y.) and still younger Athabasca sandstone.

In the Uranium City area most deposits occur close to or within the Athabasca system of mylonites, which are developed along the Black Bay and adjacent parallel faults. A process of leaching of the uranium from the mylonites soon after their formation and before recrystallization is logical. This is analogous to the leaching of uranium from tuff beds.

The known deposits appear not to have any consistent spatial relationship with the granites as would be expected for case 1 above. On the other hand, the uranium deposits are not randomly distributed, and the suggestion is that these are not caused by the processes mentioned in 2.

## Localization of Uranium deposits

The North-East Corner is compared with the Uranium City area. This is pertinent because Uranium City is nearby and it has been studied in detail: because both areas are underlain by Tazin rocks (sensu lato), and because the structural environment is almost identical.

Intensive study by many geologists in the Uranium City area points to the following common denominators in the control of uranium mineralization.

Faulting - The approximately twenty mines which have been in operation, together with the many uranium occurrences, demonstrate a very close association with shear zones and minor faults which tie in with the major structures. Broad mylonite belts are associated with the NE-SW striking faults, and there is evidence to suggest that the uranium is genetically related to the process of mylonization. The intersections of faults striking E-W with faults striking NE-SW are, statistically, particularly favourable loci for uranium.

Folding - Dilatancies along the axes of minor folds serve as structural receptors for mineralization in several mines in the area (e.g. Eldorado). In each case the folds are in close proximity to faults and, therefore, constitute a structural control secondary to the fault.

Lithology - There does not appear to be any consistent lithological control for uranium in the Beaverlodge Area; the host rocks span almost the complete range of lithologies found in the region. Most uranium deposits are found in the 1820-2200 million year old (Baadsgaard[2]) Tazin group of gneisses and metasediments. The Tazin rocks are regionally metamorphosed and the grade of metamorphism ranges from greenschist to granulite facies.

The three most notable occurrences found by Godfrey are mentioned below. These are described more fully in Preliminary Report 58-41 (Res. Counc. of Alberta). His report covers only between 5% and 10% of the Precambrian of NE Alberta.

1. On the Southwest arm of Andrew Lake radioactivity of 6 times background was noted in biotite schist and feldspathic quartzite. The full extent is not known. This ground is held by Rapid River Mines (see attachment).

2. A level of radioactivity 4 to 5 times background is associated with an occurrence at Spider Lake (Godfrey[1]) and may extend for a strike length of about 2 miles. Grab samples assayed as follows: 1.03%U - .69%Mo; 3.93%U - 1.03%Mo; 3.29%U - 1.40%Mo. This property is covered by a permit held by McIntyre Porcupine Mines Ltd.

3. Numerous occurrences have been found in the vicinity of Cherry Lake. One of these radioactive occurrences continues for at least 150 feet along strike and 400 feet across strike. This ground is held by McIntyre.

The three occurrences cited above occur in metasediments.

At least three imporatnt uranium occurrences are documented in the area outside that covered by Godfrey. One of these, the Fishing Lake discovery, occurs in granite, granite gneiss and pegmatite (see attachment). High grade uranium over narrow widths has been reported for the Leggo Lake showing where the host rock is a "black hornblende granite".

According to Collins and Swan[3], "four miles N 40° E of Allison Bay, yellow stains of alteration products were observed over an area of 30 feet by 400 feet, and, at one locality where surface blasting had been undertaken, a radioactive anomaly was found that reached a maximum of 10 times background on a Geiger ratemeter". The host rocks are granite.

Little is known of the structural control for the occurrences noted by Godfrey. These may be localized along the axes of isoclinal folds close to major cross faults. The Fishing Lake, Leggo Lake and Allison Bay deposits are located along fracture zones striking E-W to NE-SW.

## DETAILED GEOLOGY OF PERMIT 139

All the rocks underlying the permit area are Precambrian in age and belong to the Tazin group. The area has been mapped on a reconnaissance scale by Riley[5], who shows the area to be underlain by granites, ortho and para-gneisses and metasediments (see map 4). No detailed geological mapping has yet been done.

In 1958, Godfrey[4] published an aerial photographic interpretation of structures in the Northeast Corner (part of Godfrey's interpretation of the Myers Lake area is shown on Map 5). The rocks between Leland Lakes and the Slave River are formed into a fold of major dimensions. This folding is clearly described by prominent lineaments on the aerial photographs. The trace of the axial plane of the fold strikes NNE and the nose lies near the south end of Myers Lake. Permit 139 is centred on the nose of the fold.

The east limb of the fold contains the Warren Fault. This is a major fault system which extends for a considerable distance into the N.W.

Territories. The direction and extent of the southwestward extension of the fault are not known. The fault is outlined by a strong magnetic trend which seems to parallel the fault [7].

The west limb of the fold contains another major fault - the Rutherford fault. The Rutherford and Warren Faults probably intersect or merge in the vicinity of the Slave River in the southwest region of the permit.

Along its known length, the Warren fault is paralleled by a strong magnetic trend (see Fig.1 page 15). This magnetic trend curves into permit 139 until it reaches the extrapolated position of the Rutherford fault. It then bends sharply to the south to parallel the Slave River. This is the only magnetic 'structure' of this type in the Northeast Corner. It could represent a major dislocation or flexure of the fault system.

The southeast corner of the permit area covers part of the Warren fault. According to Godfrey[4] mylonization is strongly developed along the Warren fault. The Rutherford fault may also be mylonized. Proximity to the major belts of mylonites is considered to be of prime importance. Later faulting within the mylonites cause brecciation. These breccia zones are also of prime importance, as evidenced by the large orebodies in the Uranium City area ( Ace and Verna of Eldorado). Such breccia zones are known to occur within the Warren fault system[4].

The permit almost completely includes a large area of metasedimentary rocks (as mapped by Riley, Map 4.). The distinction between the metasediments and the surrounding gneiss, as mapped, is a function of the intensity of metamorphism. The metamorphic grade increases outwards from the centre. The surrounding granites could be the result of granitization of rocks which were originally sediments. The importance of metasedimentary rocks as host rocks for uranium has already been emphasized (see page 5).

The granites or granitized rocks, together with undivided metamorphic and plutonic rocks (as mapped by Riley), constitute the remainder of the permit. In the Uranium City area these rocks are believed by Tremblay[8] to constitute the source rock, from which the uranium is derived.

## ECONOMIC POTENTIAL

The rocks in the Northeast Corner belong to the Tazin Group (Godfrey[6]), which contains the host rocks for most of the uranium deposits in the Beaverlodge area of Saskatchewan. The metamorphic grades are the same.

The geological environment of permit 139 is considered highly favourable for the localization of uranium for the reasons outlined below :-

The structural environment is almost identical with that of the Beaverlodge camp where an unstable belt adjacent to the NE-SW trending Athabasca system of mylonites is transected by secondary faults, of various orientations, and associated minor faults and fractures. By comparison, the permit cover an area with a high density of faulting and fracturing which is part of an "unstable belt" adjacent to the mylonites of the Warren (and possibly the Rutherford) fault system.

The importance of faults and fault intersections as controls for uranium mineralization has been emphasized. The frequency of occurrence of these controlling structures makes this area one of prime importance. With few exceptions, the uranium deposits of the Beaverlodge area occur close to or within the Athabasca mylonite zone. A parallel can be drawn with permit area 139 which is disposed so as to straddle strong mylonite zones.

Folds can serve as secondary structural controls, as exemplified by some deposits in the Northeast Corner. As mentioned above, the permit is located to cover the nose of a major fold. Smaller scale folds, which are related to or parasitic to the major fold, are also likely to be found in the area. Such intense folding would also produce many minor faults and fractures - these are evidenced, in part, on Godfrey's map (see Map 5).

Numerous sulphide deposits occur in the NE Corner, notably sulphides of copper and molybdenum. To the south, near Allison Bay, silver mineralization, associated with uranium and copper minerals has recently been discovered in later cross faults. The Allison Bay deposits change from copper, through a silver rich zone, to uranium along strike. The association of copper, silver and uranium on a regional basis is common throughout the world. The structural controls for the sulphide deposits in the NE Corner appear to be the same as for the uranium. Although uranium is the prime target, the possibility of finding economic deposits of silver, gold and copper should not be overlooked.

The amount of overburden on the permit is minimal and therefore the likelihood of locating radioactive anomalies, both by groundwork and by airborne methods, is very much enhanced.

Only a small portion of the Northeast Corner has been mapped in detail and the remainder has been prospected in only a very cursory fashion. It is thought highly significant that, in spite of the lack of detailed work, so many important uranium deposits have been found to date in the area.

## RECOMMENDED PLAN FOR EXPLORATION

Part of the first phase of the exploration program should be to obtain a fairly detailed picture of the geology of the permit area. Mapping and prospecting could be done by a two man crew, with supervision, over a two or three month period. Mapping should be done in greater detail in the neighbourhood of favourable structures. Scintillometers should be carried on all traverses.

The percentage of rock outcrop is high. However, to supplement the geological and radiometric coverage of the area, soil or vegetation samples (geochemical or biogeochemical) could be collected in covered areas. The cost at this stage would be simply that of the sample bags. the samples could be analysed later for uranium and copper, if this is deemed feasible.

An airborne scintillometer (spectrometric) survey has been arranged to cover the area. The survey should be completed by the middle of

July. It should be emphasized at this point that, even with the most modern equipment, an airborne radiometric survey is still a reconnaissance tool. Its use will in no way preclude thework of the ground party. It could considerably accelerate the exploration program by outlining targets for investigation.

The costs are estimated for three phases of exploration, below. If a find of any significance is made in Phase 1, then Phase 2 should be considered. To complete Phase 2 the field season could be extended as necessary, or the number of men increased. The operations in Phase 3 are of course, contingent upon the success of the previous phase.

## COSTS

### Phase 1

| | |
|---|---|
| Airborne radiometric survey - approx. 31 sq. miles - 1/8 mile spacing - 270 line miles at $10.00 per line mile. (arranged). | $ 2,700 |
| Equipment - boat, motor, camp, scintillometers etc. purchase and rental. | $ 2,000 |
| Camp operating costs | $ 2,500 |
| Mapping, prospecting and supervision (2.5 months) | $ 7,000 |
| | $14,200 |

### Phase 2

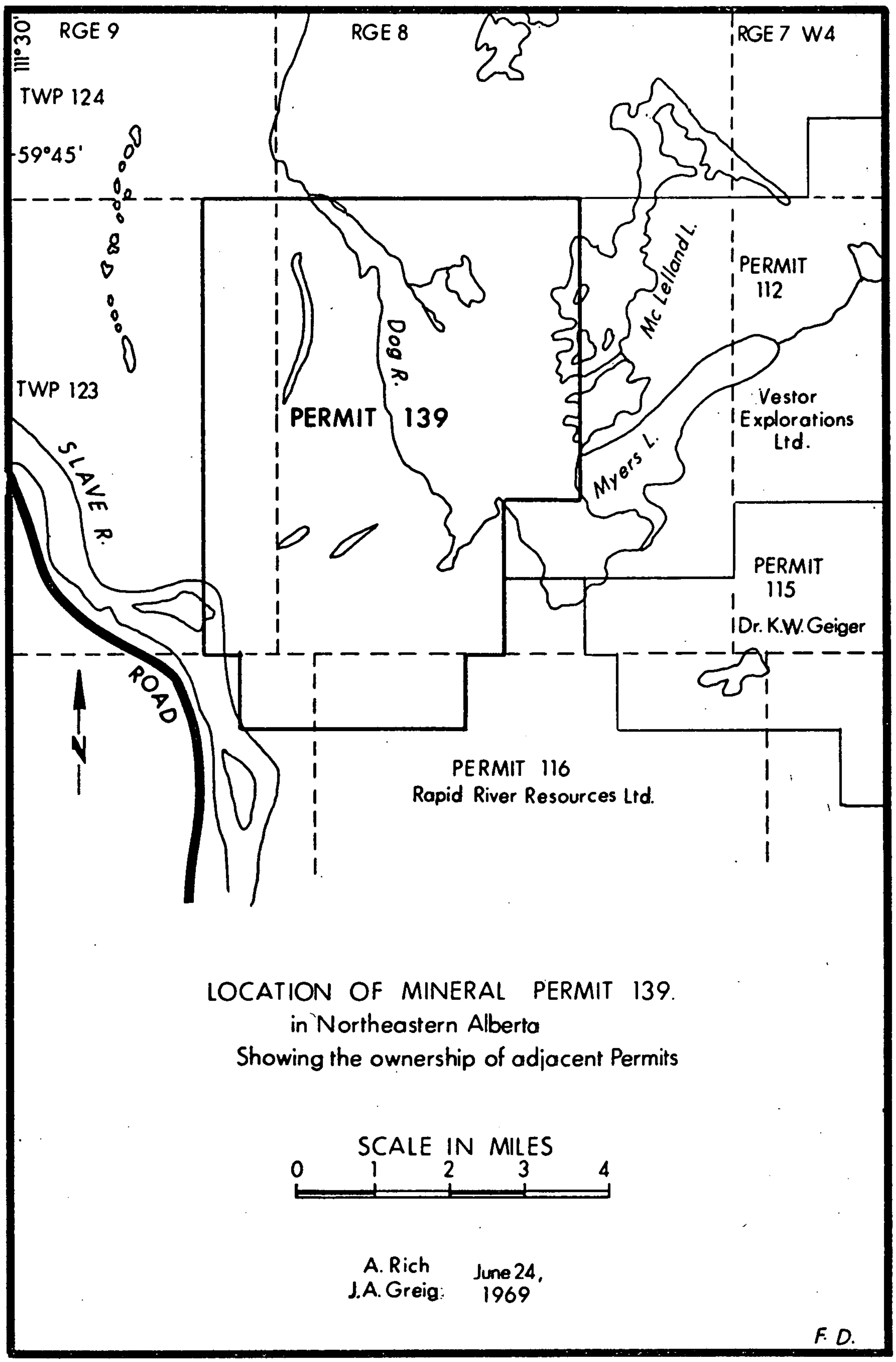
| | |
|---|---|
| Detailed mapping | $ 2,000 |
| Detailed ground geophysics | $ 2,000 |
| Trenching, smpling and assays | $ 2,000 |
| | $ 6,000 |
| Optional: | |
| Geochemical analyses | $ 3,000 |

### Phase 3

| | |
|---|---|
| Diamond drilling | $10,000 |
| Supervision | $ 3,000 |
| Sampling and assays | $ 1,000 |
| Camp | $ 2,000 |
| | $16,000 |
| TOTAL | $39,200 |

Respectfully submitted,

Anthony Rich    John A. Greig




LOCATION OF MINERAL PERMIT 139.
in Northeastern Alberta
Showing the ownership of adjacent Permits

A. Rich
J.A. Greig
June 24, 1969

MAP 3.

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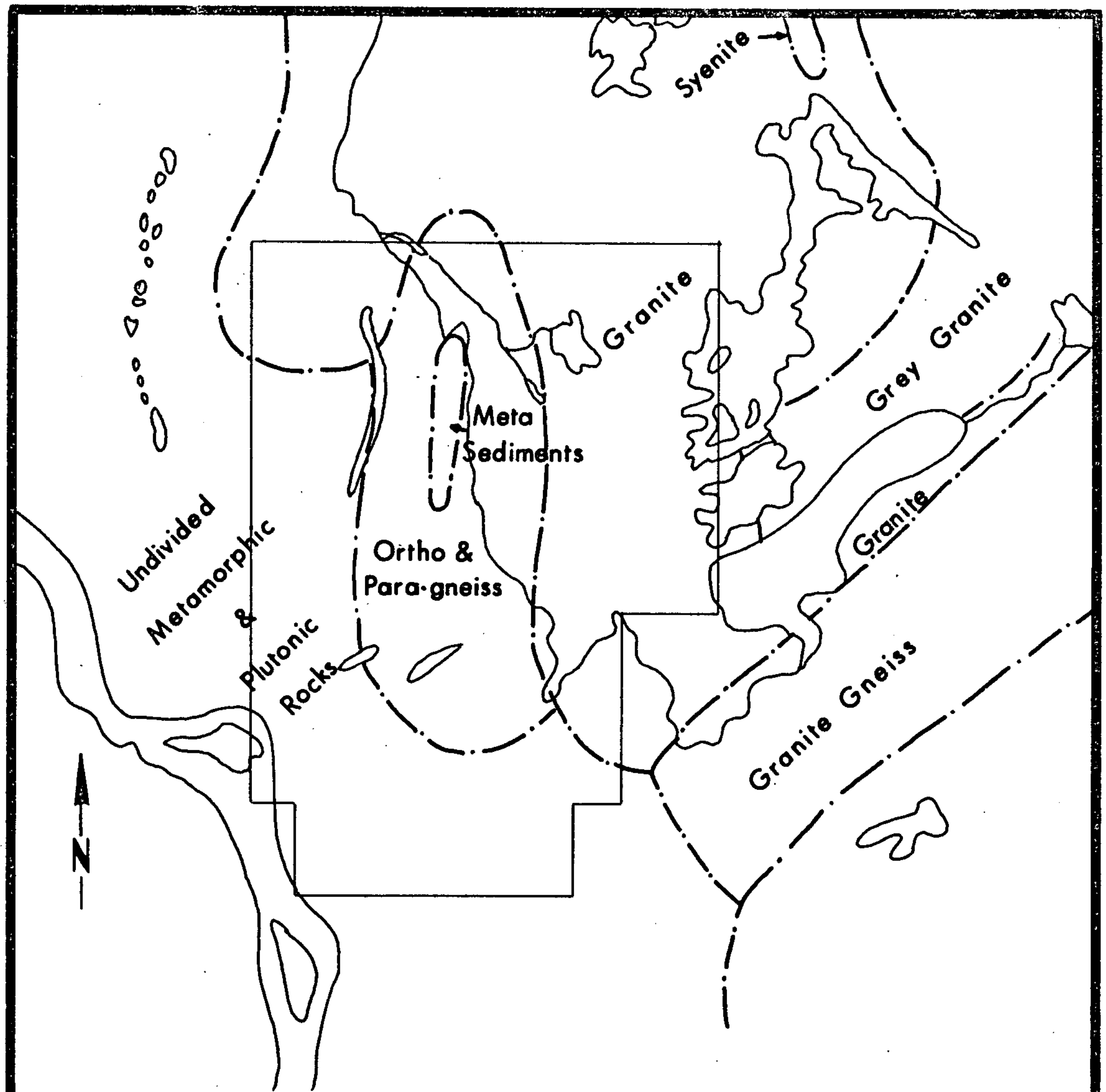


KEY

Geological boundary assumed

GEOLOGY OF PERMIT 139
*(after Riley)*

SCALE IN MILES
0 1 2 3 4 5

A.Rich & J.A.Greig June 24, 1969

F.D.

MAP 4.

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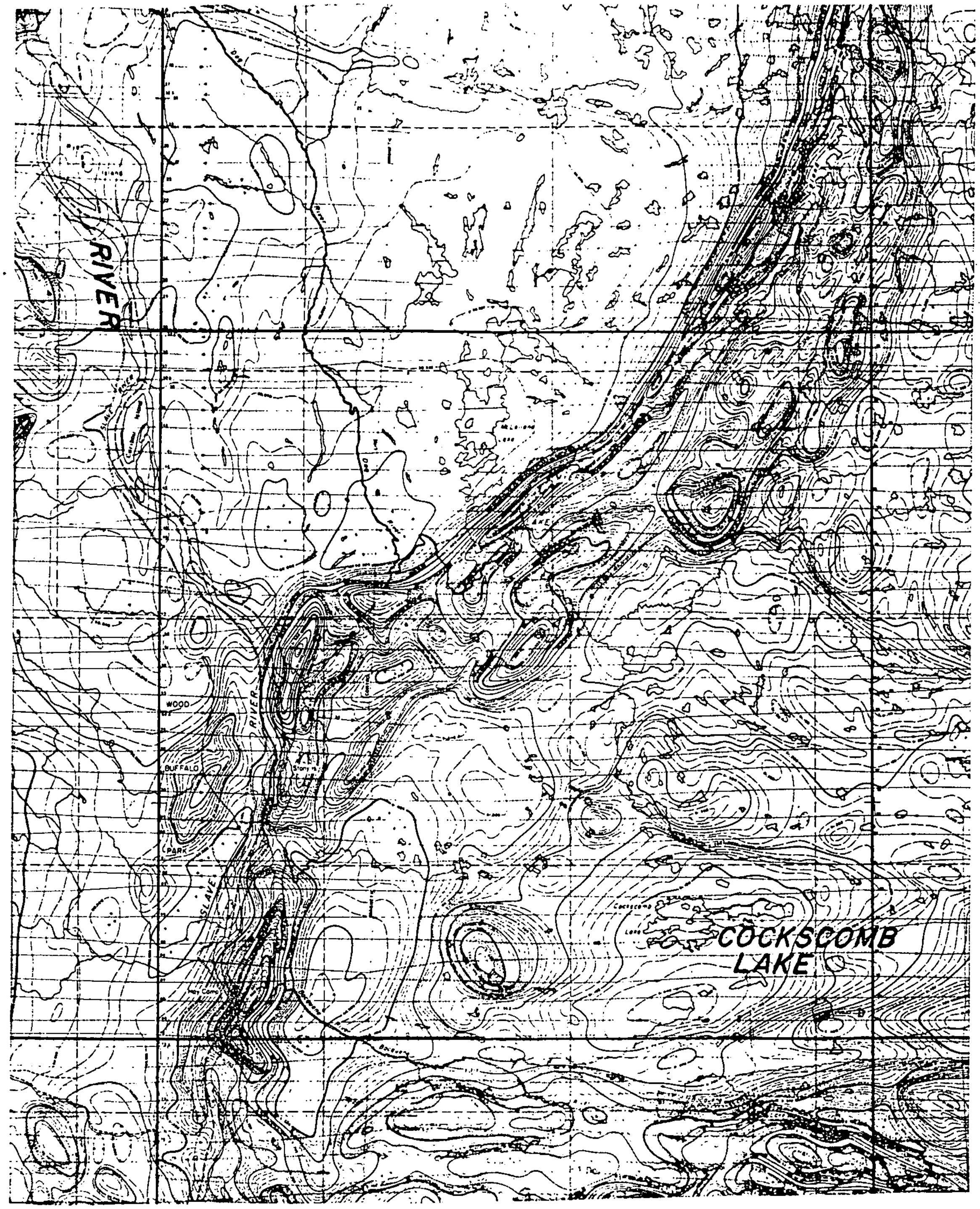


MAP 7161G

# FITZGERALD

## ALBERTA

Fig. 1

Scale: One Inch to Four Miles = $\frac{1}{253,440}$

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## REFERENCES CITED


1. Godfrey, J.D.; (1958); Mineralization in the Andrew, Waugh and Johnson Lakes Area, Northeastern Alberta; Res. Counc. of Alberta; Prelim. Rept. 58-4.

2. Baadsgaard, H.; Personal communication and; Godfrey, J.D. and Baadsgaard H.; (1962); Structural Pattern of the Precambrian Shield in Northeastern Alberta and Mica Age Dates from the Andrew Lake District; in Tectonics of the Canadian Shield; Royal Soc. Can.; Spec. Publ. No. 4.

3. Collins, G.A. and Swan, A.G.; (1954); Preliminary Report of Field Work in Northeastern Alberta; Res. Counc. of Alberta; Mim. Circ. No. 18.

4. Godfrey, J.D.; (1958); Aerial Photographic Interpretation of Precambrian Structures North of Lake Athabasca; Res. Counc. of Alberta; Bull. No. 1.

5. Riley, G.C.; (1960); Geology, Fort Fitzgerald, Alberta; Geol. Surv. of Can.; Map 12-1960.

6. Godfrey, J.D.; (1958); Precambrian Shield Structures North of Lake Athabasca, Alberta; Res. Counc. of Alberta; Contrib. No. 89.

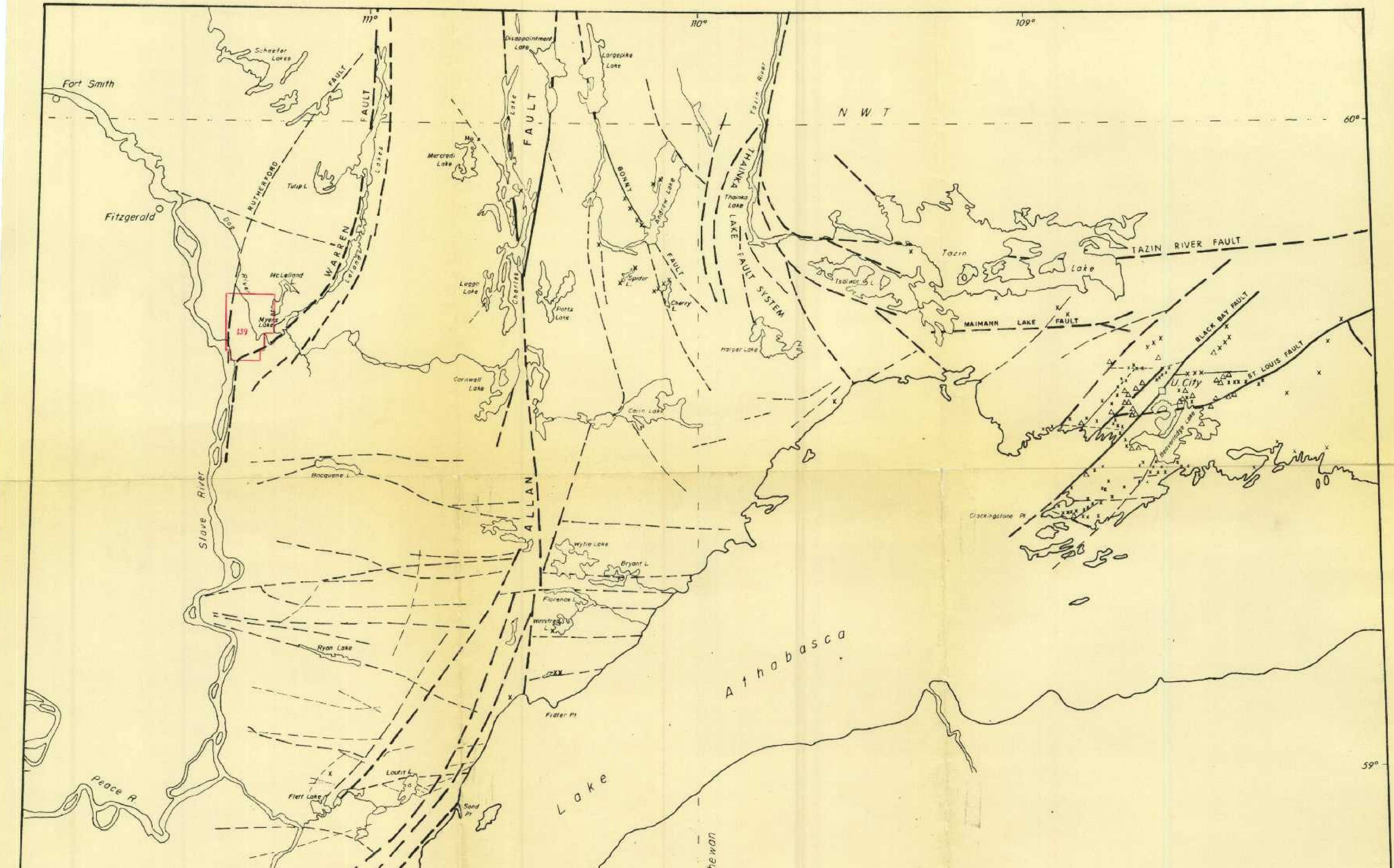
7. Aeromagnetic Map 7161G, Fitzgerald, Alberta, Geological Survey of Canada, 1962.

8. Tremblay, L.P.; (1968); Geology of the Beaverlodge Mining Area, Saskatchewan. Geol. Surv. Can. Mem. 367.


## ATTACHMENTS

Map 2. Faulting and Uranium Mineralization in the Precambrian North of Lake Athabasca.

Excerpt: Edmonton Journal, Friday, Jan. 31, 1969.
Excerpt: Edmonton Journal, Monday, March 17, 1969.
Excerpt: Page 6 of Collins and Swan Report - Reference 3 above.
Excerpt: The Northern Miner, March 6, 1969.
Excerpt: The Northern Miner, Feb. 1, 1968.
Article: Western Miner and Oil Review, Dec. 1953. "First Alberta Uranium Discovery"; Ferguson, A.B.
Excerpt: The Northern Miner, June 12, 1969.
Excerpt: George Cross News Letter, June 12, 1969.




MAP 2. to Accompany Report on Permit 139

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# QUARTZ MINERAL EXPLORATION PERMIT No.139