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GEOLOGICAL REPORT

EXPLORATION PERMITS 123, 135, and 136

NORTHEASTERN ALBERTA

by

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SUMMARY

Selected areas of Quartz Mineral Permits 123, 135, and 136 were mapped and prospected on a reconnaissance basis during September 1970. Results of this work have outlined one radioactive anomaly of 4 to 5 times background.

Geologic mapping on a scale of 1" = 2/3 mile has delineated several shear zones cutting a complex of Precambrian igneous, metamorphic, and metasedimentary (?) rocks. Seven lithologic units have been distinguished.

Areas which warrant further geologic prospecting are outlined.

INTRODUCTION

This report presents the results of a geological investigation of portions of Quartz Mineral Permits 123, 135, and 136 in the northeastern corner of Alberta. Permits 123, 135, and 136 cover approximately 10,000; 12,800; and 7,040 acres respectively. 1980

The primary objectives of the investigation were :

1. To carry out a ground geological and radiometric survey of airborne radiometric anomalies and to locate other favorable areas of mineralization.
2. To prospect for base metal mineralization.
3. To determine the geologic controls of mineralization.
4. To map the area on a scale of 1" = 2/3 mile.

The Loon Lake[1] area was selected for base camp operations for several reasons.

[1]Loon Lake is an arbitrary name assigned by the author to an unnamed lake for reference purposes (see Map 4).

(1) This lake is situated in a favorable location permitting easy access to all three permits.

(2) Several fault zones converge in the area and are potential zones of mineralization; the Allan fault system is also accessible.

(3) An airborne radiometric anomaly was indicated in the area.

Operations from this lake permitted maximum coverage of favorable zones with the limited time period available. However, it was not feasible to cover all the airborne anomalies within a short time period.

LOCATION AND ACCESSIBILITY

Quartz Mineral Permits 123, 135, and 136 are situated approximately 15 miles northeast of Fort Chipewyan, Alberta. Map 1 outlines the permit areas.

Access to the area is by float equipped aircraft based in Fort Chipewyan (15 miles southwest), Fort Smith (75 miles northwest) or Uranium City (100 miles northeast). Numerous lakes within the area of permits 135 and 136 are suitable for float equipped aircraft operations. Most of this area is accessible by foot from base camps on these lakes.

Permit 123 is relatively inaccessible to float equipped aircraft. Several narrow lakes within the permit are only of marginal length for a float equipped Cessna 180, and can be landed on only when the wind conditions are favorable. Access from the nearest suitable lake requires extremely long foot traverses across relatively rough muskeg terrain.

PHYSIOGRAPHY

The topography of the area is relatively flat, consisting of low rounded hills. Elevations range from 690 feet to 1000 feet, giving a maximum relief of 310 feet. Steep fault scarps in the order of 200 feet impart a local rugged character to the area.

Numerous rock-basin lakes, muskegs, and valleys are present, generally occupying glacially eroded fault zones. Alignment of lakes is characteristic and often delineates major fault zones.

Vegetation in the area is quite variable. Muskeg and valley areas are heavily vegetated, whereas, the higher areas are sparsely vegetated to barren. Foot travel is relatively easy except in the wet muskeg areas.

GENERAL GEOLOGY

The northeast corner of Alberta consists of a Precambrian complex of metamorphic rocks, varying in metamorphic grade from greenschist to possible granulite facies (Godfrey, 1958a, 1958b, 1966). Previous mapping in the area has been carried out by Riley (1960) on a scale of 1" = 4 miles. Riley (1960) outlined a series of ortho and paragneisses, granite rocks, and metasediments, however, his rock descriptions are very generalized. The rock types outlined by Riley (1960) in the permit areas are shown on Map 2.

Structures in the area are complex although general northerly to northeasterly trends are evident (see Map 2). Isoclinal folding is common in the metasediments, and plastic flow structures are evident within the gneisses. Major structural features have been plotted on Map 2.

The most prominent structural feature in the area is the NE-SW striking Allan fault system. This structure cuts through the south-eastern half of the permit areas, and is characterized by a broad zone of mylonites. A second system of WNW-ESE trending faults transect the Allan fault system within the permit areas. A system of N-S trending minor faults cuts all other structures in the area.

GEOLOGY OF PERMITS 123, 135 AND 136

A series of metamorphosed Precambrian igneous and metasedimentary (?) rocks form the rock complex of the mapped area. The most striking features noted are the general north-northeast trend of nearly all geologic structures, and the intersection of two prominent fault sets. The fault sets have general NE-SW and WNW-ESE trends.

A prominent band of quartzite gneisses is present and probably represents extensively metamorphosed Precambrian sedimentary rocks. Garnets are abundant in the quartzite gneisses and suggest metamorphism of at least the almandine-amphibolite facies. (Fyfe, Turner, and Verhoogen, 1958).

Seven rock types have been distinguished in the mapped area (Map 4): banded granite gneiss, grey granite, quartzite gneissA, quartzite gneiss B, undifferentiated plutonics, red granite - granite gneiss, and mylonite. In some cases, boundaries between rock types are gradational and somewhat obscure due to the high degree of deformation and metamorphism, and are arbitrary boundaries.

ROCK TYPES

Banded Granite Gneiss

This unit is characterized by its banded appearance, flow folding, and reddish to grey-pink weathered appearance. Grain size is variable but generally medium grained. Bands vary from several mm thick to 4" thick and consist of alternating felsic and mafic material, the felsic bands predominating. Composition is 3 - 10% mafic, 8 - 15% quarts, the remainder of the rock consisting of feldspars.

s and pods of granitic rock and quartz occur within the unit, generally parallel to the banding, however, often cross cutting the foliation.

Foliation varies through 180 degrees from E to W, dipping from 60° to vertical. Bands exhibit a high degree of contortion and flow folding.

Grey Granite or Monzonite

A grey to pink equigranular, coarse grained granite occurs within the Banded Granite Gneiss and Quartzite Gneiss units. This unit is characterized by an equigranular, medium to coarse texture, grey to pinkish on fresh surfaces, and grey to white weathered surface.

Composition is variable consisting of less than 3% mafics chloritized biotite, biotite, and garnets), 5 - 30% light smokey-grey quartz, the remainder of the rock being grey feldspar. Feldspar twinning and color indicate some of the feldspars may be of labradonite composition. Yellow, non-radioactive staining is present locally. The unit is locally very quartizitic and appears similar to the Quartzite Gneiss, in both texture and composition. Garnets are locally abundant particularly where the unit

resembles the Quartzite Gneiss.

Foliation is not developed.

Quartzitic Gneisses

Several distinctive quartzitic gneisses were observed and have been mapped as distince units. The most diagnostic differences between the quartzitic gneisses is color, composition, foliation, and texture.

These quartzitic gneisses may represent highly metamorphosed sedimentary rocks.

Quartzitic Gneiss A.

This unit consists of fine to very coarse grained, grey to white quartzitic gneiss. The composition is highly variable, consisting of less than 3% mafic (chloritized biotite), 5 - 40% feldspar and approximately 50 - 60% quartz. Garnets are present being very abundant locally. Granitic material intrudes the unit throughout.

Foliation is weakly developed and expressed by parallel alignment of biotite flakes, elongation of quartz grains, and occassional mafic bands. Strike of the foliation ranges from N20°E to N40°W with dips of 55°SW to 63°NW.

This quartzitic gneiss grades into the Banded Granite Gneiss.

Quartzitic Gneiss B.

Unit B consists of a recrystallized, dark grey, fine to medium grained, equigranular, well foliated quartzitic gneiss. This unit is characterized by its dark grey color on fresh surface, grey-pink color on weathered surface, flow folds, and abundance of garnets throughout (1 - 3%). The composition is 5 - 10% mafics (biotite, 1 - 3% garnets), 10 - 30% feldspar, the remainder of the rock being smokey quartz.

Foliation is well developed with a strike from N20°W to N55°E and dips from 46°NW to vertical. To the southeast, the unit becomes more sheared with feldspar augen developed.

Radiation is relatively uniform varying from 30 - 50 cps.

Mylonite

Along the axes of major shear zones, a dark grey green, recrystallized mylonite is present. Feldspar augen developed parallel to a well developed foliation, a banded appearance, and the grey-green color are characteristic.

Undifferentiated Plutonics

These rocks are granitic in composition and consist of less than 3% mafic, 10 - 40% quartz and 50 - 60% feldspar. Color on weathered surfaces varies from grey to pink. The rocks are locally very quartzitic.

The texture is generally equigranular coarse grained. Minor banding occurs striking from N5°W to N80°E with dips of 80°N to 85°W.

These rocks grade into the Banded Granite Gneiss and are not readily distinguishable. Mapped contacts are only approximate.

Red Granite - Granite Gneiss

West of Loon Lake the Banded Granite Gneiss unit grades into a characteristically Red Granite - Granite Gneiss. In this area the Red Granite - Granite Gneiss is a relatively uniform fine to medium grained, equigranular rock. Composition is less than 3% mafics (biotite), 8 - 15% quartz, and approximately 80 - 85% red potassium feldspar. Foliation is only weakly developed.

To the north and northeast of Loon Lake, a sequence of Red Granite Gneisses has been mapped. The most characteristic feature is the intense

red color on both the fresh and weathered surfaces. Composition is quite variable; generally less than 3% mafics, 10 - 40% quartz, with red potassium feldspar composing the bulk of the rock. Texture is variable from fine to coarse grained. This rock is similar to the Red Granite - Granite Gneiss west of Loon Lake but differs in that it is locally well foliated and banded, and contains very quartzitic zones. Granite gneiss is predominant to the northeast. These rocks are considered to be the same unit as mapped to the west of Loon Lake.

Foliation is well developed, particularly in the more quartzitic zones. Strike of foliation varies from N30°W to N85°E with dips from 76°SE to vertical and 50°SW to vertical. Flow folding is weakly developed, Background radiation is variable between 30 to 200 cps.

MINERALIZATION

Uranium Mineralization

Only one radioactive occurrence was found in the Loon Lake area. The location of this occurrence is shown on Map 4.

A small radioactive zone 6 feet by 15 feet measured radioactivity of 400 - 500 cps (counts per second) using an SPP-2 SRAT scintillometer. Background radiation is 100 cps, all measurements being taken at waist level.

The mineralization occurs in a pegmatitic zone within a very coarse grained, equigranular, grey granite. Faint yellow staining is present in the grey granite surrounding the radioactive zone but is not radioactive. Outcrop in the area is very sparse, and the radioactive zone occurs on an isolated outcrop in a large muskeg. Several Faults cut through the area

suggesting the possibility of more mineralization along strike and a possible structural control.

Base Metal Mineralization

No significant sulfind mineralization was found in the area investigated.

CONCLUSIONS

Reconnaissance geologic mapping and prospecting has outlined one radioactive anomaly of 4 to 5 times background. The anomaly occurs in a highly faulted area and may indicate more extensive mineralization.

Mapping on a scale of 1" = 2/3 mile has distinguished seven rock types. Several NE-SW and WNW-ESE trenching shear zones have been mapped.

The most favorable geologic zones of mineralization occur in areas of limited outcrop negating a conclusive evaluation on the basis of the present work. Further geochemical prospecting is required to gain some insight into the mineral potential of the area.

Several airborne radiometric anomalies and mineral shows have been perviously noted in the southern half of permit 123. This area was not examined during the course of the present investigation as weather conditions were unfavorable when an aircraft was available. This area should be prospected and evaluated.

RECOMMENDATIONS

It is recommended that :

(1) A detailed hydrogeochemical uranium prospecting program be carried out within the area covered by permits 123, 135, and 136 to evaluate the uranium potential of favorable zones obscured by overburden.

(2) More detailed mapping and prospecting be conducted to evaluate the airborne radiometric anomalies not investigated in this report, and other favorable areas of mineralization.

(3) Further evaluation and mapping should be done in the areas of previously reported mineralization within the southern half of permit 123.

Map 5 outlines areas recommended for mapping and prospecting, and favorable areas for hydrogeochemical prospecting.

Respectfully submitted,

[redacted]

Harold H. Williams PhD.

REFERENCES

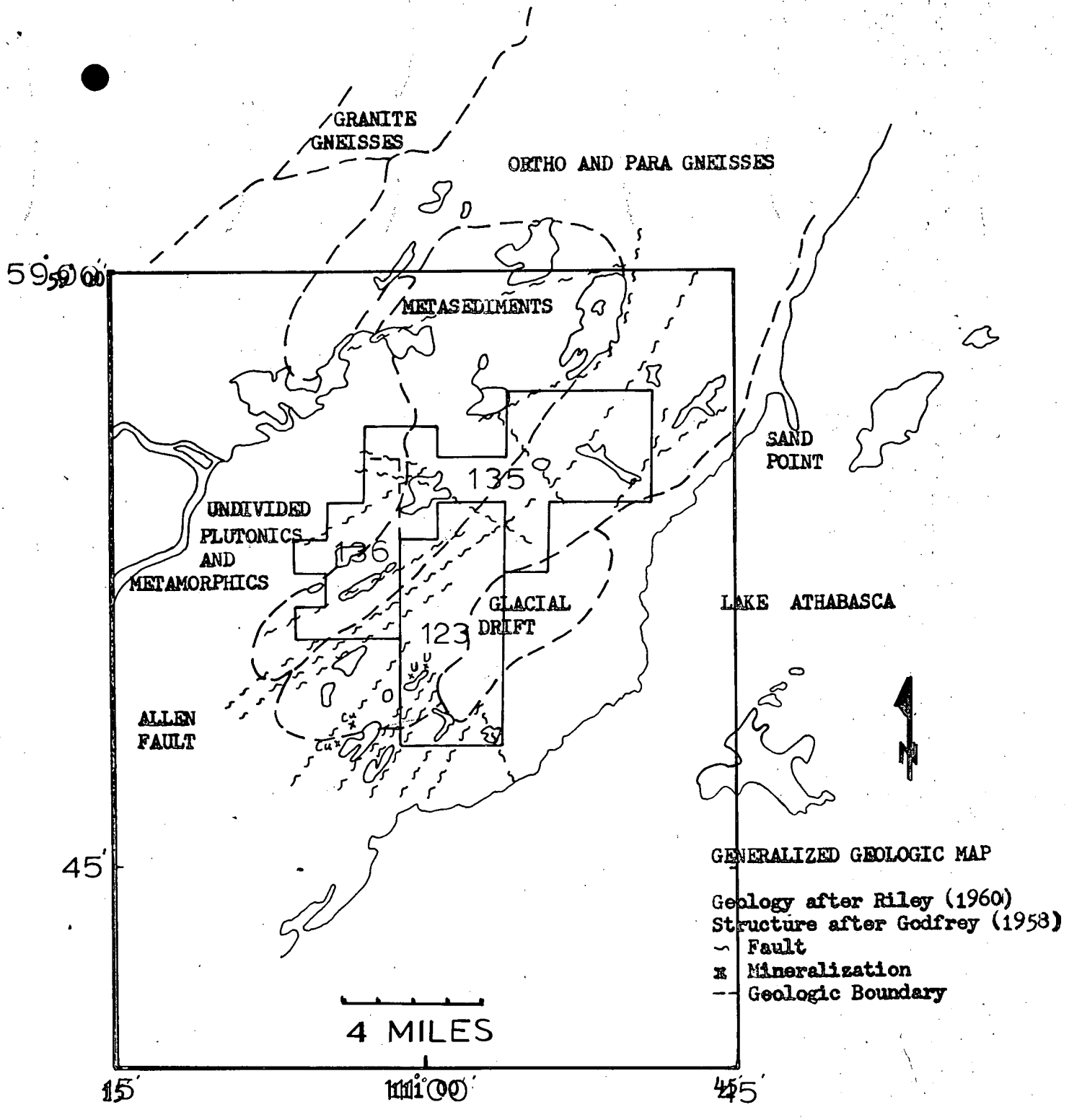
Fyfe, W.S., Turner, F.J., and Verhoogen, J. 1958 Metamorphic reactions and metamorphic facies. Geol. Soc. Am. Mem. 73, 259 p.

Godfrey, J.D.. 1958a Mineralization in the Andrew, Waugh and Johnson Lakes area, northeastern Alberta. Research Council of Alberta, Preliminary Report 58 - 4.

Godfrey, J.D. 1958b Aerial photographic interpretation of Precambrian structures north of Lake Athabasca. Research Council of Alberta, Bull. 1.

Godfrey, J.D. 1966 Geology of the Bayonet, Ashton, Potts and Charles Lakes District, Alberta. Research Council of Alberta, Preliminary Report 65 - 6.

Riley, G.C.. 1960 Geology, Fort Fitzgerald, Alberta. Geol. Survey Can., Map 12 - 1960.



MAP 2

HH WILLIAMS September, 1970

PERMIT BOUNDARIES

111°00'

Flett Lake

Loutit Lake

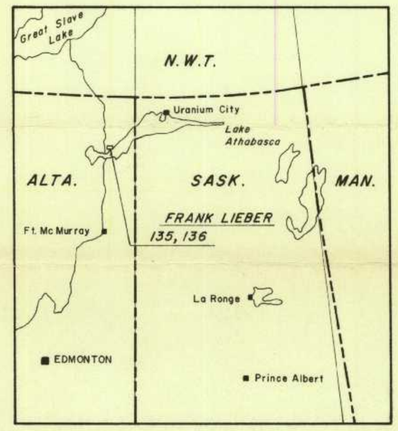
58°55'

Lake Athabasca

111°00'

INDEX MAP

SCALE: 1" = 140 MILES



NOTE.
Copied From Enlarged N.T.S. Map #74L-
Fort Chipewyan, Alberta.

1/2 0 1/2 1 1 1/2
MILES (APPROX.)

FRANK LIEBER
LAKE ATHABASCA AREA
ALBERTA

PERMITS – 135,136

FLIGHT LINE LAYOUT

GEO - X SURVEYS LTD.

DRAWN	A.N.S.	JOB NO.	FIG. NO.
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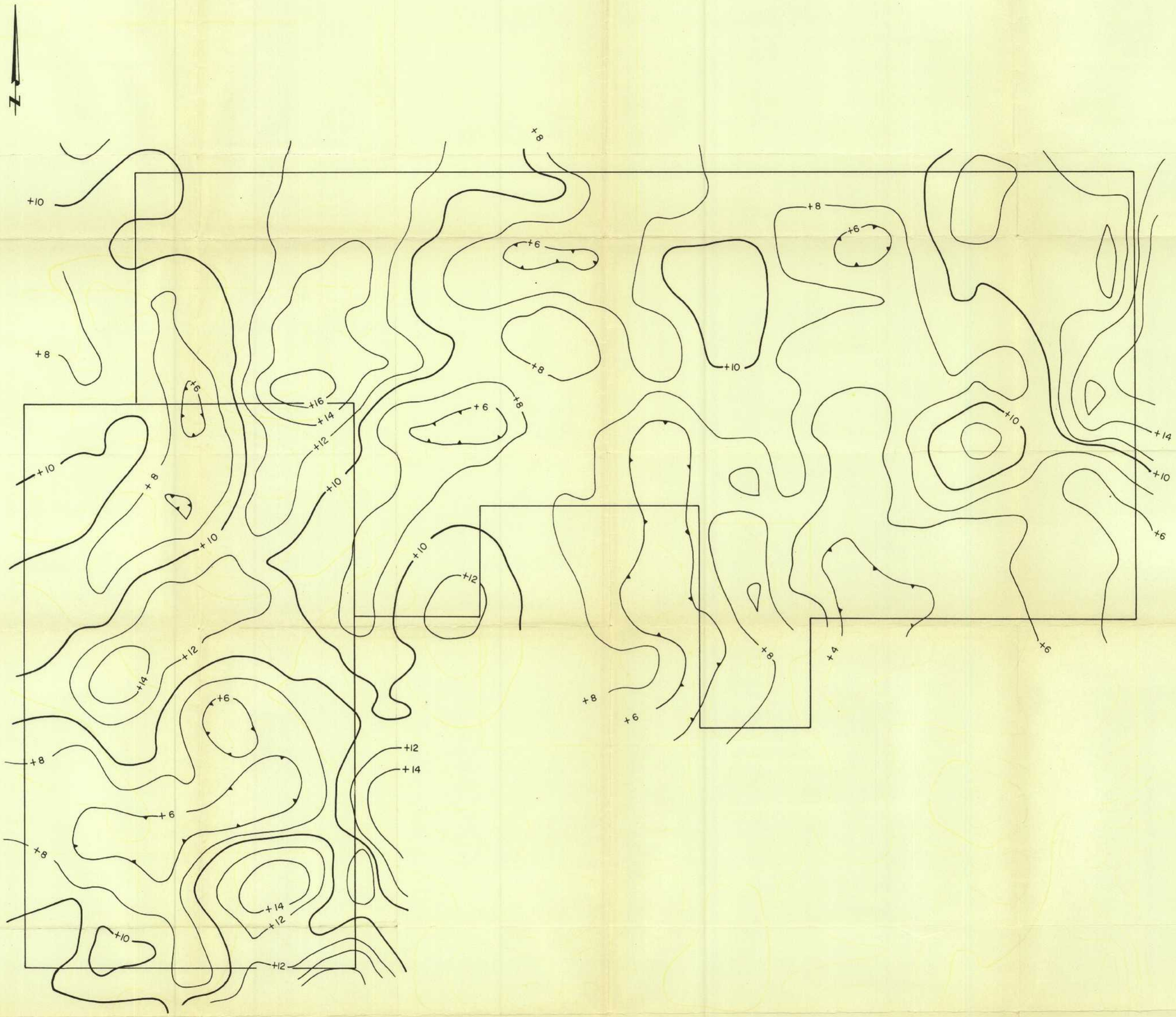
CHECKED			



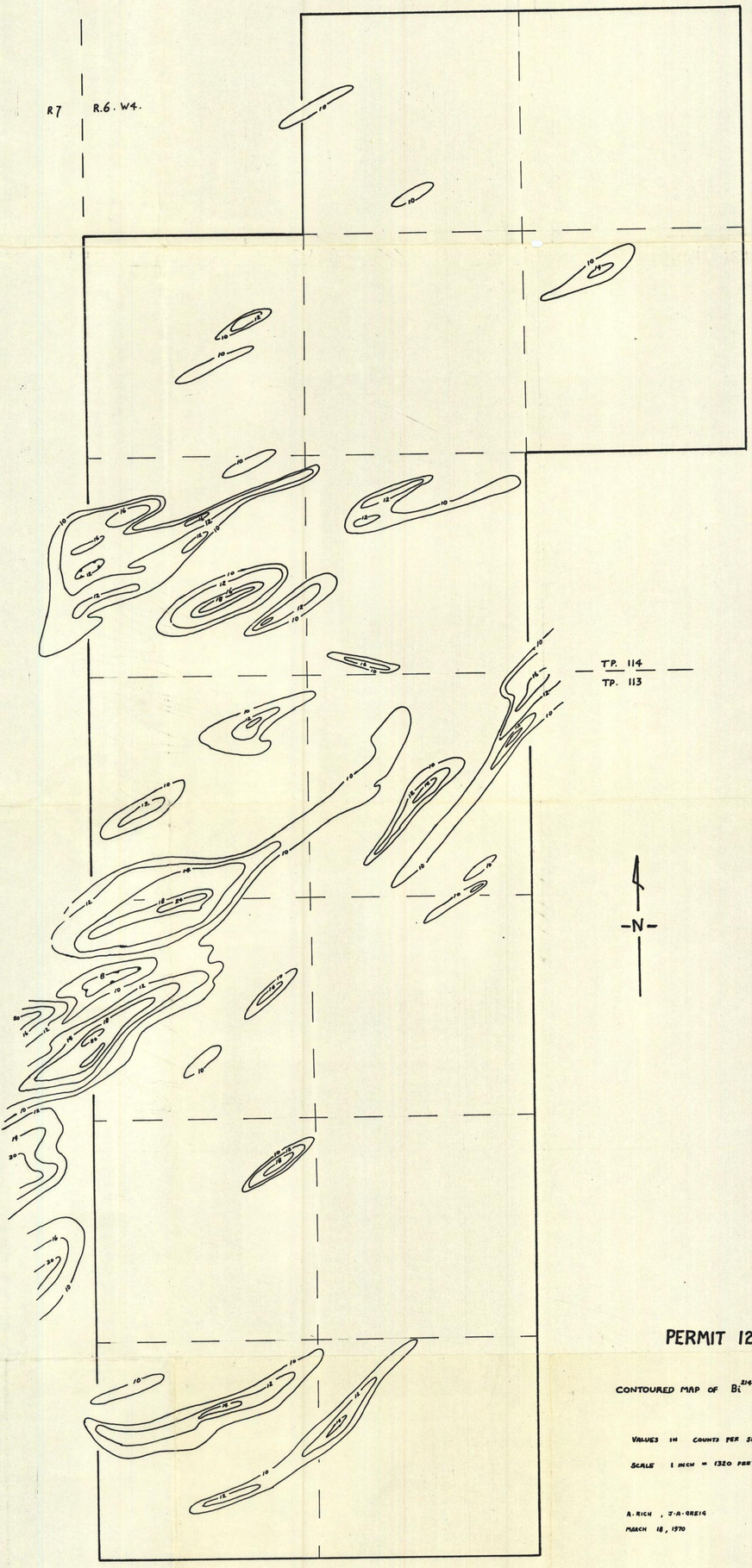
FRANK LIEBER
LAKE ATHABASCA AREA
ALBERTA

PERMITS – 135,136
BISMUTH 214
CONTOUR INT. : 2 C.P.S.

1/2 0 1/2 1 1 1/2
MILES (APPROX.)

DRAWN	CROSS CANADA	JOB NO.	FIG. NO.
DATED	OCT. 29, 1969	1113	2
CHECKED			

GEO – X SURVEYS LTD.



PERMIT 123

CONTOURED MAP OF Bi^{214} RADIATION

VALUES IN COUNTS PER SECOND

SCALE 1 INCH = 1320 FEET

A. RICH , J.A. GREIG

MARCH 18, 1970

QUARTZ MINERAL EXPLORATION PERMIT No.123

19700010

(74L/15)

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