

# MAR 19700018: NORTHEASTERN ALBERTA

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ECONOMIC MINERALS

FILE REPORT No.

U-AF-097(1)

*Monument*

GEOLOGICAL REPORT

QUARTZ MINERAL PERMIT 143

NORTHEASTERN ALBERTA

by

H.H. Williams BSc., MSc., PhD.

September 1970

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### SUMMARY

Selected areas of Quartz Mineral Permit 143 were mapped and prospected on a reconnaissance basis during the first half of September, 1970. Results of this work have outlined five radiometric anomalies located along favorable geologic structures (fault zones).

Reconnaissance geologic mapping on a scale of 1" = 2/3 mile is in general agreement with previous detailed geologic mapping. Five lithologic units have been distinguished.

### INTRODUCTION

This report presents the results of a geological investigation of Quartz Mineral Permit 143 in the northeastern corner of Alberta. The permit is presently held by Val Dun Developments Ltd. and covers an area of 9990 acres.

The primary objectives of the geological investigation were :

1. To conduct a detailed surface evaluation of the permit, and prospect intensively for indications of radioactive mineralization.
2. To prospect favorable lithologic and structural locations for indications of base metal mineralization.

Areas selected for mapping and prospecting are outlined on Map 2. Area A was selected for mapping and prospecting, whereas, Area B was selected for prospecting only.

The area has been previously mapped on a scale of 1" = 1/2 mile by Godfrey (1963) eliminating the necessity of a detailed surface mapping program. However, considerable attention was given to the existing map units to determine their usefulness on a reconnaissance mapping basis for

future work in the area. A small selected area was mapped on a scale of 1" = 2/3 mile for comparison.

#### LOCATION AND ACCESS

Quartz Mineral Permit 143 is situated in northeastern Alberta in the St. Agnes Lake area. The approximate co-ordinates are, longitude 108°00' to 115°00' and latitude 59°38' to 59°42'. Map 1 shows the geographic location of permit 143.

Access to the area is by float equipped aircraft based in Uranium City (65 miles east), Fort Smith (60 miles west), and Fort Chipewyan (75 miles southwest). Numerous large lakes in the area provide ready access via float equipped aircraft. Scheduled commercial airline flights provide tri-weekly service to most of the northern communities where float equipped aircraft are available.

The Northern Transportation Co. Ltd. operates tugs and barges out of Fort McMurray, Alberta, which may be used to mobilize heavy equipment to within 25 miles of the permit area, on the north shore of Lake Athabasca.

#### PHYSIOGRAPHY

The topography of the area is typical of the Precambrian shield, consisting of relatively flat, low rounded hills and a locally rugged topography with maximum relief of about 250 feet. Elevation varies from 1000 feet to 1250 feet above sea level.

Numerous rock basin lakes, muskegs, and swamps are present, often occupying glacially eroded fault zones. Alignment of lakes is a very useful indicator of fault zones in the permit area.

Vegetation in the area is quite variable but generally heavy. Muskeg and valley areas are more heavily vegetated than the higher sectors, spruce and pine being the predominant tree types. Underbrush is generally light, permitting easy access by foot.

#### PREVIOUS GEOLOGIC WORK

Previous geologic work within the area of permit 143 has been relatively minor.

In 1959 the Geological Survey of Canada carried out a reconnaissance survey of the Precambrian Shield in northeastern Alberta north of Lake Athabasca. This work resulted in a map on a scale of 1" = 4 miles, with marginal notes (Riley, 1960). In 1958, J.D. Godfrey of the Alberta Research Council mapped the St. Agnes Lake area on a scale of 1" =  $\frac{1}{8}$  mile (Godfrey, 1963).

The only reported mineralization within the permit area was a very small radioactive zone (3 times background) within a pegmatite (Godfrey, 1963).

#### GEOLOGY OF PERMIT 143

The permit area is underlain by a Precambrian complex of igneous, metamorphic, and metasedimentary (?) rocks. The characteristics of these rocks are largely the result of an extensive history of metamorphism and deformation.

Rocks within the permit area consist predominantly of granitic and gneissic rocks; a small portion (1 - 3%) of the permit area consisting of metasedimentary rocks (see Maps 2 and 3).

Regional foliation strikes north  $0^{\circ}$  to  $30^{\circ}$  east; however, complicated folding occurs within the permit area producing a wide range in strike attitudes. Plastic flow structures are abundant in some of the gneisses.

A predominant series of faults trending N to NW cut the area and are intersected by easterly trending cross faults. The most prominent faults are outlined on Map 3.

One of the objectives of the investigation was to compare reconnaissance mapping to the detailed map presented by Godfrey (1963). The major geologic units of both Maps 2 and 3 are in general agreement, however, some differences can be noted. The most significant differences are : (1) in the amount and distribution of amphibolite, and (2) the present mapping has not differentiated between hornblende granite gneiss and biotite granite gneiss as Godfrey has done. It is felt that reconnaissance mapping will give an adequate basis for accurate geologic interpretation of mineral occurrences in areas where detailed geologic control is not present.

The present investigation has delineated five rock types within the area mapped; pegmatite, quartzite, amphibolite, banded granite gneiss, and massive red granite. The boundaries between some of these units are not always clear due to their gradational nature. Descriptions of the major rock units follow.

#### ROCK TYPES

##### Pegmatite

This rock is characteristically coarse grained, equigranular, massive, and light grey on weathered surface. The pegmatite cuts the foliation and appears to be a late intrusive phase.

### Quartzite

This unit consists of a very well banded, fine to medium grained, impure grey quartzite. Color bands from several millimeters to several inches in width are characteristic.

The composition is typically up to 25% biotite (generally 10 - 15%), and 25 - 30% feldspar; the remainder being quartz. Hornblende and garnets are present in minor amounts.

### Amphibolite

The amphibolite unit mapped is characterized by a dark green color on fresh surfaces and grey-black on weathered surfaces. Foliation is well developed, with a strike of  $N40^{\circ}E$  and dipping  $74^{\circ}NW$ . Grain size is variable from fine to very coarse.

The rock consists principally of hornblende (50 - 75%) and feldspar (25%) with variable amounts of quartz (10 - 15%) and biotite (1 - 3%).

### Banded Granite Gneiss

This unit is highly foliated, banded, flow folded, and weathers light grey-pink. The foliation has a general strike of  $N40^{\circ}W$  to  $N40^{\circ}E$  and dips of  $35^{\circ}NE$  to  $74^{\circ}NW$ .

The rock is medium grained and grey to pink on fresh surface. The composition is approximately 20 - 15% quartz, 5 - 10% mafics (biotite and hornblende), and 60 - 70% feldspar.

### Massive Red Granite

This unit is characterized by its massive nature and rusty red color. It is a coarse grained, equigranular red granite. The composition is relatively uniform and is approximately 10 - 15% quartz, 5% mafics (biotite and hornblende) and 80 - 90% red potassium feldspar.



## MINERALIZATION

### URANIUM MINERALIZATION

Five radioactive anomalies were found in the areas investigated. Locations of these occurrences are shown on Map 3. Radiation is expressed as cps (counts per second) measured at waist level using an SPP-2 SRAT scintillometer. Descriptions of each occurrence follow.

#### Occurrence #1

A zone 10 feet by 15 feet measured 300 to 500 cps. Two smaller zones within this area, each 4 feet by 4 feet, had radioactivities of 1500 to 3000 cps. Background radiation is 50 cps.

The mineralization occurs within a pegmatitic phase in the biotite granite gneiss unit. Outcrop in the vicinity of the anomaly is very limited thus no further mineralization could be located.

The geologic setting of the occurrence is conjectural, however, the occurrence is very close to a lithologic contact as illustrated by Maps 2 and 3. If the mineralization is along a lithologic contact, the zone of mineralization would be expected to occur along strike ( $N30^{\circ}E$ ) and could be more extensive than indicated by the show.

The mineralization may also be structurally controlled and related to the major shear zone mapped immediately to the southeast. Radioactivity in the anomaly appears to be highest along small shears and fractures, suggesting a genetic relationship to faulting. This could indicate more extensive mineralization along a major shear zone.

#### Occurrence #2

This anomaly occurs on a small island of pegmatite on the northeast end of St. Agnes Lake. Godfrey (1963) first noted the radioactivity

Occurrence #2 (Cont'd)

using Geiger counters during the 1958 field season.

The anomaly is approximately 30 feet by 30 feet in size and measures slightly higher than normal background radiation of similar pegmatites in the area (150 - 200 cps), radiation being 300 - 500 cps and increasing to 1000 - 1500 cps along small fractures. This again suggests a genetic relationship to major faulting.

Occurrence #3

This radiometric anomaly is a zone 6 - 8 feet wide by approximately 70 feet long (disappears under overburden) with radioactivity of 500 cps (background of 50 - 100 cps). The radiation occurs in a pegmatitic phase of the banded granite gneiss unit. Joints and fractures do not appear to be more radioactive than the pegmatite.

The anomaly occurs approximately 400 feet east of a prominent NE trending lineation interpreted as a fault, and is on strike with Occurrence #2. These two anomalies may be genetically related.

Occurrence #4

A pegmatitic zone 20 feet by 15 feet with radioactivity of 300 - 400 cps was found along a prominent N-NE trending fault. Radioactivity along joints and fractures measured 500 - 600 cps. Background radiation in the surrounding banded granite gneiss measured 50 - 100 cps.

The full extent of mineralization is difficult to estimate due to limited outcrop.

Occurrence #5

This anomalous zone measured approximately 20 feet by 20 feet and has radioactivity up to 3000 cps. The size of the anomaly is not known

Occurrence #5 (Cont'd)

as the outcrop area is only slightly larger than the anomalous zone.

The radioactivity occurs in the pegmatite unit. Radioactivity of the pegmatite is about 600 - 800 cps with fractures in the pegmatite having radioactivity up to 3000 cps. Background radioactivity is 100 cps.

BASE METAL MINERALIZATION

No sulfide mineralization was noted in the St. Agnes Lake area investigated. However, a large quartz vein approximately 8 feet wide was found within the biotite granite gneiss unit approximately 200 feet southeast of radioactive Occurrence #5. Outcrop in the area is limited and the extent of the vein could not be determined. The presence of this vein is pointed out because of its size and the well known association of quartz and gold. The possibility of gold occurrences in the area should not be overlooked as gold has been mined at Goldfields, Saskatchewan, to the east of St. Agnes Lake.

DISCUSSION OF MINERALIZATION

Several significant facts became apparent during the course of the present investigation.

There is a definite alignment of the radiometric anomalies with interpreted major shear zones (see Map 3). Radioactivity is more pronounced along fractures and small shears in several of the occurrences noted previously. This suggests a genetic relationship of the uranium occurrences to faulting. It is also noteworthy that the mineralization occurs only within the banded granite gneiss and pegmatite units.

CONCLUSIONS

Reconnaissance ground mapping and prospecting has outlined five radiometric anomalies within Permit 143. All the anomalies are on the order of 5 to 10 times normal background.

The anomalies are located along major structural features (faults) with the highest measured radioactivities occurring in small shears and fractures within the banded granite gneiss and pegmatite units.

The present mapping has shown that reconnaissance mapping is adequate for geologic interpretations of mineral occurrences.

RECOMMENDATIONS

It is recommended that :

- (1) More detailed prospecting, using scintillometers, be carried out over other favorable areas of mineralization.
- (2) A reconnaissance uranium hydrogeochemical prospecting program be carried out in the St. Agnes Lake area. The most favorable zones of uranium mineralization are obscured by overburden necessitating such a program to gain some insight into the mineralization in the area.

Favorable areas for prospecting and hydrogeochemistry are outlined on Map 4.

Respectfully submitted,

  
HAROLD H. WILLIAMS PhD.

REFERENCES

- Godfrey, J.D. and Peikert, E.W. 1963. Geology of the St. Agnes Lake District, Alberta. Research Council of Alberta Preliminary Report 62-1.
- Riley, G..C. 1960. Geology, Fort Fitzgerald, Alberta. Geol. Survey Can., Map 12 - 1960.

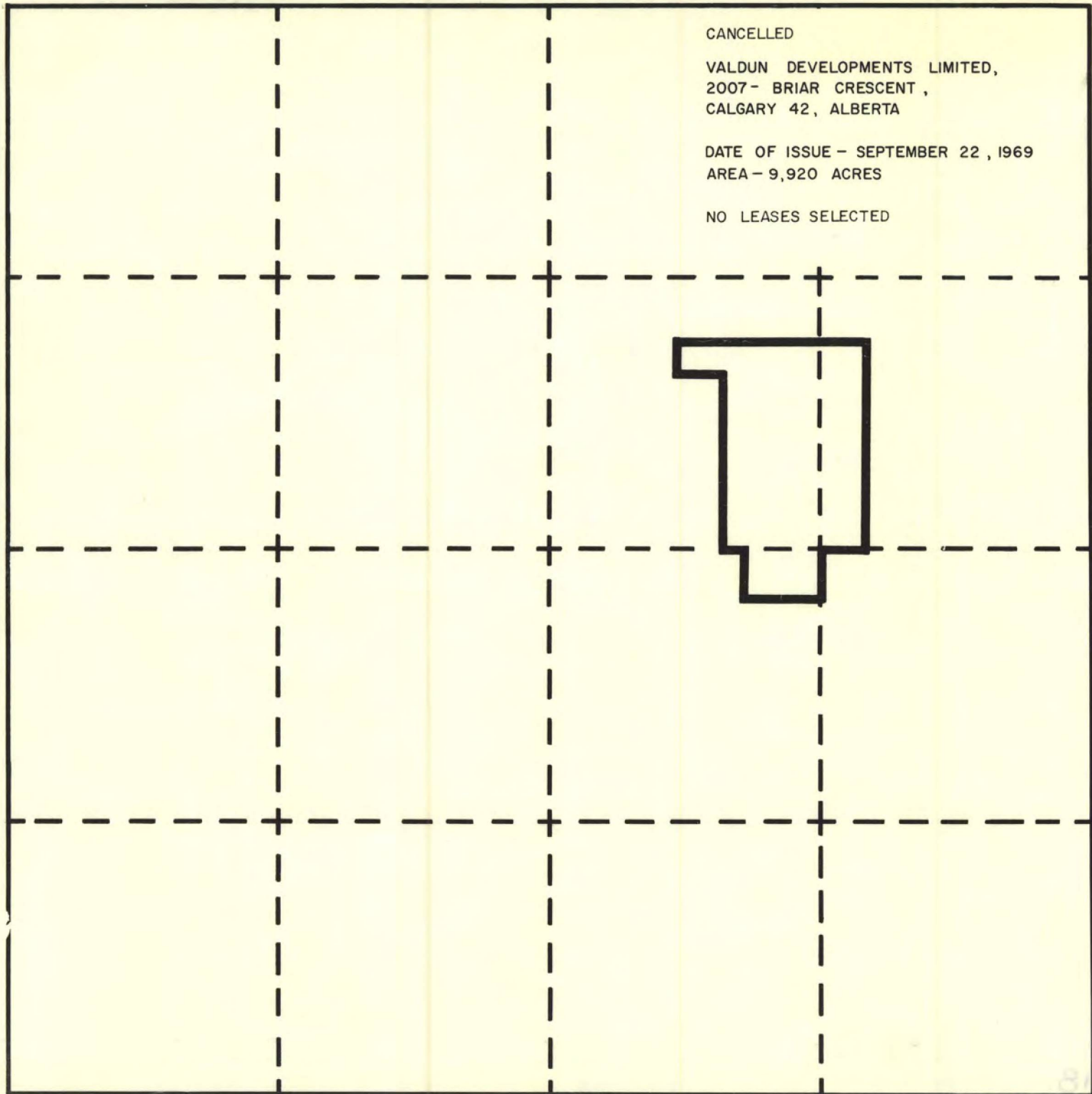
# QUARTZ MINERAL EXPLORATION PERMIT No.143

CANCELLED

VALDUN DEVELOPMENTS LIMITED,  
2007 - BRIAR CRESCENT,  
CALGARY 42, ALBERTA

DATE OF ISSUE - SEPTEMBER 22, 1969  
AREA - 9,920 ACRES

NO LEASES SELECTED



TP.123

TP.122

TP.121

R. 2

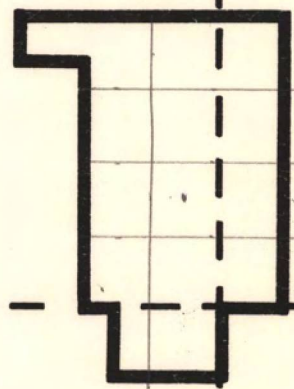
R. 1 W. 4 M.

QUARTZ MINERAL EXPLORATION PERMIT No.143

(74m/9)

VALDUN DEVELOPMENTS LIMITED,  
2007 - BRIAR CRESCENT,  
CALGARY 42, ALBERTA

DATE OF ISSUE - SEPTEMBER 22, 1969  
AREA - 9,920 ACRES



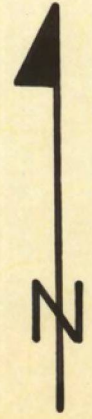
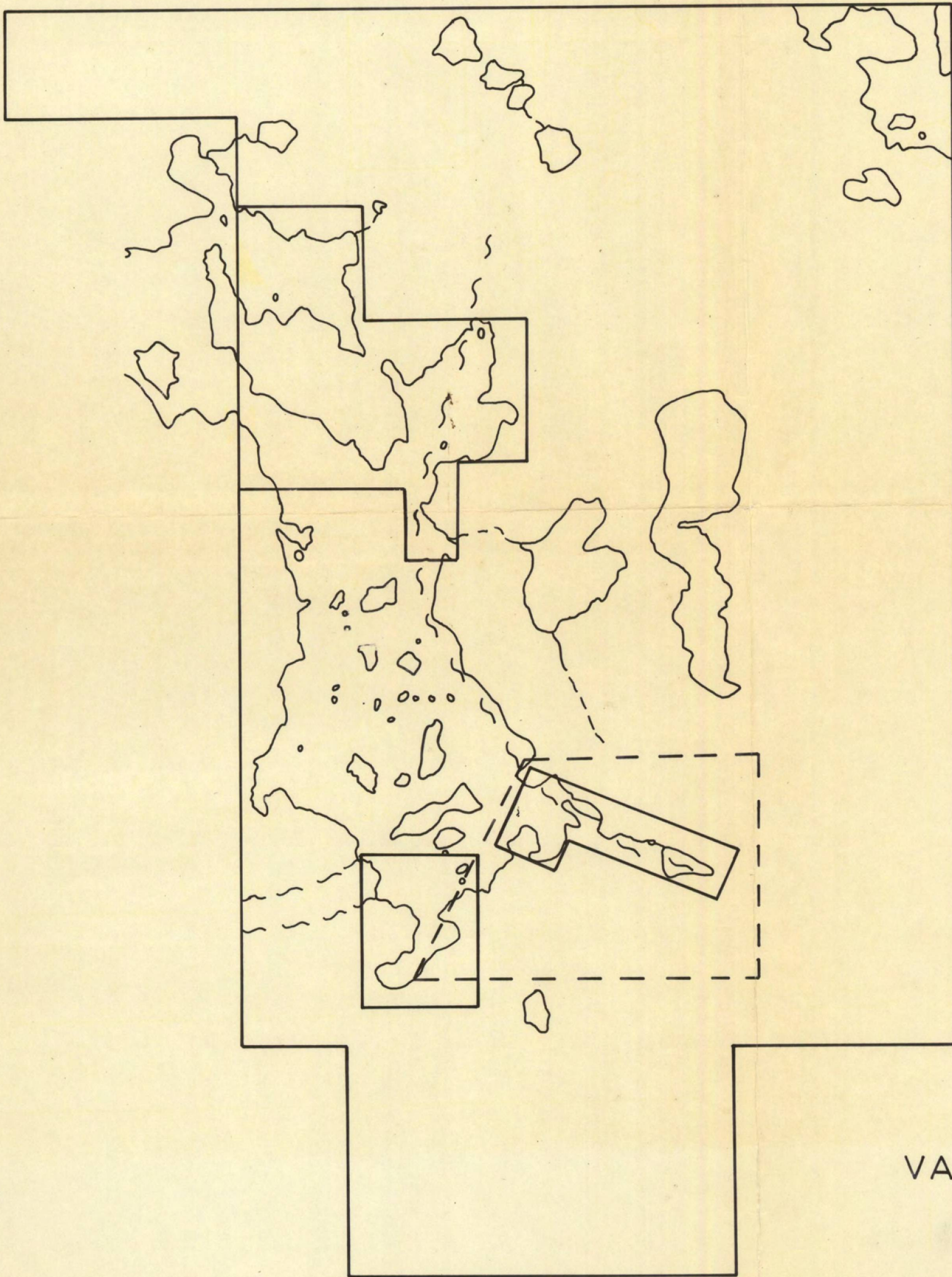
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TP.122

TP.121

R. 2

R. 1 W. 4 M.

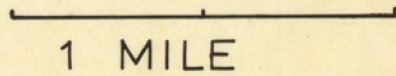


RECOMMENDED AREAS  
— HYDROGEOCHEM  
-- PROSPECTING

VAL DUN DEVELOPMENTS LTD.  
QUARTZ MINERAL PERMIT 143  
NORTHEASTERN ALBERTA

19700018

MAP 4



HH WILLIAMS

SEPT. 1970

Permit 143  
H-8-1-70  
19700018





1970018  
Map 2

LEGEND

- PRECAMBRIAN\***
- 1 Quartzite, pure and impure, white, grey, green, pink and blue; including biotite sericite schist, minor milky quartz pods, feldspar augen, granite and pegmatite lenses, ferruginous and garnetiferous zones.
  - 2 Biotite schist, with abundant quartz, some sericite; including phyllite, phyllonite, quartzite, minor milky quartz pods, feldspar augen, granite and pegmatite lenses, ferruginous and garnetiferous zones.
  - 3 Biotite granite C, with white to grey subhedral to anhedral feldspar megacrysts, one-quarter to one-half inch in size, in a foliated matrix; including minor apilite, microgranite and pegmatite.
  - 4 Gneissic biotite granite C, with white to grey feldspar augen, one-quarter to one-half inch in size, in a well-foliated to banded matrix; including microgranite bands, with minor apilite and pegmatite.
  - 5 Biotite granite D, with grey to pink to red anhedral feldspar megacrysts, one and one-half to three inches in size, in a foliated to massive matrix; including minor apilite, microgranite and pegmatite.
  - 6 Gneissic biotite granite D, with grey to pink feldspar augen, one and one-half to three inches in size, in a well-foliated to banded matrix; including microgranite bands, with minor apilite and pegmatite.
  - 7 Quartz diorite, with white to pink feldspar megacrysts, one-quarter to three-quarters inch in size, abundant hornblende, minor biotite (locally biotite rich and hornblende poor); in a foliated matrix; including minor apilite, microgranite.
  - 8 Biotite granite gneiss, with some hornblende, chlorite; including minor massive granite, porphyritic granite, granodiorite, alaskite, lenses of biotite, quartzite, amphibolite; garnetiferous zones.
  - 9 Hornblende granite gneiss, with some biotite, chlorite; including minor massive granite, porphyritic granite, granodiorite and amphibolite.
  - 10 Amphibolite, including biotite amphibolite, hornblendite; banded to massive.
- Biotite granite, with white, to pink to red feldspars, minor sericite; including leucocratic phases; massive. Muscovite granite (m), with abundant white to pink feldspars, minor biotite; massive. Phases with abundant feldspar megacrysts (p), one-quarter to one-third inch in size. Hornblende bearing phases (H).
- Granite pegmatite, with white, to pink to red feldspars, sparse biotite and/or chlorite; massive. Muscovite pegmatite (m), with abundant white to pink feldspars, quartz; massive.
- Leucocratic granite, with pink to red anhedral feldspars, equigranular; massive, locally foliated; including minor microgranite and pegmatite. Sericite bearing phases (S).
- Sheared leucocratic granite, with white to pink feldspars; medium to fine grain, typically sheared; minor biotite, muscovite, sericite.
- Basic dyke, massive, locally sheared with chlorite.

\*Note: Rock units are not arranged chronologically

- Geological boundary (defined, approximate, assumed)
- Geological boundary, gradational
- Schistosity, gneissosity, foliation (defined, assumed)
- Schistosity, gneissosity, foliation (dip-inclined, vertical, horizontal)
- Extreme contortion (structural trend)
- Tight folds (structural trend)
- Fault (defined, approximate, assumed)
- Shear, shear zone
- Breccia
- Mylonite
- Gossan
- Joint
- Sample location
- Glacial striae (direction of ice movement known)
- Radioactivity
- Garnet
- Chlorite, abundant

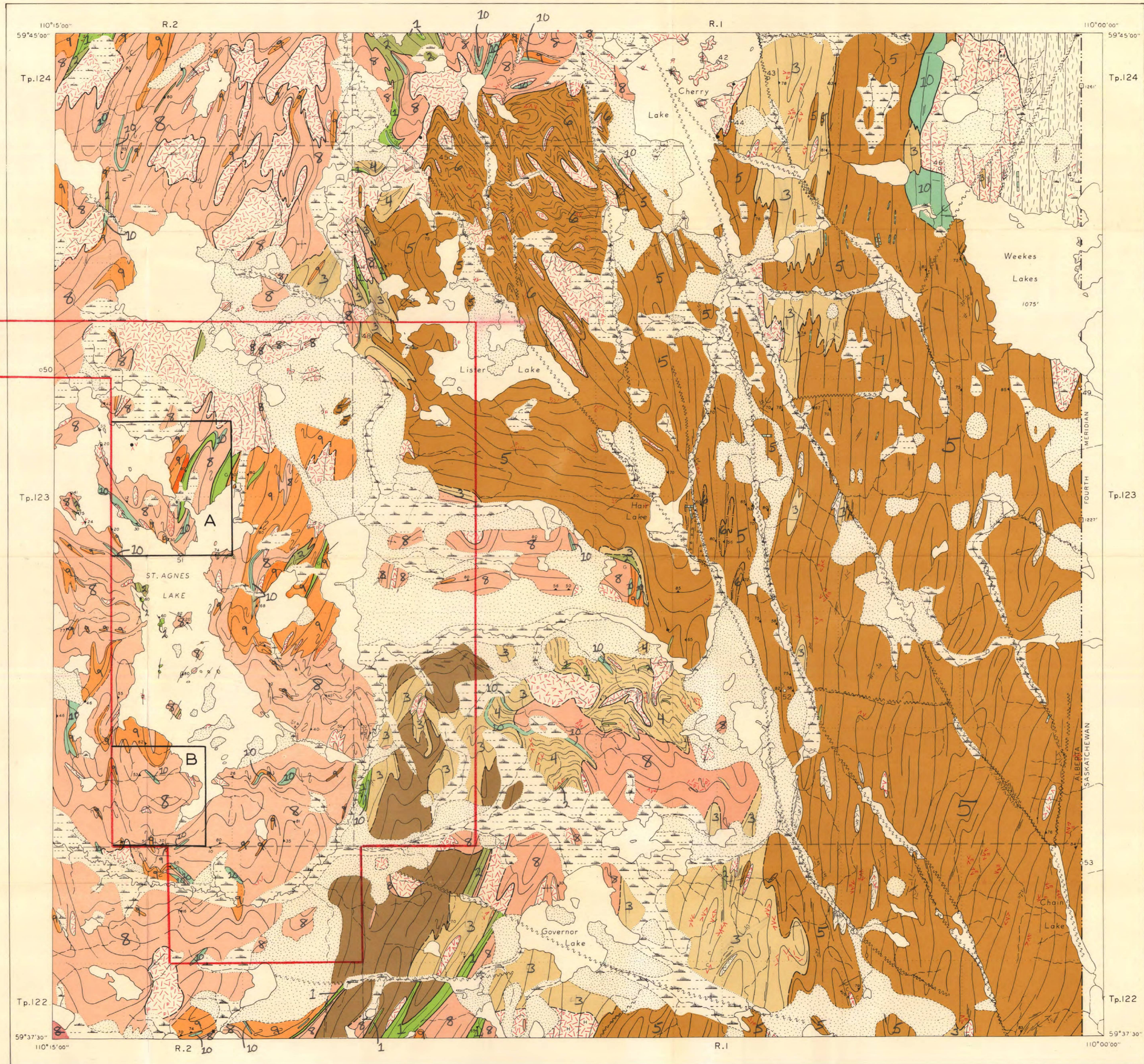
Geology by John D. Godfrey and E. W. Peikert, 1958

- Drainage (permanent, intermittent)
- Muskeg
- Sand-covered area
- Spot elevation, height in feet above mean sea-level
- Provincial boundary
- Township boundary
- Section line

Base map compiled from planimetric sheet 74 NE, quarter, published by Government of Alberta, Department of Lands and Forests, Edmonton.

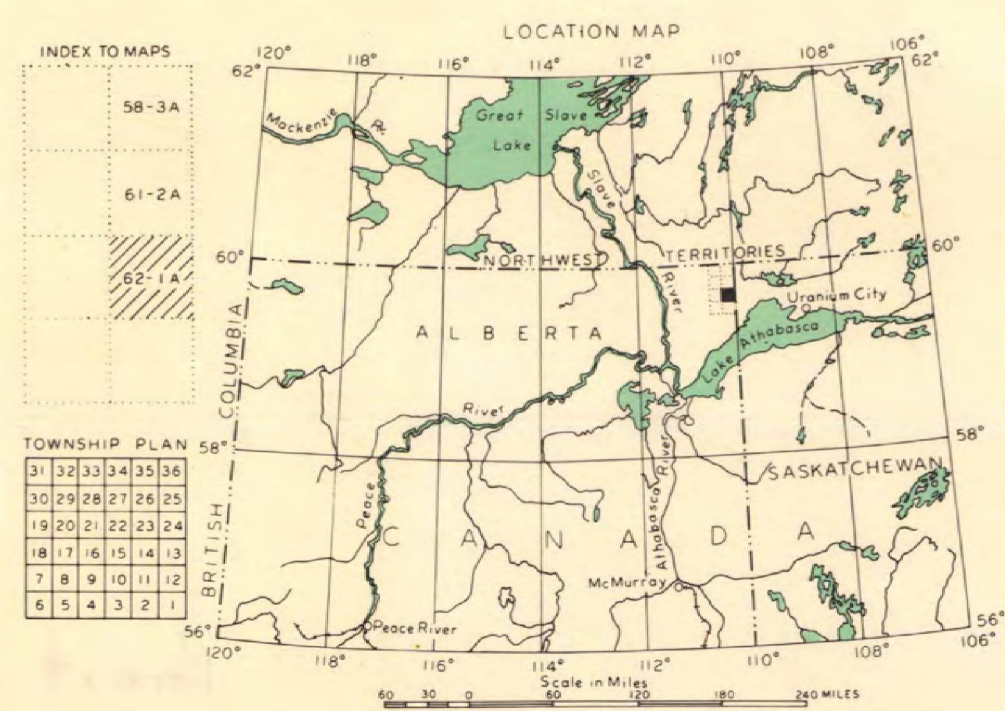
Air photographs covering this area are obtainable from the Technical Division, Department of Lands and Forests, Government of Alberta, Edmonton, and the National Air Photographic Library, Topographical Survey, Ottawa.

Approximate magnetic declination 25° 58' East in 1962, decreasing 6' annually.



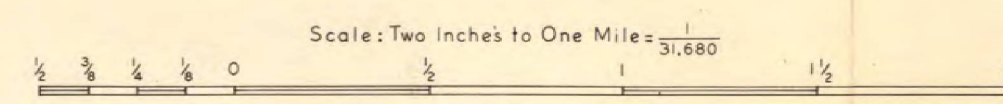
Map to accompany Preliminary Report 62-1

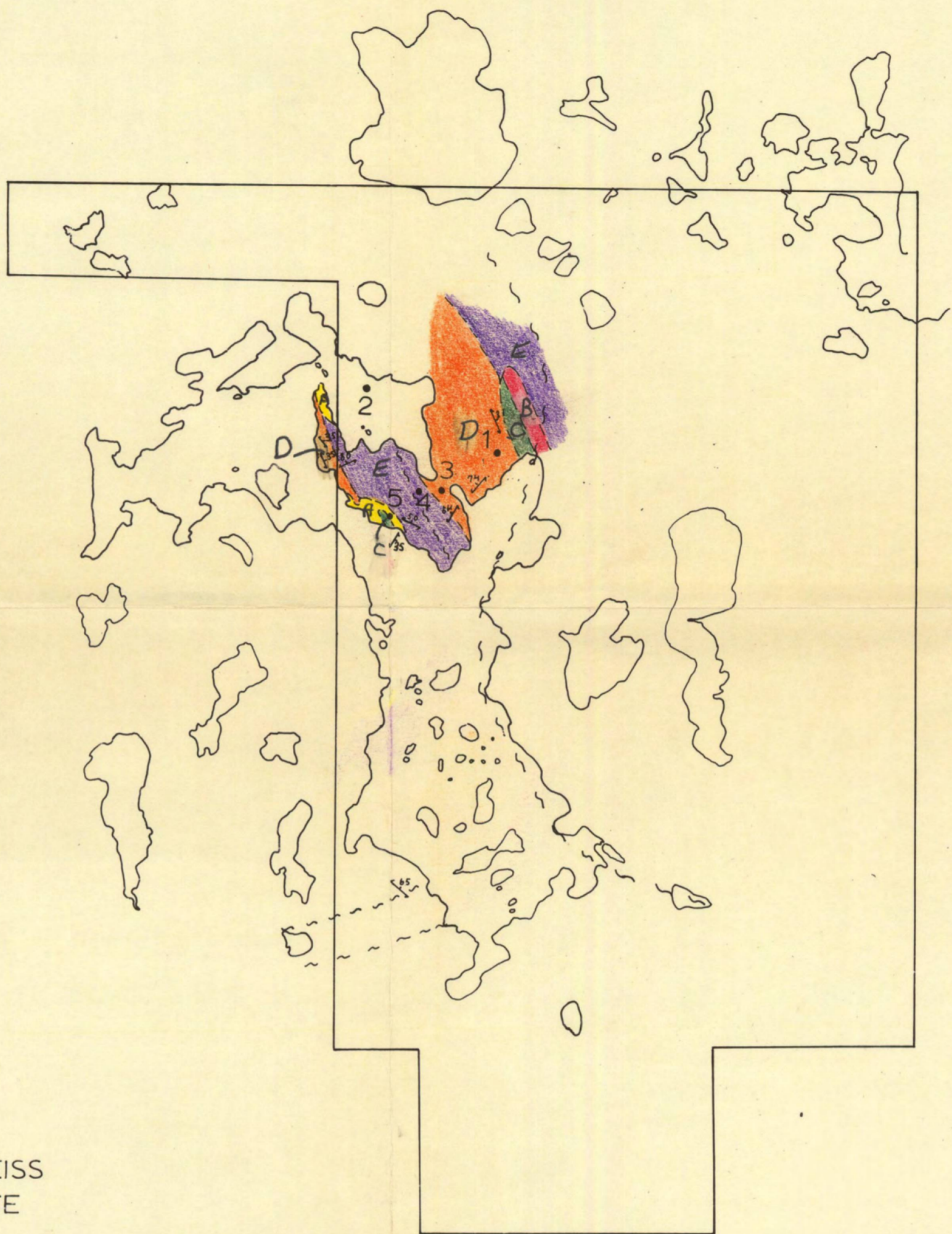
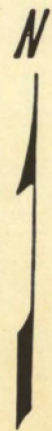
Lithographed in Canada Published 1962



MAP 2

MAP 62-1A  
ST. AGNES LAKE  
WEST OF FOURTH MERIDIAN





LEGEND

- A  PEGMATITE
- B  QUARTZITE
- C  AMPHIBOLITE
- D  BANDED GRANITE GNEISS
- E  MASSIVE RED GRANITE
- - - FAULT
- 1. URANIUM OCCURRENCE
- GEOLOGIC BOUNDARY
- APPROXIMATE PERMIT BOUNDARY
- ↗ STRIKE & DIP OF FOLIATION

VAL DUN DEVELOPMENTS LTD.

GEOLOGIC MAP OF PERMIT 143.  
NORTHEASTERN ALBERTA

H.H. WILLIAMS SEPT. 1970

19700018  
MAP 3

# CANADA

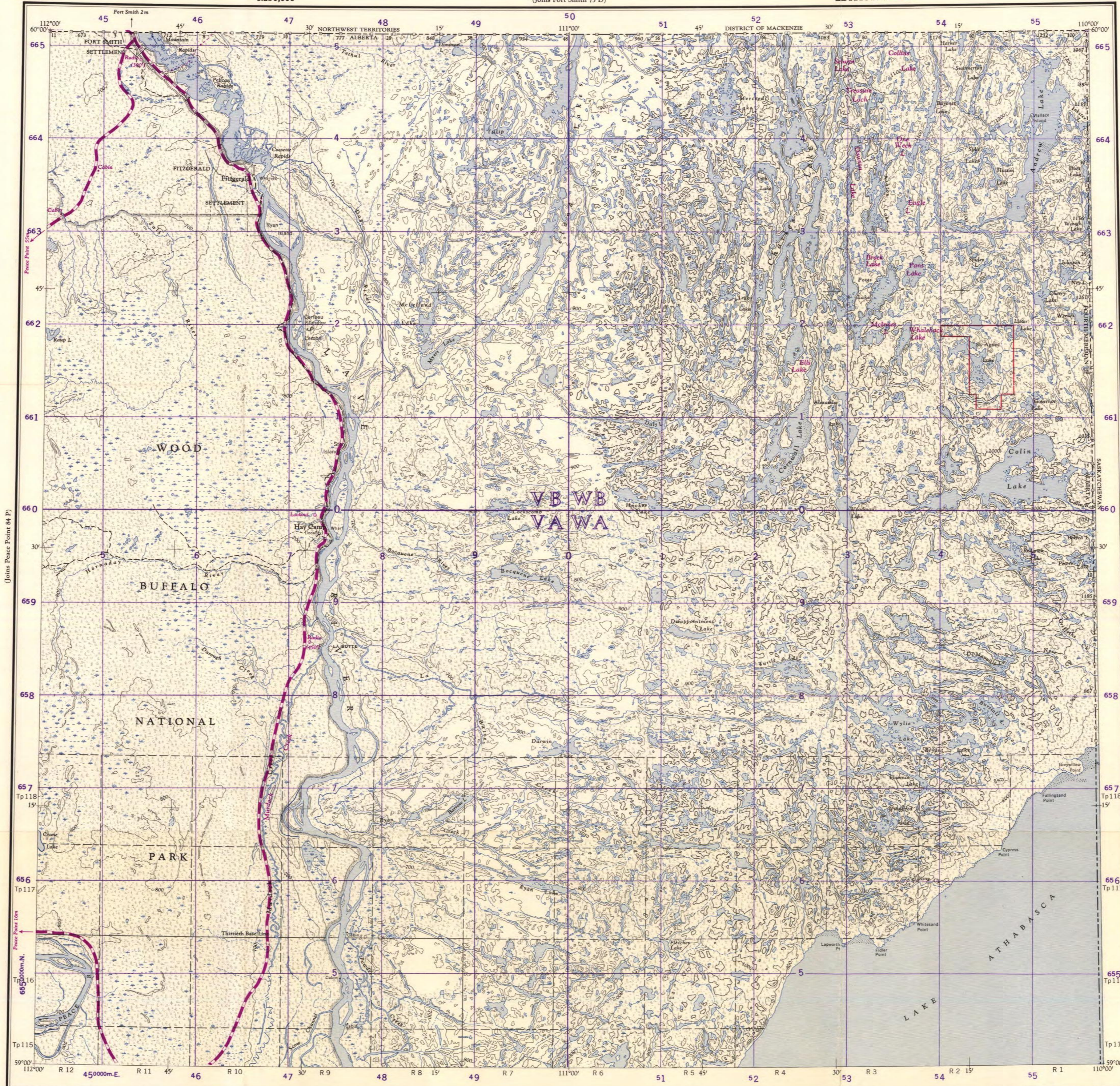
74M

1:250,000

(Joins Fort Smith 75 D)

EDITION 3 (1967)

74M



Refer to this map as: 74M EDITION 3 MCE SERIES A 502 (1967)

APPROXIMATE BOUNDARY OF PERMIT 143

GRID ZONE DESIGNATION	TO GRID 6 STANDARD REFERENCE ON THIS SHEET TO NEAREST 1000 METRES
12 V	CABIN
450000	VA 7654
	12 VVA 7654

TEN THOUSAND METRE UNIVERSAL TRANSVERSE MERCATOR GRID ZONE 12

Produced and printed by the SURVEYS AND MAPPING BRANCH, DEPARTMENT OF MINES AND TECHNICAL SURVEYS, 1963, from air photographs taken in 1955. Field surveys and culture check 1957.

Copies may be obtained from the Map Distribution Office, Department of Mines and Technical Surveys, Ottawa. Road: loose or stabilized surface, all weather. Route, gravier aggloméré, toute saison. 2 lanes or more. Power transmission line. Ligne de transport d'énergie. 2 voies ou plus.

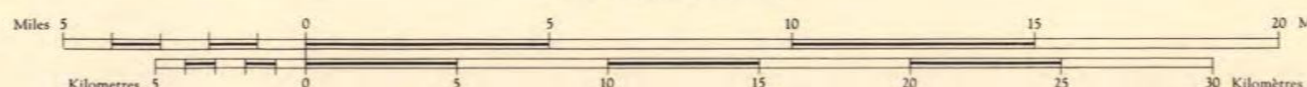
Transverse Mercator Projection  
North American Datum 1927  
Contour Interval 100 feet  
Elevations in feet above Mean Sea Level  
Magnetic declination 27° 34' East at centre of map 1963  
Annual change (decreasing) 5.2'  
Interim corrections 1967.

## FITZGERALD

ALBERTA

WEST OF FOURTH MERIDIAN - OUEST DU QUATRIÈME MÉRIDIEN

Scale 1:250,000 Échelle



PROVISIONAL MAP 1970018  
MAP 1.

CARTE PROVISOIRE  
Certains noms inscrits sur cette carte ne sont pas encore officiels. La Direction des levés et de la cartographie saurait être avisée de lui signaler corrections et additions.

Projection Transverse de Mercator  
Réseau géodésique nord-américain unifié (1927)  
Équidistance des courbes: 100 pieds  
Élévations en pieds au-dessus du niveau moyen de la mer  
Déclinaison magnétique au centre de la feuille en 1963: 27°34' Est  
Variation annuelle (décroissante) 5.2'  
Corrections provisoires 1967.

Établi et imprimé par la DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE, MINISTÈRE DES MINES ET DES RELEVÉS TECHNIQUES en 1963, d'après les photographies aériennes prises en 1955. Travaux exécutés sur le terrain et vérification des ouvrages en 1957.

Ces cartes sont en vente au Bureau de distribution des cartes, ministère des Mines et des Relevés techniques, Ottawa.

- Horizontal control point. Point géodésique.
- Boundary monument. borne frontière.
- Spot elevation, in feet. Repère de nivellement en pieds.
- Rapids; falls. Rapides; chutes.
- Marsh or swamp. Marais ou marécage.
- Depression contours. Courbes de cuvette.
- Surveyed line. Ligne arpentée.

FITZGERALD  
74M  
EDITION 3 (1967)