GEOLOGIC SETTING OF THE MORAN LAKE URANIUM SHOWINGS, CENTRAL MINERAL BELT, LABRADOR

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INTRODUCTION

The Moran Lake uranium showings lie south of Moran Lake in sandstones and conglomerates of the Helikian Bruce River Group. The three showings, designated from east to west as the A, B and C zones, were discovered by Brinex in 1957. The area was acquired in 1964 by Mokta Canada Limited, who later took out development licences on the B and C zones; these licences were subsequently dropped in 1973. The surrounding areas are held by Brinex under concession until 1980.

In a previous compilation map of the area, Smyth et al. (1975) assigned the sandstones to the Aphebian Moran Group mainly on the basis of lithological descriptions by Bernazeaud (1965), who described the uranium host rocks as "dolomitic sandstones". It was suggested that the uranium mineralization might be related to the unconformity which separates the Moran Group from the overlying conglomerates of the Bruce River Group. Re-examination of the area has shown that:

1. The sandstones are not dolomitic and are, instead, part of the Heggart Lake conglomerate formation of the lower Bruce River Group, confirming William's regional map (1970).
2. The mineralization occurs well above the Moran-Bruce unconformity and cannot be classified as unconformity type.
3. Two of the showings are associated with severely altered, dolomitized, and brecciated gabbroic intrusions.

This note describes the geologic setting of the showings and postulates on their origin.

MORAN GROUP

The Aphebian Moran Group (Smyth et al., 1975) unconformably overlies Archean basement and strikes in a northeasterly direction across Moran Lake. A thin slate unit with minor dolostone overlies weathered Archean gneisses and granites; it is overlain by a 300 m thick unit of massive and pillowed basalts.

BRUCE RIVER GROUP

The Bruce River Group unconformably overlies the Moran Group. The contact is exposed 16 km to the west at Croteau Lake (Smyth et al., 1975) where boulder conglomerates overlie fractured mafic volcanic rocks. Northeast of Moran Lake a thin breccia overlain by red sandstones unconformably overlies pillowed volcanic rocks (Ryan, this volume). South of Moran Lake at Lake 202 (Fig. 1) the contact is a fault; here the lowest exposed unit of the Bruce River Group is a red mudstone.

The basal division of the Bruce River Group, informally referred to as the Heggart Lake formation, consists predominantly of boulder and cobble conglomerates, with minor intercalated

red sandstones, mudstones, and rare mafic volcanic flows. South of Moran Lake at Lake 202 at least one feldspar porphyry flow is intercalated with red sandstones; Brinex maps (Mann and Collins, 1957) show an amygdaloidal basalt unit within the sediments southeast of Lake Louis.

The Heggart Lake formation is overlain disconformably by a pink to white tuffaceous sandstone formation, which is overlain in turn by a bimodal suite of subaerial, silicic and mafic volcanic flows with minor intercalated sandstones.

GABBRO

Two types of gabbro intrude the Heggart Lake formation in the Moran Lake area:

1. Medium to coarse grained biotite gabbro (Unit 9).
2. Medium to fine grained, intensely altered, red weathering, brecciated gabbros associated with the B and C zones (Unit 9a).

The relationship between the two types is not known.

Small biotite gabbro intrusions (Unit 9) cut sandstones and conglomerates south of Louis Lake. The body nearest Louis Lake contains lesser amounts of biotite and appears to grade into a silicic phase, rich in feldspar and hornblende with minor quartz.

Southeast of the showings near Spinney Lake, Marten (in Smyth et al., 1975) mapped a diorite that grades into a core, approximately 300 m in diameter, of quartz monzonite containing K - feldspar phenocrysts up to 2 cm across. On the north shore of Moran Lake a small plug of medium to fine grained gabbro has intruded the Archean granites.

The gabbro associated with the B and C zones differs considerably from the biotite gabbro. It is severely altered, deeply weathered, commonly brecciated and in most places is difficult to identify as a gabbro without petrographic examination of thin sections. The petrography of the mineralized gabbro is described later.

STRUCTURE

The area lies on the northern limb of the Bruce Lake syncline, a major southwest trending fold of presumed Grenville age (Smyth et al., 1975). Dips are generally moderate to the southeast. Rocks of the Bruce River Group are variably cleaved but generally show a single cleavage that dips moderately to steeply to the southeast.

The Moran Group had a more complex structural history, being affected by two periods of folding (Smyth et al., 1975). However, the pillow lava unit in the Moran Lake area resisted the deformation and is generally undeformed.

Two sets of major faults cross the area. The early faults are northeast trending high angle reverse faults or thrusts that are probably synchronous with Grenville folding. Reverse faults are important in the C zone where a wedge of Moran Group pillow lavas is apparently thrust over Bruce River mudstones and sandstones. A zone of sheared and fractured conglomerates along the southeast margin of the B zone is suggestive of a thrust fault. Ryan (this volume) has shown that the Moran Lake area is transected by a number of reverse faults indicating that the area lies in a complex zone of northwestward directed thrusts.

The early faults are transected by a set of northwest-southeast trending normal faults which in the C zone cut out the mineralized unit.

MINERALIZATION

A Zone

The A zone occurs exclusively in conglomerates and sandstones of the Heggart Lake formation. Radioactivity is spotty and is confined to narrow shear zones in coarse grey sandstones and pebble and cobble conglomerates. Where mineralized, the conglomerates typically have a grey sandstone matrix in contrast to the unmineralized red conglomerates. Disseminated pyrite and chalcopyrite and thin carbonate veins are associated with the radioactive zones. Scintillometer readings in old trenches varied from 20 to 200 times background.

B Zone

The B zone is associated with severely altered gabbroic intrusions into sandstones and grits of the Heggart Lake formation. Uranium mineralization occurs within the gabbro and locally in sandstones close to the intrusive contacts. Where mineralized the gabbro has a deep brown to ochre surface weathering and is cut by a network of thin fractures and veins which give the rock a brecciated appearance. The fractures are commonly hematized and chloritized. Rare pitchblende veinlets up to 2 cm wide were recognized in trenches in the northeastern part of the zone.

Coarse and fine grained phases of the gabbro can be identified in the field. The fine grained phase, which may be a chilled margin, consists of microphenocrysts of euhedral plagioclase (up to 0.5 mm length) in an altered groundmass of carbonate, chlorite, and opaque oxides. Carbonate veinlets are locally common.

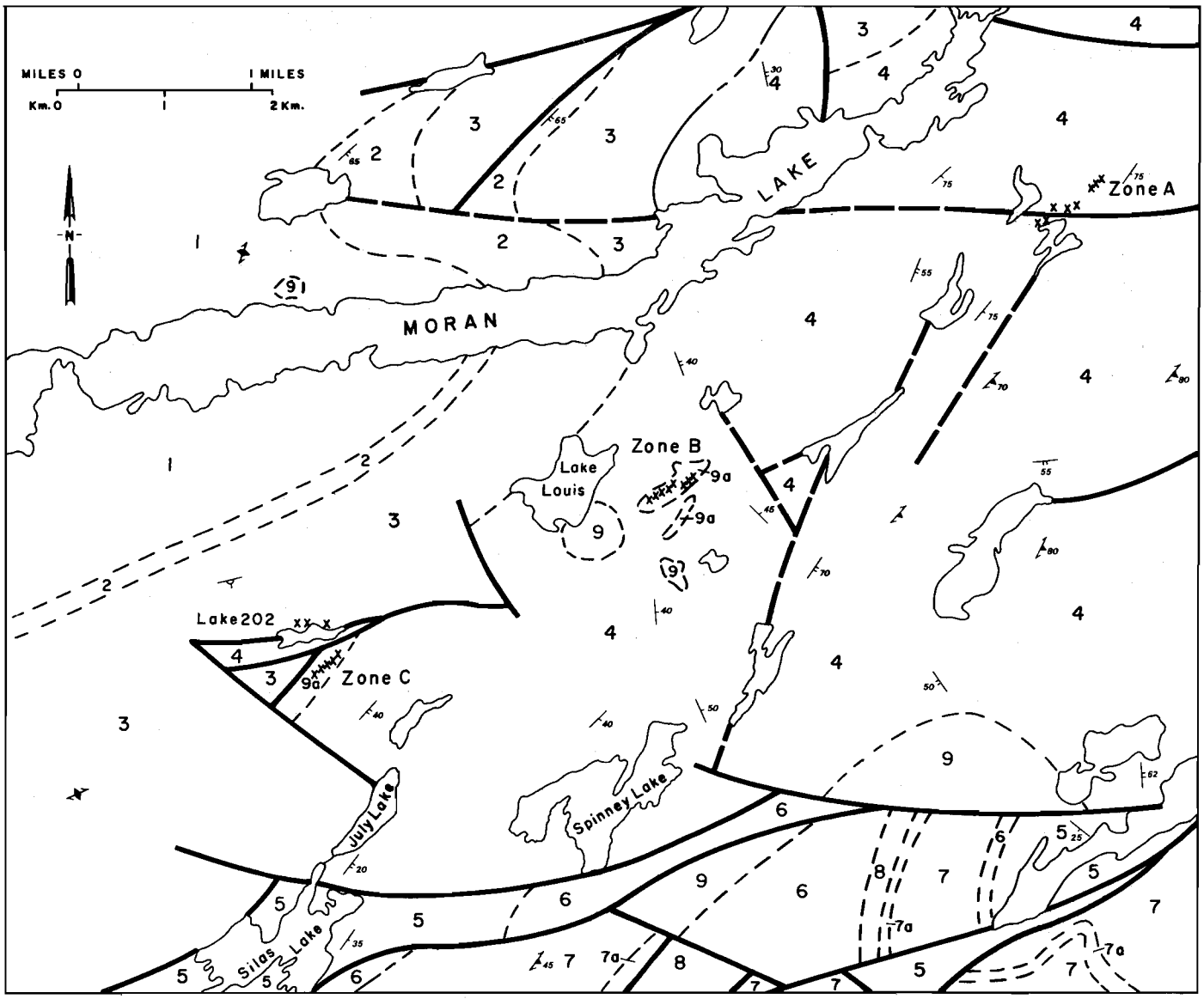
The coarser grained phases in their least altered parts consist of mildly sericitized, interlocking euhedral to subhedral plagioclase (An_{34}) laths (up to 2.5 mm long) with interstitial chlorite-opaque oxide $\pm$ sericite, which has replaced the original mafic minerals. The chlorite morphology suggests replacement of pyroxene; rare ovoid outlines suggest that some chlorite may be olivine pseudomorphs.

C Zone

The C zone lies southwest of and on strike with the B zone. Radioactivity occurs in severely brecciated, fine grained gabbro that is intrusive into sandstones of the Heggart Lake formation, and in fractured mafic volcanic rocks of the Moran Group.

Radioactivity in the Moran Group mafic volcanic rocks is spotty and is confined to fractures and shear zones close to a major east west fault that runs along Lake 202 and juxtaposes the Moran Group and the Bruce River Group. The highest counts (up to 10 times background) were obtained from carbonate filled fractures.

Outcrop over the brecciated gabbro is sparse, and intrusive contacts with the sandstones were not observed. Within the gabbro unit, there are repeated transitions upwards from fine grained unbrecciated diabase to altered diabase cut by carbonate-hematite veinlets to altered and brecciated, red weathering diabase. In one trench the breccia fragments show a near vertical alignment and stretching direction. Since the bounding rocks dip moderately (40^{o} - 50^{o}) to the southeast, the



LEGEND

PROTEROZOIC

INTRUSIVE ROCKS (POST BRUCE RIVER GROUP)

- 9 Gabbro, diorite
  9a - altered gabbro
- 8 Feldspar porphyry

BRUCE RIVER GROUP

- 7 Porphyritic dacite
  7a - sandstone
- 6 Massive mafic flows, agglomerate
- 5 Tuffaceous sandstone
- 4 Heggart Lake formation: conglomerate, sandstone, minor mafic flows

MORAN GROUP

- 3 Pillowed mafic flows
- 2 Slate, dolostone

ARCHEAN

- 1 Foliated granite and gneiss

Bedding: tops unknown, known.....

Pillows: tops known.....

Schistosity, cleavage.....

Geological contact: defined, approximate...

Fault: defined or approximate, assumed.....

Uranium showings..... x

Figure 1.

alignment of the clasts is interpreted as having been caused by fluidization during intrusion. The fine grained diabase horizons may represent a chilled margin of the intrusion repeated by thrust faults.

The fine grained diabase has basaltic microstructure in thin section. The rock is severely altered to a matted mass of pale green chlorite, carbonate and opaques, but contains relic plagioclase laths up to 0.5 mm that locally define a trachytic texture. From the fine grained diabase to the brecciated zones, the grain size increases and the rock becomes more leucocratic, containing radiating aggregates of subhedral to anhedral plagioclase with numerous opaque and sphene inclusions. The feldspar is largely replaced by carbonate.

The mineralized breccia consists of variably sized, subrounded fragments of broken feldspar crystals, altered leucogabbro or anorthosite, and fine grained diabase in a groundmass of carbonates and dusty opaques. Most of the smaller fragments are replaced by carbonate.

No uranium minerals were observed in the C zone; however, scintillometer counts up to 50 times background were obtained from trenches over the breccia.

DISCUSSION

The Neohelikian Heggart Lake formation is an important host for uranium mineralization. In addition to the three showings at Moran Lake, showings occur in this unit in the vicinity of Ferguson and Brown Lakes to the east (Beavan, 1958; Smyth et al., 1975; Smyth, this volume). These occurrences are in the conglomerates and sandstones and are minor; they are limited to local shear zones. However, where the sediments are cut by altered gabbroic intrusions, uranium is concentrated in the gabbros themselves as well as in the country rocks along the contact. Two potentially economic showings (B and C zones) of this type have been found. The gabbro bodies appear to have hydrothermally reconcentrated uranium that was originally contained in the surrounding sediments. Later faulting, fracturing and shearing probably further localized the mineralization.

The age of the mineralized gabbros is not known. They may be related to the nearby Elsonian anorthosite complexes (e.g. Harp Lake, 1450 m.y.; Michikamau, 1460-1495 m.y.; Krough and Davis, 1973) which intrude basement gneisses north of the Central Mineral Belt and are similar in age to the mafic-silicic volcanic rocks of the Upper Bruce River Group (1474 m.y.; Wanless and Loveridge, 1972). Alternatively, the gabbros could be younger, and related to the numerous gabbro-diabase sills of Gardar age (1278 m.y.; GSC, preliminary age) in the Seal Lake Group only 25 km to the west.

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