



# UNIVERSITY OF SASKATCHEWAN

## SOCIETY OF ECONOMIC GEOLOGISTS STUDENT CHAPTER

Zoë Brewster, Marjolaine Pascal, Krisztina Pandur, Cameron MacKay, Alauddin Hossain



### Cigar Lake uranium deposit

The objective of this BSc project is to determine the protolith of the problematic basement rock underlying the Cigar Lake uranium deposit, which has historically been named a "meta-arkose". The "meta-arkose" is proximal to the main fault zone at the eastern end of the ore deposit, which is the focus of mine development. Since the "meta-arkose" appears to be unique in comparison to other basement rocks associated with uranium deposits in the region, it begs the question as to whether the "meta-arkose" is a primary rock type or if it is just a product of hydrothermal alteration associated with the fault zone and ore body. In addition, the contact between meta-pelite and the "meta-arkose" is of mining significance as it is the location of historical rock falls.



Fig. 1: Cigar Lake Project Headframes



Fig. 2: Zoë examining the problematic "meta-arkose" at 500 m level

Zoë Brewster

Fig. 3: Map showing Wollaston Supergroup, Athabasca Basin, and study area; with dominant rock types (Yeo and Delany, 2007)

Zoë Brewster

The graduate and undergraduate student body of the University of Saskatchewan formed a new Student Chapter of the Society of Economic Geologists. This poster was prepared with the aim of showing some examples of the mineral deposits related projects our students are currently working on, supervised by Professors Kevin Ansdell, Yuanming Pan, Jim Hendry and Adjunct Professor Irvine Annesley.

The University of Saskatchewan SEG Student Chapter's local Industry Advisor is David Thomas from Cameco Corporation, and our Academic Advisor is Professor Kevin Ansdell.

### Hoidas Lake REE deposit

The Hoidas Lake vein-type REE deposit, located in northern Saskatchewan, contains allanite and apatite as the main hosts of the REE. The mineralized veins cut amphibolite grade gneissic rocks of the Zemlak Domain of the Rae Province, and are sub-parallel to the Hoidas-Nisikkatch Shear Zone, which is considered to be a subsidiary of the regional Black Bay Fault (Fig. 1).

The main aim of this PhD project is to understand the magmatic-hydrothermal evolution of the deposit, through a series of petrographical observations, geochemical and fluid inclusion studies, stable and radiogenic isotope analyses.

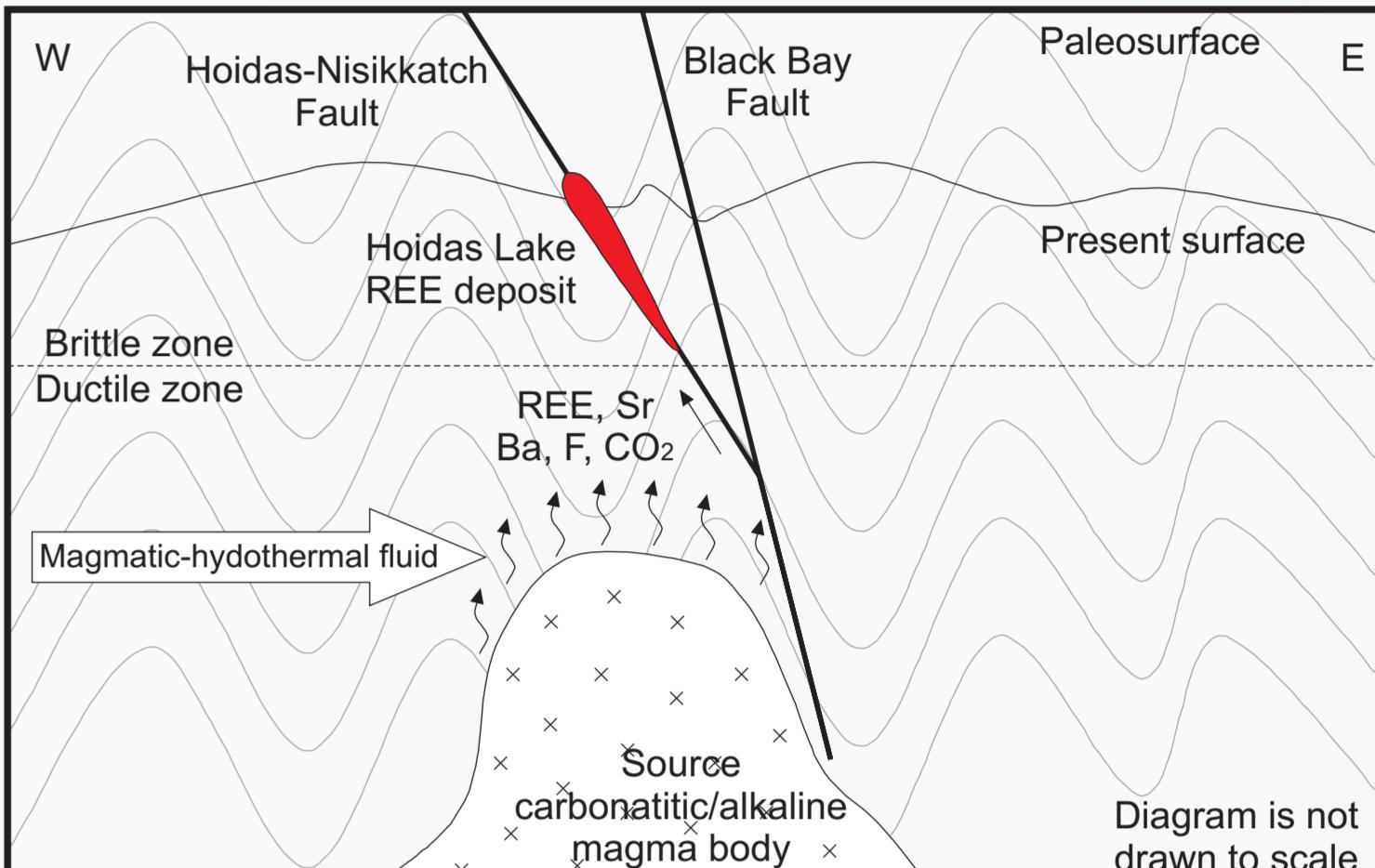


Fig. 1: Schematic cross-section showing the geological relations and potential origin of the Hoidas Lake REE mineralization (modified from Halpin, 2010)

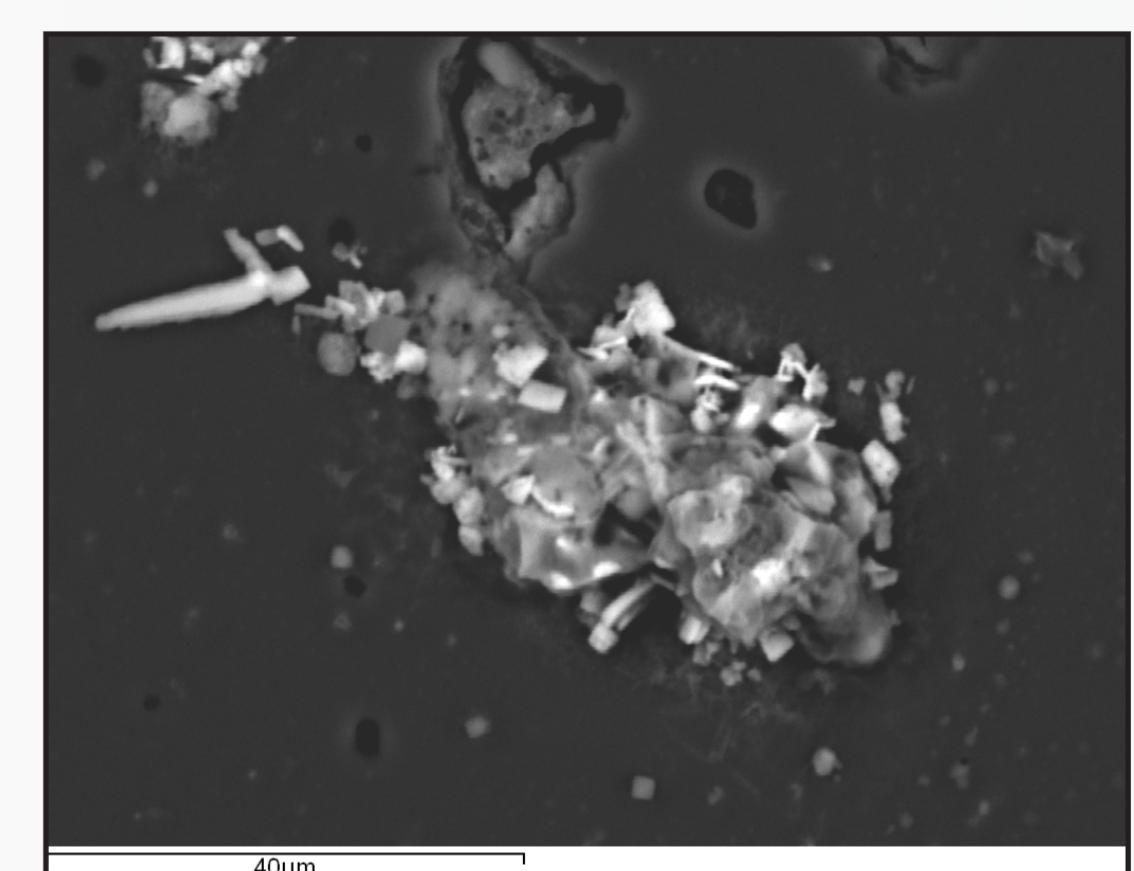


Fig. 3: Backscattered electron image of evaporate mound with Sr-salts from a quartz-rich veinlet (20keV)

Krisztina Pandur

### Hall Peninsula

A MSc project focusing on the geochemistry, petrogenesis and mineral potential of Paleoproterozoic and Archean mafic and ultramafic rocks in the Hall Peninsula.

The project takes place within the context of the Hall Peninsula Integrated Geoscience Project conducted by the Canada-Nunavut Geoscience Office on Baffin Island, Nunavut.

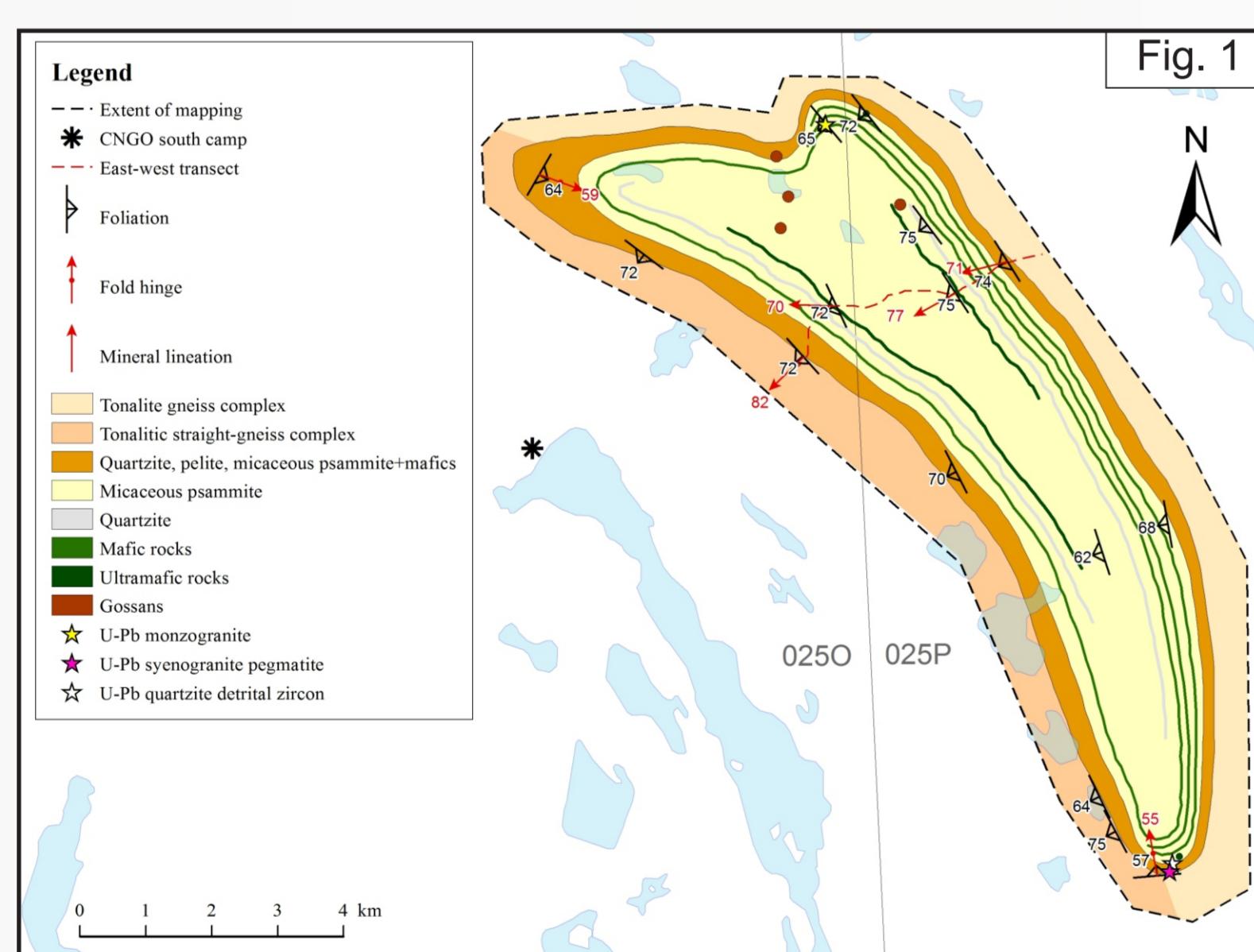


Fig. 1: Geology of the Qaqanituaq Area. A well exposed area which contains geologic relationships which are representative of a significant portion of the mafic and ultramafic rocks of the southern Hall Peninsula, Nunavut.

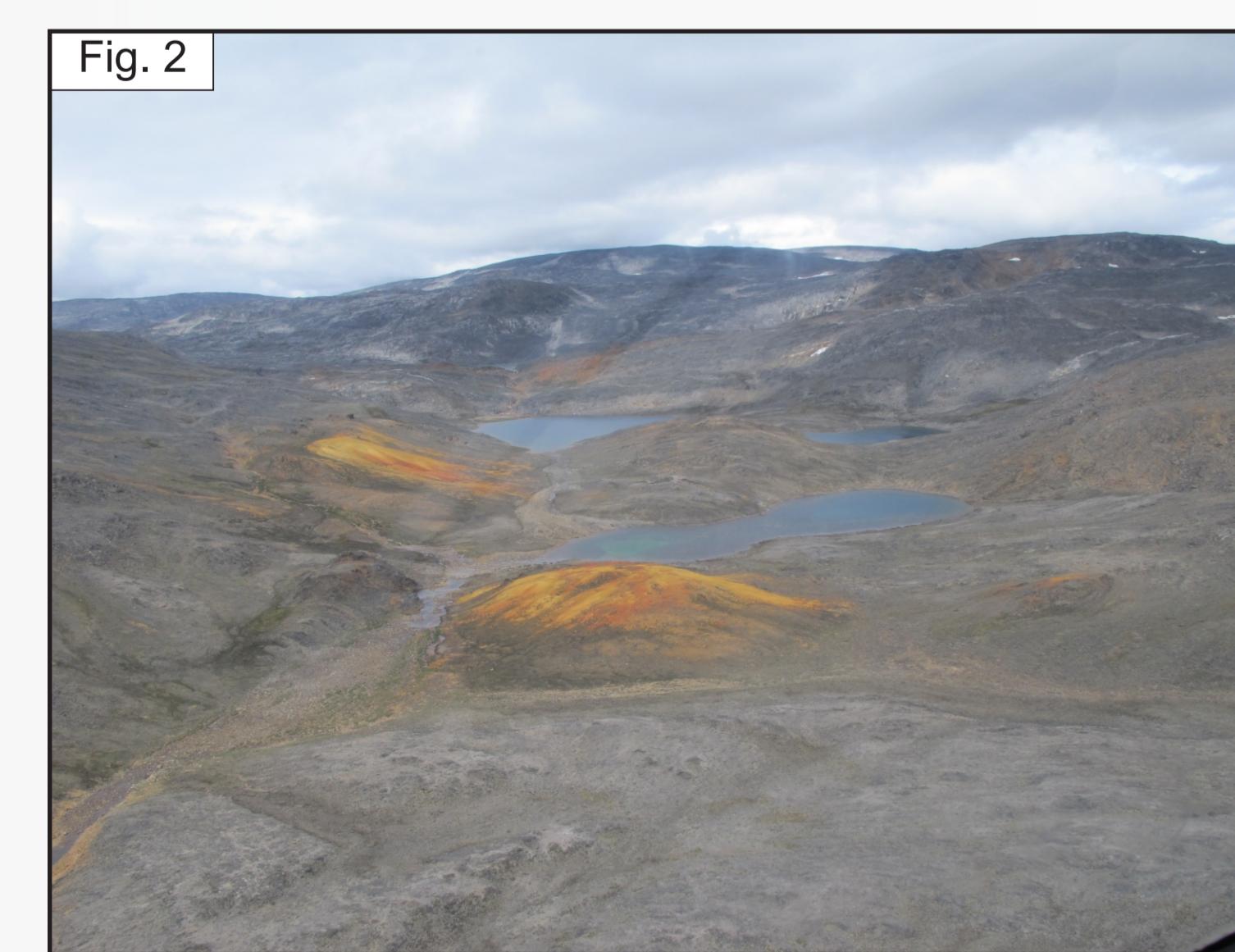


Fig. 2: West-facing aerial photograph of large gossanous areas found throughout the Qaqanituaq Area, UTM Zone # 64945125E, 702207964N, NAD 83 (foreground) and 64935227E, 702161446N (background).

Cameron MacKay



### Key Lake deposit

A MSc project focusing on mineralogical and geochemical characterization of uranium mill feeds and their effects on tailings at Key Lake.

Mineralogical characterization of ore is very important in developing mineral processing systems, designing an effective flowsheet and finally for predicting possible chemistry, mineralogy and stability of the tailings.

These goals can be addressed through quantifying the distribution of major and trace metals within ore minerals and the other associated minerals, as well as by determining how the metal-containing minerals occur, e.g. their grain size, their mineral associations, their quantities, as well as other related characteristics of the gangue minerals.

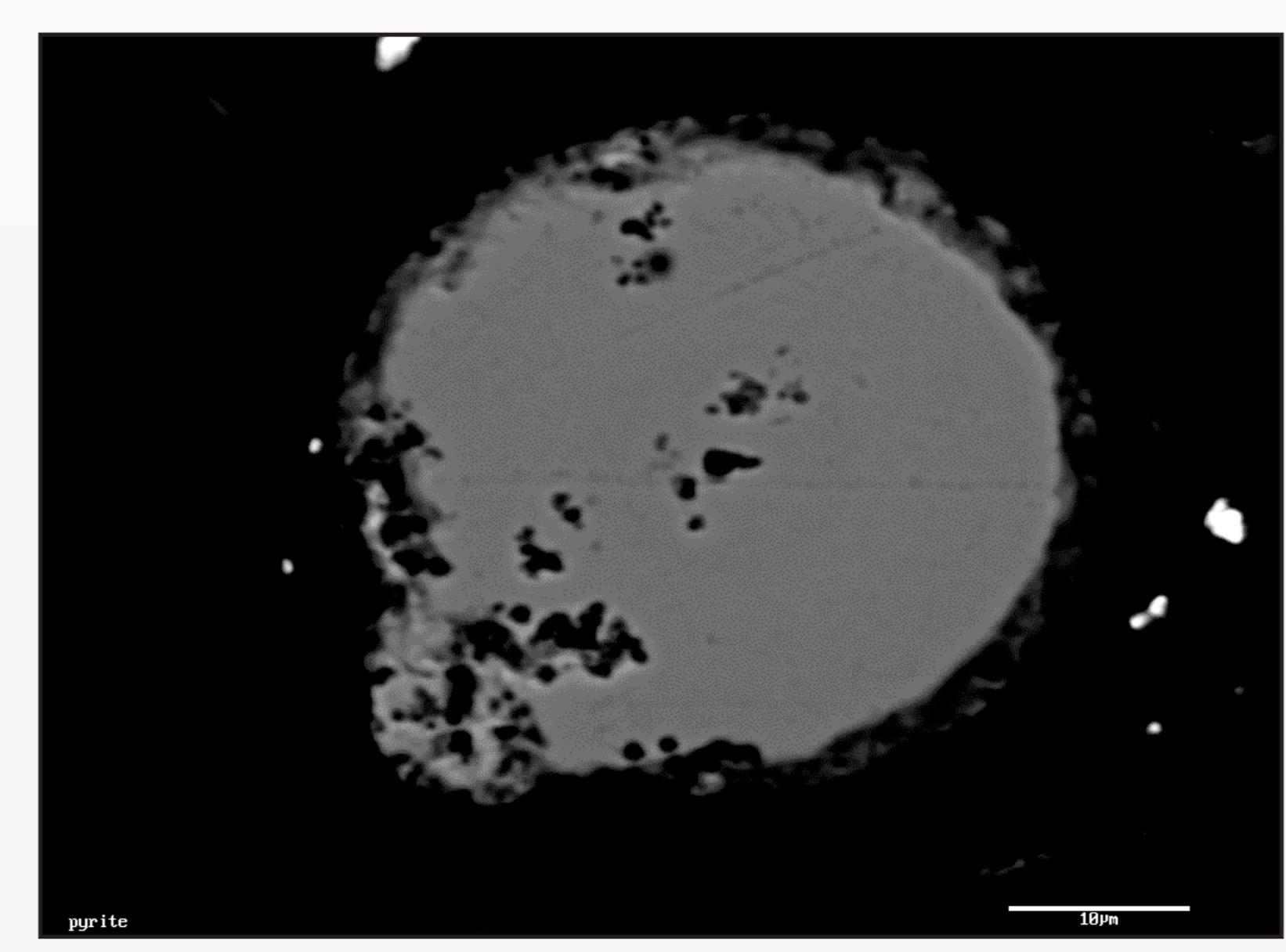


Fig. 1: A partially leached pyrite grain in leach residues from Key Lake as a result of incomplete acid leaching during uranium ore processing. There is possibility that when this pyrite as part of tailing is deposited in the tailings facility, oxidation could play a role in leaching out environmentally concerned trace elements like As.

Alauddin Hossain

### Dufferin Lake Zone, Athabasca Basin

The Dufferin Lake Zone (DLZ) is located in the south-central Athabasca Basin, in northern Saskatchewan (Canada) (Fig. 1). This later includes the world's highest grade uranium deposits which occur at the unconformity at the interface between the Proterozoic sediments and the underlying Archean to Paleoproterozoic basement rocks.

Graphite and/or carbonaceous matter (CM) are found in the basement, often concentrated along structures, and potentially could act as a reductant that could trigger deposition of uranium (Hoeve and Sibbald 1978, Komminou and Sverjensky 1996).

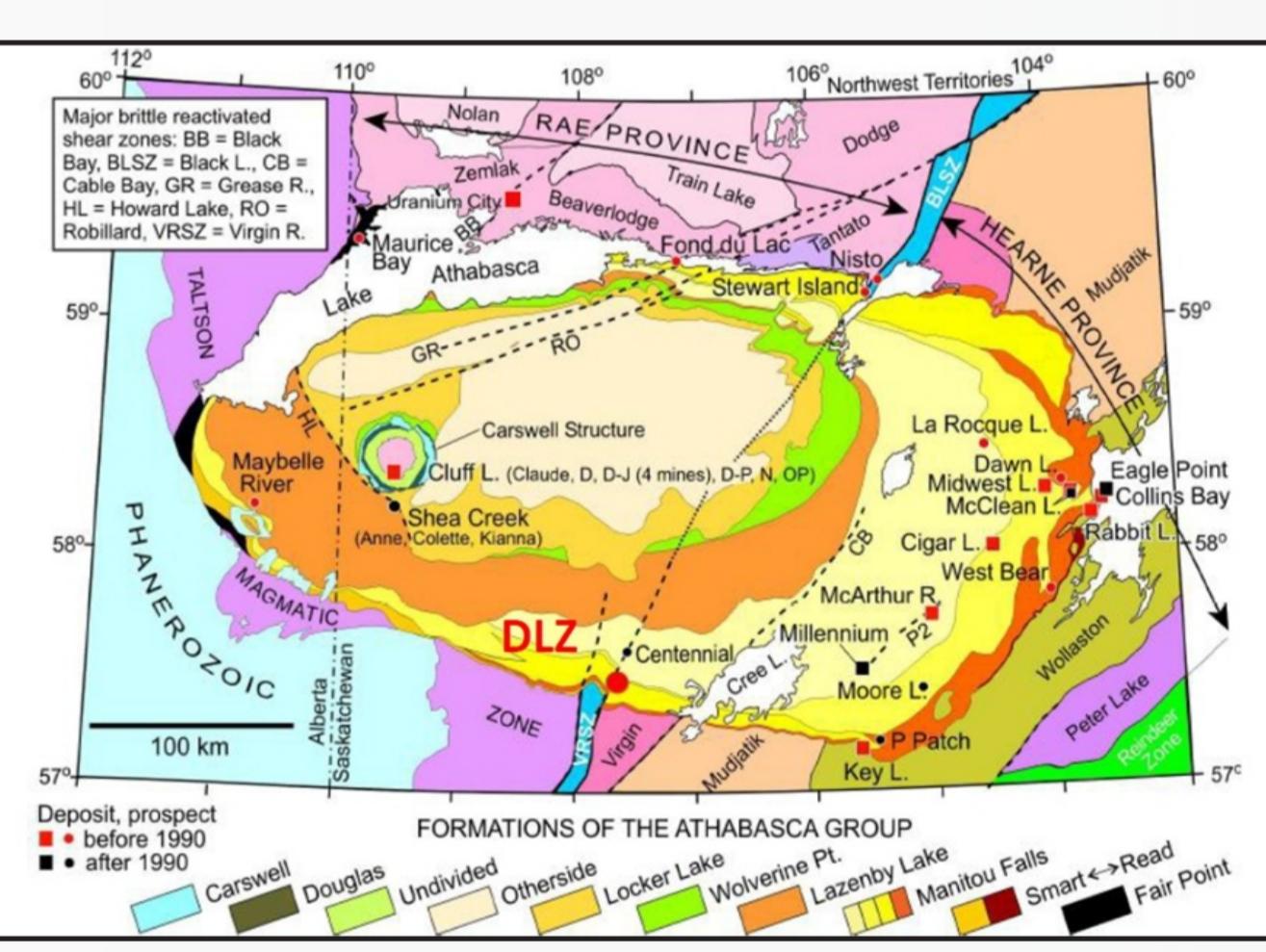


Fig. 1: Geological setting and unconformity-associated uranium occurrences of the Athabasca Basin

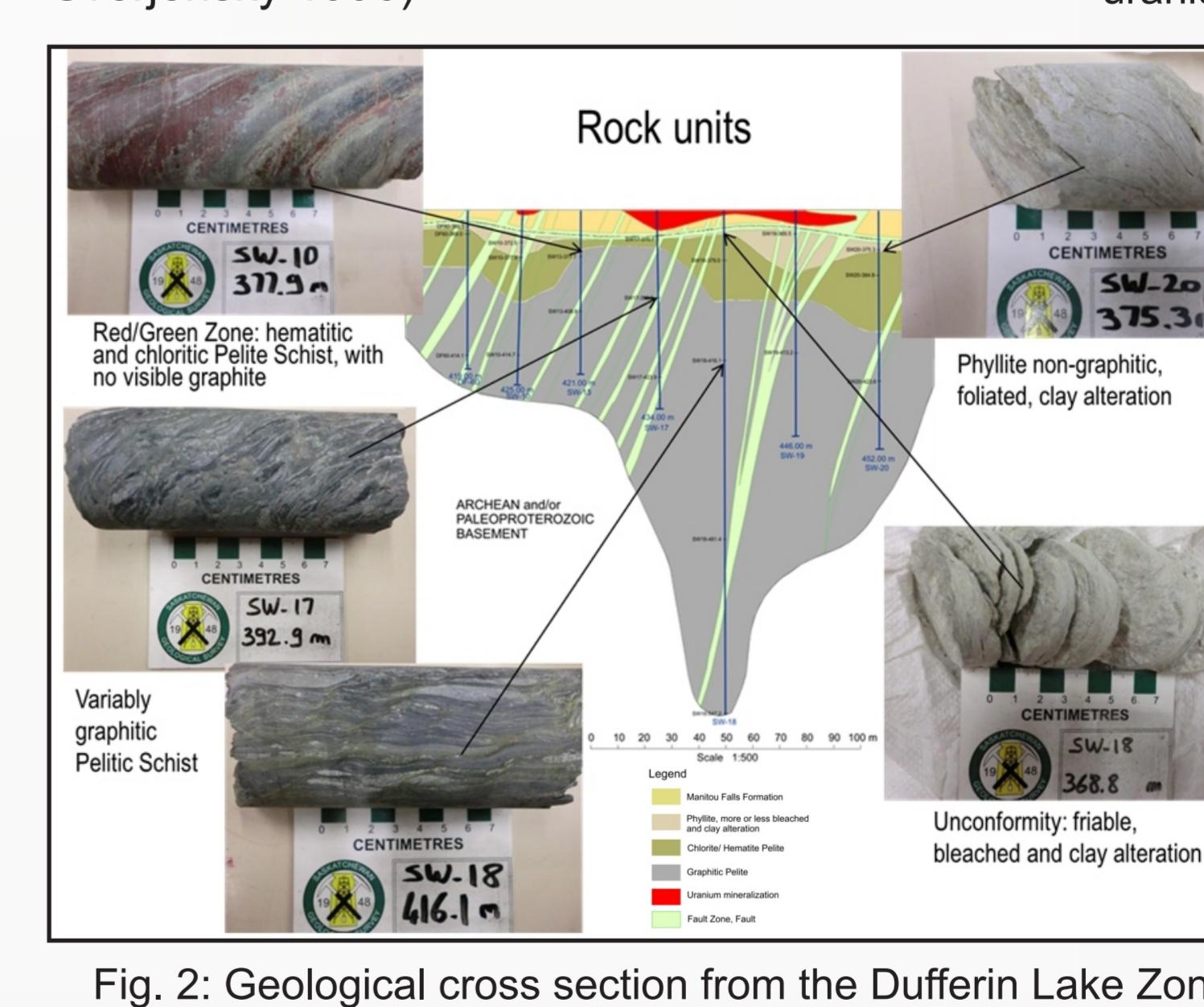


Fig. 2: Geological cross section from the Dufferin Lake Zone, illustrating the presence of graphite-depleted and graphite-rich zones, as well as the different rock units.

In the DLZ, uranium mineralization is hosted mainly in the Manitou Falls sandstones (Fig. 2), and is associated with bleaching and clay alteration. As the unconformity is approached, rocks seem to have partially to totally lost graphite.

The aim of this MSc study is to determine why graphite is consumed and by which mechanism. Is it related to the uranium mineralization? What are the reducing mechanisms and physiochemical conditions responsible for this consumption? Did the graphite or its breakdown products (e.g. CH<sub>4</sub>, CM) act as the reductant for uranium deposition?

Marjolaine Pascal