

PROSPECTIVITY ANALYSIS OF THE ATHABASCA BASIN FOR UNCONFORMITY-TYPE URANIUM

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ABSTRACT

Successful predictive exploration requires a well-defined deposit model that sets out the key *spatial* criteria for deposit localisation. A basic model for unconformity-type deposits was developed in the nineteen seventies and eighties following discoveries such as Key Lake and Rabbit Lake in the Athabasca Basin of Canada and Jabiluka and Ranger in the McArthur Basin of Australia. This model requires unconformable juxtaposition of a sandstone-dominated sedimentary basin and metamorphic basement rocks. Oxidised brines probably generated by evaporation at the earth's surface circulated deeply (>1.5 km) through the basin and into the metamorphic basement rocks, focussed along structures generated by post-depositional extension. Uranium was enriched during evaporation and as the brines interacted with rocks along their flow path. These flow paths can be identified today through substantial mineralogical changes (hydrothermal alteration) in the sandstones of the basin and underlying metamorphic basement rocks. Uranium deposition is widely believed to have been in response to reduction of the oxidised brines through contact with graphitic rocks present in the metamorphic basement, but other reductants are indicated at some deposits.

In this paper, we outline "intelligence amplified" prospectivity mapping in the Athabasca Basin of Saskatchewan, Canada. The objective was to define areas of a size suitable for tenement acquisition, rather than the identification of specific drill targets. Structural control is critically important for the localisation of the deposits. Methods proprietary to consultancy Fathom geophysics were used to treat potential field (gravity, airborne magnetic) data in order to define key structural corridors. Additional datasets used in the analysis are detailed in Bruce et al. 2020. The resultant prospectivity map was used by 92 Energy to acquire tenements that will be explored in the coming years.

REFERENCE

Bruce M., Kreuzer O.P., Wilde A.R., Buckingham A., Butera K., Bierlein F., 2020, Unconformity-type uranium systems: a comparative review and predictive modelling of critical genetic factors: Minerals V.10, 55 pp.