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Detection of Rare Earth Element (REE)-bearing minerals in bedrock and surficial sediments down-ice from the Strange Lake deposit, Nunatsiavut, Labrador, by MLA-SEM

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The Strange Lake Rare Earth Element (REE) deposit is located within Nunatsiavut on Labrador Inuit Lands Parcel -27 near the Labrador-Québec border, 150 km west of Nain. Nunatsiavut ("Our Beautiful Land" in Inuktitut) is the autonomous area of northern Labrador governed by the Nunatsiavut Government (NG). The deposit is located in Labrador Inuit Lands (LIL) and is designated as Exempt Mineral Lands (EML) by the government of Newfoundland and Labrador.

The deposit is associated with a small (6 km in diameter) alkali granite intrusion in a heavily glaciated terrain. In an earlier study, gittinsite (the main ore mineral at Strange Lake) had been detected by MLA-SEM in till from near Nain, 150 km to the east, along the same direction as a paleo-ice stream that passed through the deposit. This study was initiated to refine MLA-SEM analytical techniques to examine REE mineral compositions in crushed core material from the deposit and in surficial sediments down-ice. The MLA also provided data on mineral grain size, shape and intergrowths. Over 85 crushed core samples, and 78 surficial sediment samples were analysed. We identified over a dozen REE-bearing minerals, the most significant being gittinsite, gadolinite, bastnesite, monazite, and elpidite. Some minerals contained distinct REE element contents, such that Light-REE-enriched vs. Heavy-REE-enriched varieties could be defined. LA-ICP-MS analyses indicated matching REE patterns in gittinsite from crushed ore and till. Documentation of the unique Strange Lake REE minerals in surficial sediments suggests that the MLA-SEM techniques might be useful in the exploration for, and definition of, this and other deposit types.