Strange Lake is a mid-Proterozoic peralkaline granitic intrusion, located along the Quebec-Labrador border, and is host to a world-class rare earth element (REE) deposit. Abundant rare earth showings occur in the complex, with one historic non-NI43-101 resource discovery, the Main Zone, and three NI43-101 compliant resources at the northwestern part of the complex, the B Zone, for which Quest Rare Minerals holds 100% of the claims. The B Zone is located along the contact between the intrusion, Proterozoic quartz monzonite and Archean gneiss. This part of Strange Lake is inferred to represent the carapace of the intrusion due to the presence of roof pendants of the host rocks. The highest grade of REE mineralization is hosted in sub-horizontal sheeted pegmatites that vary from several centimeters to over 30 meters of vertically continuous pegmatite. Detailed field geology, mineralogy, drill logs and bulk rock analyzes of >23,000 samples of drillcore was used to model alteration and element distribution in the B Zone. These data were used to build a conceptual model for the genesis of the ore deposit.

Geophysical and geological interpretation indicates that an Archean gneiss roof pendant extends several hundred meters vertically into the granite, with an apparent keel-like morphology. This keel and the northwestern contact of the intrusion with country rock create an embayment structure, resulting in an efficient way for trapping volatiles and highly fractionated peralkaline magma at the top of the intrusion. The confinement of fluid-rich magma, as indicated by the presence of a pegmatite-rich zone within the elongated embayment, resulted in a further REE concentration of the evolving magma near the roof of the intrusion. As fluids accumulated during crystallization and magma cooling, complexly zoned pegmatites began to crystallize as sheets that are parallel to the geometry of the embayment and thickest at the apex of the embayment where they exhibit a dome-like morphology. These pegmatites are mineralogically zoned into a border comprising mainly zirconosilicates, K-feldspar, quartz, and arfvedsonite/aegirine and a core comprising quartz, fluorite, and exotic REE minerals. Textural relationships indicate that primary REE and other high field strength element (HFSE; Zr, Nb, and Ti) bearing minerals crystallized in the pegmatites and surrounding granite were subsequently altered during cooling of the pluton. Relicts of primary REE and HFSE minerals are rare in the pegmatites. Late stage acidic hydrothermal fluids were released during pegmatite formation, which led to a redistribution of REE and HFSE within the B Zone and the mineralization of abundant secondary REE- and Zr-bearing silicates. Three-dimensional models have been created using macroscopic mineral descriptions from mapping and core logging data that demonstrate concentrically zoned alteration patterns. Major Na-, Ca-, F-, and Fe-metasomatic events are documented overlapping each other and affecting granite and pegmatite mineralization both destructively and constructively. An alteration halo surrounding the B Zone for hundreds of meters beyond pegmatite mineralization indicates that hydrothermal fluids may be efficient for the mobilization, of both, REE and HFSE.