

## **CHARACTERIZATION AND GEOLOGIC SETTING OF THE ELK CREEK CARBONATITE, SOUTHEAST NEBRASKA, USA**

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A framework geophysical program in southeastern Nebraska during 1970 identified a near-circular feature centered in section 33, township 4 north, range 11 east having gravity relief of about 8 mgal and a magnetic anomaly of about 800 gammas. The anomaly location lies immediately north of several kimberlite bodies discovered at or near the surface in Kansas and it was thought that similar material might be present in Nebraska. Analysis of the geophysical data provided a model of a cylindrical mass of indefinite length with a radius of 5500 feet and beveled at the basement surface at about 600 feet. At 630 feet, the approximate depth at which Precambrian rocks were expected, the initial test hole encountered a very iron-rich weathered zone overlying carbonate. The carbonate rocks consist essentially of dolomite, calcite and ankerite and lesser amounts of hematite, chlorite, phlogopite, barite, serpentine pyrochlore and quartz with accessory pyrite, chalcopyrite, galena, sphalerite, feldspar, apatite and fluorite and contain barium, strontium and rare earths. Total REE, P<sub>2</sub>O<sub>5</sub> and <sup>87</sup>Sr/<sup>86</sup>Sr ratios confirm the carbonatite identification. Texturally the rocks range from fragmental to contorted to massive. Associated with the carbonatite are lesser amounts of basalt, lamprophyre and syenite. The carbonatite is overlain by marine sediments of Pennsylvanian (Missourian) age. Additional exploratory drilling has provided over 80,000 feet of rock record and has penetrated over 2300 feet into the carbonatite body.

The Elk Creek carbonatite is located near the boundary between the Penokean orogen (1.84 Ga) and the Dawes terrane (1.78 Ga) of the Central Plains orogen. This boundary strongly influenced the geometry of both the Midcontinent Rift System (1.1 Ga) and the Nemaha uplift (0.3 Ga). It is assumed that the emplacement of the Elk Creek carbonatite (0.5 Ga) was similarly influenced by the pre-existing tectonic sutures. The surrounding Precambrian basement rocks are low- to medium-grade metamorphic gneisses and schist of island arc origin and granitic plutons. The carbonatite body is located on the southeast flank of the Midcontinent Rift system and near the crest of the Nemaha Uplift. Other geophysical anomalies were drilled and proved to be gabbroic intrusives related to the rift. It is believed that the same tectonic patterns control both the location of the Elk Creek Carbonatite and the much younger kimberlite bodies nearby in Kansas.