

DISTRICT OVERVIEW

Sudbury Sulphide Nickel - Ontario Canada

Mike Porter, June 2000

**DATA
METALLOGENICA**

The Sudbury sulphide nickel deposits are located within the basal layer of the roughly oval shaped 65x25 km, 1.85 Ga **Sudbury Igneous Complex (SIC)**. This complex cuts both Archaean rocks on the southern margin of the Superior Province, and the Lower Proterozoic of the Huronian Supergroup. It is also less than 10 km to the north of the 1.2 to 1.0 Ga Grenville Front, and lies on a regional, 350 km long zone of linear gravity and magnetic anomalies. It is overlain by the Lower Proterozoic Whitewater Group, an older sequence consisting of an upward progression of conformable heterolithic breccias, a carbonaceous and pyritic argillite and a proximal turbidite unit which occupies a basin shaped structure and is only found with the oval shaped outcrop zone of the SIC.

The complex dips inward throughout at around 30 degrees and is composed of a sequence of norite, gabbros and granophyres. It comprises **two main zones**: (1) a lower 500 to 2500m thick Lower Zone of norite and gabbro-norite, grading upwards into quartz- and oxide-rich gabbro, and (2) an Upper Zone, 1 to 2500m thick, mainly granophyre, with an abruptly transitional margin to the underlying quartz-rich gabbro. The granophyre intrudes the basal Whitewater Group. There is no obvious small-scale layering within the complex.

A **third discontinuous layer** is found at the base of the SIC, particularly in embayments into the footwall rocks. This is called the "Sublayer" and contains all the major Ni-Cu sulphide deposits. The contact with the base of the Lower zone varies from sharp to gradational. It has two facies, namely: (1) the Contact Sublayer that is usually <200m thick and composed of discontinuous lenses of gabbro-norite along the basal contact of the SIC, and (2) the Offset Sublayer that constitutes apophyses or dykes of predominantly quartz-diorite that project outwards into the intruded footwall rocks. A contact metamorphic halo around 1200 m thick occurs in the footwall rocks which have been brecciated for up to 80 km from the complex - the Sudbury Breccia. The composition of the SIC is strongly influenced by the crustal rocks, with a differing succession through the complex to the north where it cuts the Archaean of the Superior Province - the North Range, and the southern side - the South Range where it intrudes the Lower Proterozoic of the Huronian Supergroup. Differences are also noted in the ores in the two ranges.

There are **three main ore types**, namely: (1) Contact type massive sulphides in the noritic Sublayer, with a lower layer of massive sulphide enclosing angular wall rock fragments and stringers extending into the footwall, while upwards the massive sulphides grade into a sulphide-matrix breccia and finally to disseminated sulphides; (2) stockworks of more Cu-rich ore in the Sudbury Breccia of the footwall, comprising massive stringers and lenses oriented parallel to the dip of the SIC; (3) deposits associated with Offset Dykes of quartz-diorite that are sub-radial to sub-parallel to the margins of the SIC, with sulphides present as either lenticular zones of sulphide blebs, or as sheaths of sulphide bleb-bearing quartz-diorite or Sudbury Breccia on the margin of the dykes. The **main ores** are composed of pyrrhotite, pentlandite, chalcopyrite, pyrite and magnetite. Bornite is locally present in higher grade zones, while higher arsenic as arsenides characterises the South Range. The **copper-rich veins** deep in the footwall are dominated by chalcopyrite and cubanite with lesser pentlandite, magnetite and pyrrhotite. The Sudbury Complex contained around 1650 mt @ 1.2% Ni, 1.03% Cu.