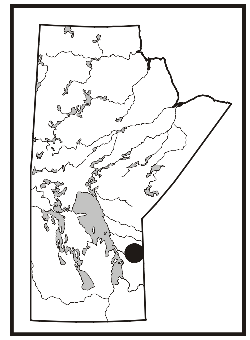
GS-27 NEW PGE-RELATED RESULTS OF STUDIES ON THE CHROME AND PAGE PROPERTIES, BIRD RIVER SILL (NTS 52L/5)

by P. Theyer



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SUMMARY

The Bird River Sill has been explored for chromite, Ni-Cu and platinum group elements (PGEs). A recent unprecedented increase in both demand for and price of PGEs, plus the demonstrated potential of the Bird River Sill to contain economic PGE deposits, have led to renewed interest in exploring the sill for these minerals. A sulphide- and PGE-bearing rock layer hosted by a highly deformed peridotite unit was defined, mapped and sampled on the Chrome property. Two PGE-bearing layers associated with chromitite had previously been defined on the property. Field investigations show that the mineralized layers are stratabound but disrupted by block faulting.

A sulphide-bearing peridotite layer, associated with chromitite in a stratigraphic position analogous to those on the Chrome property, was defined on the Page property, located approximately 2.5 km northeast of the Chrome property.

INTRODUCTION

The Bird River Sill is an approximately 20 km long, east-striking, mafic-ultramafic complex of Archean age (2745 ± Ma; Timmins et al., 1985) intrusive into the supracrustal Lamprey Falls and Bernic Lake formations of the Rice Lake Group. Subsequent granitic intrusions associated with deformation and complex faulting segmented the originally contiguous sill into offsets that, in places measure more than 1.5 km and have obliterated and/or duplicated parts of the sill (Fig. GS-27-1).

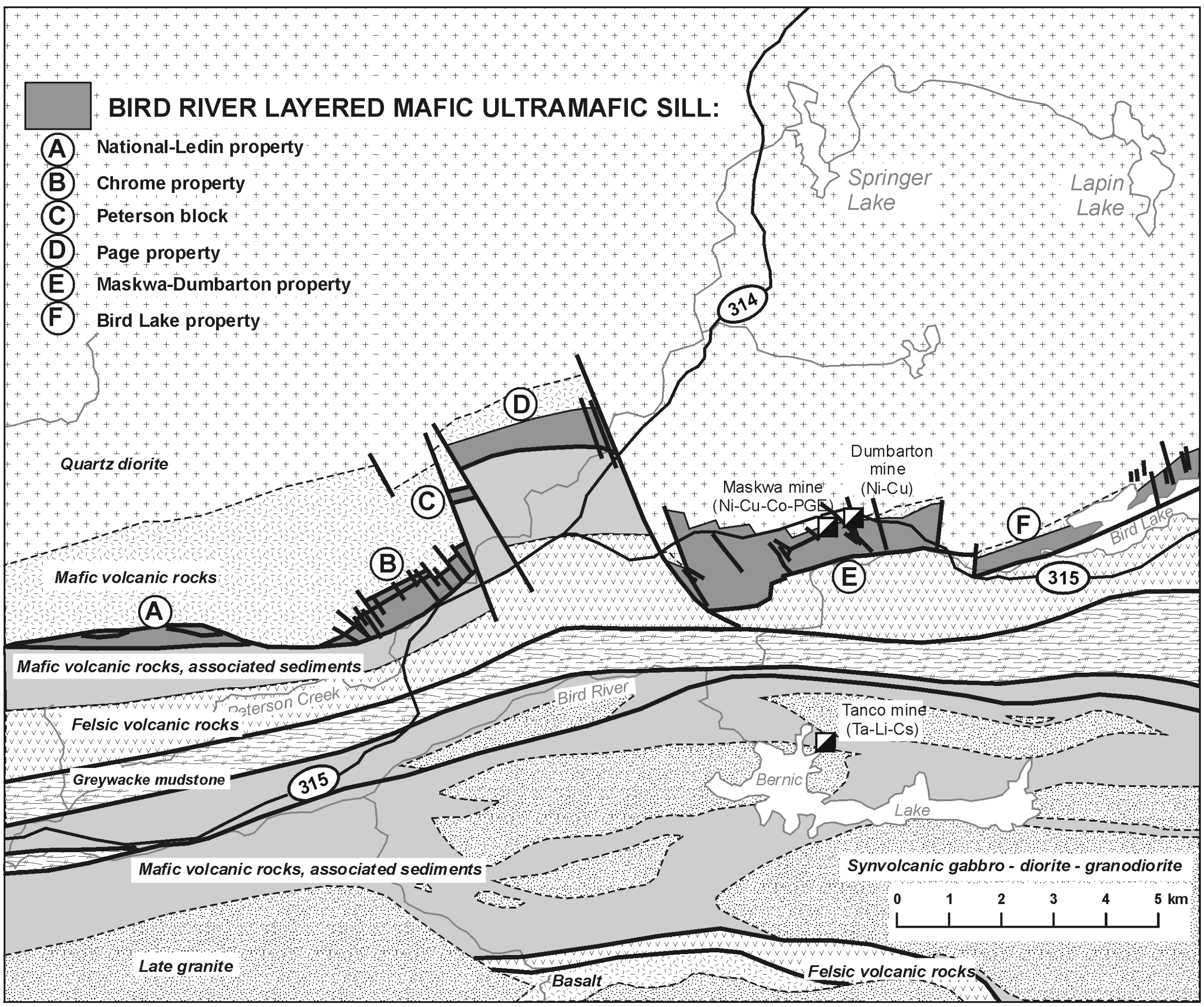

*Figure GS-27-1: Geology of the southern part of the Bird River greenstone belt, southeastern Manitoba, showing locations and names of properties on the Bird River Sill (*modified from *'Geological and proposed work report for the Page property', unpublished internal report, Canmine Resources Corporation, 2000).*

Geological investigations in the 1940s and early 1950s concentrated on the search for chromite. Exploration focused on Ni-Cu mineralization in the late 1950s, but interest reverted to chromite in the early 1980s. In the late 1980s, government-sponsored studies concentrated on the sill's chromite reserves and the feasability to concentrate and upgrade these for use as mill feed in the production of stainless steel.

Investigations of the sill's potential to contain PGEs started in 1982 when the author cut and analyzed a nearly continuous channel sample across the sill on the Chrome property (Theyer, 1982). Inclusions of PGEs in chromite from the Bird River Sill were described by Talkington et al. (1983). Theyer (1985, 1991) described two sulphide layers, each several metres thick, intersected in the ultramafic portion of his channel samples. Scoates et al. (1989) published maps and descriptions of two additional PGE-bearing layers, one associated with chromitite of the Lower Group and the other with chromitite of the Disrupted Group.

Peck and Theyer (1998) re-analyzed Theyer's (1985) channel sample material and re-affirmed that two stratigraphic intervals (34–52 m and 95–115 m, western cut; Theyer, 1985, Fig. GS-27-10), in which sulphide minerals and PGEs were concentrated, occur stratigraphically below the layers of the chromitiferous zone (Fig. GS-27-2). One of these layers coincides with the PGE-bearing rock layer described by Scoates et al. (1989).

CHROME PROPERTY

Sulphide- and PGE-Bearing Disrupted (Foliated) Peridotite Layer

The sulphide-bearing disrupted (foliated) peridotite layer is in the basal subzone of the layered zone (suite) of the ultramafic series (Scoates, 1983) of the Bird River Sill (Fig. GS-27-2 and -3). Host rocks to this subzone are disrupted, foliated and incompetent peridotite,

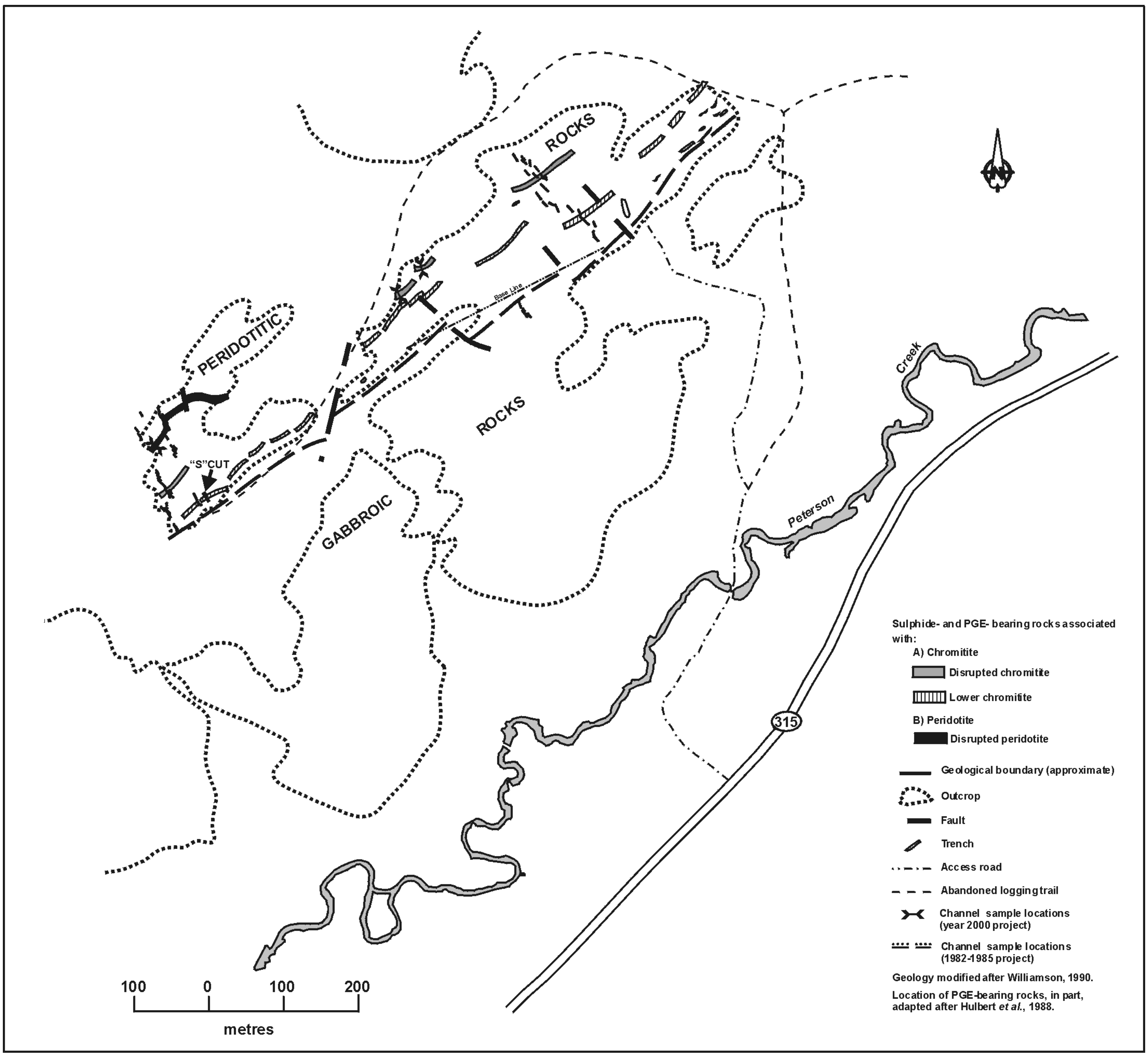

Figure GS-27-2: Geology of the Chrome property, showing location and extent of chromitite layers and of sulphide- and PGE-bearing layers. Geology and location of some sulphide bearing layers from Williamson (1990) and Hulbert et al. (1988).

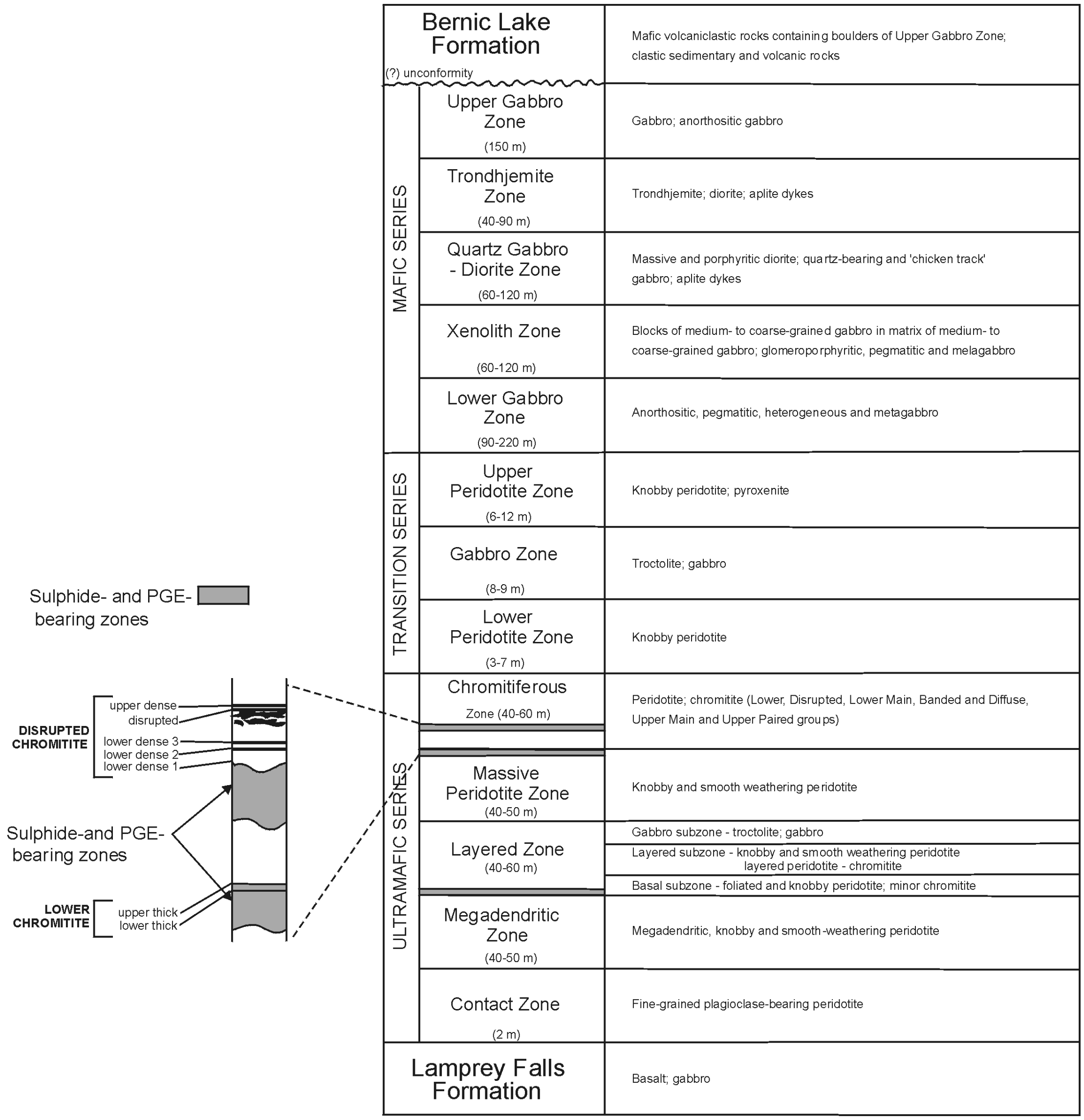

*Figure GS-27-3: Stratigraphy of the Bird River Sill, its immediate host rocks and sulphide- and PGE-bearing layers in the area of the Chrome property (*modified from *Scoates et al., 1989).*

characterized by a rust-stained, rough weathered surface. Exposed widths range from 5 to 16 m. The contact with the stratigraphically underlying, mechanically competent rock of the 'megadendritic zone' in places consists of a prominent and abrupt ledge, up to 2 m high, likely caused by relative differences in the resistance to weathering and erosion of the two lithological units. Sulphide mineralization consists mainly of subrounded, crystal-supported pyrrhotite droplets of distinctly magmatic appearance. Subordinate amounts of chalcopyrite and pyrite occur as overgrowths on pyrrhotite. Both the concentration and the distribution of sulphides vary considerably (e.g. in places, there were 10–15 cm thick layers with up to 3% pyrrhotite but also subrounded decimetre-sized accumulations of disseminated sulphides). Fractures that cut and offset the mineralized layer are, in places, characterized by centimetre-thick fault gouge, in places stained with blue and green blotches interpreted as products of the supergene alteration of chalcopyrite. The basal subzone is underlain by the megadendritic peridotites of the megadendritic zone (Williamson 1990). The peridotites of the megadendritic zone are characterized by decimetre-long, arcuate, dendritic pyroxene 'sprays' that impart an unmistakably ornamented appearance to the weathered surface. The disrupted peridotite layer is stratigraphically overlain by finely banded, layered peridotite devoid of sulphide minerals (Fig. GS-27-3).

Mineralization

Two channel samples were cut with a rock saw across parts of this layer and rock samples were sent for chemical analysis. Results of these analyses were not available at the time this report was written.

Cut 1 is a 5.5 m long channel sample sawn across the disrupted peridotite in the northwestern part of the Chrome exposure. Cut 2 is an approximately 6.5 m long channel sample (Fig. GS-27-2). Sulphide mineralization in both samples consists of up to 5% pyrrhotite in coarse-grained peridotite.

Sulphide- and PGE- Bearing Layers Associated with the Lower Group and Disrupted Group Chromitite

Two sulphide- and PGE-bearing layers, one associated with the Lower Group chromitite layer and the other with the Disrupted Group chromitite layer (Fig. GS-27-2; Scoates, 1983; (Scoates et al., 1989) were traced and sampled.

Each of the layers was sampled by means of metre-long channel samples located roughly in the centre of the Chrome property (cuts 3 and 4, Fig. GS-27-2). These samples were collected to complement the channel samples of the western and eastern Chrome property cut during the 1982–1985 project (Fig. GS-27-2).

Mineralization associated with the Lower Chromitite layer

Cut 3 (Fig. GS-27-2) is a 2.1 m long channel sample intersecting a fault-bound block of dense, fine-grained peridotite. The southern boundary of the mineralized zone, coinciding with the southern end of the cut, is 13.3 m north (stratigraphically below) of the lower thick member of the Lower Group chromitite. However, this distance may be of minor stratigraphic validity, since an intervening fault characterized by an approximately 5 cm thick mylonite layer is interpreted to indicate a relative displacement of these rock units.

Sulphide minerals consist of approximately 3% disseminated pyrrhotite, in places occurring as subrounded droplets interpreted to indicate their magmatic nature. Chalcopyrite was observed in trace quantities as fracture fillings.

Mineralization Associated with the Disrupted Chromitite Layer

Cut 4 is located approximately 1.4 m stratigraphically below the 'lower dense 2' (Scoates, 1983) member of the Disrupted Group chromitite layers (Fig. GS-27-2). The host rock is a coarse-grained dunite characterized by millimetre-sized amoeboid olivine crystals and centimetre-sized, subrounded, aphanitic, glassy, dark-coloured inclusions. Mineralization consists of approximately 4% pyrrhotite blebs ±chalcopyrite and abundant chromite in centimetre-sized pods and blebs. The weathered surface is characterized by abundant rusty and rare blue-green spots, attributed to supergene alteration of Fe and Cu sulphide minerals.

Analytical data for these samples had not been received by the time this report was written.

"S cut"

This approximately 5 m long channel sample, cut approximately 45 m east of the western cut on the western Chrome property in 1986 (Fig. GS-27-2), is outside the area mapped in detail by Williamson (1990). However, the stratigraphy and facies of the chromitite layers and the lithology of the host rocks suggest that this sample intersected the stratigraphically lower members of the Disrupted Group of chromitite layers.

Principal oxide minerals are magnetite, chromite and subordinate ilmenite. Sulphide minerals were identified as chalcopyrite, pyrite, pentlandite and millerite. High PGE concentrations (1600 ppb Pd, 610 ppb Ru and 390 ppb Pt) occur in an approximately 20 cm thick layer, that is particularly enriched in sulphide minerals and impoverished in chromite. This layer is located approximately 30 cm stratigraphically below an approximately 5 cm thick chromitite layer that was tentatively identified as the lower dense 1 member of the Disrupted Group of chromitite layers. Laurite (RuS_2), ocurring as idiomorphic inclusions in chromite, was the sole identifiable PGE mineral (T. Weiser, pers. comm., 1987).

PAGE PROPERTY

The Page property, located approximately 3 km northeast of the Chrome property (Fig. GS 29-1), is a faulted block of the Bird River Sill. Although its stratigraphy and lithology are comparable to those of the Chrome property, quality and quantity of outcrops and ease of access have tended to focus attention on the latter property. Mapping of the chromitite layers on the Page property (Young, 1992) showed a gross correspondence of the stratigraphy of the chromitite layers with those of the Chrome property.

Considering the close correlation between sulphide- and PGE-bearing layers and the Disrupted and Lower groups demonstrated for the Chrome property, it was considered likely that such a correlation could be established for the Page property. A preliminary field inspection of chromitite layers on the property showed that a sulphide-bearing rock layer occurs in the vicinity (10 m north) of chromitite layers tentatively identified as part of the Disrupted Layer Suite (Young 1992), which is equivalent to the Disrupted Layer Suite of the Chrome property (as defined by Scoates, 1983).

The approximately 1 m long channel sample intersected dense, fine-grained peridotite containing approximately 2% disseminated pyrrhotite. Analytical results were not available at the time this report was written.

RECOMMENDATIONS FOR PGE EXPLORATION IN THE BIRD RIVER SILL

In addition to previous recommendations made by Peck and Theyer (1998), it can be stated that:

1) the extent of an additional, formerly ill-defined stratabound sulphide- and PGE-bearing layer on the Chrome property should be carried out; and
2) the discovery of sulphide-bearing peridotite, associated with chromitite on the neighbouring Page property, is an indication that the Bird River Sill is an excellent target for PGE exploration.

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