## Geological Survey Canada **Scientific Presentation 28**



Figure 1. Schematic geological map of the Superior Province showing the main Ni-Cu-(PGE) and Cr deposits and the greenstone belts including the Bird River greenstone belt (BRGB). Terranes, domains, and boundaries are modified from Stott et al. (2010).

The Neoarchean Bird River greenstone belt (BRGB) was recently interpreted as part of the Bird River–Uchi–Oxford-Stull–La Grande-Eastmain superdomain which outlines a major Cr-Ni-Cu-PGE-V metallotect within the Superior Province (Figure 1; Houlé et al., 2013, 2014). In the BRGB, significant Ni-Cu-(PGE) magmatic sulphide and chromite resources are identified within nine mafic and ultramafic intrusions (Figure 2 and Table 1). These intrusions are distributed over a strike length of 75 km laterally and 20 km across and, despite some compositional differences, are interpreted to derive from a single large mafic-ultramafic magmatic event at ca. 2743 Ma that extended on either side of the Maskwa Lake Batholith (Houlé et al., 2013, 2014; Bécu et al., 2013).

The Mayville intrusion is the largest mafic-ultramafic intrusion located in the northern arm of the BRGB and hosts the M2 Cu-Ni-PGE deposit (31.8 Mt at 0.45%Cu, 0.18% Ni, 0.19ppm PGE; Table 1) as well as some PGE and chromite occurrences. The E-Ext stripped outcrop is located near the base of the intrusion, along the interpreted contact between a basal maficultramafic zone and the main mafic zone (Figure 3). This contribution (Figure 4) presents a slightly modified geological map from the previous 2001 Exploratus map of the E-Ext stripped outcrop as well as field and microphotographs of the main geological units and chromite occurrences. Field observations permitted to discriminate between at least four different types of chromite hosted by pyroxenite (letters correspond to field photographs in Figure 4): (A) a massive chromitite mainly constrained in a 0.24 wide disrupted layer; (B) semi-massive chromite aggregates; (C) disseminated chromite; and (F and I) a reactional chromite partly enclosed by leucogabbro. Microphotographs and mineral chemistry of these chromites indicate variations in mineral textures, inclusions composition and size, as well as in Cr, Fe<sup>3+</sup>, Al and Mg contents (Figure 5). While the disseminated and reactional chromites show mineral chemistry variations that could respectively be attributed to alteration and assimilation processes, the massive chromitite and semi-massive aggregates have relatively similar chromite composition when compared to Bird River sill chromite occurrences, located some 20 km to the south. This supports the interpretation that mafic-ultramafic intrusions, found on either side of the Maskwa Lake Batholith in the BRGB, sourced from a single magmatic event at ca. 2743 Ma that also generated Ni-Cu-(PGE) and Cr-(PGE) mineralisation.

The current initiative is a collaborative effort between the Geological Survey of Canada (GSC) under the Targeted Geoscience Initiative Phase IV (TGI-4) Ni-Cu-PGE-Cr project and the Manitoba Geological Survey with noteworthy logistical and technical support from Mustang Minerals Corp., Gossan Resources Ltd. and Stillwater Canada Inc., that aims to characterize mafic and ultramafic intrusions and associated orthomagmatic mineralisation within the BRGB. We would like to thank and acknowledge our colleagues X.M. Yang and H.P. Gilbert from the Manitoba Geological Survey and V.J. McNicoll from the Geological Survey of Canada for insightful discussions and collaboration throughout field and analytical work. We are grateful to Mustang Minerals Corporation, for providing access to their property, drillcore, and geological database, in particular to C. Galeschuk, for assistance and always constructive discussions.

Table 1. Compilation of historical production and resources for nine Ni-Cu-(PGE) and Cr-(PGE) deposits/occurences of the Bird River greenston belt.

DEPOSIT	DISTRICT	Ore (Mt)	Ni (%)	Cu (%)	PGE (ppm)	Cr <sub>2</sub> O <sub>3</sub> (%)	
Mayville	Bird River North	31.80	0.18	0.45	0.19		(Mustang Minerals Corp.)
New Manitoba/ Cat Lake*	Bird River North	0.60	0.24	0.58			Manitoba Mineral Inventory File No. 217
Maskwa*	Bird River South	8.27	0.61	0.13	0.42		(Coats et al. 1979; Mustang Minerals Corp.)
Dumbarton*	Bird River South	1.54	0.81	0.30			(Coats et <i>al</i> . 1979)
Page & Ore Fault Deposits	Bird River South	0.55	0.94	0.56	0.35		(Marathon PGM Corp.)
Euclid Lake*	Bird River North	4.69				6.44	(ILAM Associates)
Bird Lake*	Bird River South	1.12				7.53	(ILAM Associates)
Chrome*	Bird River South	1.34				9.65	(ILAM Associates)
Page*	Bird River South	1.71				7.40	(ILAM Associates)
*Not NI 43-101 compliant							
References							

Coats, C.J.A., Stockford, H.R. and Buchna, R, 1979: Geology of the Maskwa West Nickel Deposit, Manitoba, Canadian Mineralogist, v.17, p. 309-318.

Ilam and Associates Ltd., 1988: An evaluation of the chromite reserves in the Bird River sill southeastern Manitoba, Manitoba Department of Energy and Mines, Assessment File 74747. Marathon PGM Corporation, 2008, Technical report and resource estimate on the Ore Fault, Galaxy and Page Zones of the Marathon PGM/Gossan Resources JV, Bird River Property, Southeast, Manitoba, January 15, 2008, 103 p.

Mustang Minerals Corporation, Press Release, April 8, 2014



## **Regional Distribution**

The BRGB in southeastern Manitoba consists of two Neoarchean supracrustal packages, the southern and northern arms, which are located between the English River basins and Winnipeg River terrane of Stott et al. (2010; Figure 1). Numerous mafic and ultramafic intrusions are distributed over a strike length of ~75 km within both arms, hosting significant chromite-(PGE) and Ni-Cu-(PGE) sulfide deposits/occurrences (Figure 2).





References P.3461, 1:250 000 scale. meeting, Winnipeg, Manitoba, May 22-24, 2013, Abstract Volume 36, p. 68. meeting, Uppsala, Sweden, August 12–15, 2013.

Ontario Geological Survey, Open File Report 6260, p. 20-1–20-10. Geological Survey, Preliminary Map PMAP2012-3, scale 1:12 500.

## CHROMITE OCCURRENCES OF THE E-EXT STRIPPED OUTCROP, MAYVILLE INTRUSION, BIRD RIVER GREENSTONE BELT, SOUTHEASTERN MANITOBA

V. Bécu<sup>1</sup> and M.G. Houlé<sup>1</sup>

Figure 2. Simplified geology of the southern and northern arms of the Bird River greenstone belt showing the main mafic and ultramafic intrusions and their Ni-Cu-(PGE) and Cr-(PGE) deposits/occurences (modified from Bailes et al., 2003; Gilbert et al., 2008)

## Mayville Intrusion

1 Maskwa Lake Batholith granitoids

Figure 3. Simplified geological map of the Neoarchean Mayville intrusion in the northern arm of the Bird River greenstone belt (modified after Yang, 2012). The location of the E-Ext stripped outcrop and the M2 Cu-Ni-(PGE) deposit are respectively indicated by the black four points and the red five points stars.

Bailes, A.H., Percival, J.A., Corkery, M.T., McNicoll, V.J., Tomlinson, K.Y., Sasseville, C., Rogers, N., Whalen, J.B., and Stone, D., 2003. Geology and tectonostratigraphic assemblage West Uchi map area, Manitoba and Ontario; Manitoba Geological Survey, Open File OF2003-1, Geological Survey of Canada, Open File 1522, Ontario Geological Survey, Preliminary Ma

Bannatyne, B.B. and Trueman, D.L., 1982. Chromite reserves and geology of the Bird River Sill, Manitoba; Manitoba Energy and Mines, Mineral Resources Division, Open File Report 82-Barnes, S.J. and Roeder, P.L., 2001. The range of spinel compositions in terrestrial mafic and ultramafic rocks; Journal of Petrology, Vol. 42, p. 2279–2302.

Bateman, J.D., 1945. Composition of the Bird River chromite, Manitoba; American Mineralogist, v. 30, p. 596–600. Bécu, V., Houlé, M.G., McNicoll, V.J., Yang, X.M., and Gilbert, H.P., 2013. New insights from textural, petrographic and geochemical investigation of the gabbroic rocks of the Bird Rive intrusive event within the Bird River greenstone belt, southeastern Manitoba (abstract); Geological Association of Canada – Mineralogical Association of Canada (GAC-MAC) annual joir Gilbert, H.P., Davis, D.W., Duguet, M., Kremer, P.D., Mealin, C.A., and MacDonald, J., 2008. Geology of the Bird River Belt, southeastern Manitoba (parts of NTS 52L5, 6); Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Geoscientific Map MAP2008-1, scale 1:50 000 (plus notes and appendix).

Houlé, M.G., Lesher, C.M., Metsaranta, R.T., Goutier, McNicoll, V.J., and Gilbert, H.P., 2013. Temporal and spatial distribution of magmatic Ni-Cu-PGE/Cr-PGE/Fe-Ti-V deposits in the Bi River/Uchi/Oxford-Stull/La Grande-Eastmain superdomain: a new metallotect within the Superior Province (abstract); 12th biennial Society for Geology Applied to Mineral Deposits (SG/

Houlé, M.G., Lesher, C.M., McNicoll, V.J., Bécu, V., Metsaranta, R.T., Sappin, A.-A., Gilbert, H.P., and Yang, X.M., 2014. Overview of chromite and Ni-Cu-(PGE) deposits of the Brid Riv greenstone belt in a Ring of Fire metallogenic context; presentation given at the Manitoba Mining and Minerals Convention 2014, Short Course: Geology and Mineral potential Manitoba's Premier Mineral Belts, Winnipeg, November 19, 2014. (abstract available online: http://www.manitoba.ca/iem/convention/shortcourse.html) Stott, G.M., Corkery, M.T., Percival, J.A., Simard, M., and Goutier, J., 2010. A revised terrane subdivision of the Superior Province; in Summary of Field Work and Other Activities 201 ang, X.M., 2012. Bedrock geology of the Cat Creek area, Bird River greenstone belt, southeastern Manitoba (part of NTS 52L12); Manitoba Innovation, Energy and Mines, Manitoba





Publications in this series have not been edited; they are released as submitted by the author.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

doi:10.4095/296135

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada, 2015

For more information, please contact V. Bécu (Valerie.Becu@RNCan-NRCan.gc.ca).

![](_page_0_Picture_42.jpeg)

![](_page_0_Picture_44.jpeg)

Disseminated chromite in altered

Detail photograh from picture H. Small (cm) size chromite aggregate enclosed within a medium-grained gabbroic unit, at the base of an interpreted magmatic

![](_page_0_Picture_50.jpeg)

. Schistosed leucogabbro

medium-grained

Presented at Manitoba Mining and Minerals Convention, Winnipeg, Manitoba Date presented: November 2014

Recommended citation Bécu, V. and Houlé, M.G., 2015. Chromite occurrences of the E-Ext stripped outcrop, Mayville intrusion, Bird River greenstone belt, southeastern Manitoba; Geological Survey of Canada, Scientific Presentation 28, 1 poster. doi:10.4095/296135

rounded chromite with ilmenite lamellae and inclusions of silicates rom massive chromite

![](_page_0_Picture_61.jpeg)