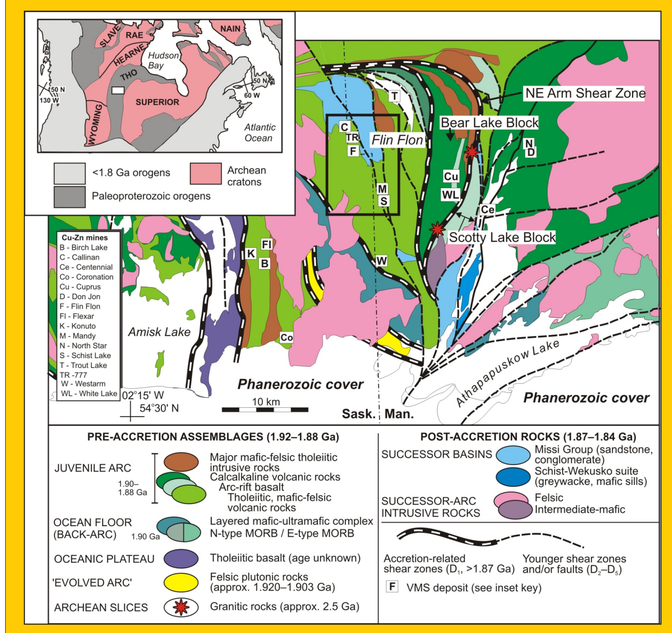
The new 1:10 000 scale geology map of the Flin Flon area, Manitoba and Saskatchewan

R.L. Simard, K. MacLachlan, H.L. Gibson, Y.M. DeWolfe, C. Devine, Kremer, P.D., B. Lafrance, D.E. Ames, E.C. Syme, A.H. Bailes, K. Bailey, D. Price,
S.J. Pehrsson, N. Rayner, E. Cole, D. Lewis and A.G. Galley



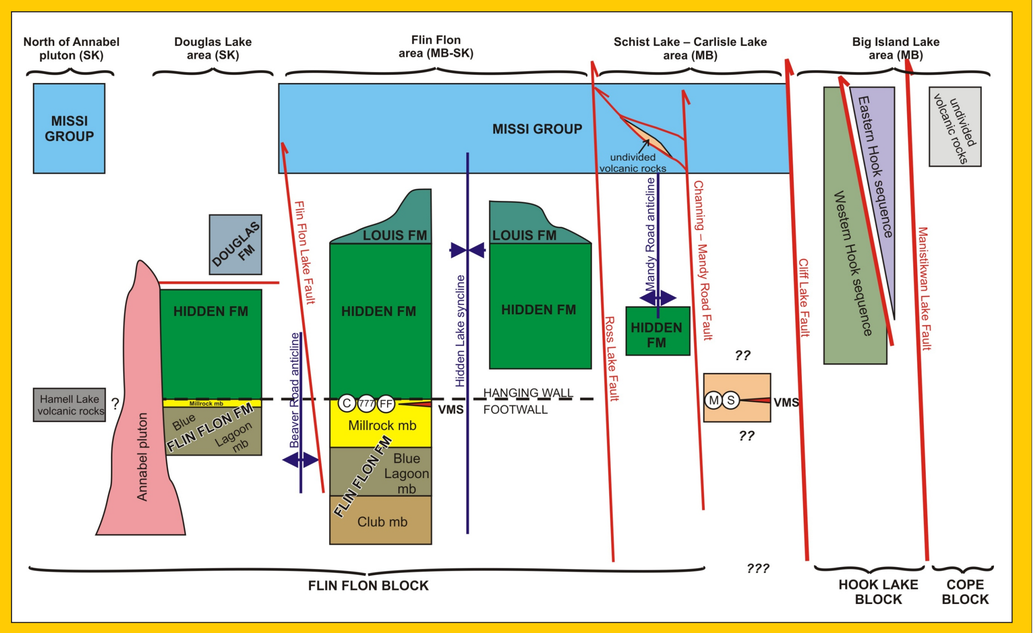
One map, One stratigraphy!

For the first time in 50 years of bedrock mapping in the Flin Flon area, one common stratigraphy has been recognized on both side of the provincial border.

In the Manitoba portion of the Flin Flon Block, the Flin Flon mine stratigraphy is composed of the Flin Flon formation (host of the deposits) conformably overlain by the Hidden and Louis formation. A similar stratigraphy can be found across the Flin Flon Lake Fault and the Beaver Road anticline in the Douglas Lake area of Saskatchewan.

Rocks of the Western Hook sequence of the Hook Lake Block are coeval with those of the Flin Flon Block at ~1890Ma; however, the rocks of the Eastern Hook sequence are significantly younger at 1881 Ma which makes them coeval with the rocks of the Trout Lake mine sequence further to the north.

The rocks that host the Schist Lake and Mandy mines share lithologic similarities with the rocks of the Flin Flon Blocks and the Western Hook sequence of the Hook Lake Block.



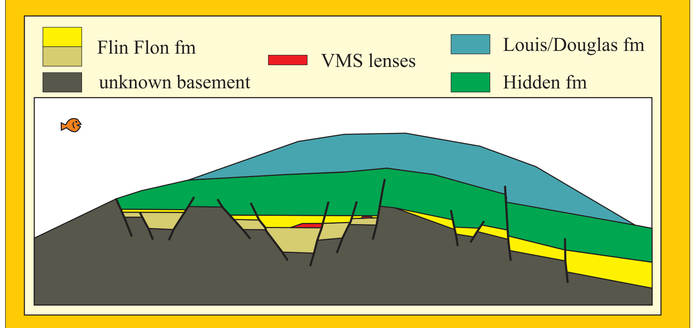
Flin Flon

The Flin Flon area of the Paleoproterozoic Flin Flon Belt is world-renowned for its volcanogenic massive sulphide (VMS) deposits. Three active (Callinan, 777 and Trout Lake) and three past-producing (Flin Flon, Mandy and Schist Lake) volcanogenic massive sulphide mines occur in the immediate vicinity of the town of Flin Flon, which makes this area one of the most productive base-metal regions in Canada.

A subsidence story...

The stratigraphy and geochemistry of the volcanic rocks associated with the Flin Flon–Callinan–777 VMS deposits record the infilling of a subsidence basin with abundant volcaniclastic material, localized felsic magmatism and the development of an intense hydrothermal alteration system (Flin Flon formation; Bailes and Syme, 1989; Syme et al., 1999; Devine, 2003), which terminated with a hiatus in volcanism and formation of the VMS deposits.

Following VMS deposition there was resurgence in volcanism and subsidence marked by the development of one or more mafic shield volcanoes atop this subsidence structure (Hidden and Louis/Douglas formations; Syme et al., 1999; DeWolfe, 2008).



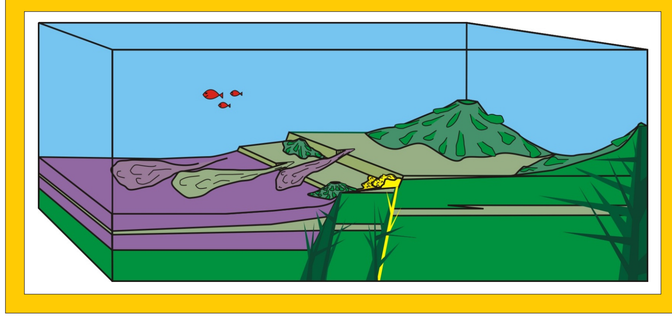
Much more to find!

The VMS-hosting stratigraphy has been mapped across major structures in the Flin Flon Block, including the Flin Flon Lake Fault, which has considerably enlarged the prospective area away from the immediate mine surroundings.

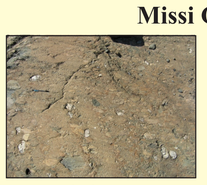
New prospective areas in the hangingwall sequence have been recognized, including :

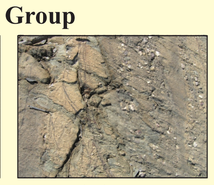
- A semiconformable alteration zone exists in the hangingwall stratigraphy on the west side of the Flin Flon Lake Fault just east of Douglas Lake, Saskatchewan. This alteration horizon sits a few hundred metres below the former Newcor mine, which was known for its gold-bearing arsenopyrite, pyrite and sphalerite. The nature of this alteration system is similar to footwall alteration in a number of other VMS deposits in the world, which might suggest potential for VMS mineralization in the Douglas Lake area.
- A synvolcanic subsidence structure complete with associated synvolcanic faults and mafic and felsic magmatism occurs within the hangingwall stratigraphy just southeast of Carlisle Lake, Manitoba. This kind of synvolcanic structure hosts VMS deposits in the Flin Flon area. In addition, smaller subsidence structures were also recognized in the hangingwall rocks just north of Louis Lake.

Recent geochronology uncovered that the Western Hook sequence of the Hook Lake Block is coeval with the VMS-hosting sequence of the Flin Flon Block at ~1890 Ma, and detailed mapping of the Western Hook sequence also highlighted that they share many similarities in terms of volcanic stratigraphy. However, the Eastern Hook sequence is coeval with the Trout Lake mine sequence at ca. 1882 Ma.

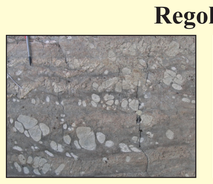


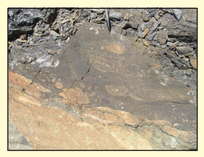
Missi Group


Missi Group
Conglomerate


Missi Group
Arkose and pebbly arkose

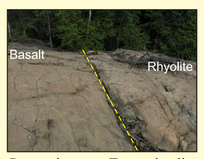
Regoliths


Regolith (corestone) in massive basalt


Regolith (liesegang rings) in pillowed basalt

Louis formation

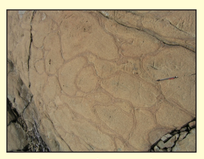

Tower member
Flow banded rhyolite



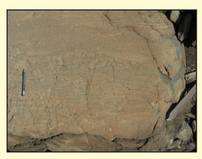
Contact between Tower rhyolite and porphyritic basalt

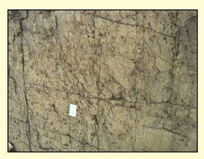
Hidden formation

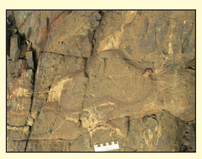

Reservoir member
Aphyric pillowed basalt

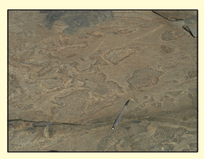

Reservoir member
Plagio-phyric basalt

Flin Flon formation


Millrock member
Mafic tuff

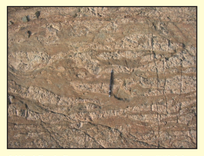

Millrock member
Flow banded rhyolite

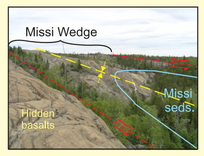

Millrock member
Peperitic pillowed basalt


Blue Lagoon member
Amoeboid pillow breccia

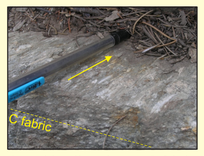

Blue Lagoon member
Plagioclase-crystal-rich tuff


Club member
Felsic breccia


Silicified flow top breccia (Hidden fm; Douglas Lake area)

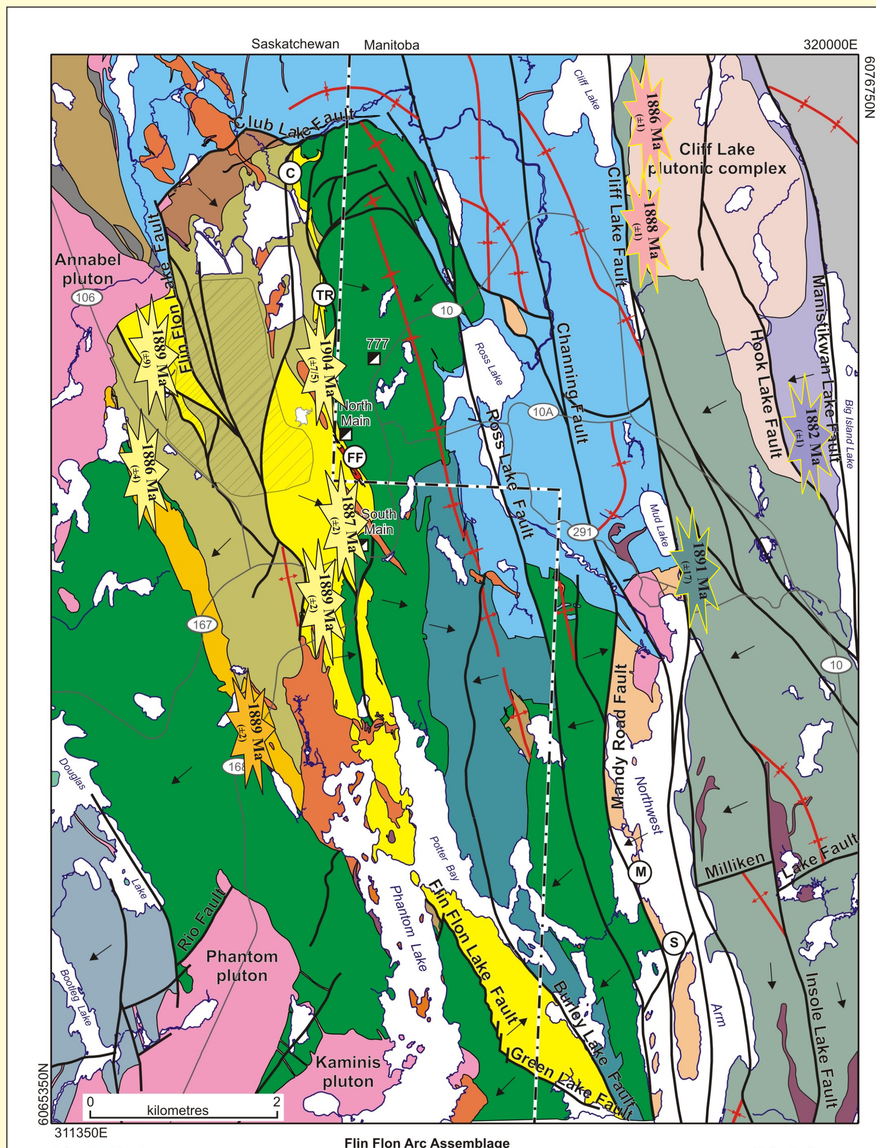


Missi Wedge structure

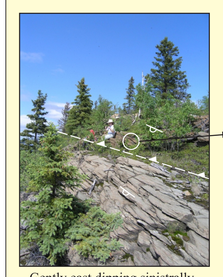


Stretching lineation on C fabric of the Upper Railway Fault


Lower Railway Fault
(offset by late near vertical fault)



Cliff Lake Fault

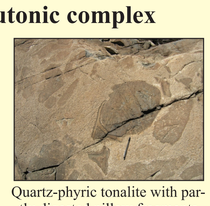

Gently east dipping sinistrally reactivated early thrust plan of the Cliff Lake Fault bringing old West Hook sequence mafic volcanic rocks over younger Missi Group sedimentary rocks; both rock sequences are overturned.

Late sinistral C-S fabric in Cliff Lake Fault along Cliff Lake

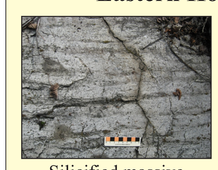
Late dextral C-S fabric in Cliff Lake Fault in gravel pit along highway 10

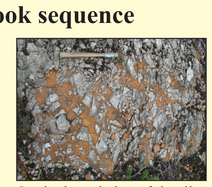
Cliff Lake plutonic complex


Quartz-phyric tonalite with mafic xenoliths


Quartz-phyric tonalite with partly digested pillow fragments

Eastern Hook sequence


Silicified massive rhyolite


In-situ brecciation of rhyolite by iron-carbonate alteration

Western Hook sequence

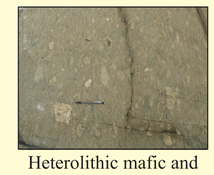

Heterolithic mafic and felsic breccia


Silicified aphyric pillowed flows

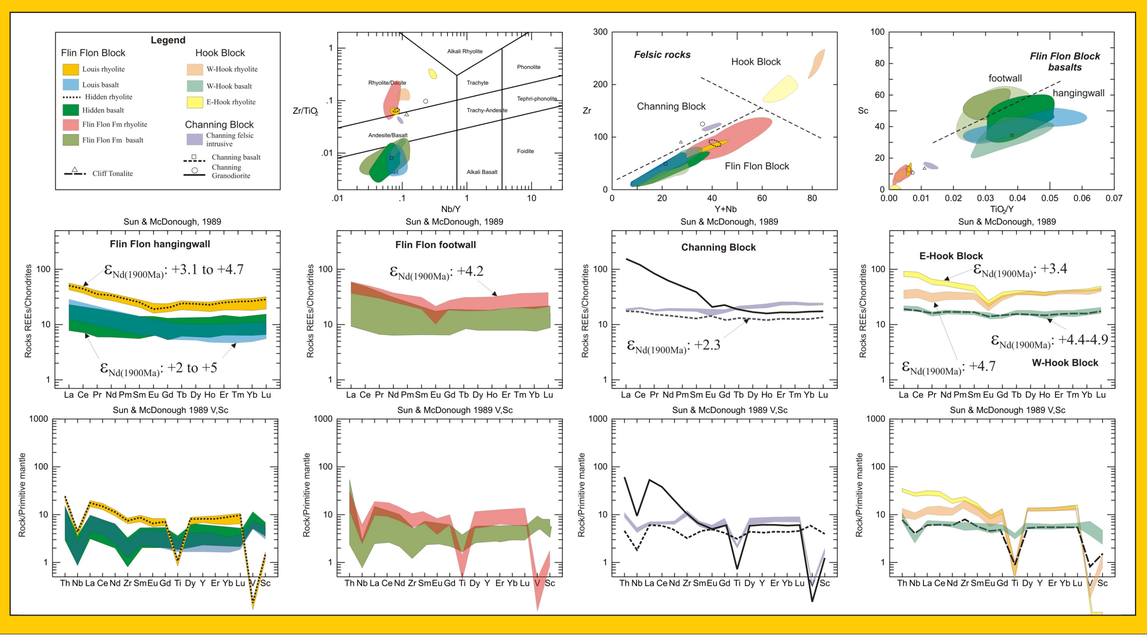

Monolithic felsic breccia


Gossan in massive rhyolite (trench)

Schist Lake - Mandy mines area


Heterolithic mafic and felsic breccia


Silicified and sericitized felsic breccia



A team effort!

The Manitoba Geological Survey and the Saskatchewan Geological Survey are very proud to announce the release of a new 1:10 000 scale “cross-border” geological map of the Flin Flon area.

A tremendous team effort over the last 5 years from geologists of the Manitoba Geological Survey, the Saskatchewan Geological Survey, the Geological Survey of Canada, researchers from Laurentian University, and Hudson Bay Exploration and Development Company Limited under the Government of Canada Targeted Geoscience Initiative (TGI-3) made this project possible.


Part of TGI-3 2007 crew; from left to right, front row: Harold Gibson, Renée-Luce Simard, Greg Ashcroft, Eilidh Coles, David Lewis, back row: Kate MacLachlan, Valerie Carange, Michelle DeWolfe, Jamie Bewcyk, James Croft, Karren Wassell and Lance Thompson.

Saskatchewan Ministry of Energy and Resources

Manitoba