



Manitoba Energy and Mines

Farley Lake Area - North Map #6

GEOLOGICAL SETTING - AGASSIZ METALLOTECT

The Agassiz Metalloctect is located in the northern belt of the Lynn Lake greenstone belt and is characterized by a unique and persistent geophysical signature (Fedikow, 1986a) and a distinctive lithological association that consists of high MgO-Ni-Cr basaltic rocks (termed 'picritic basalts'), iron formation, clastic sedimentary rocks (Fedikow and Gale, 1982) and felsic volcanic rocks (Parbery, 1988). The metalloctect has a strike length of 70 km and extends from the Spider Lake area (Fedikow, 1986b) to the Sheila Lake-Margaret Lake area (Ferreira, 1986). The Nisku, MacLellan and Rainbow Au-Ag, Pb, Zn deposits, the Dot Lake Au deposit and the Farley Lake Au deposit occur along the metalloctect (Fedikow et al., 1990).

GENERAL STRATIGRAPHY AND LITHOLOGY

Picritic (high MgO-Ni-Cr) basaltic rocks are the most conspicuous lithology of the Agassiz Metalloctect. Ranges for MgO, Ni and Cr are: 10.21-18.46%, 393-1179 ppm, and 939-2032 ppm, respectively. Picritic basaltic rocks occur throughout the metalloctect, but decrease in abundance eastward from the MacLellan deposit. Picritic rocks overlie, and are intercalated with, oxide, sulphide and silicate facies iron formation, are intercalated with dark green basaltic rocks, and are in turn overlain by felsic volcanic rocks. Picritic rocks weather a distinctive blue green to dark green and consist of 0.5 to 4 m thick heterolithic, monolithic and flow breccia, pillow breccia, tuff and pillowed flows (Parbery and Fedikow, 1987). Locally, up to 30%, disseminated, subhedral to euhedral magnetite occurs in the picritic volcanic rocks. The rocks of the Agassiz Metalloctect are bound to the south and north by aluminous basaltic fragmental rocks (Fedikow, 1986b) and minor felsic and mafic intrusions.

Heterolithic breccia contains two to five clast types that in total make up 40 to 80% of the rock. Clasts are commonly subrounded to subangular, amygdaloidal, and may be aphyric or feldspar- and/or amphibole-phyric. The clasts range in size from 0.5 by 1 cm to 15 by 30 cm. Breccia groundmass is very fine grained and consists almost entirely of chlorite and amphibole with accessory magnetite. Outcrops of fragmental picritic rock that have been strongly foliated may contain up to 10%, 1 to 4 mm amphibole porphyroblasts in the matrix and clasts.

Monolithic breccia contains 20 to 50% light green clasts in a very fine grained, dark green chlorite-amphibole matrix. Clasts are subangular to subrounded, aphyric to very fine grained, and contain up to 10%, <2 mm plagioclase + quartz amygdulites. Clasts are generally elongated parallel to foliation and may be a few to several centimetres in length.

Dark green basaltic rocks with distinctive higher contents of MgO, Ni and Cr (5 to 10% MgO and several hundred ppm Ni and Cr) than the aluminous basaltic rocks (average of three samples = 4.4% MgO, 57 ppm Ni and 91 ppm Cr; Syme, 1985) are intercalated with the picritic basaltic rocks. These mafic volcanic rocks occur along the length of the Agassiz Metalloctect.

Aphyric and quartz-phyric felsic volcanic rocks occur in several locations along the Agassiz Metalloctect and are commonly associated with picritic rocks. They are most common in the Barrington Lake area (Fedikow et al., 1990). Quartz-phyric felsic rocks have been noted in drill core at the MacLellan deposit and are considered to overlie the picritic rocks (Fedikow, 1986b).

Exposures of banded iron formation (BIF) along the Agassiz Metalloctect are sporadic. Geophysical data suggest that iron formation is present along most of the metalloctect. Most BIF observed in the field is oxide facies iron formation, either as chert/quartz magnetite or chert/quartz-hematite. These units are generally 0.1 to 1.0 m thick, have limited extent, and are interlayered with basaltic volcanic and/or sedimentary rocks. Sulphidized magnetite-chert BIF at Farley Lake contains gold (Briggs and Taylor, 1987). Silicate facies iron formation has been observed in drill core from the MacLellan deposit and contains 5 to 20%, 5 to 10 mm pink garnets in a fine grained, green, chloritic matrix with minor magnetite and lesser amounts of calcite and amphibole. In drill core, thin 1 to 10 mm cherty layers are commonly intercalated with chlorite-rich layers. The silicate facies BIF does not appear to contain sulfides or gold. Sulfide facies iron formation occurs within picritic basalt and clastic

sedimentary rocks at the MacLellan deposit. This facies of iron formation consists of 2 to 15 cm thick laminated, gold-bearing disseminated to solid pyrrhotite and pyrite layers that are rhythmically intercalated with biotite- and quartz-rich layers. Sphalerite, quartz and calcite occur as accessory minerals. Gagnon (1991) considers these iron sulphide-quartz layers to be deformed quartz veins.

Clastic sedimentary rocks are intercalated with picritic and nonpicritic volcanic rocks and have been referred to as siltstone, calcareous greywacke, and siliceous tuff (Fedikow, 1986b). Exposures are 0.1 to 2.0 m wide. The sedimentary rocks are fine grained, weather white to brown grey, and may contain up to 2%, 1 to 2 mm disseminated subhedral to euhedral magnetite crystals in a quartz-feldspar + biotite groundmass.

Laminated to bedded, reverse and normally graded siltstone has been identified at the MacLellan deposit. The siliceous and/or biotite-rich layers that host the sulfide mineralization and gold may represent either sedimentary rocks or zones of intense alteration arranged concentrically about a shear zone(s) (Fedikow, 1986b).

Other lithologies in the metalloctect include mafic to intermediate volcanic rocks and small tonalitic, dioritic and gabbroic intrusions.

STRUCTURAL COMPONENT

Rocks in the northern belt of the Lynn Lake greenstone belt have undergone moderate physical deformation. Gilbert et al. (1980) describe the northern belt as consisting of a homoclinal, north-facing sequence of supracrustal rocks; however, Parbery (1988) notes that within the high-Mg (picritic) volcanic rocks, tops are commonly to the south as indicated by pillow tops, pillow breccia and graded bedding. Isoclinal folds probably resulted in both north and south facing top directions. Strike directions are dominantly eastward and dips are steep. Foliation trend mainly east-northeast. A persistent crenulation cleavage (at 244°79'W), which can be measured over a distance of 5 km, occurs within the picritic basalts at the eastern end of the metalloctect. Picritic rocks that outcrop in the MacLellan deposit area are characterized by the development of mylonitic textures, shear bands, and pseudo-tachylite.

FARLEY LAKE AREA - NORTH

Iron Formation

At Jim Lake (5 km north-northwest of Farley Lake - not shown on map) quartz-magnetite BIF has an exposed thickness of 90 m and consists of alternating 1 to 5 mm thick quartz-rich layers, 5 mm thick green mafic silicate layers and 1 to 5 mm thick magnetite layers. Silicate layers weather recessively. Magnetite layers make up 5 to 30% of the iron formation.

Other

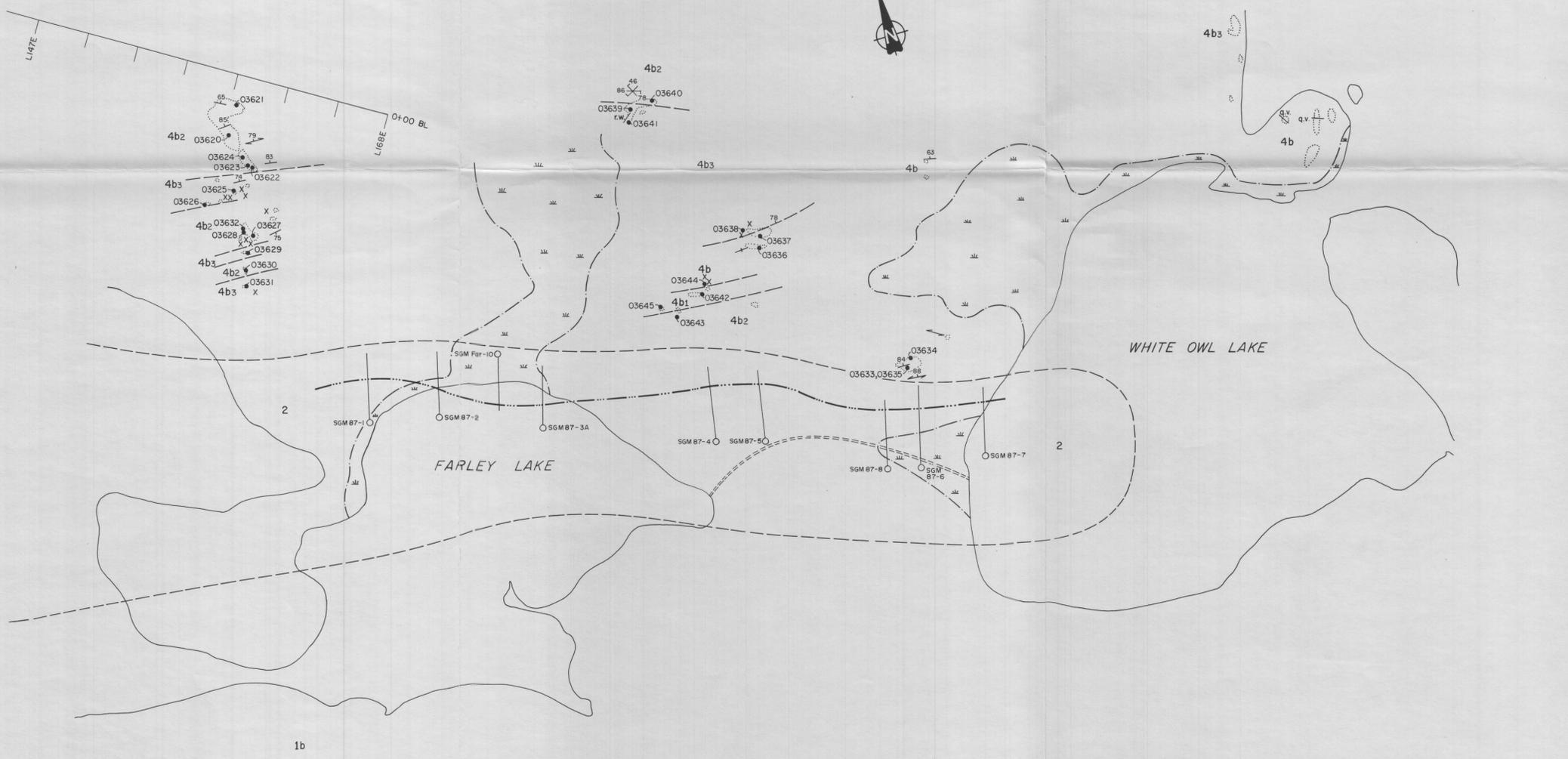
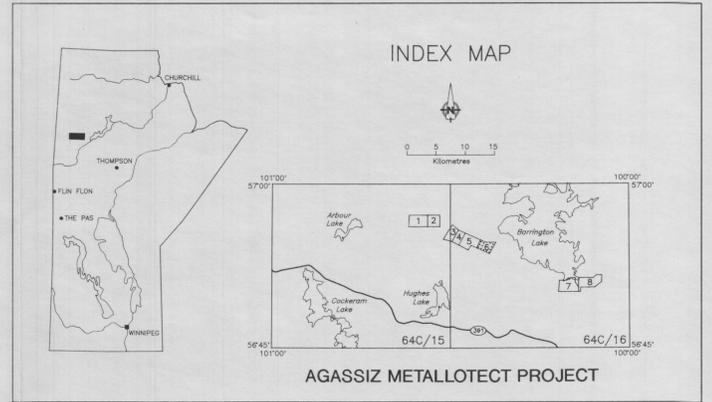
Tuff that occurs north of Farley Lake is similar in appearance to the picritic volcanic rocks that occur northwest of Gordon Lake. ICP (partial) analyses indicate that these rocks have high MgO contents. Neutron activation analyses record lower than average Cr and Ni contents (average of 6 samples: Cr = 19 ppm and Ni = <50 ppm) compared to aluminous basaltic rocks in the area.

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REFERENCES:

Briggs, D.N. and Taylor, M.R. 1987: The Farley Lake gold discovery, Lynn Lake, Manitoba; Geological Association of Canada, Program with Abstracts, v. 12, p. 26. Fedikow, M.A.F. 1986a: The Agassiz metalloctect - Spider Lake area. In Manitoba Energy and Mines, Minerals Division, Report of Field Activities, 1986, p. 23-25. 1986b: Geology of the Agassiz stratabound Au-Ag deposit, Lynn Lake, Manitoba; Manitoba Energy and Mines, Open File Report, OF89-5, 90 p. Fedikow, M.A.F. and Gale, G.H. 1982: Mineral deposit studies in the Lynn Lake area: Agassiz Metalloctect; In Manitoba Energy and Mines, Minerals Division, Report of Field Activities, 1982, p. 29-31. Fedikow, M.A.F., Parbery, D. and Ferreira, K.J. 1990: Agassiz metalloctect - a regional metallogenic concept, Lynn Lake area, Manitoba; Manitoba Energy and Mines, Minerals Division, Mineral Deposit Thematic Map Series, MAP 89-1. Ferreira, K.J. 1986: Geological investigations in the Sheila Lake-Margaret Lake area; In Manitoba Energy and Mines, Minerals Division, Report of Field Activities, 1986, p. 8-12. Gagnon, J.E. 1991: Geology, geochemistry and genesis of the Proterozoic MacLellan Au-Ag deposit, Lynn Lake greenstone belt, Manitoba; University of Windsor, M.Sc. thesis (unpublished), 275p. Gilbert, H.P., Syme, E.C. and Zwanzig, H.V. 1980: Geology of the metavolcanic and volcanoclastic rocks in the Lynn Lake area, Manitoba Energy and Mines, Geological Paper GP80-1, 118 p. Parbery, D. 1988: Investigation of volcanic stratigraphy and iron formation occurrences, Lynn Lake area; In Manitoba Energy and Mines, Minerals Division, Report of Field Activities, 1988, p. 12-15. Parbery, D. and Fedikow, M.A.F. 1987: Investigations of Agassiz Metalloctect stratigraphy, in Manitoba Energy and Mines, Minerals Division, Report of Field Activities, 1987, p. 12-16. Syme, E. 1985: Geochemistry of metavolcanic rocks in the Lynn Lake Belt; Manitoba Energy and Mines, Geological Services, Geological Report GR84-1, 84p.



SYMBOLS

- X Outcrop
Frost heaved block
Iron formation (DDH indicated)
DDH(SGM, MMR, Spy, CE, Jit and EL holes)
Portage, trail or drill road
Low/high ground boundary
Swamp
Sand plain
Trench
Farley Au deposit
Geological contact (known, assumed)
Bedding (inclined, vertical, dip unknown, tops unknown)
Pillowed flow (tops known, tops unknown)
Foliation (inclined, vertical, dip unknown)
Fracture set (inclined, vertical)
Conjugate fractures
Plunge of crenulation fold

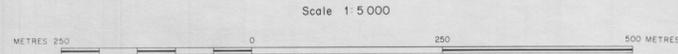
LEGEND

PRE- AND POST-SICKLE GROUP INTRUSIVE ROCKS

- 11 Fine grained mafic dyke
10 Biotite-quartz felsic dyke
9 Amphibolite
8b Gabbro
8a Diorite
7 Granodiorite
6 Syenite

WASEKWAN GROUP VOLCANIC AND SEDIMENTARY ROCKS

- 5 Felsic volcanic rocks
5d Felsic dykes
5c Dacite, dacitic tuff breccia, and lapilli tuff
5b Rhyolite breccia
5a Felsic tuff, 5a1 rhyolite tuff and lapilli tuff, 5a2, quartz-eye tuff, 5a3, feldspar-quartz crystal tuff
4 Mafic-intermediate volcanic rocks
4f Amphibole and/or plagioclase-phyric basalt, massive mafic to intermediate flows and amygdaloidal mafic flows
4e Mafic to intermediate pillowed flows
4d Mafic to intermediate flow breccia
4c Mafic to intermediate breccia, 4c1 mafic to intermediate heterolithic breccia and heterolithic tuff breccia, 4c2 polyimictic conglomerate, 4c3 two-clast breccia
4b Mafic fragmental rocks, 4b1 mafic heterolithic lapilli tuff and mafic lapilli tuff, 4b2 mafic plagioclase crystal tuff and mafic to intermediate crystal tuff, 4b3 mafic to intermediate tuff
4a Intermediate volcanic rock



Geology by D. Parbery

Cartography by C. Wojciechowski, M. Timcoe

- 3 Picritic volcanic rocks
3d Amphibole-phyric pillowed flows, pillowed flows and pillow breccia
3c Flow breccia
3b Breccia, 3b1 heterolithic breccia and heterolithic tuff breccia, 3b2 monolithic breccia, 3b3 two-clast breccia
3a Picritic fragmental rocks, 3a1 heterolithic lapilli tuff, monolithic lapilli tuff, and lapillistone, 3a2 pyroxene-phyric and hornblende-phyric crystal tuff, 3a3 massive tuff and banded tuff
2 Chemical and detrital sedimentary rocks
2e Calc-silicate unit
2d Magnetite-quartz banded iron formation
2c Hematite-quartz banded iron formation
2b Magnetite-chlorite banded iron formation
2a Sedimentary rocks, (miscellaneous) 2a1 laminated siliceous sedimentary rocks, 2a2 greywacke
1 Mafic to intermediate volcanic rocks
1c Amphibole-plagioclase crystal tuff and intermediate amphibole-phyric rocks
1b Mafic to intermediate volcanic rocks and amygdaloidal mafic volcanic rocks
1a Mafic crystal tuff