Manitoba
Energy and Mines

ECONOMIC GEOLOGY REPORT ER91-2

Gordon Lake – Farley Lake Area

Map #4

GEOLOGICAL SETTING - AGASSIZ METALLOTECT

The Agassiz Metallotect 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 metallotect 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 metallotect (Fedikow *et al*; 1990).

GENERAL STRATIGRAPHY AND LITHOLOGY

Picritic (high MgO-Ni-Cr) basaltic rocks are the most conspicuous lithology of the Agassiz Metallotect. Ranges for MgO, Ni and Cr are: 10.21-18.46%, 393-1 179 ppm, and 939-2 032 ppm, respectively. Picritic basaltic rocks occur throughout the metallotect, 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 Metallotect 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, aphanitic to very fine grained, and contain up to 10%, <2 mm plagioclase ± quartz amygdules. 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 Metallotect.

Aphyric and quartz-phyric felsic volcanic rocks occur in several locations along the Agassiz Metallotect 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 Metallotect are sporadic. Geophysical data suggest that iron formation is present along most of the metallotect. 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 0.01 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 metallotect 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. Foliations trend mainly east-northeast. A persistent crenulation cleavage (at 244°/78°W), which can be measured over a distance of 5 km, occurs within the picritic basalts at the eastern end of the metallotect. Picritic rocks that outcrop in the MacLellan deposit area are characterized by the development of mylonitic textures, shear bands, and pseudotachylite.

GORDON LAKE-FARLEY LAKE AREA (WEST)

Picritic Basalts

Picritic basaltic rocks, consisting of heterolithic breccia, pillowed flows, pillowed breccia and tuff occur west-northwest of Gordon Lake.

Felsic Volcanic Rocks

One outcrop of rhyolite breccia occurs in this area.

Iron Formation

Oxide Facies Iron Formation

In the Gordon Lake-Farley Lake area exposures of tightly folded banded oxide facies iron formation occur over a 500 m wide area. South-southwest of Gordon Lake BIF consists of 20% cherty layers, 30% magnetite layers and 50% saccharoidal siliceous layers. Hematite-bearing BIF consisting of alternating 3 to 20 cm red-brown hematite layers and 1 to 1.5 mm siliceous to cherty layers also occur in the area; locally the siliceous layers constitute 20 to 50% of the rock. Magnetite and hematite-bearing BIF contain up to 2%, 1 mm diameter, disseminated pyrite grains and rare arsenopyrite.

Near Farley Lake magnetite-chert BIF consists of alternating, very fine grained magnetite, silicate, and cherty layers. Magnetite-rich layers average 2 to 3 mm thick, contain more than 80% magnetite and make up 50% of the rock. The silicate layers contain quartz, chlorite ± feldspar and up to 2% magnetite. Cherty layers contain less than 1% magnetite and are up to 20 mm thick. At the Farley Lake Au deposit, sulphidization of the chert-magnetite BIF has produced disseminated to near solid pyrrhotite that contains gold (Briggs and Taylor, 1987).

A laminated siliceous sedimentary rock occurs on the west shore of Farley Lake.

Other

Mafic to intermediate breccia, flow breccia, amphibole-phyric basalt and tuff occur north-northwest of Gordon Lake. Sporadic exposures of mafic to intermediate volcanic rocks also occur south of Gordon Lake (south of the iron formation).

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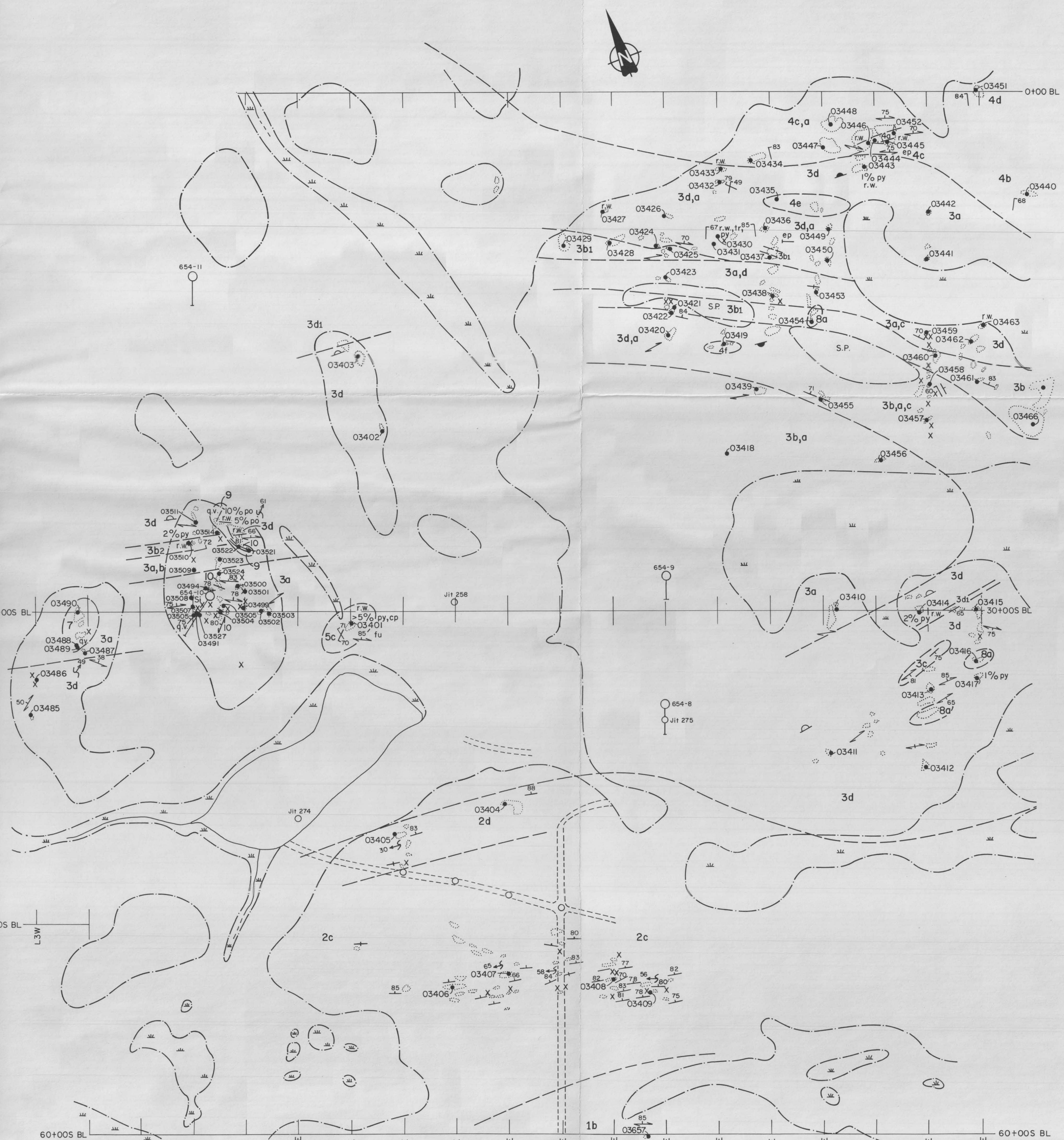
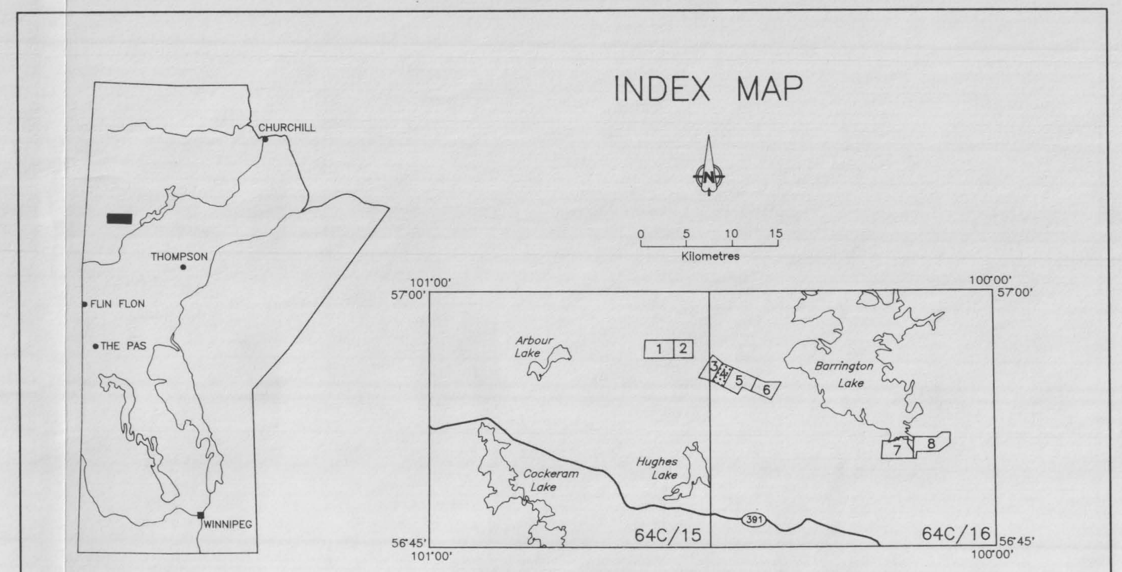


Scale 1:5 000

METRES 250 0 250 500 METRES

Geology by D. Parbery

Cartography by C. Wojciechowski, M. Timcoe



AGASSIZ METALLOTECT PROJECT

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** polymictic 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
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

SYMBOLS

X Outcrop		Alteration and Mineralization
Frost heaved block	Si	silica
Iron formation (DDH indicated)	ep	epidote
DDH(SGM, MMR, Spy, CE, Jit and EL holes)	ch	chlorite
Portage, trail or drill road	cp	chalcopyrite
Low/high ground boundary	hm	hematite
Swamp	kf	K-feldspar
S.P. Sand plain	mt	magnetite
Trench	po	pyrrhotite
Farley Au deposit	py	pyrite
Geological contact (known, assumed)	fu	fuchsite
70 Bedding (inclined, vertical, dip unknown, tops unknown)	q.v.	quartz vein, inclined, dip unknown
Pillowed flow (tops known, tops unknown)	r.w.	rusty weathered outcrop rusty weathered zone
70 Foliation (inclined, vertical, dip unknown)	• 03301	sample number (collected in 1987)
75 Fracture set (inclined, vertical)	• 202	sample number (collected in 1988)
60 75 80 Conjugate fractures		
85 Plunge of crenulation fold		

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