DESCRIPTIVE NOTES

Early reconnaissance (1:1M scale) mapping (Stevenson, 1968) portrayed the geology of the northeastern Superior Province as a large granitoid terrain without economic interest. Recent more detailed reconnaissance (Percival and Card, 1994; Stern et al., 1994; Percival et al., 1994) has been aimed at providing a more robust regional geological framework for this remote, largely unexplored territory. Whereas Stevenson's (1968) map showed sparse, isolated supracrustal remnants in a sea of granitoid rocks, the recent work has defined several relatively well

belts. The region is accessible from Povungnituk by helicopter and from Kuujjuaq by float-equipped aircraft.

Regional mapping, in conjunction with interpretation of aeromagnetic anomalies, has defined several geological domains with widths of 50-150 km and lengths of hundreds of kilometres (Fig. 1). The aeromagnetically positive Tikkerutuk domain in the west is characterized by a variety of granodioritic and granitic calc-alkaline plutonic rocks (2.70-2.69 Ga). Supracrustal rocks have not been observed. To the east, the aeromagnetically-striped Lake Minto domain consists of an older supracrustal sequence dominated by paragneiss with iron formation, and isotopically and chemically evolved calc-alkaline volcanic rocks of 2760 Ma age (Skulski et al., 1996), metamorphosed at lower amphibolite to granulite facies. Plutonic rocks include pyroxene-bearing plutons (2.78-2.72 Ga) with xenoliths of supracrustal rocks and local ~3 Ga tonalite gneiss, peraluminous granodiorites and isotopically enriched nonzogranites. In the central Minto block, the aeromagnetically negative Goudalie domain is characterized by tonalitic gneiss (2.9-3.1 Ga) and ~2720 Ma greenstones of the Vizien belt (Fig. 1; Percival et al., 1993; Skulski et al., in press; Lin et al., in press); it has not been recognized in the present map area. In its place is the Qalluviartuuq domain, consisting of a supracrustal package made up of volcanic-dominated, isotopically primitive, low-K basalts, iron-formations, such as in the northern part of the Duquet belt, warrant exploration. andesites (2840 Ma) and sub-volcanic intrusions (2832 Ma), metamorphosed at amphibolite facies. Conglomerate which unconformably overlies 2832 Ma granodiorite contains granitic clasts dated at 2768 Ma and is overlain by sandstone. Large granodiorite plutons (ca. 2775 Ma) that intrude mafic rocks of the Qalluviartuuq belt have primitive isotopic signatures. Utsalik domain in the east consists of homogeneous granodiorite and granite without supracrustal

A steeply-dipping supracrustal belt (Duquet belt; Inset map A) varying in width from 1 to 6 km surrounds Duquet

SUPRACUSTAL ROCKS IN THE DUQUET LAKE AREA

Lake and extends to the northwest and southwest. In spite of a generally high state of strain, stratigraphic sequences can be defined locally. Primary facies variations are rapid across strike and individual units appear to have limited strike extent, due partly to disruption by a set of WNW-striking shear zones. In the western arm of the Duquet belt, sedimentary rocks (As) including conglomerate (Asc) and quartzite locally rest unconformably on tonalite (At). They are structurally overlain by carbonatized basalt (Avm) and andesite (AvI), interlayered with pelite, rusty biotite schist Percival, J.A. and Card, K.D. (As) and iron formation (Asi), which locally marks volcanic-sedimentary contacts. To the north, a west-facing basaltic unit (Avm) is interlayered with and overlain by slate, pelite, siltstone (As) and conglomerate (Asc). A kilometre-thick lens of quartz-porphyritic dacite (Ap; 2775 Ma) and plagioclase-porphyritic andesite shows abrupt grain-size variations and complex cross-cutting relationships characteristic of hypabyssal intrusions. Overlying the sedimentary unit is a lens of intermediate volcanic rocks (Avi), mainly plagioclase-porphyritic andesite. Further north, a panel of well-preserved basaltic rocks and metasedimentary schist is separated from porphyritic granodiorite (Agd) to the west by a high-angle reverse ductile shear zone. The northernmost segment of the belt is an east-plunging synform Percival, J.A., Card, K.D., and Mortensen, J.K. consisting of a basaltic unit structurally overlain by sandstone, pelite and slate. Both units contain stratiform iron formations (Asi): magnetite-quartz in the western section and garnet-quartz in the sedimentary rocks to the east. The northern and eastern arms of the Duquet belt contain all of the main rock types present on the western arm, but in an attenuated state with little strike continuity and poorly preserved stratigraphic relationships. Lithological units of the Duquet belt may be present in a thin extension to the north. A belt of paragneiss, silicate-facies iron-formation, and mafic schist defines a complex outcrop pattern. Similarly, part of the Duquet belt

may have been offset along WNW-striking faults to the west, where small remnants of supracrustal rocks are preserved in the Pauline Lake area. Approximately 40 km to the southwest of the Duquet belt and connected by a thin septum of amphibolite is the Akuaraaluk belt (Inset map B). This belt has similar geometry to the Duquet belt, marked by steep dips and annular, Percival, J.A., Skulski, T., Card, K.D., and Lin, S. branching outcrop pattern. A mafic unit, comprising amphibolite, mafic gneiss, and rare pillow basalt (Avm), forms a discontinuous rim to the belt. Diorite (Ad) and andesite (Avi) are abundant on the east and greywacke (As) is common in the north and west. Where observed, the volcanic-sedimentary contact is marked by a rusty-weathering zone, locally containing up to 40% sulphides. One gossan measures 150 by 500 m and carries minor anomalies in Cu (up to 1380 ppm) and Au (up to 79 ppb). Rare rhyolite (**Avf**) from the northwestern arm of the belt has fragmental textures, and yielded a preliminary U-Pb zircon age of 2828 Ma. An intrusive complex made up of tonalite (At), with diorite (Ad) enclaves up to kilometre scale, forms the eastern boundary to the belt.

volcano-sedimentary complexes were dismembered during pluton emplacement, deformation, uplift, and erosion. Among them, a <2 km wide belt of amphibolite located approximately 40 km southeast of Duquet Lake hosts a string of gossans which extends over a strike length of 13 km. Another narrow belt of amphibolite and paragneiss about 10 km east of the Duquet belt is associated with pyroxenite pods. A thin mafic belt west of Kakiattualuk Lake is associated with peridotite.

Plutonic rocks in the Duquet Lake area can be grouped into two major and several minor suites. Voluminous

granite (Ag) and granodiorite (Agd) suites occur throughout the region whereas some of the minor suites are areally restricted. Apart from rare gneissic tonalites which feature abundant evidence for polyphase deformation, most of the plutonic rocks are homogeneous, medium- to coarse-grained, and moderately foliated to massive. tonalite aneiss (Ata: 2755 Ma) with a millimetre-scale, variably folded and boudinaged lavering intruded by concordant, centimetre-thick granite veins. The oldest rock component consists of thin mafic schlieren; small layers and pods of gabbroic anorthosite (Aa) may also predate the dominant tonalitic gneiss phase. Sheets of foliated tonalite cut tonalitic gneiss but are themselves cut by granite. Further south, similar dykes of foliated tonalite cut Anorthositic rocks are a widespread but volumetrically minor component of the granitoid complex west of Duquet Lake. The largest single body is a less than 2 km by about 10-km sheet northeast of Philpot Lake. Dominated by

anorthositic gabbro (Aa), the body includes gabbro and anorthosite. In the same region, anorthositic enclaves define distinct xenolithic zones in granodiorite and granite. Pyroxenite (Au) occurs as sporadic discrete masses up to 2 km wide within granodiorite and granite east of Duquet Lake. These coarse grained, massive bodies are generally homogeneous clinopyroxenite and hornblendite with accessory orthopyroxene, biotite, and plagioclase. Some bodies have finer grained, foliated margins and are cut by dykes of granodiorite. Peridotite (Au) bodies of similar scale, locally with cumulate layers, also occur west of the

Duquet belt. The ultramafic bodies are interpreted as cumulate enclaves on the basis of similarities to pyroxenites in the Leaf and Kogaluc River areas (Stern et al., 1994; Skulski et al., 1996). Granodiorite (Agd) and associated rocks are the predominant rock type in the eastern part of the map area. They are generally homogeneous, medium to coarse-grained and contain up to 30% combined hornblende, biotite, and epidote. A sample from eastern lkirtuuq Lake yielded a U-Pb zircon age of 2775 Ma. Clinopyroxene cores in hornblende are common in the far eastern part of the area. With increasing mafic content the composition grades to quartz diorite and diorite. K-feldspar megacrystic (Agdm) varieties form discrete kilometre-scale zones and grade to true granite (Agm). Granodiorites contain enclaves (cognate xenoliths?) of guartz diorite and diorite as well as inclusions of supracrustal rocks, locally in large enough quantities to possibly represent map-scale intrusive breccia

complexes. Granodiorites are generally foliated, with higher strain intensity adjacent to supracrustal belts.

A large body of digrite (Ad) in the northwestern part of the area may be part of the granodigrite suite. It has

gradational contacts with granodiorite, as well as similar grain size and texture. The diorite body also displays mutually crosscutting relationships with a finer grained to porphyritic diorite phase, including enclaves and dykes of the fine grained rock and indistinct lobate contacts, suggesting magma mingling. Granite (Ag) occurs throughout the region, from centimetre to batholith scale. It is generally the youngest intrusive phase in both granitoid regions and supracrustal belts. Its composition ranges from leucogranite, with less than 5% biotite, to mafic varieties with up to 20% hornblende and biotite. One body of muscovite granite was noted

near the western edge of the area and pyroxenes are present in granites in the east. Granites are commonly massive to weakly foliated; K-feldspar megacrystic varieties (Agm) may contain an igneous flow fabric defined by megacryst alignment. Most granites are distinguished by their pink colour imparted by hematite-stained K-feldspar; perthite granites weather white. In some areas, sheets of granite cut granodiorite, on scales ranging from hundreds of metres A 3 x 500 m, southwest-striking carbonatite dyke cuts granitoid rocks 30 km southwest of Duquet Lake. This unique, massive to flow-layered sövite contains sporadic ultramafic xenoliths in a coarse grained matrix of calcite, sodic amphibole and pyroxene, biotite and magnetite with traces of xenotime and zircon.

Two sets of diabase dykes represent the youngest intrusive units in the region. The sparse, west-northwestand northwest-trending bodies rarely attain 50 m in width. The west-northwest-trending dykes have sigmoidal form and may contain olivine, whereas the northwest-trending bodies are straight and generally pyroxene bearing. Crosscutting relationships between dyke swarms or with the carbonatite dyke were not observed. The dykes are probably members of the Paleoproterozoic Maguire (2230 Ma), Klotz Lake (2210 Ma) and Minto (1998 Ma)(ages from K.L. Buchan, pers. comm., 1995) swarms.

GEOLOGICAL STRUCTURE

The region is dominated by northwest structural trends, expressed in the elongate shape of supracrustal belts, heir internal structure, and foliation in plutonic rocks. For consistency with areas to the south (Percival et al., 1995a; Lin et al., 1995), the dominant, penetrative, synmetamorphic fabrics are termed D₂, although earlier tectonic fabrics are rarely recognized. In contrast to areas further south, northeasterly trends are also present and map-scale structural domes are evident in the western part of the Duquet Lake area.

Supracrustal belts in the Duquet Lake area are characterized by strong tectonic fabrics including steep foliations (S₂) and stretching and mineral lineations (L₂). Carbonate-altered volcanic rocks and pelites carry stronger fabrics (locally mylonitic) than adjacent non-altered units, indicating that D2 strain is significantly partitioned according to re type. In the northern Duquet belt, lithological units, S₂ foliations, and L₂ lineations define a moderately south-plunging, tight, symmetrical F₃ synform. No associated axial plane fabric has been recognized. Asymmetric minor folds have geometry inconsistent with formation as second-order F3 folds but are parallel to L2, suggesting that they may have ormed during the penetrative D_2 event and been subsequently folded (F_3). The D_2 deformation led to the development of mylonitic fabric and more local, narrow, ductile shear zones.

The Duquet belt is segmented by at least three ductile shear zones that cut compositional layering and S2 foliations at low angles. Although similar in plunge, associated lineations diverge from the average L_2 trend by up to 90° . It is possible that these structures formed during a late increment of D_2 strain. Plunge variations and reversals of L2 are attributed to a set of open F4 folds with east-west axes. An upright, east-west crenulation cleavage (S4) is developed sporadically in fissile rocks throughout the belt. Late west-northwest-trending, brittle fault zones cross both he Duquet belt and plutonic rocks. One brittle fault extends at least 20 km to the west-northwest as a zone of fault breccia, cataclasite, and pseudotachylite. The broad map-scale geometry of the Duquet belt may be viewed as a domal pattern developed through

nterference between F₃ and F₄ folds. A clear illustration is given in the western part of the map area where a domal structure over 30 km in diameter is outlined in plutonic domain.

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

The Akuaraaluk belt has similar overall geometry to that of the Duquet belt. Steep S₂ foliations define an upright or steeply dipping closed structure; associated L2 lineations plunge moderately to steeply southeast but have more variable trends than in the Duquet belt. Surrounding plutonic rocks carry foliations (S2) concordant to trends within the supracrustal belt, which together define regional F₃-F₄ interference patterns.

Metapelitic units provide the most visible monitors of metamorphic grade which varies regionally, from granulite facies northwest of Payne Lake (Percival et al., 1995b) to lower amphibolite facies. In general, peak metamorphic preserved and continuous belts of supracrustal rock with significant potential for Archean greenstone-belt-hosted minerals define the principal penetrative tectonic fabric (D₂). This constitutes mainly alignment of amphibole in mineralization within a northwest-trending corridor (Fig. 1; Percival et al., 1992; 1995a, 1995b; Skulski and Percival, metavolcanic rocks and phyllosilicates in metasedimentary units. Andalusite, staurolite, and garnet are common in in press). The present map portrays the geology of an area containing two such belts, the Duquet and Akuaraaluk pelites of the Duquet belt, generally in association with sillimanite. This low-variance assemblage limits conditions to about 620°C, 200 MPa. Slate in the northwestern Duquet belt may indicate local preservation of greenschist facies. An unquantified contrast in metamorphic grade is evident across a west-northwest-striking fault in the northern Duquet belt. To the north are fine grained, white mica-rich slates whereas volcanic rocks to the south are medium grained

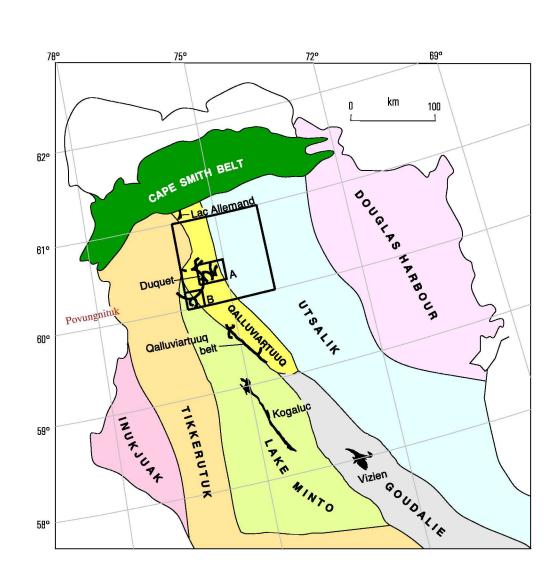
Supracrustal belts contain many gossans, mainly stratiform silicate- and oxide-facies iron-formations with minor sulphide. These less than 10 metre-scale layers expand locally into pods containing massive sulphide (northern Akuaraaluk belt; Pauline Lake area). Approximately 50 samples were analyzed for gold and base metals with modest results (<100 ppb Au; <1380 pm Cu). It is evident that concentration from high background levels would be necessary to form economic levels. Structural controls, including unit thickening in fold hinges, are critical in forming iron-formation-hosted gold deposits such as Lupin (Kerswill, 1993). In this context, F3 fold hinges involving stratiform

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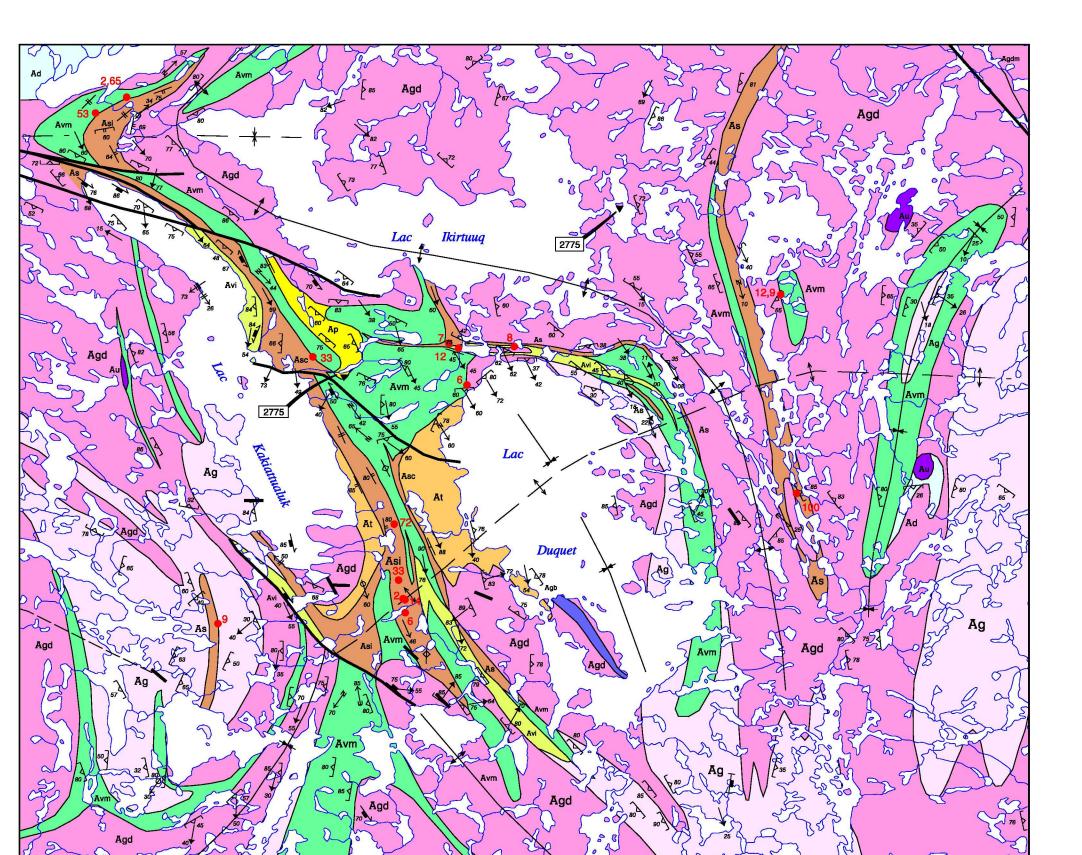
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- 1995b: Geology of the Rivière Kogaluc-Lac Qalluviartuuq region (parts of 34J and 34O), Quebec; Geological Survey of Canada, Open File 3112, scale 1:250 000. 1996: Granite-greenstone terranes of the northern Minto block, northeastern Superior Province, Quebec; in
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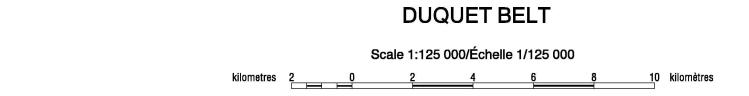
Tonalitic gneisses occur in the northwestern corner of the area. They are complex, polyphase homblende-biotite 1968: A geological reconnaissance of Leaf River map-area, New Quebec and Northwest Territories. Geological Survey of Canada Memoir 356, 112p.

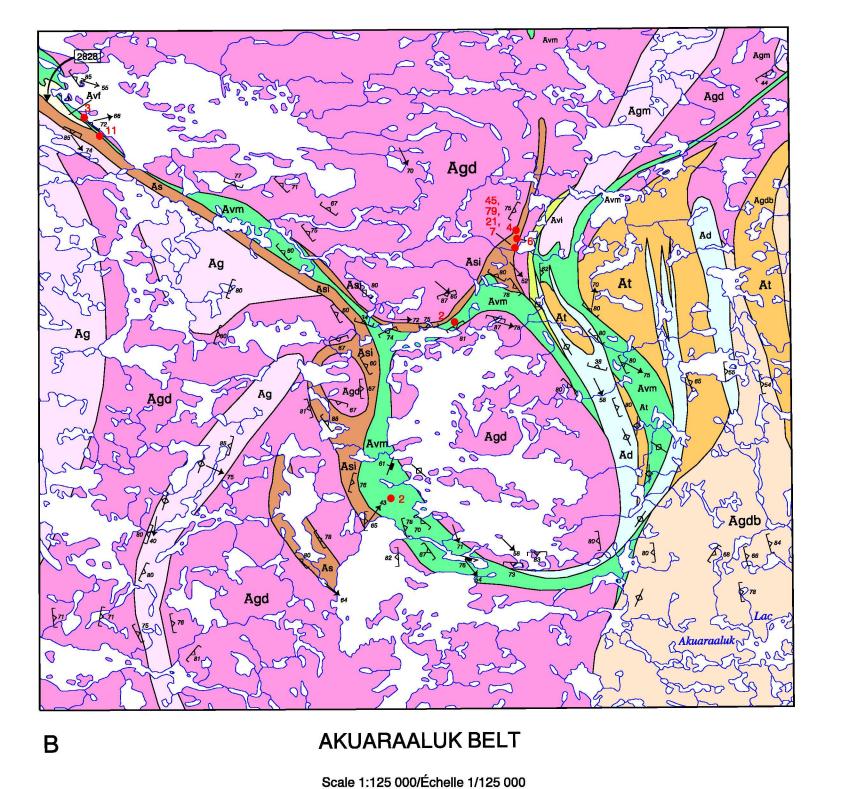


Digital base map at 1:250 000 from Geomatics Canada, Natural Resources Canada, assembled by the Geological Survey of Canada Copies of the topographical edition of this map may be obtained from the Canada Map Office, Department of Natural Resources Canada, Ottawa, Ontario, K1A 0E9 Mean magnetic declination 1996, 29°01' W, decreasing 11.0' annually. Readings

vary from 27°18' W in the SW corner to 30°38' W in the NE corner of the map







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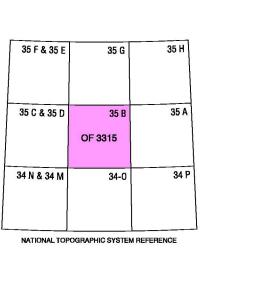


76°00'

LAC COUTURE Projection transverse de Mercator Transverse Mercator Projection CM 75°00', Scale Factor 1 MC 75°00', facteur d'échelle 1 © Crown copyrights reserved © Droits de la Couronne réservés

75°00′

OPEN FILE 3315



LEGEND PROTEROZOIO Granite, leucogranite: coarse- to medium-grained biotite +/- hornblende Granodiorite: medium- to coarse-grained, foliated hornblende - biotite +/- epidote granodiorite; includes some diorite, granite. Unit contains pyroxene in the eastern part of the region: pattern depicts K-feldspar Granodioritic intrusive breccia; contains abundant enclaves of mafic Agdb Granogionuc initiasive precisa, contains appropriate gneiss, diorite, gabbro, pyroxenite, and anorthosite Tonalite, tonalite gneiss: medium-grained, biotite +/- hornblende At, Atg tonalite. Includes homogeneous, foliated varieties (At) and gneissic rocks (Atg) with mafic and anorthositic enclaves and granitic leucosome Diorite: medium to coarse-grained, homogeneous hornblende - plagioclase Ad +/- biotite diorite; locally plagioclase porphyritic; includes some gabbro and quartz diorite Gabbro: medium-grained, homogeneous, variably foliated hornblende -Ultramafic rocks: coarse-grained orthopyroxene - clinopyroxene -hornblende +/- olivine +/- biotite +/- plagioclase rocks; occurs as pods within plutonic rocks. Includes pyroxenite and peridotite Anorthosite: coarse to medium-grained, variably foliated plagioclase +/- hornblende rocks; associated with gabbro and leucogabbro Supracrustal and associated rocks, unsubdivided (main body of map): metamorphic rocks of volcanic, sedimentary and subvolcanic intrusive origin. Includes basalt, andesite, rhyolite and porphyritic equivalents, along with greywacke, conglomerate, quartzite, pelite and iron formation SUPRACRUSTAL AND ASSOCIATED ROCKS (Maps A and B) Metasedimentary rocks: mainly biotite +/- garnet paraschist, paragneiss, with some pelite and rare arkose, sandstone and conglomerate (Asc). Bedding and graded layering are rarely preserved. Includes oxide and silicate and rare sulphide-facies iron formation (Asi) Porphyritic intrusions: plagioclase-porphyritic andesite and dacite with hypabyssal features Rhyolite - dacite: biotite - hornblende - plagioclase - quartz +/-K-feldspar schist with locally preserved breccia textures Andesite: hornblende - plagioclase +/- epidote leuco-amphibolite with

Basalt and associated mafic rocks: hornblende - plagioclase - epidote

J × Y

. 2755 ▼

+/- garnet amphibolite with locally preserved volcanic breccia,

pillow breccia; includes some gabbro

Geological boundary (inferred)

Fault: ductile or brittle .

F3 fold axis (antiform).

F3 fold axis (synform).

F4 fold axis (antiform) . .

F4 fold axis (synform) . .

Limit of mapping .

Igneous layering . .

Gold value (ppb) in gossan . .

Clinopyroxene (ornamented side) . .

Orthopyroxene (ornamented side) .

Bedding, top known (inclined, overturned) . .

Bedding, top unknown (inclined, vertical) . .

Fold hinge: generation unknown, 2nd, 3rd . .

Vertical shear zone, sense unknown . .

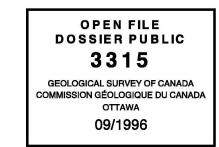
U-Pb zircon geochronology site: age, Ma . .

Lineation, generation unknown: stretching, mineral . .

Lineation, fold hinge: u, z, s, unknown geometry .

Foliation, generation unknown: inclined, vertical; 2nd generation. .

Shear zone: normal, reverse, dextral, sinistral, sense unknown . . .



Geology by J.A. Percival, T. Skulski, and L. Nadeau, 1995, Geological Survey of Canada Digital cartography by the Geological Survey of Canada

Electrostatic plot produced by the Geoscience Information Division