Notigi Lake is a reservoir on the Churchill River system created by Manitoba Hydro in 1979 and located approximately 100 km west of Thompson along Provincial Highway 391. The Notigi Lake map area is outlined in the simplified geology of the northeastern Kisseynew Domain (Figure 2; Abbreviation: GSZ Granville Lake structural zone).

Geoscience Initiative 3 (TGI-3) Flin Flon Project (Percival et al., 2006; Percival et al., 2007; Zwanzig, 2008). The purpose of the work at Notigi Lake is to define the tectonostratigraphy, structural geology and tectonic history of an accessible and well-exposed area on the eastern

Recent work in an area extending from southeast of Notigi Lake to the Thompson Nickel Belt (TNB) has revealed the existence of Archean gneiss with a supracrustal succession similar to that of the Ospwagan Group, which hosts the deposits in the TNB (Percival et al., 2005, 2006; Zwanzig et al., 2006; Figure 2). Geological investigations in the Notigi Lake area, with its well exposed tectonostratigraphy, may serve as a guide for the three-dimensional extent of older and economically-promising rocks in less well-exposed areas.

volcanic rocks and associated mafic intrusive rocks;

by turbidity currents and rare quartz-rich sandy beds with minor iron formation (Bailes, 1980; Zwanzig, 1990);

deposited in a shallow water environment (Milligan, 1960). The main intrusive rocks at Notigi Lake are:

1) gabbronorite-leucogabbro interpreted as sills related to the original flows that were transposed into the layered amphibolite;

2) monzodiorite identified as Black Trout diorite;







Sickle Group (K)

The Sickle Group rocks consist of layered quartzofeldspathic magnetite-bearing paragneiss. Units in the Sickle Group are mapped using distinct compositional changes defined by the presence or absence of hornblende

Gabbronorite-leucogabbro (lm)

appearance and does not exhibit well-defined layering. These mafic rocks range in diopside-bearing neosome (Figure 12). mineral composition from gabbronorite to melagabbro to leucogabbro. Secondary weak

The **amphibolite** typically has alternating layers of

Burntwood Group(B)

An anomalous sillimanite-bearing leucosome occurs in Burntwood Group migmatite north of Notigi Lake along the Rat River and in rare exposures in the southernmost the northeast shoreline (Figure 6). It is interpreted as bays of Notigi Lake (Figure 5). It is interpreted as deriving

Lake structure, the Sickle Group units occur above the assemblage in the following order: 1) sillimanite-bearing Notigi assemblage in the following order: 1) basal biotite gneiss (Figure 8), 2) biotite-bearing gneiss, 3) hornblendegneiss, 2) hornblende-biotite gneiss (Figure 7), 3) biotite gneiss and 4) biotite gneiss. In addition, thin generally more siliceous upper biotite gneiss and 4) cordierite-sillimanite-bearing diatexite occurs close to the sillimanite-bearing arkosic gneiss that may form the Notigi assemblage, along a northern peninsula and along uppermost unit. On the east side of the Notigi structure, the easternmost part of Notigi Lake (Figure 9). or sillimanite. Along the southwestern side of the Notigi the Sickle Group units stratigraphically overly the Notigi

layering is defined by leucosome lenses that are folded in places. The gabbronorite contains altered orthopyroxene (possibly bastite after enstatite), hornblende and The gabbroic rocks at Notigi Lake underlie the Notigi assemblage and are interpreted as plagioclase with orthopyroxene-bearing leucosome (Figure 10). The melagabbro sills related to the original flows that were transposed into the layered amphibolite. contains altered orthopyroxene (possibly to phlogopite) and clinopyroxene (Figure 11). Compared to the amphibolite in the Notigi assemblage, the gabbro has a more uniform The gabbro contains hornblende, plagioclase, diopside with lesser orthopyroxene and

green to white) and possibly chert (white) (Figure 4). from originally more arkosic or pelitic sediment deposited within the Burntwood Group turbidites. Garnet-bearing siliceous gneiss is exposed in thin layers in the southern bays of Notigi Lake and in one location along

deriving from fine-grained quartz-rich sandy beds.

Summary

The fieldwork at Notigi Lake, within the northern flank of the Kisseyne Domain, has contributed significant details to the structure, extent and composition of the layered amphibolite, subdivisions in the Burntwoo and Sickle groups and mafic to felsic intrusive rocks (Figure 1).

Geology of Notigi Lake, Manitoba compiled by L.A. Murphy

The layered amphibolite unit is grouped with siliciclastic metasedimentary rocks in a volcano-sedimentary assemblage, (herein referred to as the 'Notigi assemblage'). On the eastern side of the Notigi structure, Sickle Group units occur in the following order: 1) sillimanite-bearing gneiss, 2) biotite-bearing gneiss, 3) hornblendebiotite gneiss, and 4) biotite gneiss. The most easterly sillimanitebearing gneiss can be interpreted to represent the base of the



Structur	e symbols		
++	Bedding, tops unknown (upright, overturned)	+1	Fold axis, symmetry unknown 2, generation unknown)
Não 100 V	Foliation, generation unknown (inclined, vertical, dip unknown)	AH.	Fold axis, Z-symmetry, genera
777	Foliation (generation 1, generation 2, generation 4)	A.	Fold axis, S-symmetry, gener
22	Gneissocity (generation unknown, generation 1)	2	Fold axis, symmetric, generat unknown,
Y	Crenulation cleavage, generation unknown, sense unknown	ŧ	Fold axial plane, generation 3
1	L-fabric, generation unknown	#	Dike
A	L-fabric, mineral lineation	19	Fault (sinistral, sense unknow
A A	Intersection lineation (generation unknown, generation 3)	1	Shear zone, sense unknown

Symbols					
Geological boundaries					
	Contact defined				
	Contact approximate				
	Contact assumed				
	Contact gradational				
	Contact under water				
-	Fault defined				
	Fault approximate				
	Fault assumed				
Minerals of note					
	Cordierite				
*	Sillimanite				
Infrastructure					
	Road, loose surface, all-wea				
******	Road, loose surface, limited				
	Control structure				
	Transmission line				
O	Communication tower				

evised	geology of the Notigi Lake area,	Mai
	(parts of NTS 63O14, 64B3)	

1000 200

md

nzodiorite (Black Trout diorite)

Burntwood Group migmatite (generally Bmx)

Silicate-sulphide-iron formation

Garnet-silicate gneiss

na Notigi Assemblage: layered amphibolite and quartz-rich metasedimentary rock

Garnet-biotite migmatite (10-50% leucosome)

Garnet-biotite diatexite (50-90% leucosome)

stratigraphic section or this succession is the result of isoclinal F1 folding above a fault that cuts off much of the section. The structure is tentatively interpreted as a small refolded nappe, which may serve as a model for the crustal-scale structure that appears to feature recumbent isoclinal folding and upright refolding. This structure is interpreted to have a regional application.

> be regarded as a final interpretation of the geology of th area. Supercedes Preliminary Map PMAP2007-2. SUGGESTED REFERENCE Murphy, L.A. and Zwanzig, H.V. 2008: Revised geology of the Notigi Lake area, Manitoba (parts of NTS 63O14, 64B3); Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Preliminary Map PMAP2008-2, scale 1.20 000. REFERENCES Frohlinger, T.G. 1979: Wapisu Lake; in Geology of the Nelson House-Pukatawagan Region (Bumtwood al Services Branch, Geological Report GR78-3, Geological Maps, MAP 78-3-13, scale 1:50 000. Kiss, F. and Coyle, M. 2008: Residual total magnetic field, Kisseynew-north aeromagnetic survey, Wapis Lake / naii Lake (NIS 5-7-074 and part of 63-0/13), Manitoba; Geological Survey of Canada; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Open File Report OF2008-2, ap at 1:50 000 scale.

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Investigations at Notigi Lake indicate that the tectonostratigraphic package at Notigi Lake has undergone crossfolds. an extreme attenuation and large-scale isoclinal folding in A comparison of geochemical plots shows that rocks from the north and northeastern parts of the Kisseynew Domain. the Notigi assemblage may be related to the Tod Lake basalt The early isoclinal folding caused repetition of the at Granville Lake (Zwanzig, 2008) and juvenile ocean-island stratigraphic sequences in a vertical stack that was later basalt (Flin Flon Belt). The presence of small gold showings involved in reclined folding and doming. This structural style in similar rock at Granville Lake make the correlative layered is also believed to be characteristic of the poorly exposed volcano-sedimentary assemblage at Notigi Lake and in narrow belts of Archean orthogneiss with a supracrustal adjoining areas possible exploration targets. This widely cover that may host Thompson-type nickel deposits south of regional association is tentative and remains the focus of Notigi Lake. The inferred, strongly layered crustal structure continued research. Traces of malachite in the Sickle Group of the northeastern part of the Kisseynew Domain appears may indicate a sedimentary copper origin similar to that of to be similar in style to the Notigi structure and shares much more significant showings at Russell Lake (Baldwir of its deformation history with the more prospective rocks

- Geology Report 79-5, 20 p.
- 3-22.
- gneiss belt, File Lake, Manitoba; in Early Precambrian Publication 57-1, 317 p.

(Figure 13; red circle on Figure1). The gabbro unit north of Timew Island is in shear contact with, and The Notigi assemblage is exposed in fault contact locally folded into, an east-plunging synformal pair with the Burntwood Group migmatite and is with Burntwood migmatite (Figure 14). The contact unconformably overlain by Sickle Group paragneiss. of gabbro with sillimanite-bearing gneiss is locally A simplified sketch of outcrops along one of the faulted and commonly intruded by pegmatite. The northern peninsulas illustrates the complex contact gabbro becomes more strained close to the Notigi relationship of the Notigi assemblage and gabbroic assemblage and exhibits C- and C'-fabric (Figure 15).

multi-element (Table 1).

pes that indicate fractionation to enrichment alteration Trout diorite (Figure parative mid-ocean-ridge-basalt (N-MORB) normalized model age of 2.58 Ga (Table 1). ot of the Notigi assemblage indicates that two samples are Neodymium-isotope data indicate a juvenile source for the Notigi assemblage, with an epsilon Nd value of 2.4 at 1.9 Ga

Monzodiorite (md)

Narrows. A comparative primitive-mantlenormalized multi- Neodymium-model age of 2.1 Ga (Table 1). plot shows that the monzodiorite has trace-

element characteristics similar to those of the type Black The Th spike in both samples is likely indicate an older crustal source for the Black Trout diorite with a negative epsilon Nd value (-4.1) at 1.9 Ga and a Nd-

Granodiorite and porphyry sheets (pg) fractionated trend. The depletion of heavy REEs (Yb and Lu was likely caused by the loss of Fe due to the presence of vestern side of the Rat River channel and south of Timew indicate a juvenile source for the granodiorite with a

cal data from the Notigi Lake area, northeastern Kisseynew Domain ¹ .											
	Easting2	Northing:	2 Sm (ppm)	Nd (ppm)	147Sm/144Nc 1	43Nd/144N	lcUncertainty (±2σ)TDM	~Tma	εNdT	145Nd/144Nd
ge	486568	6201672	2.617	10.81	0.1464	0.512129	0.000008	N/A	1900	2.4	0.348381
te	480721	6198490	22.69	139.23	0.0985	0.511202	0.000008	2.58	1900	-4.1	0.348387
	476766	6191648	7.069	47.67	0.0897	0.511419	0.000007	2.13	1900	2.3	0.348390
iog	genic Isoto	ppe Facility,	University of	of Alberta, E	Edmonton, Alberta		² NAD 83, Zone 14	1.00		1.00	

Notigi granite (gn)

The Notigi granite is located at the center of the map area marked with a star (\mathbf{x}) in Figure 1 and intrudes mostly Sickle Group rocks. The rock is pink, phaneritic, feldsparrich and uniform with foliation defined by biotite. A sample was taken for eochronology and sent to the Geological Survey of Canada (GSC) in 2007. Chemistry data is provided by J. Whalen (GSC; unpublished) and plotted to a primitive-mantlenormalized multi-element diagram (Figure 19). The REEs are elevated with depleted Sr and Eu indicating plagioclase fractionation. Preliminary U/Pb-SHRIMP zircon data is provided by N. Raynor (GSC; unpublished). Zircons were distinctive with 1862+/- 6Ma cores and 1806 +/-9Ma rims (Figure 20 and 21). The core is herein tentatively interpreted as inherited and the rims may represent crystallization during regional peak netamorphism (Figure 21).

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directly to the southeast. The best preserved units of su

rocks, and possible nickel deposits, may be in the hing

zones of F2 recumbent folds brought to surface by F3

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