FIELD GEOLOGY AND PETROGRAPHY, CLAIM BLOCK 842189, "THUNDER BAY NORTH" PROJECT, GREENWICH LAKE AREA (S.W.), THUNDER BAY MINING DIVISION, NORTHWEST ONTARIO

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ABSTRACT

This report describes prospecting and mapping work undertaken on the 12-unit (192-ha) claim block 842189, along and near the west and east shores of Current Lake, in the southwest part of Greenwich Lake map area (52A/15), Thunder Bay mining division, northwest Ontario, on 14-17 May 2006. The centre of the claim block lies at approximately 88°56.5'W, 48°46.0'N (Figs. 1-4) in M.N.D.M. G-plan sheet G-2705. The field work, and subsequent petrographic work, research and interpretation, were undertaken by Graham Wilson, consulting geologist and 50:50 holder of the claim block in conjunction with partner Dr. Gerald Harper. These claims and 25 other adjoining blocks, the "Thunder Bay North" project, have been optioned by Wilson and Harper to Magma Metals Limited of West Perth, Western Australia, via their Canadian subsidiary, Magma Metals (Canada) Limited, incorporated under the Business Corporations Act of the Yukon. The Thunder Bay North project, including claim block 842189 described herein, lies in the late Archean Quetico metasedimentary belt of the Superior craton. The bedrock of the area is a sequence of felsic intrusive rocks and grey schist, phyllite and gneiss, within a regional strike and foliation of ~N80°E. The latest field work describes more than 100 locations in and adjacent to the claim block, including features of bedrock lithology and structural geology, and aspects of Quaternary surficial deposits. The ice-flow direction in the area is identified by new observations at N206°E (S26°W), based on striations and chatter marks on Quetico granitoid bedrock.

The main economic interest stems from 3 occurrences of angular, mineralized ultramafic boulders at Current Lake, identified in summer 2001, August 2005 and May 2006. These can be interpreted in the context of prospecting work conducted by Harper and Wilson since 1993, between Onion Lake in the west, Greenwich Lake in the east, what is now called the Escape Road in the south, and the corridor of the Dorion Cut-Off Road in the north. Such boulders have been found only around Current Lake, with two finds on the west shore and the latest find on the east shore. After the failure of a limited west-shore drill program to locate similar mineralized rock in 2001, we switched from a model of a local intrusion to a more distal source, and considered sites as far off as the Seagull intrusion, some 25 km due north of Current Lake, and the wider area of the Nipigon sills extending east and northeast from Seagull Lake. The boulders (Fig. 5) are composed of oxide-rich serpentinized peridotites with variable content of sulphides, 1:1 Pt:Pd ratios, and grades up to ~4 ppm Pt, 4 ppm Pd, 1% Cu and 0.25% Ni. Ore minerals identified to date include chalcopyrite and pyrrhotite, pentlandite and cubanite, and the Pt-Bi telluride moncheite. The observations in this report, plus earlier work, are held to be consistent with a Keweenawan, Midcontinent Rift origin of the boulders. The latest information leads us to reaffirm a local source of the mineralization, probably within the TBN project area, and quite possibly hidden at shallow depth under, beside or within 1 km of Current Lake itself. The new (east shore) finds and the earlier finds across the lake straddle the N206°E ice-flow direction. Further work is planned.

Conversion Table N.B. Most factors are approximate

Unit	*Times*	*Equals*
Length		
1 inch	25.4	mm
1 foot	0.3048	m
1 mile (statute)	1.6093	km
Area		
1 square mile	2.59	km^2
1 acre	0.4047	ha
Mass		
1 ounce (advp)	28.3495	g
1 ounce (troy)	31.1035	g
1 ton (short)	907.18	kg
1 ton (long)	1016.05	kg
Concentration		
1 troy oz/short ton	34.2857	g/t (ppm)
Volume		
1 Imperial gallon	4.54596	l
1 U.S. gallon	3.78541	l

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WILSON,GC (2006) Field geology and petrography, claim block 842189, "Thunder Bay North" project, Greenwich Lake area (S.W.), Thunder Bay mining division, northwest Ontario. Turnstone Geological Services Ltd, Report 2006-01F, for Magma Metals Limited, West Perth, WA, x+60pp. plus 1:5,000 scale map.

Frontispiece

Figure 1. Location map.

The Thunder Bay North project is located some 60 km northeast of the city of Thunder Bay, accessible via the Trans-Canada Highway (Hwy. 17E), the Armstrong Highway (Hwy. 527) and the major logging access roads nowadays referred to as the Escape Road and the Shallownest East Road. Road travel to several of the more southerly claim blocks, including block 842189 described in this report, takes roughly one hour, given reasonably good weather conditions.

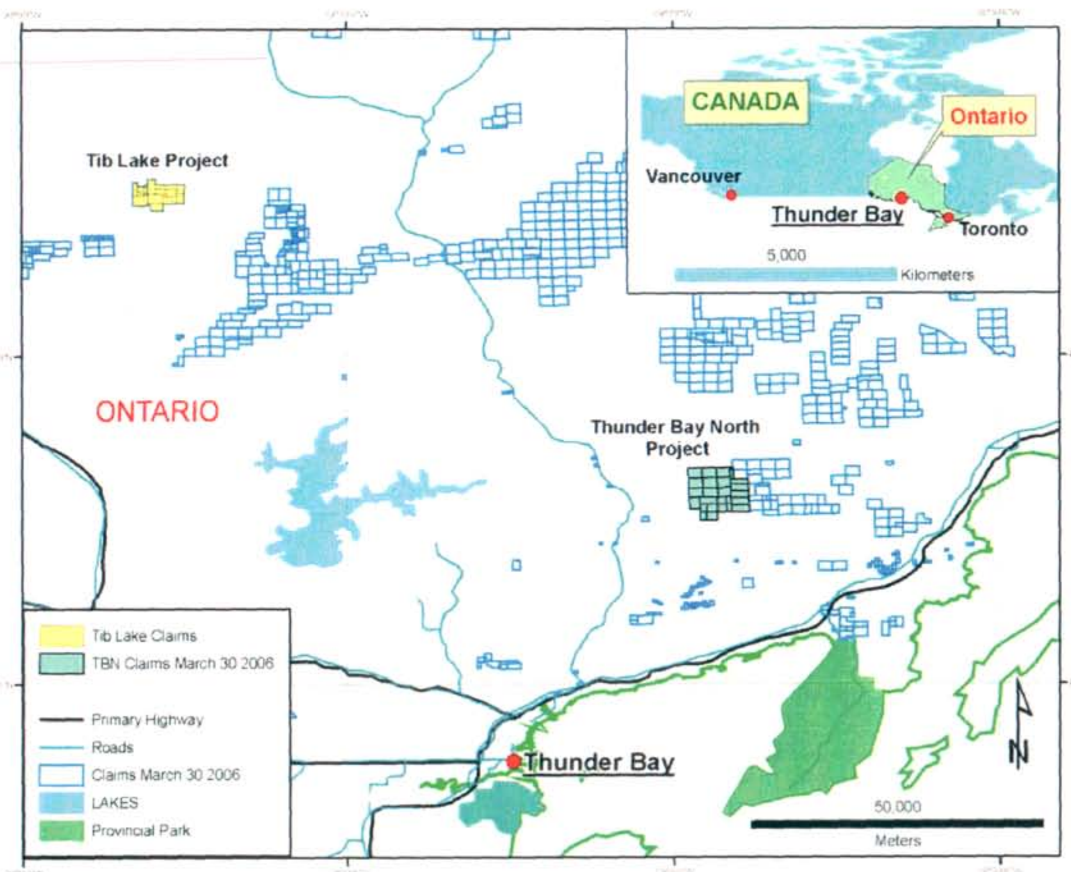


Figure 2. Claim Map.

Detail, printed from MNDM Claim Maps on-line database, 1300 hrs, 07 July 2006. Block 842189 is highlighted in red. Part of the field work included retracing the claim boundaries, and relocating the three corner posts plus the witness post for the No.4 (N.W.) corner of the block. The north shores of Escape Lake can be seen to the south. Scale bar ~1 km.

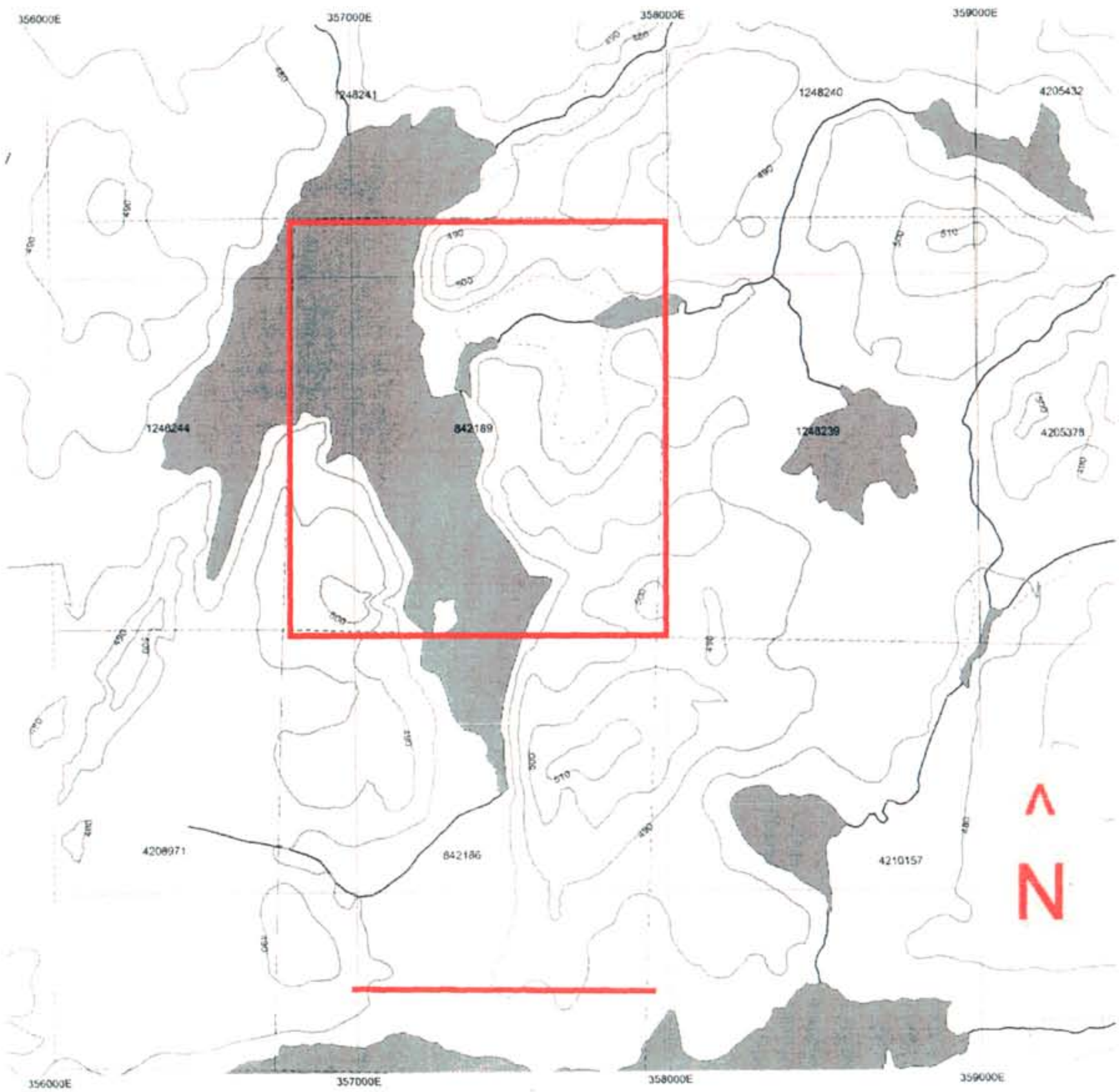
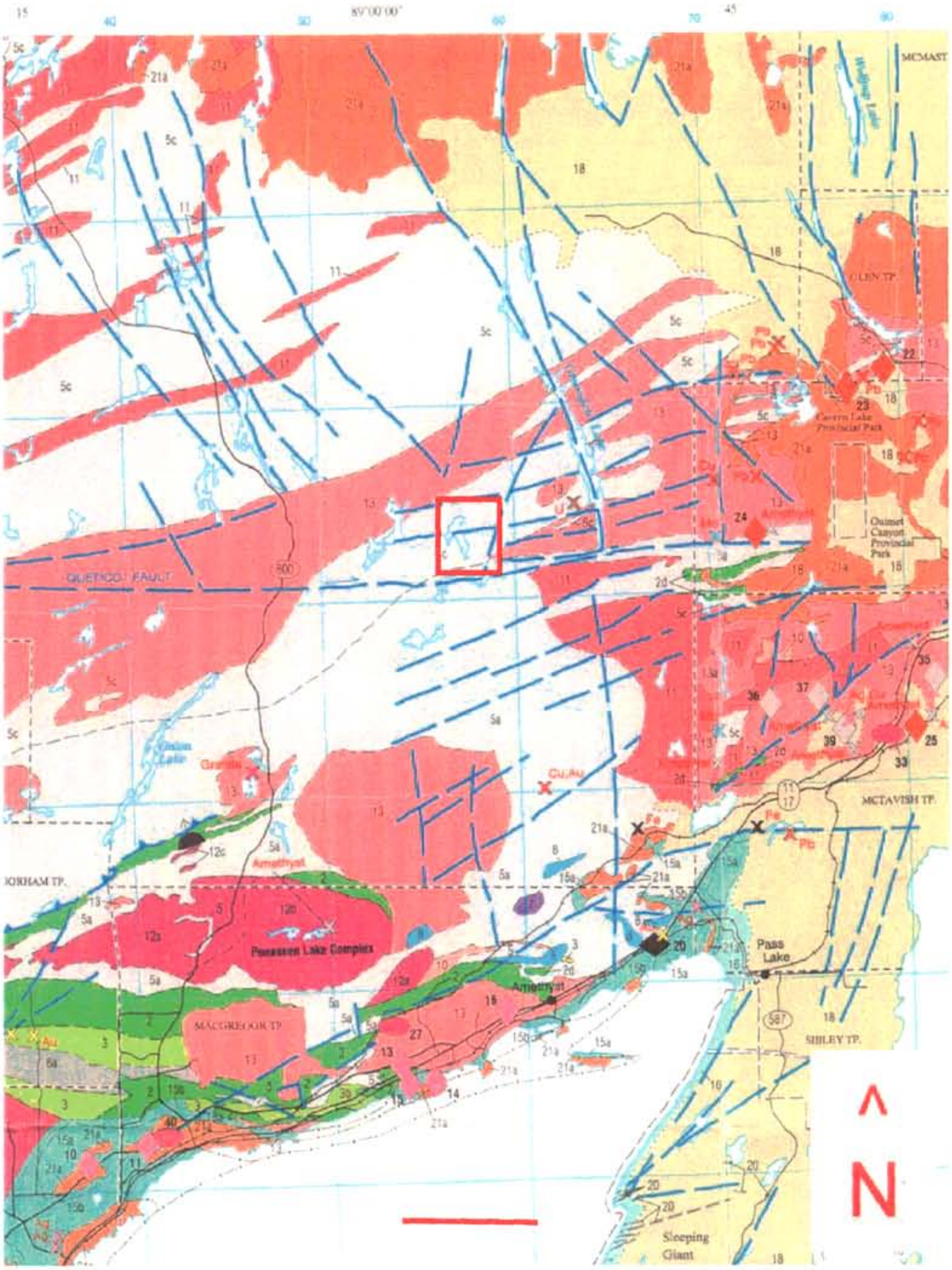
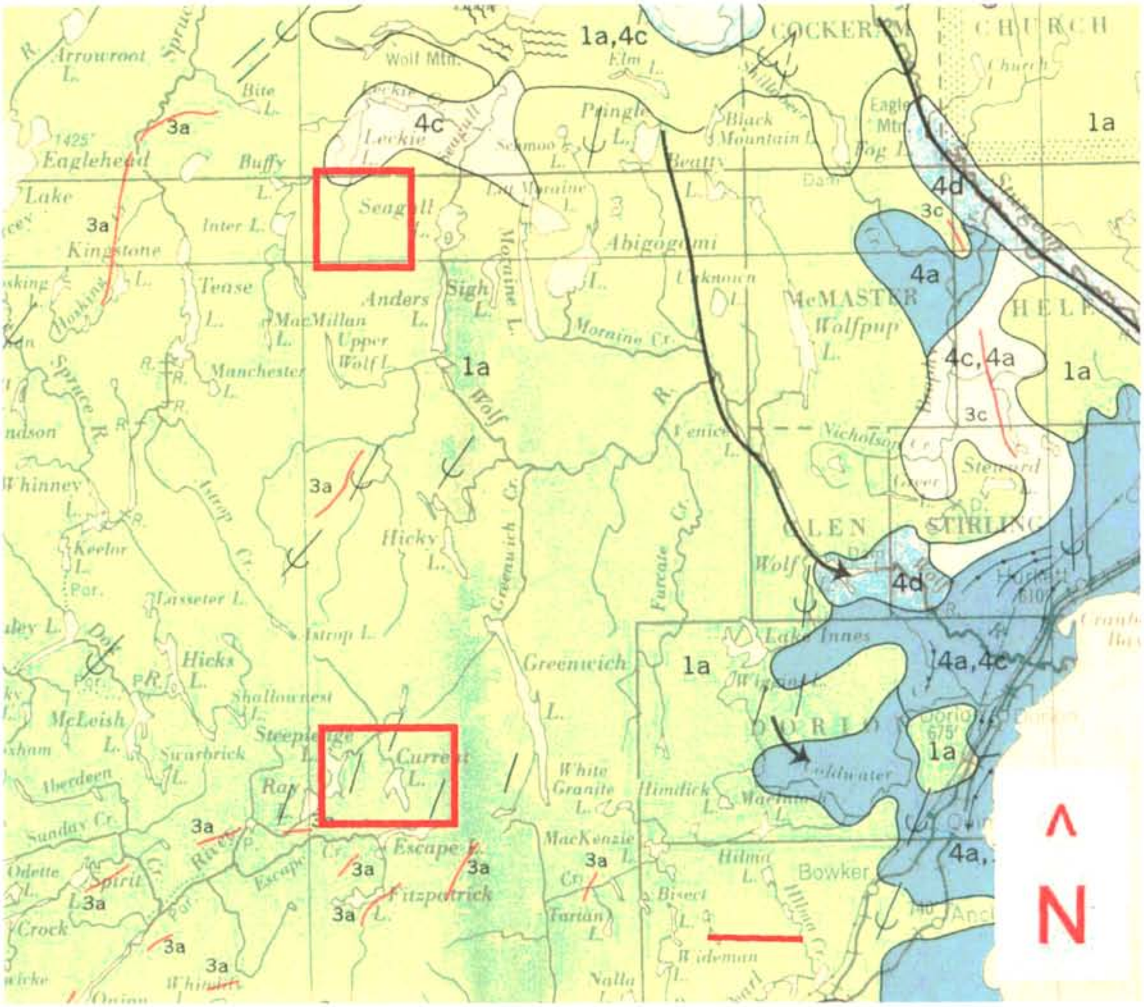


Figure 3. Regional Geology Map.



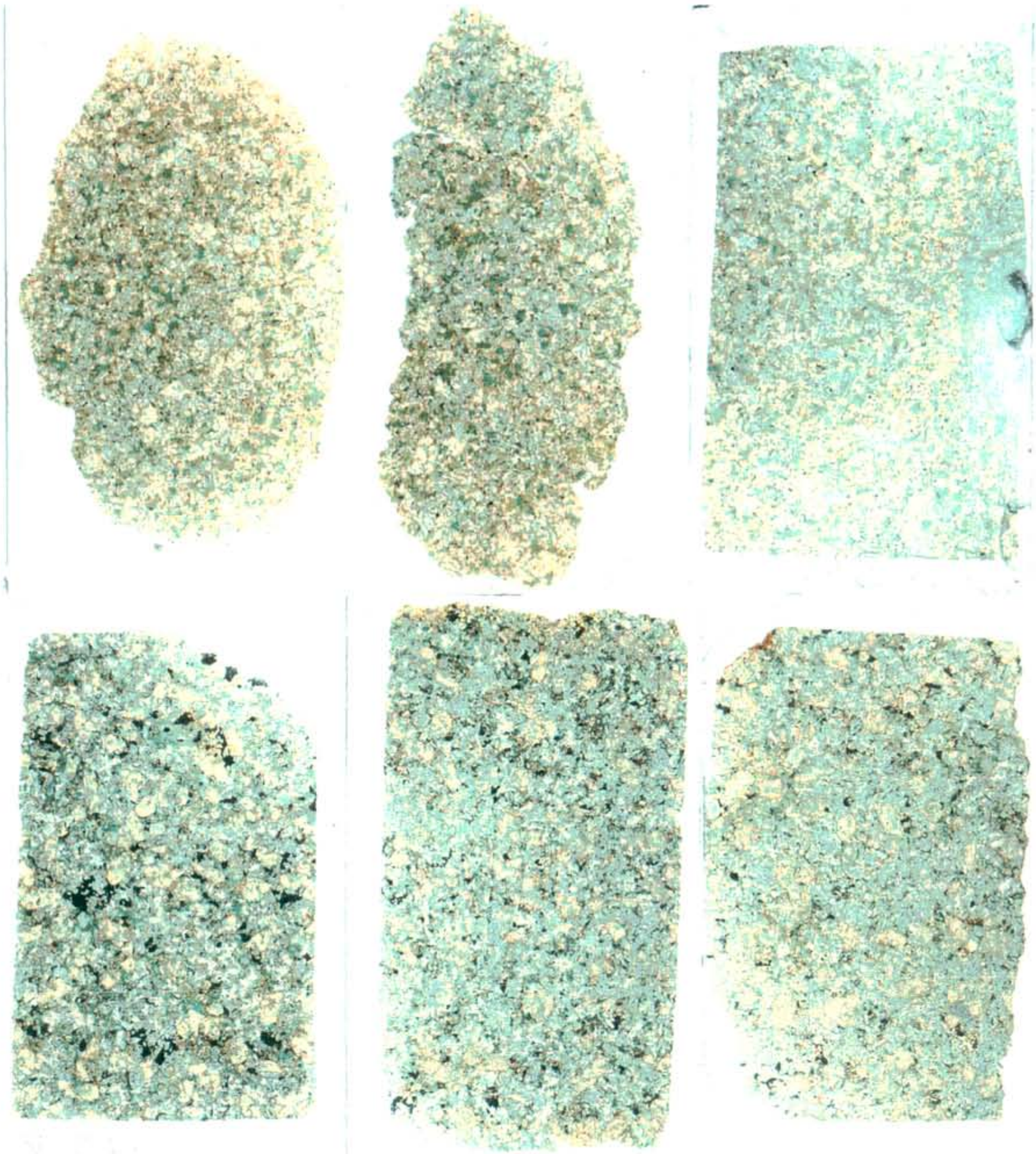
Taken from OGS map 2441 (Santaguida, 2001). The red rectangle marks the Current Lake area, including the claim block described herein. Scale bar ~5 km.

Figure 4. Quaternary Geology.



Detail from drift map of Zoltai (1965a). Note (1) locations of Current Lake and the Seagull intrusion, some 25 km to the north; (2) the general S.S.W. (~N200ºE / S20ºW) orientation of ice-flow indicators in the area around and north of Current Lake; and (3) the big arrow pointing S.S.E. towards Dorion, which denotes a spillway channel. Scale bar ~5 km.

Figure 5. Thin Sections of Ultramafic Boulders.



The upper row of samples (L-R: sections 2483A, 2483B, 2534) are from the most sulphide-depleted rocks sampled to date, while the lower row (L-R: 2479, 2481 and 2547) are rich in Cu-Ni-Fe sulphides and PGE. The source boulders of 2479, 2481 and 2483 have also been referred to elsewhere as M2, M4 and M6. 2547 is from the east shore of Current Lake, the other samples from the west shore.

Acronyms

A few convenient terms are defined below, some universal, others local or capable of confusion with other terms.

C1	Type I carbonaceous chondrite, primitive meteorite class chosen as geochemical benchmark for normalization of PGE, REE and other elements
CFZ	Christianson Fault Zone (uranium-enriched zone east of block 842189)
GIS	Geographic Information System
GPS	Global Positioning System
LNRGI	Lake Nipigon Region Geoscience Initiative
LILE	Large-Ion Lithophile Elements
PGE	Platinum Group Elements (the metals Os, Ir, Ru, Rh, Pt and Pd)
PGM	Platinum Group Minerals (discrete minerals with essential PGE content)
REE	Rare Earth Elements (15 elements of similar chemistry, 14 of them stable), including both light and heavy rare earths (LREE, HREE), often compared in terms of the ratio of chondrite-normalized lanthanum and ytterbium content (La_N/Yb_N), or other normalized ratios of elemental abundances.
TBN	Thunder Bay North exploration project, a mineral property currently consisting of 26 mineral claim blocks west of Greenwich Lake, northwest Ontario, of which block 842189, described in this report, is one of the three founding blocks.

Location and Access

Claim block 842189 consists of 12 400x400-m (16 ha) units, located on the east and west shores of Current Lake, ~60 km by road northeast of Thunder Bay (NTS 1:50,000 scale topographic map 52A/15, Greenwich Lake, EMR Canada, 1975). The centre of the claim block lies at ~88°56.5'W, 48°46.0'N. It is uninhabited, save for a single, seasonally-occupied cabin built near the south end of the west shore of the lake, circa 2001 (there is an older cabin on the north shore). There is no infrastructure. One clear-cut broaches the east line. Two spur roads approach the east and south lines.

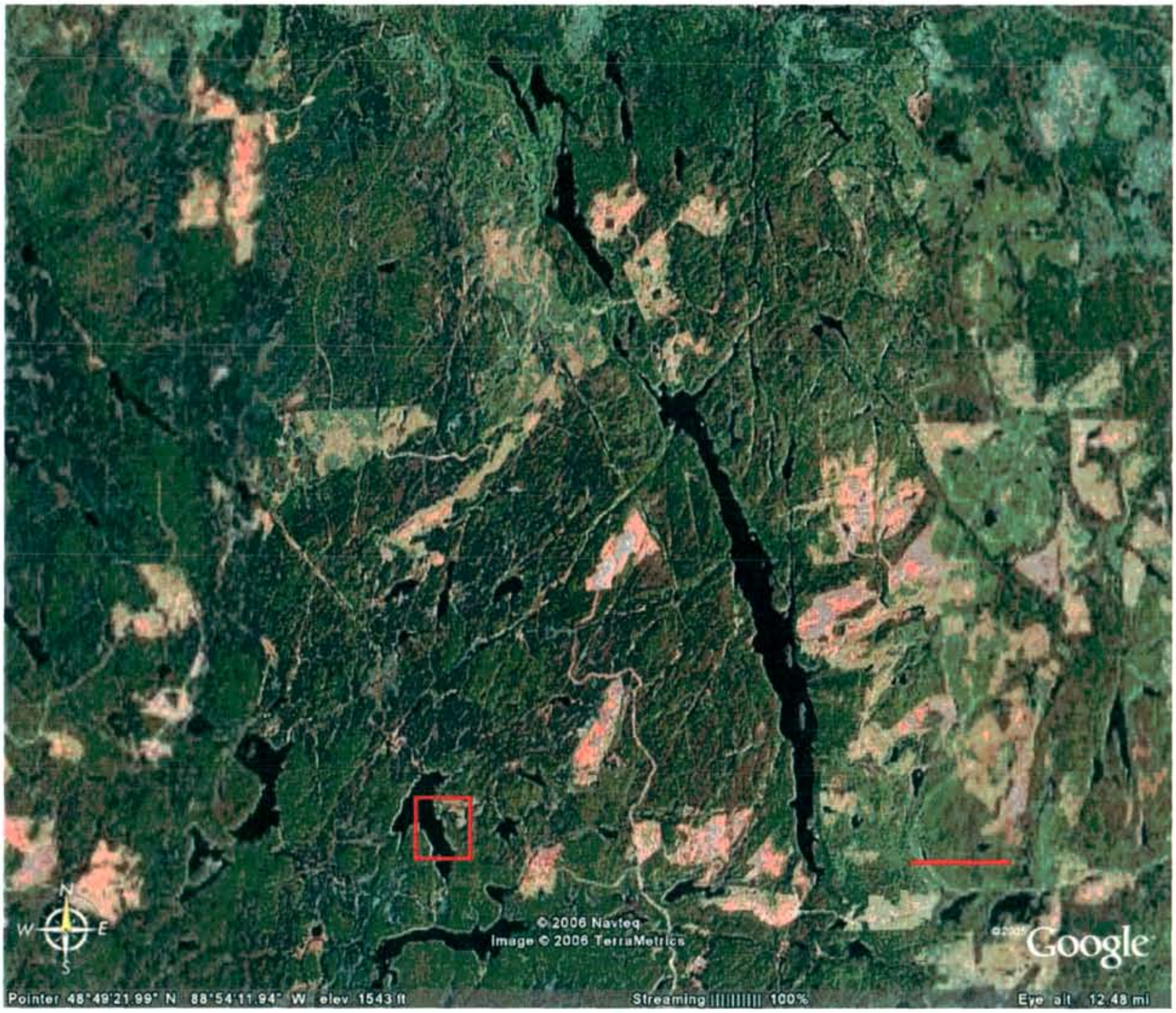


Figure 6. A "Google Earth" image of the project area, downloaded on 15 July 2006. The claim group is outlined in red. Pinkish areas are recent clear-cuts: partially re-grown areas are inconspicuous. Greenwich Lake is almost 10 km in length - scale bar ~2 km.

Nowadays, the usual route to the project takes roughly one hour, in good conditions, from downtown Thunder Bay, and access to the southern claim blocks can be described as excellent. Forestry operations since 1999, when the first claims were staked here, have extended clear-cuts and link roads to within a few hundred metres of Current Lake's eastern shore, although the majority of the area remains tree-covered (Fig. 6). The access described below is very simple, whereas some of the northern claims staked in late 2005 still present a real challenge.

Km (section)	*Km (elapsed)*	*Location, feature*	*Notes*
0.0	0.0	Thunder Bay	Railway station
10.4	10.4	Hwy. 17E / Hwy. 527 turn	N up Armstrong Highway
17.4	27.8	Walkinshaw Lake	On right (east)
5.3	33.1	Escape Road (turn right)	E on gravel road off Hwy. 527
10.1	43.2	10 km marker	
1.2	44.4	Low grey outcrop S of road	Glacial striae at N206°E
6.0	50.4	Shallownest East Road	Go left (N)
5.3	55.7	Main junction to left (W)	Go left (W)
2.0	57.7	Spur on left (S) in clear-cut	Go straight (W)
		CHOICE	
1.6	59.3	Go left (S)	
1.0	60.3	Park near W side of clear-cut	Access S end of Current Lake
		OR	
1.6	59.3	Go straight / right	
1.2	60.5	Park on chipper pad	Access to NE part of block

History of Work on Claims

<u>Pre-1993</u> [the uranium era]

The earliest local exploration of which we are aware concerns uranium. Much of the following summary is gleaned from Benkis (1977). The original uranium find was made by T. Christianson in 1949, near the west shore of Greenwich Lake. His initial 36 claims sparked a staking rush that totalled some 2,000 claims. In 1952-1955, radioactivity was detected along this N.N.W.- trending "Christianson fault zone" (CFZ) over a distance of 1,400 feet (427 m, Oja, 1969). Little more happened until 1965, when the original finder restaked the prospect. Oja describes a subsequent airborne radiometric survey flown over a small area just west of Greenwich Lake, at a nominal height of 75 feet (23 m) over the tree tops. Relevant to the TBN project is his observation that northwest and northeast-trending faults create steep-walled depressions now occupied by creeks and lakes. Oja advocated a careful ground survey on the margins of swamps in fault-controlled valleys. The west margin of his survey lies some 300 m east of the present east margin of the TBN project, but suggestions such as these apply to a much wider region than the original, limited claim blocks.

Exploration for uranium continued on either side of Greenwich Lake, in Quetico granitoids, paragneiss and so-called albitite (Goldsmith, 1975). On the Celotti prospect west of the lake, Goldsmith noted a zone of U mineralization ~1,300 feet (396 m) in length, striking N83°E (the direction of the regional foliation), strongest near the east end of the zone, and up to 37 feet (11.3 m) wide near the adjoining (easterly) claims of MW Resources Ltd. Seven new showings were also located east of Greenwich Lake, on a lineament trending N74°E. The principal mineralization on the Celotti prospect is hosted by two "albitite" horizons and adjacent paragneiss. The albitite, of uncertain origin, is a coarse white rock, composed of plagioclase with quartz and some biotite and muscovite mica. It "appears to be conformable with the enclosing metasediments".

In 1976 there was no ready access to the Greenwich Lake area, except by float plane or helicopter. Rio Tinto optioned claims from MW Resources Ltd in January 1976, staking at least 89 units in addition to the 55 they had optioned, for a total of 144 claim units, in an inverted T-shaped array extending west from 2 km east of Greenwich Lake to the west shore of Current Lake, up and down the length of Greenwich Lake: Benkis, 1977). The south edge of these claims lay immediately south of the small promontory on the west shore of Current Lake, thus overlapping block 842189 and the wider area of the present TBN project. Rio Tinto then undertook a detailed survey for uranium in the summer of 1976 (Benkis, 1977). The work by Rio Tinto's crew led them to explore west to Current Lake and Steepledge (Ray) Lake, where they traversed and mapped outcrops in the Quetico granitoids, especially by canoe along shorelines. Rio Tinto dropped its option after completing this detailed, very useful survey.

A possible "last gasp" of the historic uranium era involved geophysical surveying of a small area just west of the southern reach of Greenwich Lake, searching for possible fault-hosted sulphide mineralization (Webster, 1979). This author's most relevant comment for present purposes may be the interpretation of a 500 ohm-m resistivity observed over a swampy area as being consistent with conductive overburden, which probably explains the anomaly in question.

<u>1993-1998</u> [TBN's "prehistory"]

The modern activity at Current Lake can be traced to Gerald Harper's recognition of airborne magnetic anomalies in the area as potential kimberlites or other intrusives of possible economic significance. Together with Graham Wilson and Francis Manns, an exploration of targets in the region was initiated in late September 1993. Episodic field work, including claim staking; sampling of rocks, soils and heavy minerals; plus petrographic and geochemical research has continued from that date across parts of the Onion Lake, Tartan Lake and Greenwich Lake areas, and further afield in the region south and southwest of Lake Nipigon. Absence of encouragement for kimberlitic bodies, and evidence of much mafic float led gradually to a focus on Ni-Cu-PGE potential in the Midcontinent Rift. It soon became critical to differentiate between the ubiquitous Keweenawan diabase-gabbro suite and other rock types, of whatever age, which could have a more direct link to mineralization.

1999-2000 [back to Current Lake]

Access in much of this region was very limited in 1993, but forestry activities over the next decade extended access eastward towards Greenwich Lake along what are now called the Escape Road and Shallownest East Road. Much of the early work was not filed, and relates to claims long since lapsed, so here we will confine the discussion to the claims at hand, and reports filed for the above-mentioned work plus related geophysical surveying and drilling. The work, 1993-2006, was episodic, dependent on the financial capabilities and time commitments of the participants.

Harper and Wilson were intrigued by some mafic boulders on the shore of Current Lake, found while prospecting the area in late July 1999. Receipt of Ontario Prospectors Assistance Program (OPAP) grants facilitated a range of prospecting and sampling work in the region, including limited soil sampling and ground magnetic surveys (Harper and Wilson, 2000; Wilson and Harper, 2000). The initial boulder finds of 1999 proved subeconomic, but the diversity of material encouraged further exploration. Archean rock types included biotite schist, amphibolite and siltstones, in addition to the ubiquitous granitoids, and some mafic boulders of possible Archean age, as well as minor intrusives of uncertain nature. Some pyritic and rusty zones rocks were found, but with low values of Au and other key metals.

2001-2002 [PGE discovery]

The claim block was recorded on 30 July 2001, after discovery of four metre-scale ultramafic boulders with appreciable sulphides on the west shore of Current Lake. Assays revealed ppm levels of Pt and Pd, a 1:1 Pt:Pd ratio, and elevated levels of other metals, particularly Cu, Ni and Au. The size and angular nature of the boulders led to speculation of glacial transport over a very short distance, perhaps from the bed of the lake whose waters lapped on the flanks of the dark blocks, which exhibit sutured surfaces typical of many ultramafites. That autumn, Scott Jobin-Bevans collected 16 samples from the boulders, five of which had 2-5% visible sulphides, averaging 1442 ppb

Pt, 1453 ppb Pd, 109 ppb Au, 0.29% Cu and 0.16% Ni. Based on this and other available information the claims were optioned by Pacific North West Capital Corporation of Vancouver, and additional claims staked.

In the winter of 2001-2002, ground-magnetic and electromagnetic surveys were conducted over the ice on Current Lake and a small pond ("Beaver Lake"), east of the south end of Current Lake, on the north side of Escape Lake (Spence, 2002). The tie-on claim-staking had by now increased the size of the property to 177 units in 15 blocks, an area of 28.32 km^2. The magnetic data were collected at 12.5-m intervals, with 1 gamma (1 nT) resolution, using a GEM GSM-19 proton magnetometer. The associated VLF EM work also involved measurements at 12.5-m intervals. This Max Min II+ survey was made with an in-line array, with two coplanar coils moving in tandem along survey lines, in-phase and out-of-phase readings taken at 25-m intervals along the survey lines at two frequencies (1777 Hz and 444 Hz). In the Current Lake grid the Max Min II+ survey picked up 10 mostly weak conductors, labelled A-J. The main conductive and magnetic area includes two S.E.-N.W. conductors parallel to the west shore of the main part of Current Lake, just northwest of the small promontory. On the Beaver Lake grid, 12 weak conductors were outlined, dubbed A-L. Many of the conductors may, it was thought, be due to conductive overburden.

Shortly after this, Wilson and colleagues made an unsuccessful bid for an OMET (Ontario Mineral Exploration Technologies Program), grant to study local and regional PGE mineralization from the standpoint of exploration methodologies.

A brief drill program was conducted from three pads on the west shore of Current Lake in September-October 2002 (Kleinboeck and Jobin-Bevans, 2002: see also note on page 41). The program involved six holes, of individual lengths as great as 241.5 m, total length 813.5 m. Five sections were assayed at 25-cm intervals with a 32-element analytical package. The drilling found only weak mineralization with minimal assay values, with pyrite the principal sulphide, mostly as fracture fillings. The holes cut a north-south, west- dipping gabbro or diabase dyke under the lake. The dyke, not seen at surface, appears to be ≤10 m thick. It is altered and does not resemble the ultramafic boulders found on the adjacent shores. The program was of very limited scope, in terms of the adjacent lake, but as a magnetic target was identified, with no strong assay values, no further work was recommended and the option lapsed. However, the source of the boulders, and the origin of some of the magnetic anomalies, remained to be determined.

<u>2003-2004</u> [holding pattern]

After the demise of the PFN option, the project was again set aside, pending fresh interest from the exploration sector. In early 2003 a modest study described the fine-grained gabbros, altered diabase and monzogranite from recovered from the 2002 drill program. This work (Wilson, 2003, 2004) is summarized in the petrographic section. In November 2004, a second period of regional uranium exploration was initiated, with claim staking around Greenwich Lake, and follow-up staking by various parties both there and further north along the Sibley-Keweenawan contact, nearer the Dorion Cut-Off Road, continued into 2005-2006.

2005-2006 [renewed activity]

By March of 2005, Wilson had re-evaluated the possible sources and suggested four target areas, one being the Current Lake area and three areas much further up-ice (i.e., up presumed N. to N.N.E. bearings). The Seagull intrusive was an obvious candidate, but the hard-rock mineralization thus far discovered there is also blind, as far as is known. Limited available data suggested that the boulders at Current Lake represent a lower reef or feeder environment of the same magmatic episode that generated the Seagull intrusion, as opposed to an upper reef or the basal contact mineralization. However, the area of the Current Lake claims was small, and the potential search area >1,000 km^2, which made the project hard to sell, since the vendor controlled barely 1% of the area of interest.

In August 2005 two key events took place. Early that month, Harper and Wilson paid a brief visit to the proposed northern sources of the boulders, without success. Later in August, Wilson returned to Current Lake with the management of Australian firm Magma Metals Limited. Lake levels were very low, and a second zone of smaller but still angular and high-grade ultramafic blocks was identified south of the 2001 find. Magma, after visiting and reviewing several projects in northwest Ontario, optioned the TBN project. By the end of the year, TBN had grown by staking to an area of ~50 km^2, some 9 km north-south and 6.5 km east-west. The project was one of seven acquired, audited and listed by Magma Metals Limited in its successful initial public offering on the Australian Stock Exchange. Their detailed prospectus (Magma, 2006) put forth the revised view of the group, which tended once again to a proximal source for the boulders. As part of the due diligence process for Magma's listing, the Australian consulting firm RSG Global Limited brought in consultant Dr. C. Tucker Barrie of Ottawa, who conducted a review of library files, other reports and archived drill core, and paid a brief visit to the 2001 discovery site at Current Lake. His findings are reported in the prospectus (Magma, 2006): in a reprise of the discoverers' wavering own views, he opted for the Seagull intrusion as the most probable source. He also suggested that the property, which he felt held low PGE potential, had some interest for possible uranium mineralization associated with the Quetico granitoids. This appears to be the focus of claims on the east margin of the TBN project, staked in 2004-2006 for Maple Minerals and East West Resources, which includes the terrain prospected by Rio Tinto (Benkis, 1977) and its predecessors back to 1949, who have periodically sought uranium on either shore of Greenwich Lake and (Benkis, 1977), as far west as Steepledge Lake. At the end of April, a third party re-staked the claims around the "Beaver Pond" southeast of block 842189, which had been allowed to lapse the previous November. Apart from a single unit staked and allowed to lapse in the same area, and the recent uranium "rush", this is the only other staking in the immediate area since the TBN project was initiated in 1999.

In May 2006, the latest fieldwork took place, followed by the other work described in this report. This work further investigated the nature of the Quetico bedrocks, and made two additional, critical findings relevant to the source of the boulders: a third boulder field, and strong evidence of the principal or only ice-flow direction.

The Broader Historical Context

An OGS compilation map (Carter *et al.*, 1973) provides an indication of the geology of the area around Greenwich Lake, Current Lake and Steepledge Lake, a region of granitoids and metasediments. One can measure on this map the distances and bearings to outcrops and subcrops of Keweenawan mafic-ultramafic rocks, e.g., more or less due north (355° to 5°), from the centre of Current Lake to central Seagull Lake (27 km), Leckie Lake (32 km), Wolf Mountain (35 km), Disraeli Lake (39 km) and Black Sturgeon Lake (63 km). Hele township lies some 40 km E.N.E. (at circa 58°) from Current Lake, Kitto township some 100 km to the northeast (38°). To the north, there is an east-west belt of Sibley sediments succeeded above (and northwards) by diabase around Anders Lake, Sigh Lake and Moraine Lake, and to the northwest at Seagull Lake and Leckie Lake.

The Quetico belt, at least in the sector southwards of Lake Nipigon, appears to have the limited metallogenic potential that might be anticipated in a terrane dominated by moderately evolved granitoids and host rocks, notably clastic metasediments. There are some interesting leucogranites, but none have yet been described with mineralized facies to approach, say, the pegmatite fields that straddle the provincial border to the west. The uranium potential of the area, examined in the 1970s, is again of some interest today. Throughout the 1980s and early 1990s any PGE exploration in the region tended to focus on known target types, such as the Lac des Iles suite of Archean mafic-ultramafic rocks, the Keweenawan-age Coldwell complex near Marathon, and intrusives southwest from Thunder Bay, such as the sill hosting the Great Lakes Nickel deposit, and other bodies southwards into the Duluth complex of Minnesota.

The metallogeny of the Midcontinent Rift, with its voluminous Keweenawan magmatism, has inspired renewed exploration efforts in the past 15 years, some companies working on a model based on the vast Noril'sk deposits of Siberia (see, e.g., Lightfoot *et al.*, 1999). This is not the place to review this activity, except to comment that, because the regional mapping reveals the Quetico belt as a broad gap between Nipigon sills to the north and the south and southwest, this activity largely bypassed our region. More importantly, when the significant provincially-sponsored Lake Nipigon

Region Geoscience Initiative (LNRGI) was designed, the extensive geological and geophysical mapping efforts extended away from our area, northwards from a southern boundary roughly coincident with the Dorion Cut-Off Road, some 20 km north of Current Lake. Some of the research pertinent to Keweenawan magmatism, and other publications concerning the Seagull intrusion, are relevant. This will merit brief mention below, concerning the provenance of the ultramafic boulders.

Field Geology

Fieldwork, May 2006

The degree of exposure is very good in some areas, particularly recent forestry clear-cuts on gently rolling granitoid highlands, such as an area east of Current Lake on the east margin of the claim block. The small area west of the lake is untouched, and the outcrop more restricted, except along the rocky shore. In the wider context of the TBN project as a whole, there are also outcrops along logging access roads, but also broad swamps (Fig. 7), shallow linear gullies, marshy lake shores and vegetated ponds which all exhibit scant to zero outcrop. Outcrops in woodland areas frequently take the form of low narrow ridges or gently-dipping, often moss-covered rock slabs. Large outcrops, tens of metres in maximum dimension, are exceptional (Fig. 8).

The sketch map (Fig. 9) shows the rough lines of traverses undertaken during the four days of field work in May 2006. Much of this was familiar from the time of staking in 1999, but subsequent logging on the east and southeast margins has greatly increased the local exposure of Quetico granitoids and associated, generally subordinate metasedimentary units.

Extrapolation of published data from 1974 indicates that the mean magnetic declination in the area is decreasing by 0.6'/year, and in the year 2000 true north and grid north were respectively some 1°03' and 2°21' west of magnetic north (estimated from data in EMR Canada, 1975). Fieldwork involved collection of observations and samples, recording each location by GPS. Initial data recording was on the UTM grid system using the NAD 27 map datum, to ensure compatibility with the topographic map. Data were transferred to an Excel spreadsheet, with additional columns to display both NAD 27 and WGS 84 UTM coordinates. The 1:5,000 scale map (see separate sheet) was prepared by M.I. Garland with MapInfo software, separating the columns of data (easting, northing, lithology, sample number, structural data, claim lines, etc) into layers within a geographic information system, superposed on a base map derived from the M.N.D.M. claim map database, which uses the NAD 83 datum. Note that WGS 84 was chosen as an option that seems to be in close agreement with NAD 83. The table below, based on data from this study, indicates the simple and reliable transformation from NAD 27 to WGS 84 coordinates. The spatially-referenced map data were collected at 131 key stations, 14-17 May 2006. Some additional general observations were also recorded, but the key data are all tied to GPS readings. Additional GPS route data plot the position of logging roads, across the TBN project and, in particular, on the eastern approach to the claim block.

Conversion	NAD 27=>WGS 84 coordinates	Mean and $2\sigma_{n-1}$ (n=131)
Eastings	Subtract 2 m	-2.32 ± 0.94
Northings	Add 225 m	+225.44 ± 1.00

Figure 7. The "Big Swamp", looking east from a point roughly 200 m east of Current Lake. This prominent feature extends west to enter Current Lake just south of the East Shore boulder field. The north arm of the logging access road runs across a culvert in the east part of the wetland. Other than this, in wet conditions there may be just one other dry crossing opportunity, just east of a breached beaver dam immediately east of the eastern claim line of the block.

Figure 8. Unusually large and well-jointed granite outcrop on the east line of the claim block, 60 metres north of the S.E. (No.2) claim post. Sample 2541, a moderately foliated biotite- K-feldspar granite, was collected at the far (west) end of the outcrop.

Bedrock Geology

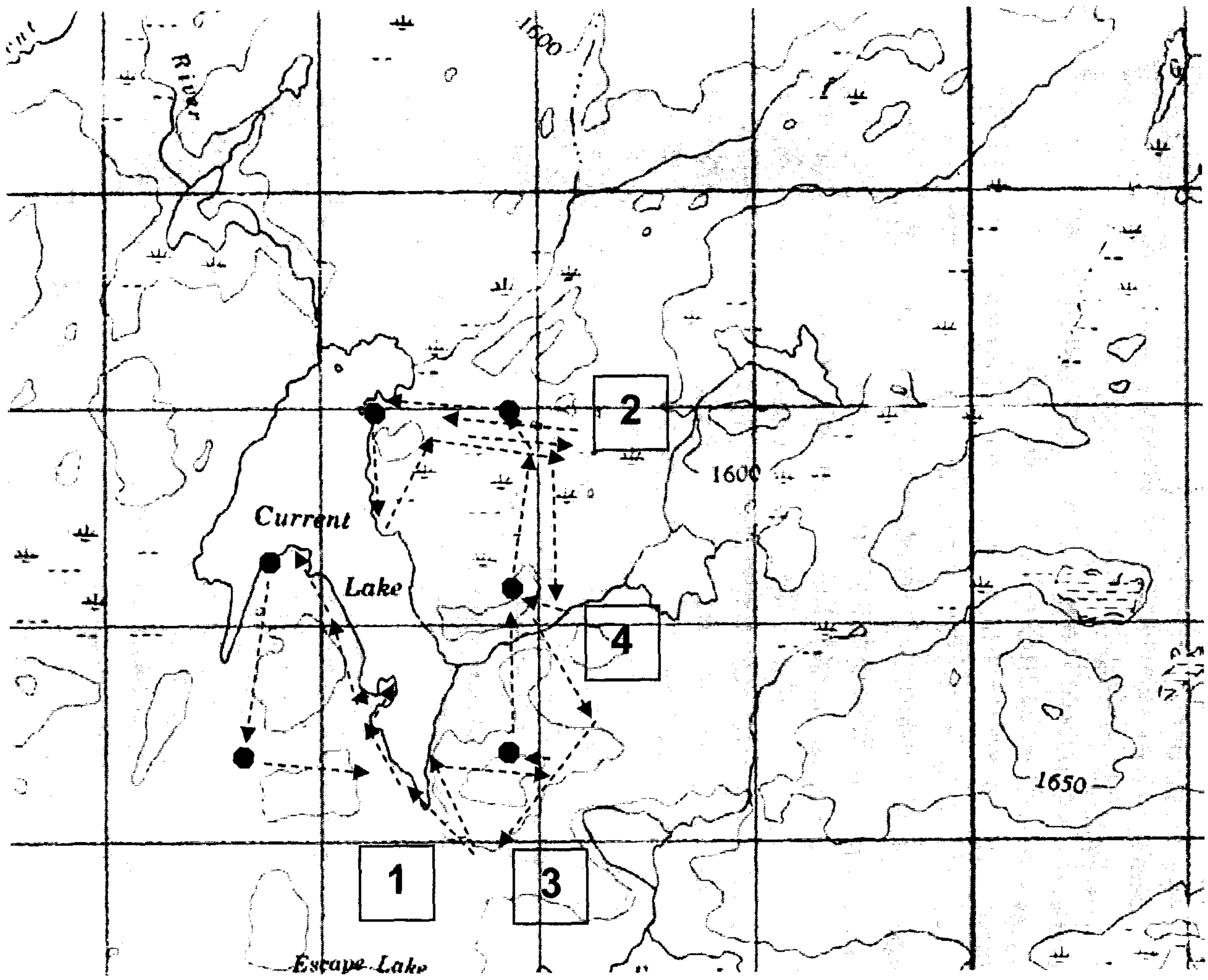
Lithologies

Benkis (1977) described the bedrock lithologies around and east from Current Lake as follows: most are variably foliated, with a broadly east-west trend:

- fine-grained biotite gneiss, with biotite, quartz, feldspar and accessory almandine garnet, apparently a metasediment,
- migmatites, biotite gneiss and tonalite, locally contorted with ptygmatic folds
- syntectonic tonalite, white granite, and pegmatite dykes, with sodic plagioclase, quartz, biotite and muscovite, foliated and sheared, with gneissic xenoliths, and
- post-tectonic quartz monzonite, massive, pink, medium- to coarse- grained, with K-feldspar, oligoclase, quartz, and 2-5% micas. In the area west of Greenwich Lake, Benkis (1977) recognized monzonite sills cutting migmatites, the sills generally 50-100 feet wide, swelling to 300 feet (15-30 up to 90 m) , the largest sill 1,460 m long, 15-90 m wide. These sills were found mostly in the apparent uplifted block west of the CFZ. The central quartz monzonite body is about 6.4 km long, striking N80 E, some 360 to 520 m wide. It extends west from the west shore of Greenwich Lake and tapers out about 400 m east of Current Lake.

Figure 9. Claim Map and Daily Traverses. Sketch map of claim block 842189, showing the approximate traverses walked on days 1-4, the 14, 15, 16 and 17 May 2006. Day 4, the critical day of the survey, is shown in blue to distinguish it from Day 2. Six key claim posts, including the 1,2 and 3 posts and the witness post to the 4 post (which would lie in the lake near the northwest shore) are also shown.

See the 1:5,000 map sheet for details on each locality, including sampling sites (this will also give a far more accurate account of the location of all observations, claim posts and other features). The rock samples are also detailed in Appendix 1, hand specimen descriptions, with UTM coordinates using the NAD 27 map datum employed on the 1:50,000 scale topographic sheet for the area (EMR Canada, 1975), which of course is the base on which this sketch was created, 1 square = 1 km.



Local granitoids (Fig. 10) include massive or weakly foliated granites with smoky quartz, pink K-feldspar and white plagioclase. Biotite, chlorite, muscovite, Fe-Ti oxides and epidote are the main ferromagnesian phases. Variants include biotite granodiorite and K-feldspar granite. Some outcrops are weakly feldspar-phyric. To date, observations have not been reconciled with the interpretation of Benkis (1977): this may be possible after a detailed traverse of the access road which cuts the regional strike to the east.

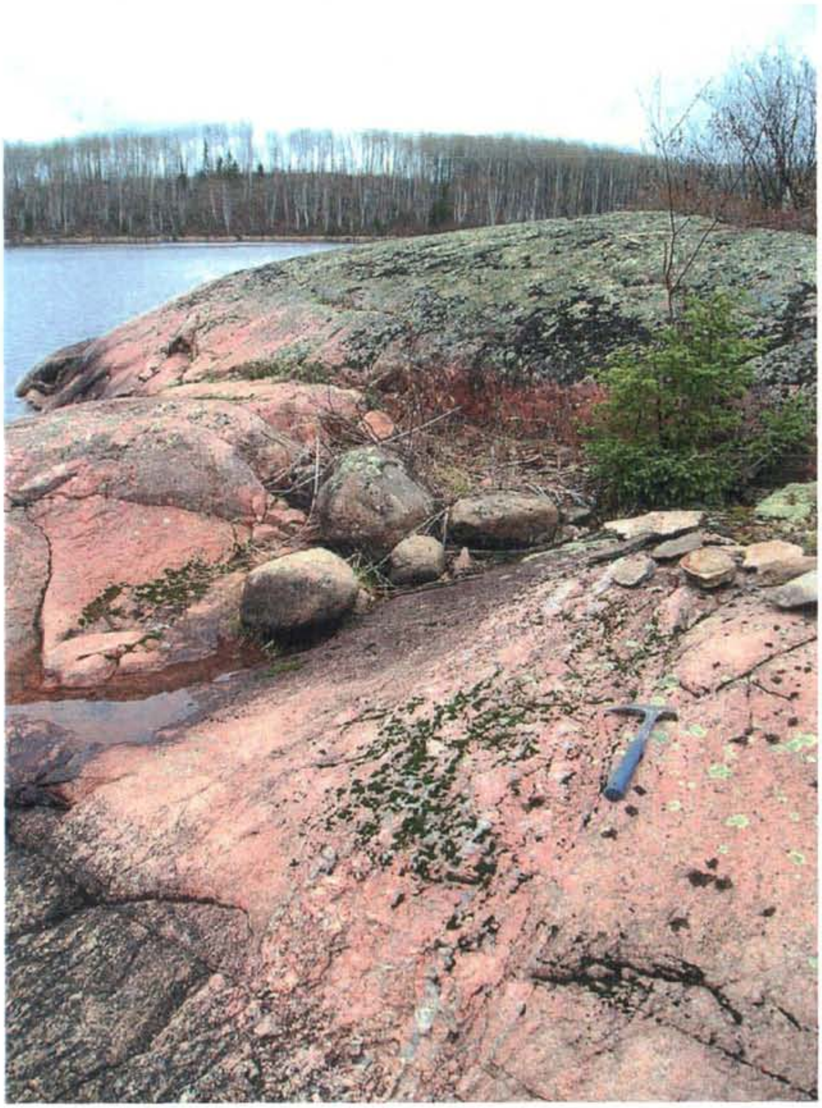


Figure 10. Moderately sheared outcrop of pink granite on northeast side of the peninsula jutting east from the west shore of Current Lake. Pegmatitic segregations occur in the reddened, jointed granite (see sample 2531). View across to the east shore.

Granitic pegmatites (Fig. 11) are of limited development and generally simple mineralogy: Quartz, two feldspars and biotite are the principal components. Host granite, including leucogranite, may be slightly reddened against the pegmatites. These bodies take the form of small lenses, most often only 10-30 cm thick, aligned closely to crudely with the regional foliation, i.e., striking ~N70-90°E. There is minimal evidence of mineralization, unless the darker quartz may signify radiation damage and thus local concentrations of U and Th.

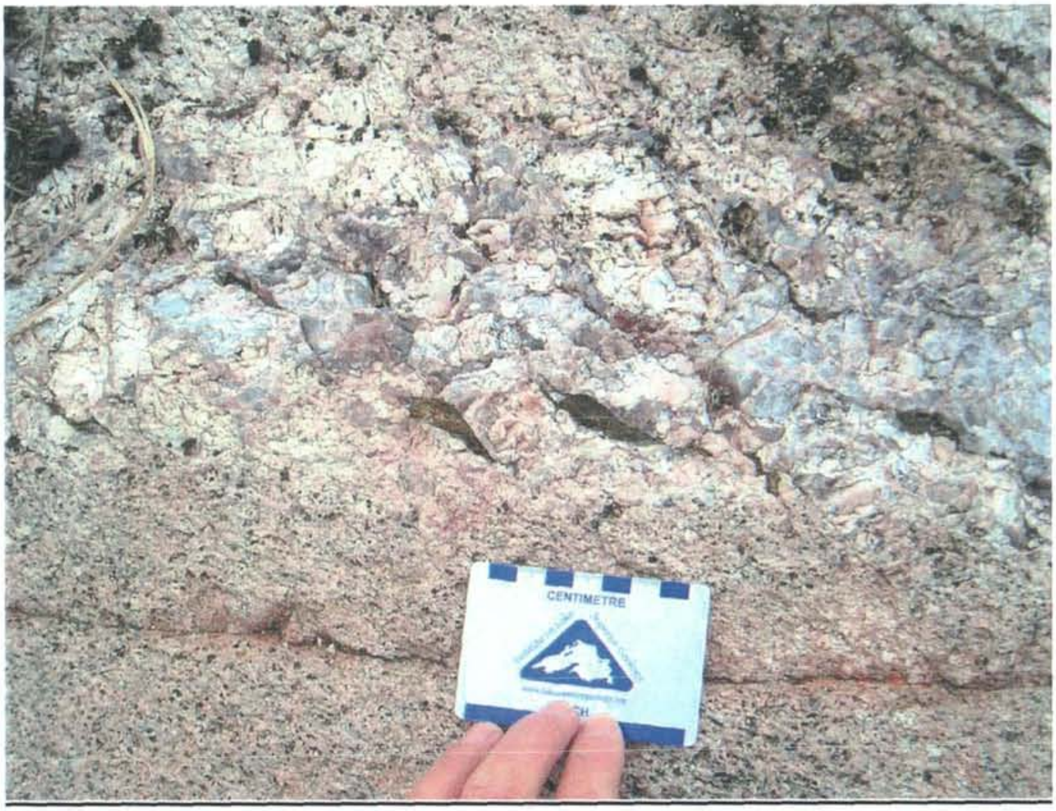


Figure 11. An example of pegmatite veins which are quite abundant in the clearcut near the midpoint of the east line of the claims, and within 100-200 m on either side of that line. Three examples are crudely aligned with the regional fabric, at ~N70-90°E.

Metasediments are common on the claims, but generally occur as thin "screens" or inclusions in the granitoid-dominated basement, often no more than 1 metre in apparent thickness. The rocks are predominantly biotite schist or phyllite (Fig. 12).

Mafic intrusive rocks are capable of forming impressive mountain scenery, whether of Archean age (Stillwater complex of Montana) or Tertiary (such as the Palaeocene intrusive centres of northwest Scotland and east Greenland). The

Keweenawan sills form impressive cuestas both in the Lake Nipigon region and near the shoreline of northwestern Lake Superior. Thus far, no mafic-ultramafic intrusive rocks have been found in outcrop, nor proven beneath shallow glacial cover, on the TBN claim blocks. Benkis (1977) describes the north-south diabase dykes mentioned previously, and the 2002 drill program found the mafic dyke beneath the west shore of Current Lake (Kleinboeck and Jobin-Bevans, 2002: the core is stored at the M.N.D.M. yard in Conmee Township, near Kakabeka Falls).

Structural Geology

Foliation

The regional structure of the Quetico fault passes west-east through Escape Lake, just to the south of Current Lake, and a subparallel structure cuts across the centre of Current Lake to the north, trending circa N80°E (Santaguida, 2001). The predominant regional fabric is steeply dipping and oriented at ~N80°E. Foliation is evident in metasediments (Fig. 12) and coarser granitoids alike, although there are also numerous occurrences which appear massive and post-tectonic, as noted by Benkis (1977). Although many of the granitoids appear massive, microscopy reveals highly strained quartz with incipient recrystallization (so-called mortar texture: samples 2540, 2548).

Joints and tension gashes

At least ten of the shoreline granitoid exposures and larger outcrops display 1-3 directions of well-developed jointing. Mostly steeply-dipping, but some low-angle unloading joints can be seen near the base of the north end of the granite knoll which lies north of the peninsula and just west of the west shore of Current Lake. Quartz-filled tension gashes are of local occurrence, and generally less abundant than the small, impersistent pegmatite lenses noted above.

Faults and veining

Small-scale faults may be observed (Fig. 12b), and slickensided surfaces are quite common, but larger structures are more readily inferred from linear depressions, and are thus amenable to air-photo and field topographic observations. The CFZ, which strikes N25°W, on the east part of the former Rio Tinto claims, shows 300 feet (~90 m) of dextral displacement (Benkis, 1977). Some Sibley sediments are preserved in the CFZ, which is interesting as a) the Sibley is now eroded from the area and otherwise occurs solely as glacial erratics, and b) this demonstrates a post-Sibley age for the faulting. Primary U mineralization may be related to pegmatites, but secondary U mineralization has been described as pyrite-pitchblende veins and the CFZ breccia zone (Benkis, 1977). Only insignificant bull quartz veinlets have been seen on the claim block.

Figure 12a,b. Above: grey, strongly foliated metasediments with intercalated granitic veins near the north line of the claim block. View west from northeast shore of Current Lake. Below: strongly folded biotite schist on the western shore, near the cabin at the south end of the lake. Note the offset of felsic streaks along small-scale fault planes.

Strongest features

The most intense deformation appears to lie within the regional fabric, east of the northern half of Current Lake, upon and on either flank of the low hill which lies south of the claim line, north of the "Big Swamp" and its outlet stream, and immediately north of the East Shore boulder field. Evidence includes:

- Orthogneiss on the hill itself, above the lake,
- A 10-cm-wide vein of bull quartz, postdating foliation, strike N126ºE, and a curious 20-cm-wide boudin of white pegmatite, both astride the claim line by the lake shore,
- Strongly foliated schists along the shore (Fig. 12a), and
- Further deformed rocks in low outcrop disappearing into the large swamp in the northeast corner of the lake.

Intrusions

Our knowledge of local intrusions is scant, but we can say that a) they occur and b) they are most probably of Keweenawan age. Benkis (1977) reported two extensive diabase dykes along north-trending lineaments to the west of Greenwich Lake, east of the modern TBN project. The main map in his report displays the two dykes, one over 700 m long, the other >1,000 m long, Greenwich Lake lies on a major north-south structure which shows fault displacement. Other lineaments are regional joint systems. Benkis thought that the Quetico quartz monzonite may be diapiric, rising in a north-south compressional regime, with steep flanks. He also recognized late Proterozoic diabase dykes up to 30 feet (9 m) wide, occupying north-south linears, expressed as steep-walled depressions with flat bottoms. The diabase is recessive, with minimal outcrop. The author has not seen these dykes, which lie just east of the TBN project, but has long harboured the suspicion that some lineaments on the TBN claims, often with resistant granitoid shoulders which typically 1-2 metres above swamp- or water-filled depressions, are reflections of eroded, weathered intrusive rocks and/or shear zones, and that such a setting is where the local source of the boulders will lie, if it indeed exists.

Quaternary Geology

The discovery, under particularly favourable lighting conditions, of glacial striae east of Current Lake confirms a S.S.W. ice-flow direction in at least one phase of glaciation. Four sets of striae were measured on granitoid outcrops east of the lake, and a fifth set by the south side of the Escape Road, ~8 km south of Current Lake. All five sets are indistinguishable, estimated at N206±2°E, a result in agreement with the drift map of Zoltai (1965a: see also Fig.4, page viii of this report). It is generally accepted that an area may be affected, over time, by two or more ice-flow directions. However, the only strong alternative direction mapped by Zoltai (Fig. 4) is a S.S.E. landform, represented by steep-walled valleys such as Pijitawabik Canyon, which are identified as meltwater channels or spillways. These may have formed in part by differential erosion along faults prior to glaciation, and later been sculpted by subglacial meltwater floods (Barnett, 2005). The Greenwich Lake-Dog Lake area was affected by the Dog Lake readvance of the Hudson Bay mass, so named because the ice came from the direction of that distant bay (Zoltai, 1965b). The key findings in the course of the May 2006 traverses were the discovery of a new boulder field (see below) and recognition of the striae (Fig. 13).

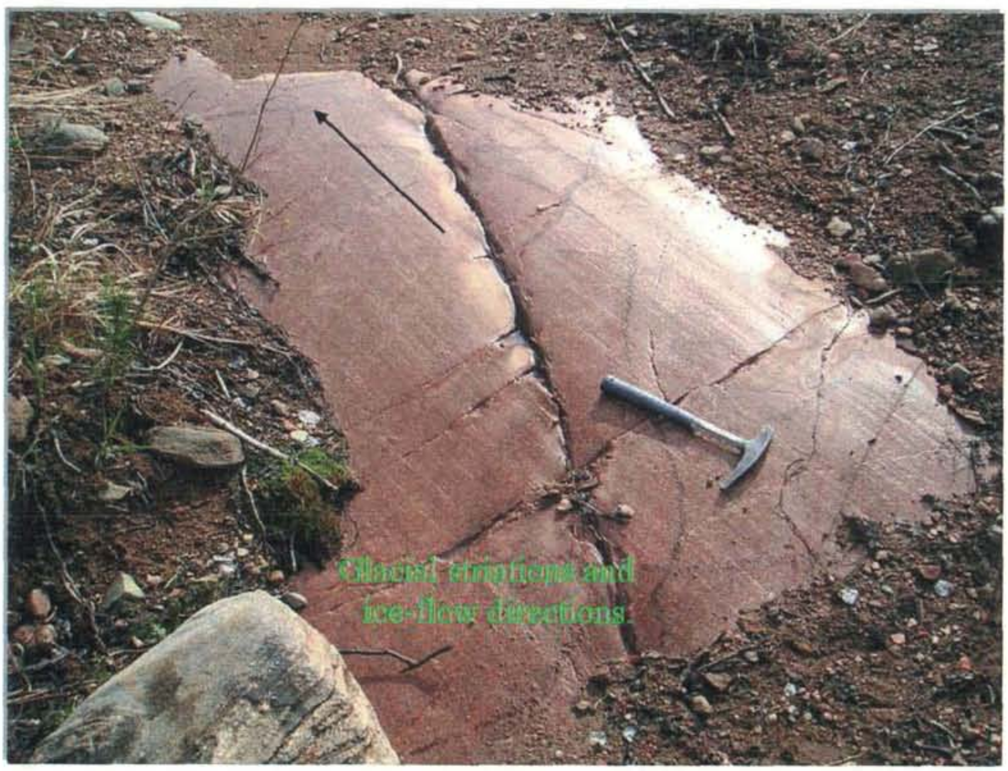


Figure 13. Fine striae on east side of the access road east of Current Lake and immediately east of the claim block (on block 1248239). Hammer handle points south.

The majority of the region extending from Thunder Bay and Dog Lake to the south shore of Lake Nipigon is ground moraine (silty to sandy till), including the smaller area from Greenwich Lake and Current Lake north to Seagull Lake. Glacial fluting and linear drift patterns (black dashes on Fig. 4) near Greenwich Lake- Current Lake run to the west of south, measured from the map at approximately N195°E. Esker complexes (red lines on Fig. 4) to the south have a more southwesterly general orientation, as around Fitzpatrick Lake and Onion Lake. Glacial striae (black dash with arcuate arrow mark on Fig. 4) are seldom marked but locally lie between the orientations of the fluting and esker complexes: three occurrences of striae and one esker north and west of Hicky Lake (in the same NNW trend as the northern reaches of Greenwich Lake) are oriented at roughly N32°E- N212°E.

The principal inference to be drawn from the comparison of the published work with the new observations of striations, and of the identical sight-line between the east and west-shore boulder occurrences across Current Lake, is that the west-shore boulders, and the 2001 drill testing of the west shore of the lake, are down-ice from the east shore occurrence, not from the distant Seagull complex. If we can assume a single operative ice-flow direction, then the primary source of the mineralized boulders is either very near to the east-shore occurrence, or further up-ice to the N.N.E.

Boulder Occurrences

In some of the forested areas, and along much of the local lake shores, definitive bedrock outcrop is sparse and geological clues include the distribution of decimetre-scale cobbles and larger blocks, up to several metres in maximum dimension. Many of these are well-rounded Keweenawan diabase, or "local" (Quetico) white to red granitoids. A few are the Mesoproterozoic Sibley sediments which often have distinctive orange hue, and are locally indurated, explaining their occasional transport for possibly tens of kilometres. The large boulder in Figure 14 lies in a clearing in woodland and is very distinctive. It is composed of fresh Keweenawan diabase, the rock type typical of many lake shores in the region, albeit mostly as rounded cobbles 15-30 cm in diameter. This rock is characteristically tough and quite strongly magnetic, fine- to fairly coarse-grained. The block, rounded and in process of exfoliation, is quite unlike the angular, slabby forms which typify the local serpentinite boulders.

The serpentinites (variably altered peridotites) are described elsewhere in this report. They are typically angular, with distinctive surface textures, first seen in 2001 (Fig. 15), ascribed to preferential weathering along joint sets which lead eventually to parting on flat planes to yield smaller, slabby examples up to 1 metre in size. The new East Shore find (Fig. 16) probably represents several tens of tonnes of material similar, if on average less mineralized, than the original finds, which are up to 2.5 m in maximum dimension.

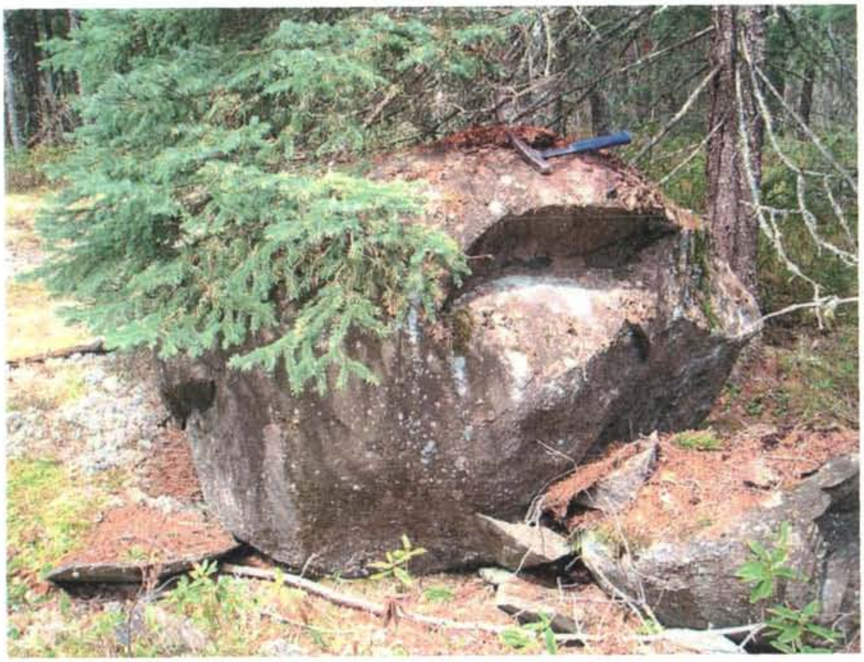


Figure 14. A rounded, exfoliating 2x1x1-metre boulder of fresh Keweenawan diabase, located on the north line of the claim block, 200 m west of the No.1 post.

Weathering in altered ultramafic rocks

Figure 15. A boulder in the East Shore boulder field displays the same characteristic surface texture seen in the original discovery boulders across the lake.

Figure 16a,b. The east shore of Current Lake, just north of the outfall of the "Big Swamp". Both views look northwards along the shore. Walking north from the outlet of that wetland, passing numerous granitic and a few ultramafic boulders en route, the scene at the left is encountered, with numerous serpentinite blocks ~0.5-1 metre in size. Reaching a small point, by the leaning conifer in the left image, the shore shown on the right comes into view. Here occurs the boulder with the classic "polysutured" surface shown in Figure 15. The swamp is off to the right, while just beyond the taller trees in the mid-distance is the hill and the zone of relatively intense deformation mentioned earlier (p.16).

Petrography

There are ample reasons to examine some of the local sample suites, including granitoids, metasediments and mafic-ultramafic boulders: classification, microstructural state, ore-mineral content and provenance, to name but four. Six samples are described in Appendix 2. Selected features of the samples are illustrated by photomicrographs (Figs. 19-22, in Appendix 2).

In mineralogical terms, the granitoids and ultramafic rocks are most reliably classified by the modal proportions of their rock-forming minerals (see references in Appendix 3 for details).

Some Previous Observations

At least 33 rock descriptions have been prepared on rocks from the immediate area of Current and Escape Lakes, from October 1999 to the present, including the six examples appended to this report. Some of the work is summarized here, as it relates to drill core recovered from beneath the west shore of Current Lake, in claim block 842189, during the program described by Kleinboeck and Jobin-Bevans (2002). In early 2003 a modest study (Wilson, 2003) described the fine-grained gabbros, altered diabase and monzogranite from drill program on the west side of Current Lake. This work documented abundant Fe-Ti oxides in the mafic rocks. The four samples are as follows:

1) Strained pyritic monzogranite, the host rock of the target,

2) A fine-grained, somewhat vuggy oxide-rich gabbro, with late deuteric alteration such as quartz, chlorite, pyrite, calcite and epidote, from a sheet-like minor intrusion. The pyrite hosts minor chalcopyrite,

3) An oxide-rich diabase with subophitic texture, recovered in a transition zone between the host rock and the mafic sheet represented by the last sample, and

4) Another oxide-rich fine-grained gabbro. Pyrite, chlorite and quartz are again present as late phases. This sample displays spectacular leucoxene pseudomorphs, a trellis texture interpreted as remnants of ilmenite plates exsolved within a host phase, such as magnetite, since corroded away. Chalcopyrite is present in this sample, but free in the gangue, not pyrite-locked as in the other gabbro.

An earlier contribution, also relevant to the claim block, concerned assay and transmitted and reflected light study of the mineralized float and other finds (Wilson, 2001a,b). Sulphidic serpentinite (5 samples from the first-found metre-scale boulders), a metagabbro and two diabase samples were studied.

- The serpentinites were rich in chalcopyrite and pentlandite, pyrrhotite and magnetite, olivine (~Fo_{80}) and serpentine, plus orthopyroxene and clinopyroxene, less brown mica ("biotite"), bright green chlorite, ilmenite, brown amphibole, apatite, goethite and calcite. The protolith appears to be a feldspathic lherzolite. Economically favourable features are chalcopyrite with cubanite exsolution plus pyrrhotite with pentlandite exsolution. Some of the pentlandite appears granular, magmatic, while some occurs as later, exsolved flame-like features in host pyrrhotite. A small grain of the Pt-Bi-Te phase moncheite was later identified in chalcopyrite in one boulder (Wilson, 2004).

- There is one uralitized, non-cumulate metagabbro, with minor sulphides (marcasite, pyrrhotite and pyrite).

- Two samples were identified as Proterozoic, Keweenawan diabase float, with abundant ilmenite, essential labradorite and augite, and accessory phases such as olivine and biotite mica.

- The serpentinites and metagabbro were initially thought to be of late Archean age., but by the end of the work it appeared possible that the mineralized suite, all quite ilmenite-rich, with only traces of chromite, could be local, cogenetic, and perhaps all Proterozoic, Keweenawan rocks. These all stand in contrast to local metagabbro float, which was thought to be of local but Archean origins.

A Note on the Seagull intrusion

The Seagull intrusion (Heggie and Hollings, 2003, 2004) is an ultramafic layered intrusion with cumulate olivine and oxides, plus pyroxene oikocrysts and interstitial feldspar. Lithologies include dunite, lherzolite, olivine gabbronorite, gabbro and pyroxenite. The intrusion has a maximum drill-delineated thickness of 730 m, and the recent drill core has been studied in detail by Greg Heggie as part of his MSc project at Lakehead University. The core is dominated by cumulate dunite, lherzolite and olivine websterite, with minor olivine-hornblende pyroxenite. Whole-rock analyses and mineral chemistry alike show a relative homogeneity. Olivine, pyroxene and oxides show little variability, e.g., olivine is Fo_{80-89} (n=737). REE patterns show a decrease in absolute REE abundances with increasing negative Eu anomaly towards the top of the intrusion. PGE occur as PGM grains with pentlandite, which is found at discrete intervals, increasing towards the base of the intrusion. The most significant mineralization found to date at Seagull lies in the `basal' and `sub-main' units. Ni occurs as bravoite interstitial to olivine crystals. Cu occurs as chalcopyrite with the Ni sulphide, but more often as veinlets of native Cu cutting earlier sulphides. PGE occur as discrete PGM on the boundary of Ni-Fe sulphides, and include sperrylite ($PtAs_2$), keithconnite ($Pd_{20}Te_7$), stibiopalladinite (Pd_5Sb_2) and a Cu-Pd alloy.

A petrographic study of Keweenawan ultramafites (Schandl, 2005) includes five samples from the Seagull intrusion. The samples include a serpentinized lherzolite (no relict olivine), two fresher lherzolites, an altered websterite and a dunite cut by a gabbro vein. The serpentinized lherzolite contains an estimated 10% phlogopite, bright green chlorite, magnetite, chromite (the only primary phase) and abundant serpentine after olivine and pyroxene. Fresher lherzolites may have a cumulus texture, with olivine, orthopyroxene (in one case), interstitial clinopyroxene, and minor kaersutite (in a partial replacement of pyroxene), magnetite and phlogopite, as well as serpentine. On of the rocks contains traces of sulphide (pyrite, pyrrhotite and pentlandite) and native copper. The coarse dunite is cut by a gabbroic vein dominated by plagioclase, clinopyroxene and phlogopite. Ilmenite is the main opaque phase in the altered websterite, while the dunite and websterite contain accessory apatite.

The boulders show many similarities to Seagull rocks described in recent reports. The presence of phlogopite mica, distinctive green chlorite and a brown magmatic- deuteric amphibole are probably a distinct signature of Keweenawan ultramafites in the region, and the boulders appear to belong to this suite. However, the rocks in the dunitic core of the Seagull complex, which host both reef-type and basal-contact mineralization, appear to be dominated by sugary-textured, fine-grained cumulates, a "textbook" rock type which appears to be a variant distinct from the coarser boulder lithologies. The ore mineralogy also appears to be distinct (e.g., chalcopyrite, cubanite and two generations of pentlandite in the Current Lake boulders versus chalcopyrite, native Cu and bravoite at Seagull). Metal grades also tend to be higher in available assays from Current Lake, although this may be a sampling issue.

Magnetic Susceptibility Measurements

Estimates of magnetic susceptibility (*k*) were made for a small number of hand specimens, available if possible in consistent geometric format as rectangular sawn offcuts, circa 45x25x5 mm in size, generated during the preparation of polished thin sections. This parameter varies by orders of magnitude between rock types, depending in particular on the content of oxides such as magnetite. The results are presented separately on pages 58-60, and display a variation of more than two orders of magnitude between granitoid rocks and magnetite-rich serpentinized peridotites. The observed variation is readily correlated to the visually estimated content of magnetite, ilmenite and other oxides. Repeat measurements on assay rejects (mm-scale crushed and partially powdered samples) of three serpentinites show good reproducibility (i.e.,

σ_{n-1}~2%, 5-10 observations) for the method when an ideal (powdered or geometrically reproducible) format is employed, and further show that magnetite will tend to trump sulphides, even pyrrhotite, in establishing *k* values for a suite of otherwise similar rocks.

The observed variation can be compared with published values (Lowe, 1999), which display wide ranges of *k* in most rock types, including gabbro, serpentinite and granitoids (the latter with higher values in magnetite-rich I-type as opposed to magnetite-poor S-type granites). Our limited data should be considered as a good illustration of variability, rather than good absolute estimates. This parameter may well be worth measuring systematically using a modern portable meter. It will prove valuable if the content of the oxide and sulphide species, which appreciably control magnetic susceptibility, vary in a systematic way with respect to features such as primary magmatic layering and alteration along faults and contact zones.

As mentioned previously, despite the drill discovery of the altered mafic dykes under the west shore of Current Lake, there remain both airborne and ground-indicated magnetic anomalies in the region that require further investigation. The east shore of the lake, including the area of the newly recognized boulder field, is one such area.

Recent Assay Data

Four serpentinite samples were submitted for assay in June 2006. All data and details of the assay methods can be found in the appended assay certificates. The data can be interpreted by various means. Thus the PGE and REE contents of the rocks can be normalized to primitive meteoritic values (C1 chondrites, choosing the values of Anders and Grevesse, 1989) and the resultant "signatures" compared with different potential source rocks, or styles of mineralization. In particular, the data can be compared with Keweenawan and other magmatic suites. Finally, they can be compared to the known characteristics of possible source rocks such as the Seagull complex, as a test of provenance. A detailed exercise of this type, including all existing data, will be deferred until more analyses are available, but some initial findings follow.

General

The samples provide the broadest sampling of the boulders to date. That is, past work focused on high-grade, sulphidic samples (e.g., M4-2481, collected in late 2005) or 2547, which, like the other two samples, was collected on the East Shore in 2006. 2545 contains very minor chalcopyrite and pyrrhotite, while composite sample 2546 may be the most useful sample for provenance studies, an attempt at finding a "barren" peridotite. It is actually remarkably anomalous, with 0.10% Ni, 0.04% Cu, 177 ppb Pt and 168 ppb Pd. Unlike Ni, Cu, Pt, Pd and Au, Co is quite low and uniform throughout, averaging 124 ppm. S/Se ratios of 2,500 and 4,000 for the two sulphide-rich blocks are approximate, given the low abundance of Se. They suggest only a modest crustal contamination of the magma (see below). In terms of major oxides, the four samples are quite uniform, averaging 41.1% SiO_2, 21.7% MgO, 1.47% TiO_2 and 0.44% Cr_2O_3. As examples of LILE, total REE content averages 116 ppm (see below), Ba 190 ppm.

PGE

A roughly 1:1 Pt:Pd ratio appears to be a signature of Keweenawan magmas in the Nipigon plate, and is utterly distinct from Archean PGE mineralization in the region, typified by the Lac des Iles deposit (where Pd/Pt may exceed 10). The normalized PGE patterns (Fig. 17) trend upward to the right, which is typical of sulphide- as opposed to chromite- dominant PGE ores around the world. Whereas Pd may occur in high levels in solid solution in pentlandite, Pt is less likely to substitute at high levels in the lattices of the observed base-metal sulphides. The coexistence of ppm levels of Pt, Bi and Te in sample 2547 suggests that this boulder probably contains more PGM such as moncheite, observed previously in a West Shore boulder. Low levels of Sb (<0.5 ppm) seems to rule out appreciable antimonide PGM as reported at Seagull.

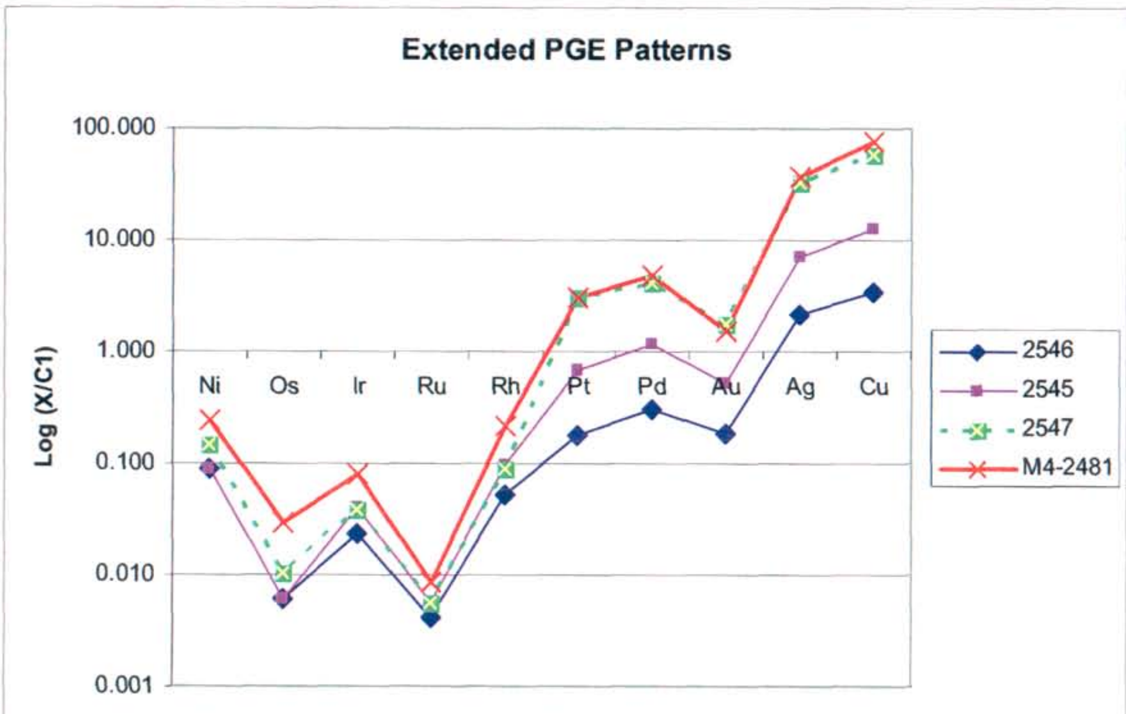


Figure 17. Chondrite-normalized extended PGE patterns, arranged in decreasing order of precious-metal melting points. The Os is below detection limit (3 ppb) in 2546 and 2545, and so should plot below the indicated points.

REE

The rare-earth element patterns of the serpentinized peridotite suite exhibit rather monotonous decline from the LREE to the HREE, with no appreciable europium anomaly (Fig. 18). This similar patterns and small range in REE contents may simply reflect the variable concentration and consistent ratios of possible host phases for low levels of REE, such as apatite and pyroxenes.

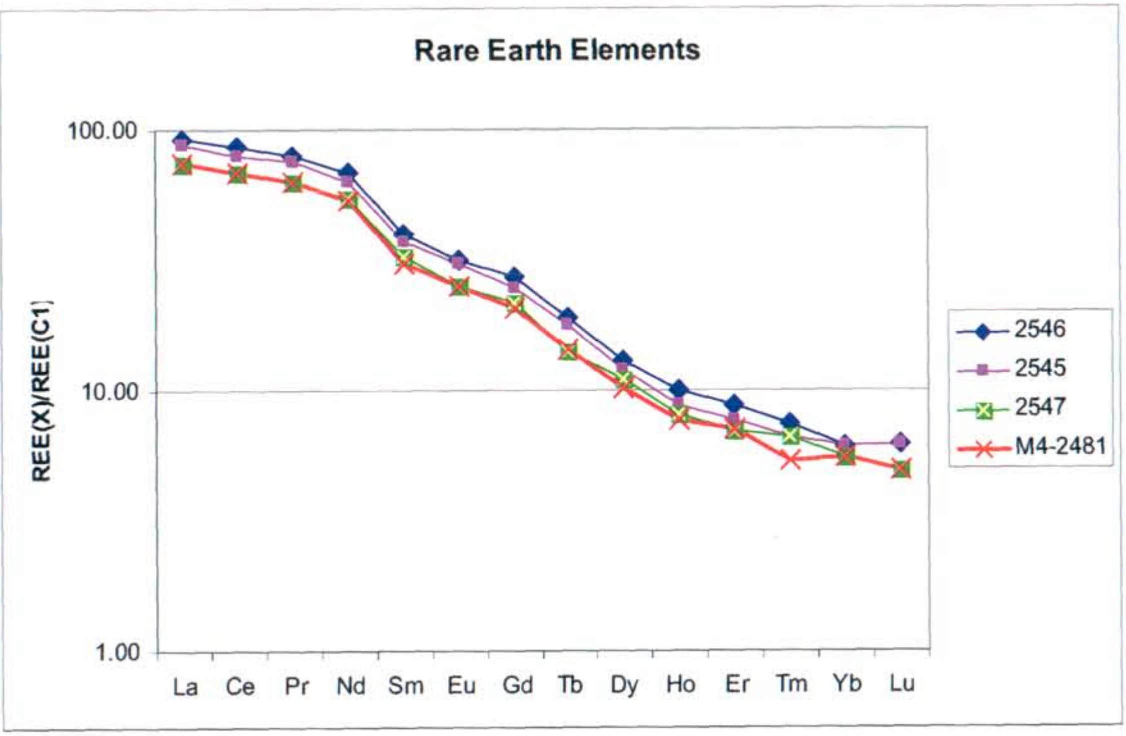


Figure 18. Chondrite-normalized REE patterns for the boulder suite. The patterns are very similar, with modest LREE enrichment (La_N/Yb_N)=14, averaging 116 ppm total REE (inversely proportionate to mineralization, falling from 132 ppm in the "barren" composite to 104 ppm in the most sulphidic, PGE-rich rock).

Commentary

Other unpublished work (Wilson, 2004) on two drill-core samples of the altered diabase dyke beneath Current Lake suggests wallrock assimilation, indicated by a high S/Se ratio of 14,300 in one sample. In contrast, early data for sulphidic, PGE-rich serpentinites indicate S/Se ~1,200-1,500, consistent with a primitive magma. Possibly this rock is part of the Keweenawan suite, but assays of fresh rock are lacking. A brief comparison of PGE data was made with Seagull samples. Data for 5 PGE plus Au, Cu and Ni were taken from the "Seagull and Disraeli" property description on the East West

Resources web site, http://www.eastwestres.com. The data are for three drill intercepts plus one sub-interval. They are as follows: (1) hole WM98-05, 569-585 m, (2-3) hole WM00-03, 526.3-530.3 m and 528.8-529.8 m, and (4) hole WM00-05, 734 to 736.1 m (data downloaded from site on 10 July 2006). The PGE patterns are similar to the Current Lake boulders, but with enriched Ir and especially Os, indicative of higher trace levels of these most-refractory metals, probably associated with Cr spinels in the dunites. PGE grades reported from Seagull are mostly somewhat lower than the most sulphidic boulders: this may simply reflect a discrepancy in concentration of PGE-enriched sulphide content between the two suites. Mean Pt/Pd in the four boulder samples is 1.12±0.11 ($1\sigma_{n-1}$): in the Seagull intersections it averages 0.86±0.04 ($1\sigma_{n-1}$).

Some LNRGI products will be useful to further work on these issues. For example, a recent survey of the mafic sills of the wider Lake Nipigon region, drawing also on current research from the Ontario Geological Survey and others, recognizes five suites of sills (Richardson *et al.*, 2005). A focused study on sulphide saturation in the Seagull and Kitto intrusions suggests that the Noril'sk model, which would involve assimilation of sulphate from Sibley evaporite strata, is not viable for Seagull, but that some input of S from the Quetico metasediments is very likely, especially with regard to the basal mineralization, as opposed to the higher reefs (Kissin *et al.*, 2005, 2006). As with the chemistry of the PGE mineralization itself, these avenues can be explored by straightforward means, namely correlation of geochemical data and (sulphide saturation) microprobe analysis of olivine compositions and further collection of S/Se data.

Conclusions and Recommendations

At the time of writing, there is still no firm evidence of any mineralization in the ground at the Thunder Bay North project, and specifically claim block 842189. However, the discovery of a third set of variably-mineralized serpentinized peridotite boulders does provide valuable additional information on the property. This is especially true when it is noted that the direction from the new discovery to the original discovery across the lake is aligned in the same direction (±2°) as glacial striations identified in the immediate area (N206°E).

The occurrence of three sets of boulders in a 1 km^2 area of the claims, their orientation, and the distance to the next-nearest known mineralization of similar type (the Seagull intrusive, some 25 km due north of Current Lake, with only sub-surface primary mineralization and black sand eluvial PGE concentrations recognized to date) are considered evidence of the likely occurrence of outcropping mineralization within a few km, and possibly <1 km, of the east shore of the lake. Part of our confidence in saying this is based on past experience, since 1992, exploring the ground from Onion Lake east towards Greenwich Lake. Were the Seagull intrusion the source of the observed boulders, which in total must weigh some tens of tonnes, then it would be surprising if we had not found some evidence of Seagull float in other locations: but some years of field, petrographic and geochemical study have revealed only diabase / gabbro blocks of evident Keweenawan, Nipigon-sill origins.

Following this approach, it is thought quite probable that the intrusive body responsible for the boulders is buried at a distance of no more than a few metres beneath surficial deposits, including thin glacial till and derived soil cover, marsh and (quite possibly) stream and lake waters. The mineralogy and geochemistry of the mineralized peridotite is such that, wherever its primary origin, it is probably of Keweenawan age and of close genetic affiliation to the Seagull intrusion and kindred early, ultramafic bodies that form a low-volume but highly prospective portion of the extensive mafic magmatism of the mid-Proterozoic Midcontinent Rift. The lack of regional geophysical anomalies is further indication that the parent body is not a large mass such as Seagull, but possibly a steeply-inclined sheet- or pipe-like body structurally controlled by the dominant fault directions in this part of the Quetico province. The target could be a feeder dyke or other remnant portion of a differentiated Keweenawan body intruded into the Quetico belt and now largely eroded.

Despite the latest findings; the absence of evidence from locations removed from Current Lake; and the lack of publicized surface mineralization near Seagull Lake, it is yet possible that a glacial transport mechanism more complex than one-stage, down-ice rafting has transported rocks from the Seagull complex or some other distal source of outcropping, subcropping or possibly eroded, and therefore former mineralization of Keweenawan geochemical signature. This possibility will be further tested shortly.

The findings of May 2006 affirm the potential for *in situ* Ni-Cu-PGE mineralization on the 50 km^2 of the Thunder Bay North project, and indeed beneath or immediately adjacent (up-ice) of the 842189 "discovery" claim block. A customised helicopter-borne geophysical survey with high-resolution magnetic and radiometric sensors was carried out in the past month and the data will be interpreted in the immediate future, with the possibility of further drilling thereafter. Magnetic-susceptibility measurements on archived hand specimens, outcrops and boulders, and both extant (2001 program) and possible future drill core may help with interpretation of the limited existing and planned superior airborne magnetic data sets.

Acknowledgements

Keith Watkins and Ralph Porter of Magma Metals Limited provided assistance and encouragement with this project. Ralph also supplied the location map (Fig. 1). Gerald Harper has contributed numerous ideas and discussions over the years, and since our last joint visit to the region in August 2005. Angelique Magee (M.N.D.M., Thunder Bay) provided access to Ministry assessment files. L.A. (Larry) Pavlish (University of Toronto) organized the collection of magnetic susceptibility data. The polished thin sections were prepared by Shawn McConville of the Department of Geology, University of Toronto. The assay work was carried out by SGS Minerals Services of Toronto. Last but not least, Dr. Mary Garland provided invaluable skilled assistance in undertaking the GIS data manipulation and 1:5,000 map production associated with this project.

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CERTIFICATE AND CONSENT
To Accompany the Technical Report on the Geology of the "Thunder Bay North" project, claim block 842189, Thunder Bay Mining Division, Northwestern Ontario

I, Graham C. Wilson, residing in Campbellford, Ontario, do hereby certify that:

1) I am a self-employed consulting geologist with an office at 47 Pellissier Street South, Campbellford, Ontario, Canada;

2) I am a graduate of the University of Oxford with a B.A.(Hons.) degree (Dept. of Geology and Mineralogy, 1976). I obtained a PhD from the University of Cambridge (Dept. of Mineralogy and Petrology) in 1981. I have practised my profession continuously since 1981;

3) I am a fellow of the Geological Association of Canada (1986), the Geological Society of India (1996), and the Association of Applied Geochemists (1998), and a Professional Geoscientist registered with the Association of Professional Geoscientists of the Province of Ontario (No. 0623);

4) I have prepared this report on behalf of my client, Magma Metals Limited, as objectively as possible. **NOTE** however that I; a) hold a 50% interest in the claim block and project under discussion, currently optioned to Magma, and b) hold shares in Magma Metals Limited;

5) I am not aware of any material fact or material change with respect to the subject matter of the technical report, which is not reflected in the technical report, the omission to disclose which makes the technical report misleading;

6) I, as the qualified person, am independent of the issuer as defined in Section 1.5 of National Instrument 43-101;

7) I have authored all the sections of this report, including collecting and tabulating the field data for the map, except that I did not generate the map itself;

8) I have personally conducted necessary research for this project, including prospecting, mapping, sampling and petrographic work and interpretation;

9) I have read National Instrument 43-101 and Form 43-101F1 and the technical report has been prepared in compliance with this Instrument and Form 43-101F1 (but see [4] above);

10) I was retained by Magma Metals Limited to prepare this report on the geology and mineral potential of claim block 842189. This report, number 2006-01F, is based on my work, and on material from the files of my research company, Turnstone Geological Services Limited;

11) I hereby consent to use of this report for submission to any provincial regulatory authority.

Campbellford, Ontario, Canada
July 19th, 2006

G. C. Wilson

Graham C. Wilson, PhD, P.Geo.

PROFESSIONAL GEOSCIENTIST
GRAHAM C. WILSON
PRACTISING MEMBER
0623
ONTARIO

=== NOTES ===

About the author: *Geologist and mineralogist Graham Wilson is a practising professional geoscientist in Ontario (P.Geo, APGO member 0623, 2002) and a fellow of the Geological Association of Canada (1986), the Geological Society of India (1996), and the Association of Applied (Exploration) Geochemists (1998). Member of the Association of Geoscientists for International Development, Meteoritical Society, Mineralogical Association of Canada, Prospectors and Developers Association of Canada, and Society of Economic Geologists. He was for many years a Research Associate of the IsoTrace Laboratory of the University of Toronto. Secretary of the Meteoritics and Impacts Advisory Committee to the Canadian Space Agency (2002-). He also serves on the Allocations Committee to the National Meteorite Collection in Ottawa. He has developed his own Earth-science databases since 1983, and continues this work via his wholly-owned, federally-incorporated company, Turnstone Geological Services Ltd. (incorp. 1985).*

COURIER deliveries; please use street address, quote Tel. number:
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APPENDIX 1.
CATALOGUE OF HAND SPECIMENS FROM THE THUNDER BAY NORTH PROJECT, CLAIM BLOCK 842189

By
Graham C. Wilson, PhD, P.Geo. (Ontario)
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Tel (705)-653-5223
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Thu 30-Jun-2006
Sample numbers 2529-2548, n=20

(Relevant Petrographic Descriptions: 3241-3246)

<u>Format of each description</u>:

Sample Number
Rock Type
Area
Locality detail
Collection date
Description of hand specimen
Sample: HS=hand specimen, ± offcut ± PTS (Polished Thin Section/Description number)
References: Report, page of field note book --- Presumed age of sample
Easting and northing on NAD27 datum (as per available 1:50,000 topo map of area), **UTM zone 16 U.**

ABSTRACT

Samples collected in 4 days of assessment work on this claim block, 14-17 May 2006.

A note on terminology: (1) <u>in situ</u> means collected directly from outcrop, as far as can be ascertained. (2) <u>effectively in situ</u> refers to a sample collected loose from an outcrop of apparently identical rock type, evidently moved no more than a few metres. (3) <u>loose</u> refers to all other samples, whether or not there is any obvious connection with local outcrop, if any.

Location: Thunder Bay North, 12-unit claim block 842189 -

2529
Micaceous phyllite
Current Lake area, N.W. Ontario
Foliated metasediment, leucogranite veining, white granite parallel to host foliation. In situ, on west shore of lake near cabin.
14 May 2006
Dark grey, quite dense, moderately foliated phyllite, seen in outcrop to entrain minor 1-3-mm-wide qz veinlets within the foliation. Not appreciably magnetic.
HS
Rep. 2006-01; FNB, p.117 - Late Archean.
357428E, 5402214N

2530
Weakly foliated pink granite
Current Lake area, N.W. Ontario
SE tip of peninsula - granite outcrop (some 30 m to NE, an angular boulder of granite projects above the lake). Foliated granite, with qz streaks and veinlets, appears to be a set of fractured blocks, in situ, on solid bedrock.
14 May 2006
A weakly foliated and slickensided granitoid with qz, 2 feld and appreciable silvery musc plus darker grn chl flakes, gs circa 2 mm. Not appreciably magnetic.
HS + offcut / PTS (D3241)
Rep. 2006-01; FNB, p.121 - Late Archean.
357330E 5402652N

2531
Massive pink granite
Current Lake area, N.W. Ontario
North shore of the peninsula. Coarse qz-feld segregations in reddened granite with joints. Sample of granite about 1 m above current lake level. Joints cut both host rock and segregations. In situ.
14 May 2006
Massive pink granite, gs 2 mm, a 2-feld granite with smoky qz, pink K-feld and white plag. Not appreciably magnetic. Rare white feld megacrysts to 10 mm.
HS plus smaller chip
Rep. 2006-01 - Late Archean.
357266E 5402712N

2532
Massive pink granite
Current Lake area, N.W. Ontario
NE shoulder of granite knoll with, at N end, low down, some low-angle unloading joints which seem to dip at a very shallow angle westwards. In situ, on the side of the knoll above the lake.
14 May 2006
One quite large specimen of pinkish-red granite. Massive granite, gs only 2 mm or a little less, 2 feld, qz and bi, with minor tabular feld phenocrysts up to 8 mm in max dimension. Not appreciably magnetic.
HS
Rep. 2006-01; FNB, p.126 - Late Archean.
357126E 5402822N

2533
Massive pyroxenite
Current Lake area, N.W. Ontario
Float blocks, largely diabase + lesser granite, Sibley sediments and (rare, sampled) melagabbro / pyroxenite (which may or may not be part of the "Current Lake suite". Loose block, ≈60 m S of slab sampled in August 2005.
14 May 2006
A 30-cm block of dark igneous rock, with ragged cracks in surface, apparently a pyroxenite lacking in sulphide. Weakly magnetic. Dense, massive rock, gs 2-3 mm, colour index to be >90%, seems quite fresh.
HS
Rep. 2006-01; FNB, p.127 - Keweenawan (?)
357055E 5403106N

2534
The `barren', massive serpentinite
Current Lake area, N.W. Ontario
Just around corner of inlet, on shore facing N across small inlet, and just opposite (S of) original discovery blocks. Granite, diabase, minor Sibley, and an apparently barren serpentinite, noted previously, sampled today. Loose.
14 May 2006
The `barren serpentinite', the smaller piece sawn in two and yielding a PTS plus offcut. Strongly magnetic. Bluish-black, granular, appears massive yet cut by en echelon planar fractures, gs only 1-2 mm. The rock seems to be spared from recent oxidation, but has little or no sulphide (traces of fgr sulphide appear in the PTS).
HS, 2 small HS, + offcut / PTS (D3242)
Rep. 2006-01; FNB, p.129 - Keweenawan (?)
356965E 5403205N

2535
Biotite schist layers in pink granite
Current Lake area, N.W. Ontario
10 m N into clear-cut, W side of road. Pink, moderately foliated mgr-cgr granite with thin grey sheets, foliated and boudinaged, up to 15 cm true thickness. Schist bands align with near-vertical foliation in host. In situ.
15 May 2006
Sharp contacts of biotite schist with 2-feldspar granite. 3 of the 5 pieces fit together - this is from the top of the widest part of the most prominent schist band within the enclosing foliated granitoid. Contacts and foliation dip N at about 55°. Not appreciably magnetic. Sample displays a 3-cm thickness of schist, plus 2.5 cm of granite.
HS in 5 pieces
Rep. 2006-01; FNB, pp.144-146 - Late Archean.
358465E 5403796N

2536
Foliated biotite granodiorite
Current Lake area, N.W. Ontario
Low mossy outcrop, just into trees N of the "Big Swamp", circa 300 m E of Current Lake. A plag-phyric mgr granodiorite, appears only weakly foliated. In situ, from S side of outcrop, where a sapling has been pushed over.
15 May 2006
Pale grey mgr granodiorite with white plag and lesser grey qz and pink K-feld, plus fgr bi flakes, not appreciably magnetic. Some plag phenocrysts. Mica indicates weak but definite foliation.
2 HS
Rep. 2006-01 - Late Archean.
357553E 5403756N

2537
Coarse, pink, weakly foliated biotite granite
Current Lake area, N.W. Ontario
Pink 2-feld-qz granite with sparse biotite-rich foliae, E side of a small ridge striking N40°E. Possibly a dyke of a granitoid younger than the granite with sedimentary screens (?). In situ.
15 May 2006
A coarse pink granite, typical gs 4-6 mm, with sparse biotite foliae in otherwise apparently massive bulk. Not appreciably magnetic.
2 HS
Rep. 2006-01; FNB2, p.5 - Late Archean.
357577E 5403812N

2538
Biotite schist
Current Lake area, N.W. Ontario
Another ridge of speckled, mgr-cgr pink granite with trace biotite. These low ridges could be fault-bounded slivers - not necessarily dykes. Ridge trends N355°E on west side. S end has metasediment (sample, in situ).
15 May 2006
A fine-grained, rather weakly foliated biotite schist or phyllite. Not appreciably magnetic.
HS + offcut / PTS (D3243)
Rep. 2006-01 - Late Archean.
357738E 5403832N

2539
Weakly foliated biotite K-feldspar granite
Current Lake area, N.W. Ontario
Predominant, weakly foliated host granite in the cliff on the east shore of the lake. Claim line goes through here, E-W, 15 m S of the exact sample site, which is about 10 m vertically above the surface of Current Lake. In situ.
16 May 2006
Weakly foliated, fairly fgr (gs 2-3 mm) biotite granite. A K-feldspar granite with far more pink K-feld than plag or qz. Not appreciably magnetic.
HS
Rep. 2006-01 - Late Archean.
357494E 5402384N

2540
Massive pink biotite granite
Current Lake area, N.W. Ontario
Nice fresh pink granite, fgr-mgr, seems massive, 2 feld, qz, chl, bi. In situ.
16 May 2006
Fresh and apparently massive pink biotite granite, with K-feld, plag, qz and bi. Not appreciably magnetic.
HS + offcut / PTS (D3244)
Rep. 2006-01 - Late Archean.
357870E 5402351N

2541
Foliated biotite K-feldspar granite
Current Lake area, N.W. Ontario
Oriented sample of granite, near W end of large outcrop. Coarse pink granite with 2 sets of steep joints at N65°E and N153°E, and lesser set at N23°E. Three examples of sinistral offset on joints, 5-10 cm in each case. In situ.
16 May 2006

A mgr, pink, moderately foliated biotite K-feldspar granite. Not appreciably magnetic. Nice oriented structural sample.
Large HS
Rep. 2006-01 - Late Archean.
357778E 5402470N

2542
Biotite schist
Current Lake area, N.W. Ontario
High knoll overlooking the lake from above the east shore. A mgr-cgr granite with sheets of biotite schist and vertical alignment of streaky pegmatitic segregations. Effectively in situ, m-scale angular block 1 m from source.
17 May 2006
A fgr, dark grey biotite schist or phyllite. Not appreciably magnetic.
HS
Rep. 2006-01 - Late Archean.
357241E 5403865N

2543
Porphyritic granodiorite to granite
Current Lake area, N.W. Ontario
High knoll overlooking lake. A mgr-cgr granite with sheets of biotite schist and streaky pegmatitic segregations. Like 2542, effectively in situ in m-scale frost-heaved from origin 1 m away, on rock platform above lake.
17 May 2006
Not appreciably magnetic. A biotite granodiorite to granite with local pink K-feld phenocrysts to 15 mm in dia. The latter may enclose small blebs of smoky qz. Rusty surfaces hint at weak biotite-enriched foliation.
2 HS
Rep. 2006-01 - Late Archean.
357241E 5403865N

2544
Biotite orthogneiss
Current Lake area, N.W. Ontario
Foliated granite, verging on biotite orthogneiss. Approx foliation E-W. In situ, lower elevation than 2542-2543, on gentle slope down to east shore of Current Lake. In situ.
17 May 2006
Foliated biotite orthogneiss with the felsic layers variously fgr and qz-rich, or coarser and rich in 2 feld, between laminae dominated by biotite. Not appreciably magnetic.
Small HS
Rep. 2006-01 - Late Archean.
357225E 5403776N

2545
Serpentinized peridotite
Current Lake area, N.W. Ontario
Important new find of ultramafic boulders on E shore of lake. The original 2001 discovery site is across the lake at circa N208°E. Numerous blocks, often with traces of pyrrhotite. First block found today. Loose. Assayed.
17 May 2006
Dense, moderately magnetic ultramafic rock. From a 40x40x30-cm blockwhich splits readily on two mutually perpendicular joint planes. Bluish-black serpentinized peridotite with <1% sulphide (localised pyrr, chalc). Much material of this kind here, may be strongly magnetic. Black to yellow-orange rusted outer surface.
Large HS
Rep. 2006-01 - Keweenawan (?)
357192E 5403651N

2546
Serpentinite chip sample composite
Current Lake area, N.W. Ontario
Important new find of ultramafic boulders on E shore of lake. The original 2001 discovery site is across the lake at circa N208°E. Numerous blocks, often with traces of pyrrhotite. Chip sample of 8 boulders. Loose. Assayed.
17 May 2006
This chip sample was crushed and pulverised for analysis - all the blocks show trace pyrrhotite. The least-mineralized chip of 2545 was included, but no 2547. Assay reveals appreciable enrichment of PGE+Au, even in this rather dull rock. Serpentinized peridotite.
Crushed chip sample
Rep. 2006-01; FNB 2, pp.50-54 - Keweenawan (?)
357192E 5403651N

2547
Serpentinized sulphidic peridotite
Current Lake area, N.W. Ontario
Important new find of ultramafic boulders on E shore of lake. The original 2001 discovery site is across the lake at circa N208°E. Numerous blocks, often with traces of pyrrhotite. The most-mineralized block. Loose. Assayed.
17 May 2006
A massive, serpentinized sulphidic peridotite. Strongly magnetic. Rusty, somewhat pitted weathered surfaces. Abundant (2-3%) fgr (1 mm) blebs of chalc and pyrr. With 2 PTS (one top-quality, one spare).
HS, chip + offcut / 2 PTS (D3245)
Rep. 2006-01 - Keweenawan (?)
357192E 5403651N

2548
Massive red K-feldspar granite
Current Lake area, N.W. Ontario
Various boulders (granite, pegmatite, schist, Sibley and diabase). Jointed granite outcrop, a mgr granite with much red K-feld. In situ.
17 May 2006
A massive, mgr K-feld granite, gs 3-4 mm, with much red K-feld (distinctly dark hue), grey qz, white plag, plus fgr black bi and trace fgr py. Not appreciably magnetic.
2 HS + offcut / PTS (D3246)
Rep. 2006-01; FNB 2, p.56 - Late Archean.
357231E 5403565N

*****

Footnote: a location summary of the diamond drill holes of 25 September-23 October 2002 on the west side of Current Lake (after Kleinboeck and Jobin-Bevans, 2002):

DDH	Casing (m)	L (m)	Azimuth (Nx°E)	Dip	UTM NAD83 E	UTM NAD83 N	Horizontal reach (m)	Absolute depth (m)
CL02-H1	2.2	145.0	60	41	357079	5403192	109	95
CL02-H2	3.0	131.5	20	45	357079	5403192	93	93
CL02-H3	3.0	136.1	20	60	357079	5403192	68	118
CL02-H4	16.0	16.0	0	52	356952	5403388		
CL02-H5	16.0	143.5	0	60	356952	5403388	72	124
CL02-H6	12.0	241.5	25	45	357169	5403062	171	171

APPENDIX 2.
PETROGRAPHIC DESCRIPTIONS OF SAMPLES FROM THE THUNDER BAY NORTH PROJECT, CLAIM BLOCK 842189

For further explanation, see appended 6-page Glossary of Terms

also available at

http://www.turnstone.ca/petglo.pdf

TURNSTONE **PETROGRAPHIC DESCRIPTION** **Status; CONFIDENTIAL**

Sample **; 2530** **Description ; 3241**
TGSL Project; 2006-01

Client/job ; Magma Metals Limited, West Perth, WA / TBN
Locality ; Current Lake area, N.W. Ontario, Canada - SE tip of peninsula on west shore. A granite outcrop (some 30 m to NE, an angular boulder of granite pokes above the lake). Foliated granite, qz streaks and veinlets, apparently fractured blocks in situ.

Collection details; HS + offcut (PTS, area 8.2 cm^2).

Format ; PTS - 32 µm - by U. of T. DOG, Toronto, Ont
Hand specimen data; Weakly foliated, slickensided granitoid with qz, 2 feld, appreciable silvery musc, and dark grn chl flakes, gs ~2 mm. Not appreciably magnetic.

Major Minerals;
* K-feldspar - perthitic (36%) and microcline-twinned grains (15%). generally quite fresh, the twinned grains up to 2.2x1.8, 1.9x1.4 mm in section. The perthitic grains are generally coarse, unstrained, and less altered than plag, such as the occasional small plag inclusion within the feld. Max gs 3.8x2.8, 2.8x1.8 mm. May contain small qz blebs, and be cut by late veinlets of qz. 51%.
* Quartz- Mostly fgr, the coarser material strongly strained, max gs 1.8x1.0 mm. 33%.
* Plagioclase feldspar- Finely albite-twinned in part, max gs 3.2x3.2 mm, variably cloudy with sericitic and keolinitic alterations. RI<qz => sodic composition. Neither plag nor the K-feld are obviously zoned. 13%.

Minor and Accessory Minerals (3%);
* Chlorite- Grn flakes, strongly pleo, with pale grey, notably normal 1st-o int colour. Str ext, LS, max absorption parallel to polarizer (as bi), max gs at least 650x200 µm. 1%.
* Biotite- Brn, strongly pleo mica, partially chloritized and may in part be replaced by white mica too. Max gs 1000x400 µm. 1%.
* Muscovite- Colourless mica flakes, bright bir, max gs 500x150 µm, found esp in late fractures and with late, fgr qz => deuteric or later, foliation-related mica. A few of the larger flakes may be of older, primary origin. 1%.
* Epidote- Granular, fairly high relief, bright int colours, max gs 150x100 µm. Pale yl, faintly pleo, may be flanked by chl, between feld grains. Tr.
* Fe Ti oxides- A few small anh grains of opaque oxide, max gs 150x60 µm, appears isot, found with fgr micas interstitial to feld. Hematite. Tr.

Texture; Allotriomorphic seriate, granitic texture, partially overprinted by shearing and comminution of quartz and superposition of weak foliation with muscovite and chlorite. Feldspars are mildly altered, biotite partially chloritized. Estimated QAP mode is 34-53-13, colour index 3%.

Summary; Weakly foliated muscovite-biotite leucogranite (and a granite, *sensu strictu*).

Age; Late Archean.

Petrography; GCW, Turnstone Geological Services Ltd
Jul 4, 2006

TURNSTONE **PETROGRAPHIC DESCRIPTION** **Status; CONFIDENTIAL**

Sample **; 2534** **Description ; 3242**
TGSL Project; 2006-01

Client/job ; Magma Metals Limited, West Perth, WA / TBN
Locality ; Current Lake area, N.W. Ontario, Canada - on shore facing N across small inlet, and just opposite (S of) original discovery blocks. Granite, diabase, minor Sibley, and an apparently barren serpentinite, noted previously, this sample.

Collection details; HS, 2 small HS, + offcut (PTS, area 9.0 cm^2).

Format ; PTS - 27 µm - by U. of T. DOG, Toronto, Ont
Hand specimen data; The `barren serpentinite', the smaller piece sawn in two and yielding a PTS plus offcut. Strongly magnetic. Bluish-black, granular, appears massive yet cut by en echelon planar fractures, gs only 1-2 mm. The rock seems to be spared from recent oxidation, but has little or no sulphide.

Major Minerals;
* Serpentine- Colourless fibrous serp, for the most part pseudomorphous after oliv. 50%.
* Clinopyroxene- Prisms with highly incl ext, max gs 3.5x2.0 mm. Basal sections can show symm ext, with cleavage traces at near 90° angles, wide biaxial +ve figure. Pale cpx, variety augite. 20%.
* Orthopyroxene- Coarse colourless opx. Equant, str ext, mid-1st-o bir, max gs 3.5x2.0 mm, partially altered to serp (bastite). 10%.
* Relict olivine- Colourless, moderate relief, 1st to 2nd-o int colours, largely isolated as small relict domains in serp. 8%.
* Green chlorite- Bright grn pleo sheet silicate, quite distinct from the pale serp. 5%.

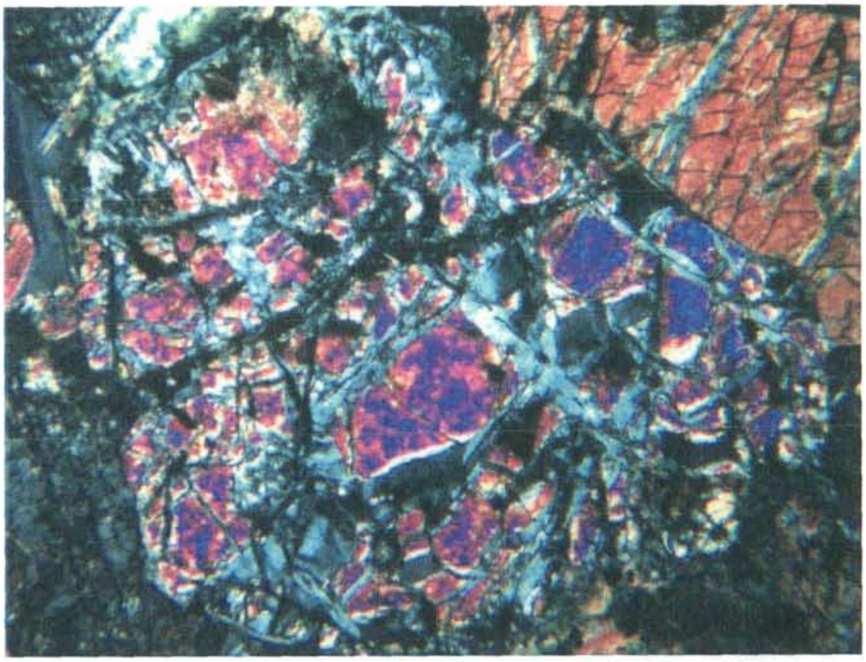
Minor and Accessory Minerals (7%);
* Phlogopite- Rich, medium orangey-brn pleo mica, in ragged flakes, LS, str ext, max absorption parallel to polarizer. 3%.
* Fe Ti oxides- Tabular ilmenite, aniso, max gs 450x125 µm. Two habits of magnetite. The other includes discrete primary grains, max gs 400x225 µm, and thin sheets of secondary mag between relict islands of oliv, each long sheet 2-20 µm thick. 3%.
* Brown amphibole- Pale brn pleo amph, high relief, incl ext, ragged relicts of a primary magmatic amph. 1%.
* Apatite- Colourless, high relief and low bir, LF, str ext. Tr.
* Pyrrhotite- Anh, clove-coloured aniso sulphide, max gs 175x125 µm. Tr.
* Chalcopyrite- Yl sulphide, small and anh, max gs 150x75 µm. Tr.
* Pentlandite- Tiny pale feathery exsolution on margin of pyrr. Rare Tr.

Texture; Massive, granular ultramafic rock, with some coarse pyroxenes in a matrix dominated by secondary sheet silicates (phlogopite perhaps the earliest, then abundant green chlorite and pale serpentine), with primary and secondary oxides and relict olivine, plus accessory apatite and sulphides.

Summary; Ultramafic rock, highly altered, colour index 100 percent. A serpentinized peridotite. The least-mineralized example of a suite of boulders, but still containing traces of Cu and Ni sulphides. The overall primary mode of essential phases can be estimated as OLIV-OPX-CPX 66-11-23, a lherzolite. This example does not seem to contain any plagioclase feldspar.

Age; Keweenawan (?).

Petrography; GCW, Turnstone Geological Services Ltd
Jul 5, 2006



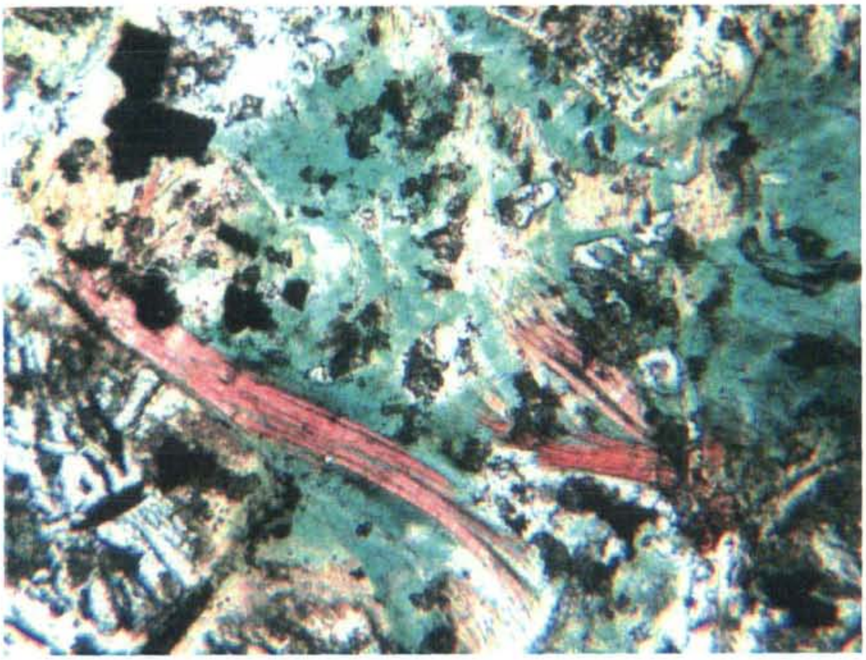


Figure 19. Sample 2534. (a), above: relatively large relict olivine grain, cut by veinlets of secondary serpentine, adjacent to a rather large amphibole prism. Image at 50X magnification, in XP-TL light, long-axis FOV 1.6 mm. (b), below: characteristic green chlorite and rich brown phlogopite mica, with pale serpentine, relict serpentine and fine-grained oxides. 100X, PPL-TL, long-axis FOV 0.8 mm.

TURNSTONE **PETROGRAPHIC DESCRIPTION** **Status; CONFIDENTIAL**

Sample ; 2538 **Description ; 3243**
TGSL Project; 2006-01

Client/job ; Magma Metals Limited, West Perth, WA / TBN
Locality ; Current Lake area, N.W. Ontario, Canada - a low ridge of speckled, mgr-cgr pink granite, trace biotite. The ridges could be fault-bounded slivers, not necessarily dykes. Ridge trends N355°E on west side. S end: metasediment (?) HS, in situ.

Collection details; HS + offcut (PTS, area 8.5 cm^2).

Format ; PTS - 32 µm - by U. of T. DOG, Toronto, Ont
Hand specimen data; A fine-grained, rather weakly foliated, grey and granular biotite schist or phyllite (?). Not appreciably magnetic. Traces of deformed (?) qz veinlets.

Major Minerals;
* K-feldspar and alteration products- Shows much flaky sericitic alteration. Max gs 700x450 µm. Traces of perthitic exsolution in some grains. 50%.
* Biotite- Dark brn pleo mica, LS, str ext, max gs 550x150 µm, ragged flakes, generally elongate and unstrained. 20%.
* Quartz- Often somewhat strained, elongate, variable gs. Some of the larger and more deformed domains, showing mortar texture, are apparently disrupted minor qz veinlets. 16%.
* Plagioclase feldspar- Rather fresh plag with albite, simple and pericline twin laws, max gs 450x350 µm. Fgr ser and kaol alteration may follow twin planes, but in general the plag is less altered than the K-feld. 14%.

Minor and Accessory Minerals (Tr.);
* Pyrite- Generally elongate, anh grains, yl-white, high refl, isot. Commonly oriented along foliation, max gs 160x50 µm, may be partially overgrown by biotite. Often with thin rind of partial oxidation to goethite. Tr.
* Epidote- Pale yl, moderate relief, bright int colours, max gs 200x100 µm, moderately high relief. Tr.
* Apatite- Colourless, high relief and low bir, LF, str ext. One 130x100 µm ovoid grain has a dark turbid core and pale rim, also appears to be ap. Tr.
* Pyrrhotite- A 25x15 µm grain in pyrite. Rare Tr.
* Chalcopyrite- A 10x10 µm yl grain bordered by goethite, near py. Rare Tr.

Texture; The feldspathic composition is curious for the rock, presumed in the field to be a schist or phyllite, and probably a metasedimentary inclusion or screen in the granitoid-dominated Quetico bedrock. However, the mineralogy is consistent with a biotite-rich igneous rock, dominated by feldspars, biotite and quartz, plus accessory apatite, epidote and sulphides. A moderate foliation is imprinted on this granular rock, which perhaps is a chilled hypabyssal intrusion, and micas plus accessory pyrite show a preferred alignment.

Summary; A feldspathic biotite-rich rock, fine-grained and granular, with few grains >1 mm in size. The high feldspar content yields an estimated QAP mode of 20-62-18, colour index 20%, consistent with a granite to quartz syenite protolith. Thought to be a potassic biotite granite, deformed and moderately foliated, perhaps a thin dyke. Strained quartz is thought to represent deformed and broken quartz veinlets in the rock.

Age; Late Archean.

Petrography; GCW, Turnstone Geological Services Ltd
Jul 8, 2006

TURNSTONE **PETROGRAPHIC DESCRIPTION** **Status; CONFIDENTIAL**

Sample **; 2540** **Description ; 3244**
TGSL Project; 2006-01

Client/job ; Magma Metals Limited, West Perth, WA / TBN
Locality ; Current Lake area, N.W. Ontario, Canada - nice fresh pink granite, fgr-mgr, seems massive, 2 feld, qz, chl, bi. In situ.

Collection details; HS + offcut (PTS, area 9.3 cm^2).

Format ; PTS - 35 μm - by U. of T. DOG, Toronto, Ont
Hand specimen data; Fresh, apparently massive pink biotite granite with salmon-coloured K-feld, white plag, grey qz and dark brown bi mica flakes, gs relatively fine at 1-2 mm. Not appreciably magnetic.

Major Minerals;
* K-feldspar and alteration products- Abundant perthitic K-feldspar, and minor grains with microcline twinning. Max gs 3.4x2.6 mm. Patchy ser and kaol alteration. Some tabular grains display simple twinning. 44%.
* Quartz- Highly strained qz, single crystals or domains to 2.0x1.6 mm. 40%.
* Plagioclase feldspar and alteration products- Albite-twinned plag, patchy ser and kaol alteration. Max gs 2.0x1.0 mm. 8%.
* Biotite- Dark brn pleo mica flakes. 6%.

Minor and Accessory Minerals (2%);
* Muscovite- Colourless flakes with bright 3rd-o int colours, LS, str ext, max gs 900x450 μm. Some flakes are significantly bent, a feature obvious in XP. 2%.
* Chlorite- Deep grn chl, body colour masks bir, with fgr oxide as inclusion in K-feld. Max gs 150x100 μm. Tr.
* Fe-Ti oxides- Aggregates of fgr rutile prisms, deep brn, high relief, to 300x120 μm, grey in RL, and traces of dark secondary oxide along mica cleavage planes. Tr.

Texture; Apparently massive granite with abundant strained quartz and moderate content of two micas, biotite>muscovite. The quartz is notably deformed, with well-developed mortar texture indicative of incipient recrystallization. Many biotite flakes define a crude foliation, consistent with the deformed quartz. Minor, fine-grained muscovite flakes overgrow the biotite foliae (the coarser muscovite, in contrast, appears to be primary).

Summary; Medium-grained, weakly foliated granitoid, estimated QAP mode 43-48-9, colour index 8 percent, a biotite alkali-feldspar granite.

Age; Late Archean.

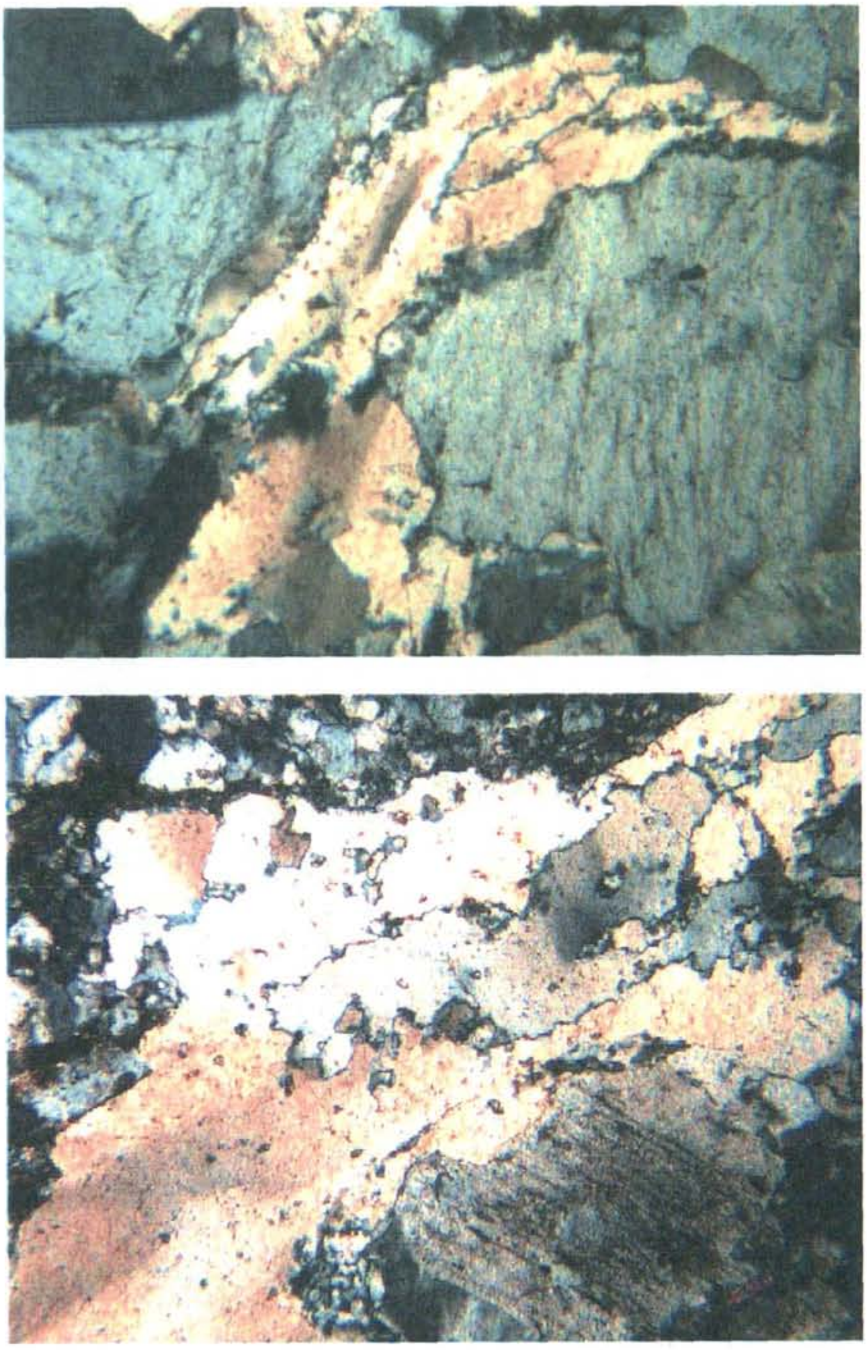


Figure 20. Sample 2540. Two views of highly strained quartz with mortar texture, adjacent to turbid K-feldspar and plagioclase. 50X, XP-TL, long-axis FOV 1.6 mm.

TURNSTONE **PETROGRAPHIC DESCRIPTION** **Status; CONFIDENTIAL**

Sample ; 2547 **Description ; 3245**
TGSL Project; 2006-01

Client/job ; Magma Metals Limited, West Perth, WA / TBN
Locality ; Current Lake area, N.W. Ontario, Canada - important new find of ultramafic boulders on E shore of lake. The original 2001 discovery site is across the lake at circa N208°E. Numerous blocks, often with traces of pyrrhotite. The most-mineralized block.

Collection details; HS, chip + offcut (2 PTS, area 7.9 [better PTS] +7.2 cm^2).

Format ; 2 PTS - 32 µm - by of T. DOG, Toronto, Ont
Hand specimen data; A massive, serpentinized sulphidic peridotite. Strongly magnetic. Rusty, somewhat pitted weathered surfaces. Abundant (2-3%) fgr (1 mm) blebs of chalc and pyrr. With 2 PTS (P1 good, P2 thin, if perhaps better polished, the bulk of the TL observations here made on the former).

Major Minerals;
* Serpentine- Masses and veinlets pseudomorphing oliv. Prominent LS veinlets, with assoc laminae of secondary mag, replacing oliv, and less-obvious scaly masses assoc with grn chl, in the matrix of the rock. 42%.
* Olivine- Relict oliv, within networks of serp veinlets. Bright 2nd and 3rd-o int colours, as small rounded relict domains in optical continuity with nearby domains. Rarely simple-twinned. 15%.
* Clinopyroxene- Bright int colours, coarse and anh, highly incl ext, max gs 2.6x1.5 mm, encloses small rounded serpentinized oliv grains. 9%.
* Plagioclase feldspar- Albite-twinned anh feld, interstitial to earlier-crystallized ferromagnesian silicates. Max gs 1.2x0.4 mm, quite fresh, moderate kaol alteration. 8%.
* Orthopyroxene- Mid-1st-o bir, str ext, pale px, max gs 1.8x1.1 mm. Biaxial +ve figure, 2V≈60°, on coarse basal section with well-developed px cleavage traces. 6%.
* Green chlorite- Bright grn sheet silicate, LS, pleo, strong body colour tends to mask bir, exact species uncertain, late in paragenesis, like the closely assoc brn mica (phlog). 6%.
* Fe-Ti oxides- Largely isot magnetite: coarse primary spinel / thin sheets of secondary mag in serp after oliv. Max gs 500x250 µm. Lesser tabular ilmenite, strongly aniso, max gs 900x170 µm (in P2). Primary mag is rounded, often embayed. 5%.

Minor and Accessory Minerals (9%);
* Phlogopite- Rich brn pleo mica flakes, up to 500 µm in dia, rims oliv, oxide and sulphide grains. 4%.

* Chalcopyrite- Yl sulphide, in rounded, equant to elongate masses, often embayed, largely monomineralic. Max gs 1700x700 µm, 1400x300 µm, 1000x450 µm. 3%.
* Brown amphibole- Pale brn pleo magmatic amph, may envelope rounded primary magnetite. 1%.
* Carbonate- Colourless carb, twinkles on rotation, extreme bir, max gs 350x300 µm. 1%.
* Pyrrhotite- Assoc with chalc, clove-coloured sulphide, max gs 230x200 µm. Tr.

Texture; A partially serpentinized peridotite. Assayed 2.96 ppm Pt, 2.31 ppm Pd, 248 ppb Au, plus 0.45% Cr_2O_3, 7250 ppm Cu, 1650 ppm Ni, 123 ppm Co, 6.58 ppm Ag, 3.92 ppm Bi, 5.39 ppm Te, 0.81% S, 23.1% MgO and 40.1% SiO_2. A curious feature of this sample is a close association of oxide and sulphide. In particular, platy oxide sections, which appear to be magnetite (not ilmenite) are often enclosed by coarse blebs of chalcopyrite. The bulk rock is highly magnetic. The polish is not ideal on this sample, and pitting across the section will tend to obscure small features: no exsolution textures could be detected, nor less-common ore minerals (cubanite, two habits of pentlandite and other phases have been noted in other samples of this suite, and the assay data for this sample suggest that some rare phases such as tellurides probably exist).

Summary; A sulphidic serpentinized peridotite with abundant Fe-Ti oxides and chalcopyrite. The estimated primary mode, ascribing the serpentine to precursor olivine, is 8-13-79 (OPX-CPX-OLIV), with angular, interstitial PLAG, thus the protolith is an **oxide-bearing feldspathic lherzolite**.

Age; Keweenawan (?).

Petrography; GCW, Turnstone Geological Services Ltd
Jul 12, 2006

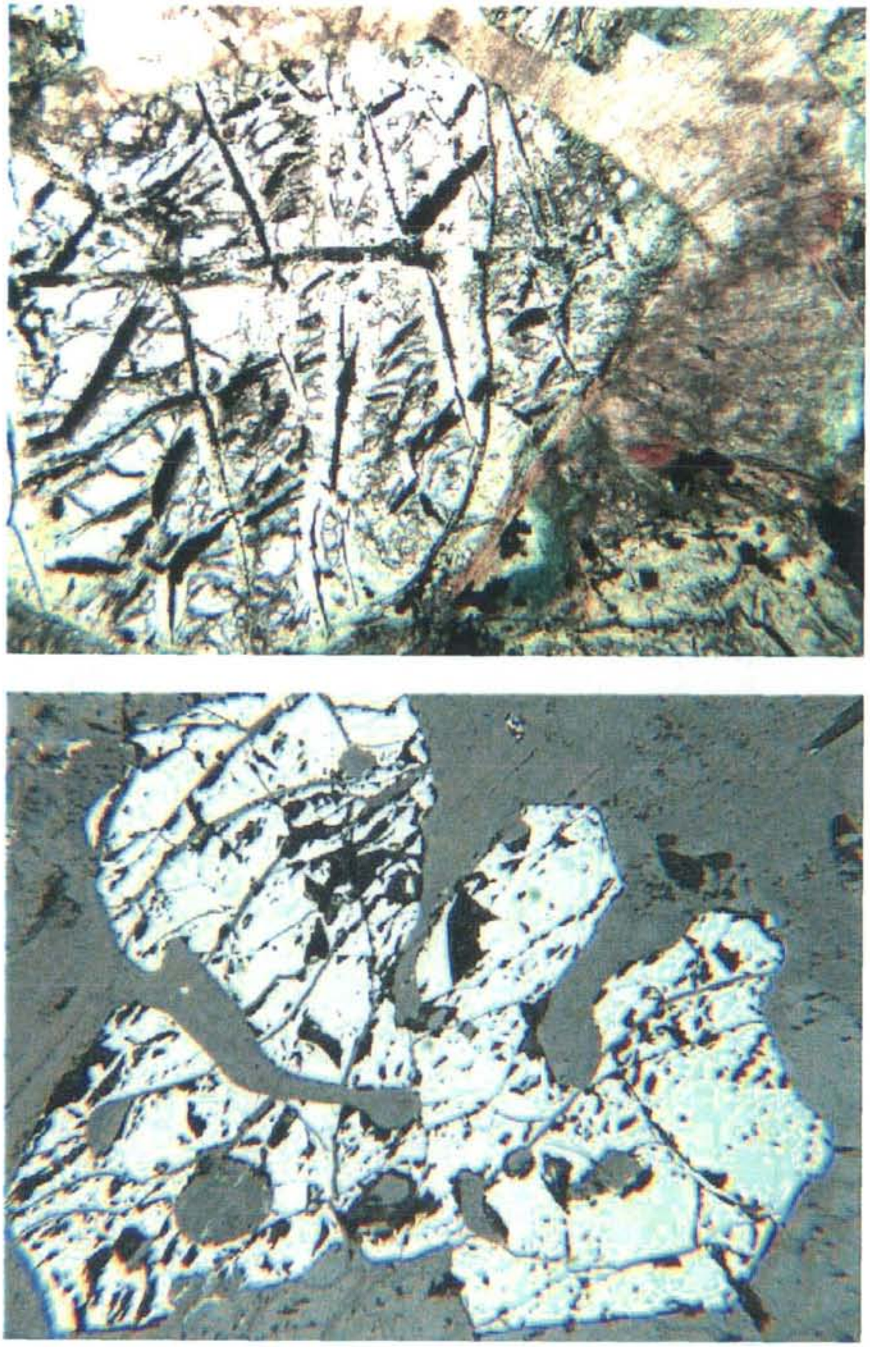


Figure 21. Sample 2547. Serpentinized, sulphidic peridotite. (a), above: olivine riven by veinlets of secondary serpentine and magnetite, surrounded by turbid feldspar and minor brown mica and green chlorite. 50X magnification, PPL-TL, long-axis FOV 1.6 mm. (b), below: embayed primary magnetite in brown amphibole (below) and phlogopite (above), 200X, PPL-RL, long-axis FOV 0.4 mm.

TURNSTONE **PETROGRAPHIC DESCRIPTION** **Status; CONFIDENTIAL**

Sample ; 2548 **Description ; 3246**
TGSL Project; 2006-01

Client/job ; Magma Metals Limited, West Perth, WA / TBN
Locality ; Current Lake area, N.W. Ontario, Canada - various boulders (granite, pegmatite, schist, Sibley and diabase). Jointed granite outcrop, mgr granite with much red K-feld. In situ.

Collection details; 2 HS + offcut (PTS, area 8.8 cm^2).

Format ; PTS - 33 µm - by U. of T. DOG, Toronto, Ont
Hand specimen data; A massive, mgr K-feld granite, gs 3-4 mm, with much red K-feld (distinctly dark hue), grey qz, white plag, plus fgr black bi and trace fgr py. Not appreciably magnetic.

Major Minerals;
* K-feldspar and alteration products- Frequently a coarse perthite (max gs circa 7.4x3.5 mm), also grains with microcline tartan twinning, max gs 3.5x3.3 mm, RI<qz, may enclose rounded qz blebs. Some sericitic alteration, localized kaol alteration on fractures. 51%.
* Quartz- Often highly strained, max gs 3.5x2.2 mm, 1.9x1.0 mm, anh and angular (except, rounded when occurring as inclusions in K-feld). There is also a trace of small, rounded patches of myrmekite in K-feld, mixtures of vermicular qz inclusions with host plag (RI<qz). The qz has complex internal structures, including mortar texture. 30%.
* Plagioclase feldspar and alteration products- Albite-twinned plag, variably altered. May display more intense kaol and ser alteration than adjacent K-feld. Max gs 2.8x2.0 mm. Some grains are kaolinized, but display coarser sericite, localized along cross-cutting fractures. 12%.
* Chlorite- Lush grn, pleo sheet silicate, max gs 2.0x0.5 mm, dark grn body colour obscures bir. 6%.

Minor and Accessory Minerals (1%);
* Biotite- Dark brn mica flakes to at least 1.2x0.9 mm, largely replaced by grn chl. 1%.
* Muscovite- Fgr colourless mica, bright bir, assoc with chl and (sericite) plag. Tr.
* Fe Ti oxides- Largely fgr, anh granules with chl, between feld grains. Rarely forms discrete grains, such as a 200x150 µm, euh, 4-sided (?) pseudomorph after pyrite, now bl-grey hematite with red internal reflections. No fresh py seen. Tr.

Texture; A K-feldspar-rich granitoid, composed in the main of coarse, variably altered feldspars plus highly strained quartz, the latter essentially monomineralic with few inclusions of other minerals. The quartz is partially recrystallized, the biotite mica largely chloritized. Some of the quartz is clearly remobilized, infilling brittle fractures in coarse, turbid K-feldspar.

Summary; Chloritized biotite granite, estimated QAP mode 32-55-13, colour index 7 percent.

Age; Late Archean.
Petrography; GCW, Turnstone Geological Services Ltd
Jul 11, 2006

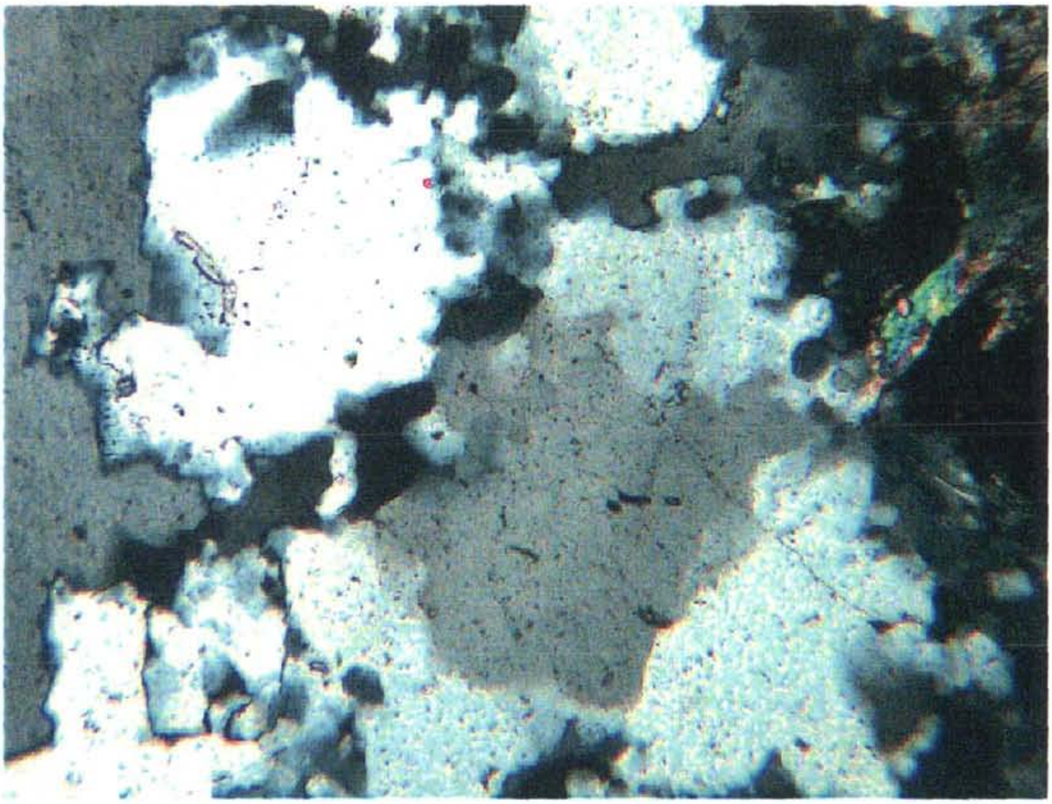


Figure 22. Sample 2548. Highly strained quartz with mortar texture, adjacent to a muscovite flake adjoining dark chlorite. 100X, XP-TL, long-axis FOV 0.8 mm.

=== NOTES ===

MEASUREMENTS OF MAGNETIC SUSCEPTIBILITY, k

Measurements by LAP and GCW at the University of Toronto
Data collected 06 July 2006, annotated 14 July 2006

TBN 842189 claim block

Reading	*Sample*	*Mass* g	*MSx10^{-5}* cgs units	*Comments on sample type*	*Normalized to* 20 grams (cgs)	*Mean* n=3/10/5	*s.d.* σ_{n-1}	*Oxides, format, other features*	*MSx10^{-5}* SI units	*Mean* n=3/10/5	*s.d.* σ_{n-1}
				Assayed samples							
1a	2546	20.7	260.0	Serpentinite composite, minimal sulphide,	251			mm-scale chip "rejects" of the	3157		
1b		16.5	220.0	chosen to be a "barren" sample	267			assay of pieces of 8 boulders	3351		
1c		12.3	143.0	but still with elevated PGE+Au	233	250	17	with only a trace of pyrr	2922	3143	215
1d		7.5	69.0		184			**Results seem less**			
1e		3.5	23.0		131			**consistent if M<10 g**			
2a	2545	17.9	200.0	Serpentinite, minor sulphide -	223			mm-scale chip "rejects" of the	2808		
2b		18.3	205.0	similar Ni to 2546, but roughly	224			assay of a sulphidic block	2815		
2c		19.5	217.0	4 times the contents of Pt, Pd and Cu	223				2797		
2d		18.2	188.0		207				2596		
2e		18.6	206.0		222				2784		
2f		17.3	190.0		220				2760		
2g		17.1	189.0		221				2778		
2h		19.6	212.0		216				2718		
2i		18.4	200.0		217				2732		
2j		18.8	206.0		219	219	5		2754	2754	64

Reading	*Sample*	*Mass g*	*MSx10^-5 cgs units*	*Comments on sample type*	*Normalized to 20 grams (cgs)*	*Mean n=3/10/5*	*s.d. σn-1*	*Oxides, format, other features*	*MSx10^-5 SI units*	*Mean n=3/10/5*	*s.d. σn-1*
3a	M4-2481	23.3	343.0	Serpentinite, high sulphide and PGE -	294			mm-scale chip "rejects" of the	3700		
3b		22.4	331.0	circa 8% sulphides (4% chalc and 4% pyrr)	296			assay of a rich boulder	3714		
3c		20.6	295.0	plus 2% oxides (mag+ilm). Highly enriched	286				3599		
3d		22.8	336.0	in Pt-Pd, Au, Ni-Cu, Bi-Te	295				3704		
3e		21.2	320.0	Roughly 20X the PGE content of 2546	302	295	6		3794	3702	69
				Petrographic samples - offcuts				*Below: offcuts*			
5	2548	17.4	1.6	Chloritized biotite granite	2			Trace oxide (hem)	23		
6	2530	12.3	3.2	Muscovite-biotite leucogranite	5			Trace oxide (hem)	65		
7	2540	11.8	1.6	Biotite K-feldspar granite	3			Trace oxide (rut)	34		
9	2538	14.4	4.9	Grey "schist" - a foliated biotite granite (?) dyke	7			Minimal oxide, trace sulphides	86		
				Miscellaneous ultramafic blocks							
11	CL306	13.6	135.0	Sulphidic serpentinized peridotite	199			Mag+ilm 2+2% / Pyrr+chalc+pent 2+1+1%	2495		
12	2534	24.8	195.0	Serpentinite, almost barren of sulphides	157			3% ilm+mag, traces of sulphides	1976		
16	CL307	20.7	170.0	Sulphidic serpentinized peridotite	164			Mag+ilm 1+1% / Pyrr+chalc+pent2+1+1%	2064		
13	2547	19.3	230.0	Sulphidic serpentinized peridotite	238			5% oxides (say 4% mag, 1% ilm), 3% chalc, trace pyrr	2995		
								Below: cm-scale chips of broken rock ...			
17	M4-2481	16.0	135.0	Sulphidic serpentinized peridotite	169			Rough chip, 8% sulphide, 2% oxide - see above	2121		
19	M2-2479	10.1	110.0	Sulphidic serpentinized peridotite	218			Rough chip, 4+3% pyrr+chalc, trace pent, 1% mag	2737		

The first 3 samples were in the form of mm-scale chips of crushed rock ("assay rejects"), and 5-10 aliquots of each were measured to test for reproducibility. The tests of the first sample suggest that a minimum sample size of 10 g suits the geometry of the test equipment. Powders in a uniform volume (circa 10 cm^3) are an ideal standardized sample format. If powders are not available, the use of a standard sample size (such as an offcut, rather than a rough rock chip) aids the comparison of samples. Irregular chips will be only crudely comparable. Use of a modern portable unit on consistent flat sample or outcrop surfaces, or drill-core samples, should work well. **Note that the serpentinized peridotites have k values circa two orders of magnitude greater than granitoid rocks, and that magnetite content will be the principal factor influencing variation in k between serpentinites.**

The key ore minerals are magnetite and ilmenite, chalcopyrite and pyrrhotite, plus minor pentlandite and other sulphides

GLOSSARY OF ABBREVIATIONS USED IN PETROGRAPHIC DESCRIPTIONS

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Glossary begun June 1984, Version of 20 July 2006.

The following are often obvious, but for the record all regular abbreviations are given below, with some additional notes on procedures. This system has been evolved for detailed, standardised descriptions (Turnstone numbered descriptions, #401 onwards). Summaries of all descriptions (circa 3,000) are stored in the **PETSUM** database, and complete descriptions (#976 on) are created in the related **PETDAT**. Textural and summary sections are written `in full', but shorthand forms are generally retained for detailed information on each mineral. These descriptions are the central feature of many of the 380-plus extant Turnstone reports. An earlier (1986), Spanish -annotated edition of this glossary is available: two relevant works in Spanish are: Anon (1981), Williams *et al.* (1968). Plutonic rock nomenclature generally follows the modal classification of Streckeisen (1976), summarized in Hyndman (1972, pp.31-41). See also Le Maitre *et al.* (1989) and Sharma (1992).

Colour

bl	blue
brn	brown
grn	green
or	orange
yl	yellow

General

anh	anhedral
assoc	associated
balsam	mounting medium: balsam or glue of similar RI.
DDH	diamond drill hole (drill core samples). Sizes: X-Ray (19.0 mm, 0.75"), A (27.0 mm, 1.06"), B (36.5 mm, 1.44"), N (47.6 mm, 1.87"), and H9 (63.5 mm, 2.50") / HQ (63.0 mm, 2.48").
dia	diameter
EDS	energy-dispersive spectrometry (of EPM)
eff in HCl	effervescence in (cold) dilute (10%) hydrochloric acid
EPM	electron microprobe analysis
esp	especially
euh	euhedral
HS	hand specimen
magnetism	magnetic samples, rich in ore minerals such as mag and magnetic pyrr, identified in HS descriptions. High concentrations of these phases yield an extremely magnetic sample, in which an offcut slice (say 45x25x5 mm) of the rock can be lifted with a small magnet.
max/min	maximum/minimum
mesh size	examples of ASTM mesh sizes; 8 (2.36 mm), 10 (2.0 mm), 18 (1.0 mm), 20 (850 μm), 35 (500 μm), 60 (250 μm), 80 (180 μm), 200 (75 μm) and 400 (38 μm).
PIXE	Proton-induced x-ray emission (proton microprobe)

PGE	Platinum Group Elements (Os, Ir, Ru, Rh, Pt and Pd)
PGM	Platinum Group Minerals (major proportions of one or more PGE)
rel	relatively (or `relief', discontinued)
staining	K-feld staining involves the HF-sodium cobaltinitrate test (Sclar and Fahey, 1972) leaving a bright yellow stain on the feldspar. For carbonate staining a variety of methods can distinguish, e.g., calcite, dolomite, ankerite and magnesite, the most important carbonates to identify when outlining gold-related alteration assemblages. See Friedman (1959), Wolf *et al.* (1967) and Hutchison (1974).
symm	symmetric(ally)
tr	trace
WDS	wavelength-dispersive spectrometry (of EPM)

Grainsize

dia	diameter
gs	grain size - NB: section orientation influences apparent size of tabular and acicular minerals (e.g., micas and tourmalines respectively).
...fgr	fine-grained
...mgr	medium-grained
...(v)cgr	(very) coarse-grained
mm	1 mm=0.03937 inch
µm	1 micron=0.001 mm

Minerals (74 species and groups of minerals: see also Fleischer and Mandarino, 1991)

ab	albite	
act	actinolite	
amph	amphibole	
an	anorthite	
and	andradite	- Ca-Fe garnet, in context
anth	anthophyllite	
ap	apatite	
asp	arsenopyrite	
aug	augite	
bi	biotite	
cal	calcite	
carb	carbonate	
chalc	chalcopyrite	
chl	chlorite	
chr	chromite	
clzo	clinozoisite	
cord	cordierite	
cpx	clinopyroxene	
ctoid	chloritoid	
cumm	cummingtonite	
di	diopside	- Mg-Ca cpx
dol	dolomite	
en	enstatite	
epi	epidote	
fa	fayalite	- Fe oliv
fo	forsterite	- Mg oliv
foid	feldspathoid	- sodalite, nepheline, etc

fstilp	ferrostilpnomelane		
gal	galena		
gar	garnet	-	common end-members include pyrope, almandine, spessartine, uvarovite, grossularite and andradite
go	goethite		
gro	grossularite	-	Al-Ca garnet
grp	graphite		
hb	hornblende		
hed	hedenbergite	-	Fe-Ca cpx
hem	hematite		
hyp	hypersthene		
ilm	ilmenite		
joh	johannsenite	-	Mn cpx
kaol	kaolinite		
K-feld	alkali feldspars	-	Kfeld: orthoclase, microcline, perthite, sanidine
ky	kyanite		
lim	limonite		
ma	marialite	-	sodic scapolite ($\delta=0.009$)
mag	magnetite		
marc	marcasite		
me	meionite	-	calcic scapolite ($\delta=0.036$)
moly	molybdenite		
musc	muscovite		
neph	nepheline		
of	orthoferrosilite	-	pyroxene Fe-rich endmember
oliv	olivine		
opx	orthopyroxene		
pent	pentlandite		
phlog	phlogopite		
plag	plagioclase feldspar		
px	pyroxene		
py	pyrite		
pyrr	pyrrhotite		
qz	quartz		
rieb	riebeckite		
rut	rutile		
ser	sericite		
serp	serpentine		
sill	sillimanite		
sphal	sphalerite		
sphen	sphene	-	more properly, titanite
staur	staurolite		
stilp	stilpnomelane		
tour	tourmaline	-	common varieties are schorl, dravite and elbaite
ves	vesuvianite	-	alias idocrase
woll	wollastonite	-	(may be abbreviated to `Wo', e.g., $En_{75}Of_{10}Wo_{15}$)
zir	zircon		
zo	zoisite		

Miscellaneous

C-A	Carlsbad-Albite twinning in plagioclase
QAM	Quartz- Ankerite- Mariposite rock (distinctive green alteration assemblage, as in the Mother Lode: also known as `listwanite')
QAP	Quartz - Alkali-feldspar - Plagioclase estimated modes in a rock, normalized to 100% (see Streckeisen, 1976).
QFP	Quartz-Feldspar-Porphyry

Mode

A rough visual estimate. Accessory phases <1% are annotated `Tr.' (trace): subdivisions are `Abundant tr.' and `Rare tr.'. An attempt is made to counteract the common tendency to overestimate the frequency of the dark phases. Minerals are described in order of decreasing modal abundance.

Optical Properties

aniso	anisotropic/anisotropy
bir	birefringence - relative retardation is often written in shorthand, e.g., 1st-o yl = first-order yellow. The maximum birefringence is estimated from the thickness (calculated from colours of dependable minerals, such as quartz) and the highest colours seen in the section.
birl	bireflectance
ext	extinction. May be `str' (straight, parallel to length) or `clean', meaning that the whole grain goes dark at once, c.f. strained quartz.
int	interference
LF/LS	orientation: length fast/slow
MEA	Maximum Extinction Angle (degrees) in the Michel-Levy test of plagioclase composition. Where possible, at least six suitable grains are used. MEA is also used for other minerals. For intermediate -calcic plagioclase, note that the M-L test often gives results which are rather more sodic than the the actual composition, as determined by either the Carslbad-Albite (C-A) test or by EPM (seldom noted, but see Finn, 1981). If both are available, a C-A number is generally preferred to a M-L value. In the case of albite and oligoclase below An_{20}, unless a perfectly oriented section is found, the estimate may be too calcic. This is unlikely to be a major obstacle in interpretation, although in one case plag estimated at An_8 (M-L test) and An_5 (C-A test) was found by EPM to be An_1, nearly pure albite.
PH	polishing hardness: see Uytenbogaardt and Burke (1971, pp.17-21)
Pleo	pleochroism
PPL	plane polarized light
refl	reflectance
RI	refractive index
RL	reflected light
`RL'	obliquely-incident light, sometimes employed on CTS
ST	sensitive tint plate (orientation and optic sign work)
TL	transmitted light
XP	cross-polarized light: usually with exact alignments of polarizer and analyser. In RL one is often offset (rotated) a few degrees in order to emphasise anisotropy / bireflectance. Some properties (pleochroism and relief), are described relative to the orientation of the polarizer (the `vibration plane of the lower nicol' is equivalent to the polarizer).

Ore Microscopy
For optical properties in reflected light see Craig and Vaughan (1981) or Spry and Gedlinske (1987), which each contain descriptions of about 100 opaque minerals. Properties such as scratch and polishing hardness, bireflectance and reflection pleochroism are also briefly discussed (Craig and Vaughan, 1981, pp.36-43). Descriptions of ore minerals are also listed in Uytenbogaardt and Burke (1971), Ineson (1989) and the classic work of Ramdohr (1980).

Photomicrographs and Figures

Colour	Photomicrographs are made by either (a) using daylight- balanced colour film and a blue filter, or (b)using film balanced for tungsten lighting, without a blue filter. Photos taken in RL may thus have bluish-grey backgrounds (method (a)) or brownish backgrounds (method (b), mostly in early descriptions). Intermediate colour renditions can also be achieved with daylight film, and no blue filter. Slide film is used for maximum flexibility and quality control: 2-3 (or more) slides are taken per subject due to high rejection rates.
FOV	Field of view in mm (long axis of photo): the primary scale indicator, as magnification (for a given FOV) is dependent on equipment used. FOV is approximate: prints often show only 95% of so of the FOV on the original slide. Quoted FOV may sometimes be reduced from that of the original by extra enlargement and/or cropping of the print.

Sample Format

CTS	covered thin section, nominal thickness 30 µm.
(D)PTS(C)	(doubly-) polished thin section (C=> circular, in 25 mm diameter form for microprobe work: some rectangular PTS are also microprobe-compatible). Used in reflected light study. For high -current ion beam analyses, such glass-backed mounts have been prepared with a thickness of about 500 µm or more: `ThPTS(C)', now generally supplanted by the PRS methods noted below.
PM	polished mount, for reflected light microscopy, also microprobe-compatible unless qualified. Generally circular, ≈10 mm thick.
PRS	polished rock slice, often an offcut of PTS preparation (see below).
Thickness	of CTS and PTS, gauged by interference colour of quartz or other phases. Excludes the slide margins, which commonly taper somewhat.

Sections (including the glass backing slide) are ≈1 mm thick: normal CTS and PTS are 46x27 mm in plan. Large sections (75x50 mm) are especially useful for structural geology, often with oriented samples. In the case of PM (`ore mounts') it is probably better to prepare smaller mounts than the older samples commonly found in teaching and museum collections. While some of these (e.g., 30 mm wide and 18 mm deep) may fit into electron microscope sample chambers, maximum compatibility with microprobe systems is achieved with circular mounts 25 mm wide and (say) 10 mm thick. Modern PM are mostly 25 mm in diameter, but larger (40 mm) PM may be useful for examining large volumes of mill products. Most of the volume is usually the epoxy mounting medium: the sample can be a few sub-mm grains, mm-scale flakes or drill chips, or a rock slice up to 25 mm wide and a few mm thick.

Special Formats include grain mounts, which typically contain 20 or more mineral grains or metal shards. These may be used especially for EPM/PIXE of diamond indicator minerals such as garnets (the PM format can also be used here). A novel mount is a polished offcut (PRS), ideally the complement of a PTS, used in Accelerator Mass Spectrometry for ultra-trace element analysis (e.g., detection levels of parts per billion for gold and PGE). In this technique, `minicores' 4 mm in diameter are often drilled from a number of PRS, and mounted in sets of 12 in a 25-mm aluminium mount, suitable for a full range of in-situ microanalytical techniques (EPM, PIXE, AMS, etc).

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SGS

Certificate of Analysis

Work Order: 089080

To: Graham C. Wilson
P.O.Box 1000
47 Pellissier St. South
CAMPBELLFORD
ONTARIO K0L 1L0

Date: Jun 29, 2006

P.O. No. :	
Project No. :	DEFAULT
No. Of Samples	4
Date Submitted	May 25, 2006
Report Comprises	Pages 1 to 11 (Inclusive of Cover Sheet)

Distribution of unused material:

4 Rocks

Comments:

The detection limit for Cs was increased to 5 ppm due to the inconsistency of its concentration levels in the reagents used.

Certified By : ______________________

Stuart Lam
Operations Manager

ISO 9002 REGISTERED
ISO 17025 Accredited for Specific Tests. SCC No. 456

Report Footer:

L.N.R. = Listed not received
n.a. = Not applicable
I.S. = Insufficient Sample
-- = No result
*INF = Composition of this sample makes detection impossible by this method
M after a result denotes ppb to ppm conversion, % denotes ppm to % conversion
Methods marked with an asterisk (e.g. *NAA08V) were subcontracted

Subject to SGS General Terms and Conditions

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Final : 089080 Order:

Element	Au	Au	Pt	Pd	Pt	Pd	Rh	Ru	Ir	Os
Method	FAA313	FAI313	FAI313	FAI313	FAM363	FAM363	FAM363	FAM363	FAM363	FAM363
Det.Lim.	5	1	10	1	1	1	1	1	0.5	3
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
2546	26	N.A.	N.A.	N.A.	177	168	7	3	11.2	<3
2545	72	N.A.	N.A.	N.A.	668	645	13	4	18.9	<3
2547	N.A.	248	2960	2310	>1000	>1000	12	4	18.3	5
M4	N.A.	211	3050	2720	>1000	>1000	29	6	37.8	14
*Dup 2546	26	N.A.	N.A.	N.A.	164	159	6	2	10.7	<3

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Final : 089080 Order:

Element	SiO2	Al2O3	CaO	MgO	Na2O	K2O	Fe2O3	MnO	TiO2	P2O5
Method	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V
Det.Lim.	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.01
Units	%	%	%	%	%	%	%	%	%	%
2546	42.8	6.32	5.54	21.4	1.22	0.48	14.3	0.19	1.52	0.20
2545	42.5	6.71	5.81	20.4	1.29	0.54	14.5	0.19	1.60	0.18
2547	40.1	5.58	5.20	23.1	0.91	0.32	15.5	0.19	1.36	0.17
M4	39.0	5.51	5.19	21.7	1.02	0.42	16.7	0.19	1.39	0.16
*Dup 2546	42.9	6.35	5.51	21.4	1.21	0.50	14.3	0.19	1.52	0.20

SGS

Final : 089080 Order:

Element	Cr2O3	Rb	Sr	Y	Zr	Nb	Ba	LOI	Sum	Y
Method	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	XRF76V	IMS95R
Det.Lim.	0.01	2	2	2	2	5	20	0.01	0.01	0.5
Units	%	PPM	PPM	PPM	PPM	PPM	PPM	%	%	PPM
2546	0.41	17	383	13	249	13	220	4.65	99.2	14.8
2545	0.35	19	461	10	232	13	210	4.40	98.6	13.1
2547	0.45	15	360	12	208	7	180	5.50	98.5	11.6
M4	0.54	23	388	9	203	10	190	5.05	96.9	11.3
*Dup 2546	0.42	16	380	13	247	12	210	4.60	99.3	14.4

SGS

Element	Ce	Dy	Er	Eu	Gd	Ho	La	Lu	Nd	Pr
Method	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R
Det.Lim.	0.1	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.1	0.05
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
2546	52.1	3.15	1.39	1.76	5.38	0.56	21.6	0.15	30.9	7.10
2545	47.9	2.93	1.22	1.72	4.88	0.49	20.7	0.15	28.4	6.71
2547	41.4	2.67	1.10	1.41	4.26	0.45	17.4	0.12	24.6	5.63
M4	41.6	2.46	1.13	1.41	4.05	0.43	17.4	0.12	24.2	5.64
*Dup 2546	52.4	3.20	1.34	1.67	5.25	0.50	22.2	0.14	30.6	7.34

SGS

Element	Sm	Tb	Th	Tm	Yb	Al	Ba	Ca	Cr	Cu
Method	IMS95R	IMS95R	IMS95R	IMS95R	IMS95R	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B
Det.Lim.	0.1	0.05	0.1	0.05	0.1	0.01	5	0.01	1	0.5
Units	PPM	PPM	PPM	PPM	PPM	%	PPM	%	PPM	PPM
2546	5.9	0.69	1.6	0.18	1.0	3.54	212	3.77	2020	424
2545	5.5	0.65	1.5	0.16	1.0	3.64	188	3.87	1670	1580
2547	4.8	0.51	1.2	0.16	0.9	2.93	181	3.25	2030	7250
M4	4.5	0.52	1.2	0.13	0.9	2.98	180	3.42	2600	9450
*Dup 2546	5.8	0.69	1.7	0.16	1.1	3.55	205	3.83	2000	459

SGS

Final : 089080 Order:

Element	Fe	K	Li	Mg	Mn	Na	Ni	P	S	Sr
Method	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B
Det.Lim.	0.01	0.01	1	0.01	5	0.01	0.5	50	0.01	0.5
Units	%	%	PPM	%	PPM	%	PPM	PPM	%	PPM
2546	9.47	0.43	18	12.7	1450	1.02	996	840	0.35	377
2545	9.31	0.46	19	11.8	1380	1.04	980	730	0.29	426
2547	9.66	0.27	13	13.2	2300	0.76	1650	550	0.81	328
M4	10.5	0.37	8	12.4	1350	0.86	2680	490	1.76	360
*Dup 2546	9.35	0.43	18	12.5	1450	1.02	955	800	0.34	369

SGS

Final : 089080 Order:

Element	Ti	V	Zn	Zr	Ag	As	Be	Bi	Cd	Ce
Method	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B
Det.Lim.	0.01	1	1	0.5	0.02	1	0.1	0.04	0.02	0.05
Units	%	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
2546	0.88	190	99	136	0.43	18	1.2	0.24	0.20	47.7
2545	0.91	187	97	109	1.40	<1	1.0	0.70	0.43	40.2
2547	0.78	161	96	102	6.58	<1	0.8	3.92	1.67	34.1
M4	0.77	170	101	98.3	7.22	5	1.0	3.81	1.68	36.0
*Dup 2546	0.88	183	96	126	0.47	16	1.0	0.23	0.23	44.2

SGS

Final : 089080 Order:

Element	Co	Cs	Ga	Ge	Hf	In	La	Lu	Mo	Nb
Method	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B
Det.Lim.	0.1	5	0.1	0.1	0.02	0.02	0.1	0.01	0.05	0.1
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
2546	113	<5	12.1	0.5	3.50	0.05	20.6	0.17	0.99	16.8
2545	106	<5	11.8	0.3	2.88	0.06	17.4	0.19	0.75	16.5
2547	123	<5	9.6	0.2	2.72	0.10	14.9	0.14	1.04	13.9
M4	156	<5	10.3	0.2	2.57	0.11	15.8	0.15	0.72	13.6
*Dup 2546	109	<5	11.8	0.2	3.28	0.05	18.9	0.17	0.84	16.2

SGS

Final : 089080 Order:

Element	Pb	Rb	Sb	Sc	Se	Sn	Ta	Tb	Te	Th
Method	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B
Det.Lim.	0.5	0.2	0.05	0.1	2	0.3	0.05	0.05	0.05	0.2
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
2546	5.8	14.1	0.08	22.0	<2	1.2	1.40	0.69	0.50	1.9
2545	8.5	15.2	0.07	20.8	<2	1.3	1.38	0.60	1.18	1.5
2547	26.9	9.1	0.34	18.2	2	2.1	1.16	0.52	5.39	1.3
M4	26.8	14.0	0.07	18.4	7	2.2	1.13	0.53	4.00	1.4
*Dup 2546	6.6	13.7	0.12	20.3	<2	1.1	1.35	0.66	0.41	1.7

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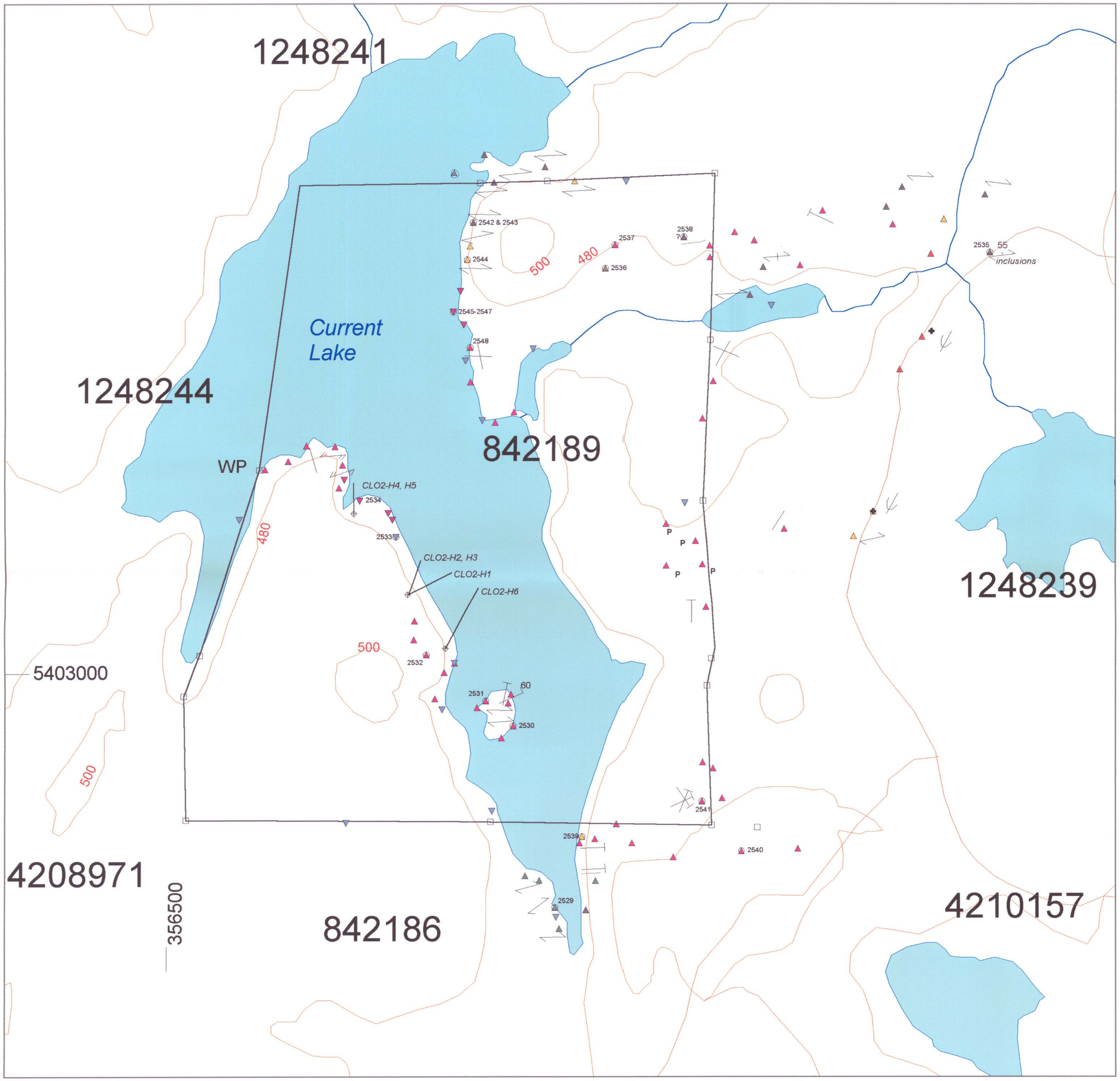
Final : 089080 Order:

Element	Tl	U	W	Y	Yb
Method	ICM40B	ICM40B	ICM40B	ICM40B	ICM40B
Det.Lim.	0.02	0.1	0.1	0.1	0.1
Units	PPM	PPM	PPM	PPM	PPM
2546	0.16	0.5	0.4	14.4	1.0
2545	0.31	0.4	0.2	12.6	0.9
2547	0.29	0.4	0.5	10.3	0.8
M4	0.11	0.4	0.2	11.2	0.8
*Dup 2546	0.15	0.5	0.4	14.0	1.0

SGS Canada Inc. | Mineral Services 1885 Leslie Street Toronto ON M3B 2M3 t(416) 445-5755 f(416) 445-4152 www.sgs.ca



LEGEND

Lithology

- Ultramafic float, some of which is mineralized
- Unit G--pink to light red granite
- Unit Gm--massive pink granite
- Unit Gf--foliated pink granite with pegmatitic segregations
- Unit Gs--white granite with sedimentary inclusions
- Unit Gd--granodiorite
- Unit Sg--grey, foliated metasediment
- Miscellaneous float--diabase, granite, sedimentary rocks
- Glacial striae in rocks

Structure

- Foliation-dip unknown
- Foliation-vertical
- Foliation-inclined
- Gneissosity or segregations
- Joint-dip unknown
- Joint-vertical
- Joint-inclined
- P Pegmatite
- Glacial striae
- Assumed geological contact
- 2532 Sample location and number

Topography

- Lake
- River
- 500 Contour line (m)
- Claim post
- Outline of claim of interest
- Diamond drill hole
- Logging road

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N
Astronomical

2.32750
[redacted]

FIELD GEOLOGY AND PETROGRAPHY
CLAIM BLOCK 842189
"THUNDER BAY NORTH" PROJECT
GREENWICH LAKE AREA (SW)
THUNDER BAY MINING DIVISION, NW ONTARIO

GEOLOGY BY GRAHAM C. WILSON, PHD, P. GEO.

Universal Transverse Mercator Projection NAD83, Zone 16
Topographical base: Land Information Ontario

0 50 100 200 metres
Scale 1:5000

Drafted by M.I. Garland, PhD, P. Geo.