ONTARIO CANADA

Explore the Opportunities!

RECOMMENDATIONS for Exploration 2009-2010

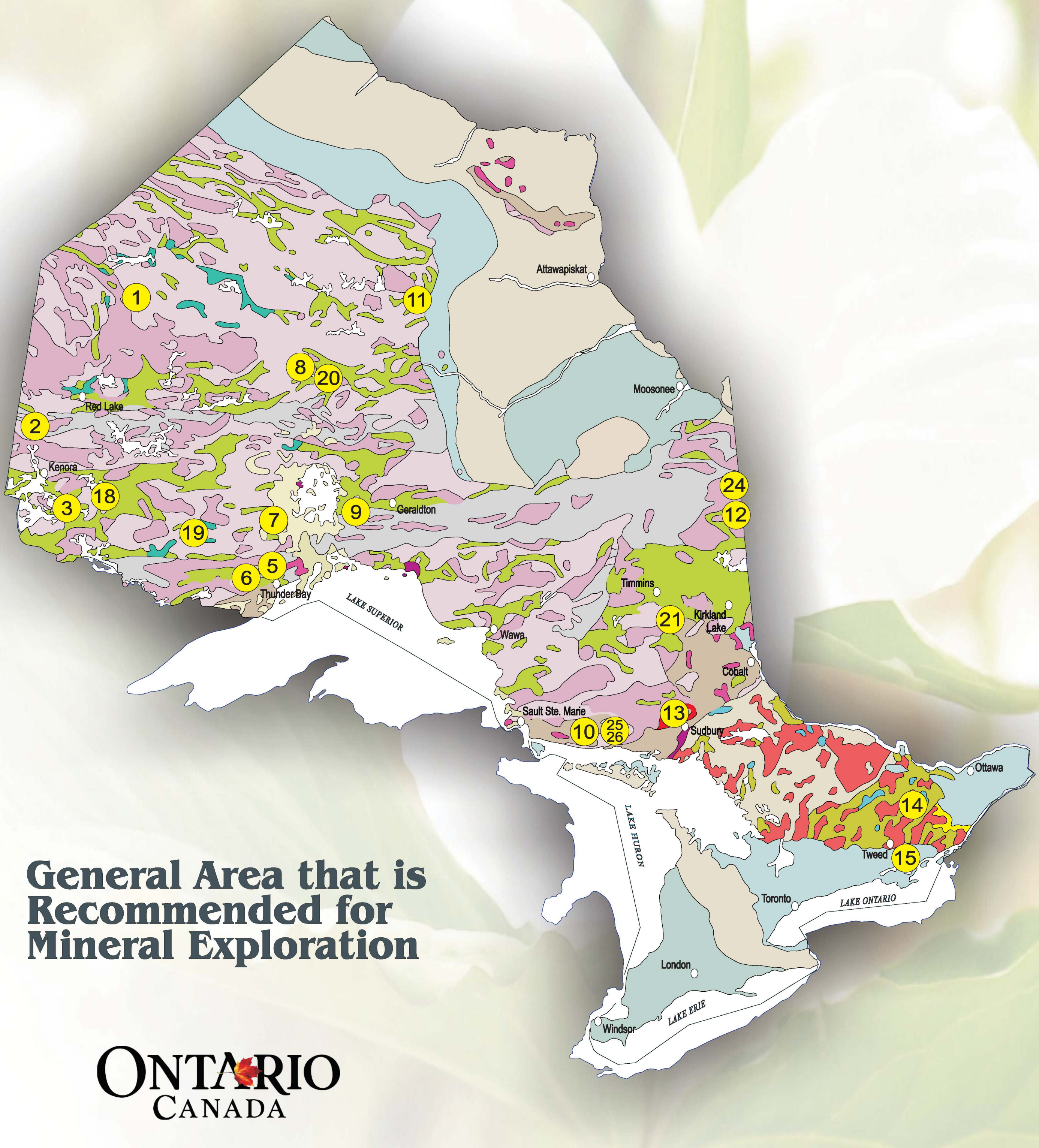
Long term growth can only come from new discoveries;
new discoveries can only come from early stage exploration...

Ontario

Ontario Geological Survey Resident Geologist Program
Ministry of Northern Development, Mines and Forestry

Recommendations for Exploration

2009-2010



General Area that is Recommended for Mineral Exploration

ONTARIO
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Photo courtesy of Karen Labonte

The Ontario Resident Geologist Program

The role of the Ontario Geological Survey's Resident Geologist Program is to monitor, stimulate and facilitate mineral exploration and support the sustainable development and stewardship of Ontario's mineral resources. The program is provincial in scope, forms the primary client service component of the Ontario Geological Survey and operates with a staff complement of 41 through a network of 9 field offices strategically located across the province. Six Regional Resident Geologists, supported by 10 District Geologists, 8 District Support Geologists, 2 Mineral Deposit Compilation Geologists and 3 GIS/Data Specialists provide a variety of services to mineral industry clients as well as functions internal to government that support the mineral resource sector. The Program's Land Use Policy and Planning Co-ordinator and 3 Regional Land Use Geologists provide input into land use planning issues in support of the mineral exploration industry. A First Nations Minerals Information officer, based in Thunder Bay, provides education, information, advice and expertise regarding geology, mineral exploration and mining to First Nation Communities throughout Ontario generally, and northern Ontario particularly.

Program services and functions are grouped into the following 7 key areas:

- **Provide expert geological consultation and advisory services to promote and stimulate mineral exploration and support the development and stewardship of Ontario's mineral resources in an environmentally responsible manner**
- **Generate and transfer new geoscientific data and ideas**
- **Maintain and provide public access to geoscience databases/other resource materials**
- **Monitor and report on mineral exploration and development activity**
- **Provide input into land use planning issues and initiatives to support the stewardship of Ontario's mineral resources**
- **Foster relationships amongst government, the mineral sector and Aboriginal communities**
- **Participate in marketing forums to promote Ontario's mineral endowment and attract mineral resource investment to the province**

The Resident Geologist Program also provides support to MNDMF's Mining Lands Section front-counter client services.

The Senior Manager for the Resident Geologist Program is Jim Ireland, who is resident in Sudbury.

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For additional information on the Resident Geologist Program and the Ontario Geological Survey please log on to:
http://www.mndm.gov.on.ca/mines/ogs/resgeol/default_e.asp

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HIGHLIGHTS

- **21 newly catalogued lode gold occurrences associated with the Bear Head fault zone**
- **intrusion-hosted Au and polymetallic veins associated with sanukitoid-type pluton**
- **magmatic (chromite) layering in thick komatiitic succession hosts Ni-Cu occurrences**
- **new massive sulphide occurrence discovered by OGS mapping**

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Enhanced Precious and Base Metal Potential of the North Spirit Lake Greenstone Belt

A recent multi-disciplinary study of the North Spirit Lake greenstone belt (geological and airborne geophysical surveys; geochronology; mineral occurrence compilation) conducted by the OGS under the **Far North Geological Mapping Initiative**, has greatly increased our understanding of the geological history of the belt, revealed hitherto unrecorded precious and base metal occurrences, and has enhanced our understanding of previously known mineralization and alteration.

Twenty-one new mineral occurrences were catalogued by Puumala (2007), the majority of them shear zone-hosted polymetallic and lode gold type, typically located in close proximity to deformation zones (most commonly northwest-striking) that are interpreted to be genetically related to late-tectonic activity along the Bear Head fault zone.

Several Cu-Au and polymetallic occurrences are clustered around the margins of, and the immediate supracrustal rocks adjacent to, the **Bijou Point intrusion** on the south shore of North Spirit Lake. The intrusion-hosted occurrences, and occurrences found in the supracrustal rocks immediately adjacent to the intrusion typically consist of narrow arsenopyrite and/or chalcopyrite-rich (sometimes massive) veins that commonly return significant gold values (up to 2.38 opt Au (Bateman 1938)). A polymetallic occurrence hosted within supracrustal rocks farther from the intrusive contact consists of mineralized shears or quartz veins containing pyrite, pyrrhotite, chalcopyrite, and galena (Préfontaine and Williams 2007).

An occurrence of **Cu-Ni mineralization** near Makataiamik Lake (0.95% Cu, 0.08% Ni from an OGS grab sample; Madsen Occurrence - MDI53C07NW00021) is found in a conglomerate of the Makataiamik assemblage (Thurston, Osmani and Stone 1991). The mineralization at this location occurs in ultramafic clasts that are likely to have been derived from an older intrusion or metavolcanic rock (Prefontaine et al. 2007), that may be related to the underlying Wapisipi assemblage. The **Peridotite Bay nickel occurrence** (0.14% Ni, 0.28% Cr; MDI53C10SW00004) has been documented in ultramafic rocks of the Wapisipi assemblage. The central part of the assemblage contains the largest volume of komatiitic rocks in the North Spirit Lake greenstone belt. Houlé et al. (2008) interpret the subvolcanic-volcanic architecture of the komatiitic succession, with the presence of magmatic (chromitite) layering, and a potential sulphur source in interbedded iron formation, to provide a suitable environment for magmatic sulphide mineralization.

Large areas of interpreted VMS-related alteration occur in the anticline of the Hewitt assemblage which roughly correlates with the volcanic edifice (Buse et al. 2007). Alteration comprises veins and patches of garnet-amphibole, increasing in intensity to andalusite-cordierite, and anthophyllite-cordierite-garnet. A new occurrence of massive sulphides was found in the Shrimp Lake pluton (Buse et al. 2007). It consists of pyrrhotite-pyrite-chalcopyrite grading >800 ppm Cu and 349 ppm Ni. The **massive sulphide zone** is approximately 10 by 10 m in size and is surrounded by altered host rock with disseminated pyrrhotite-pyrite-chalcopyrite mineralization.

Enhanced Precious and Base Metal Potential of the North Spirit Lake Greenstone Belt …cont'd

Algoma-type iron formation (Crown Trust – MDI53C07NW00025) has been documented in the Peridotite Bay area in the eastern portion of North Spirit Lake greenstone belt. This deposit is associated with rocks of the circa 2896 Ma Wapisipi assemblage (Buse et al. 2007). Sixty percent (60%) of the Wapisipi assemblage situated west of Nemakwis Lake is underlain by iron formation. This resource has never been well delineated, but historical work estimated 1.3M long tons per vertical foot of 33.94% Fe (Wood 1977).

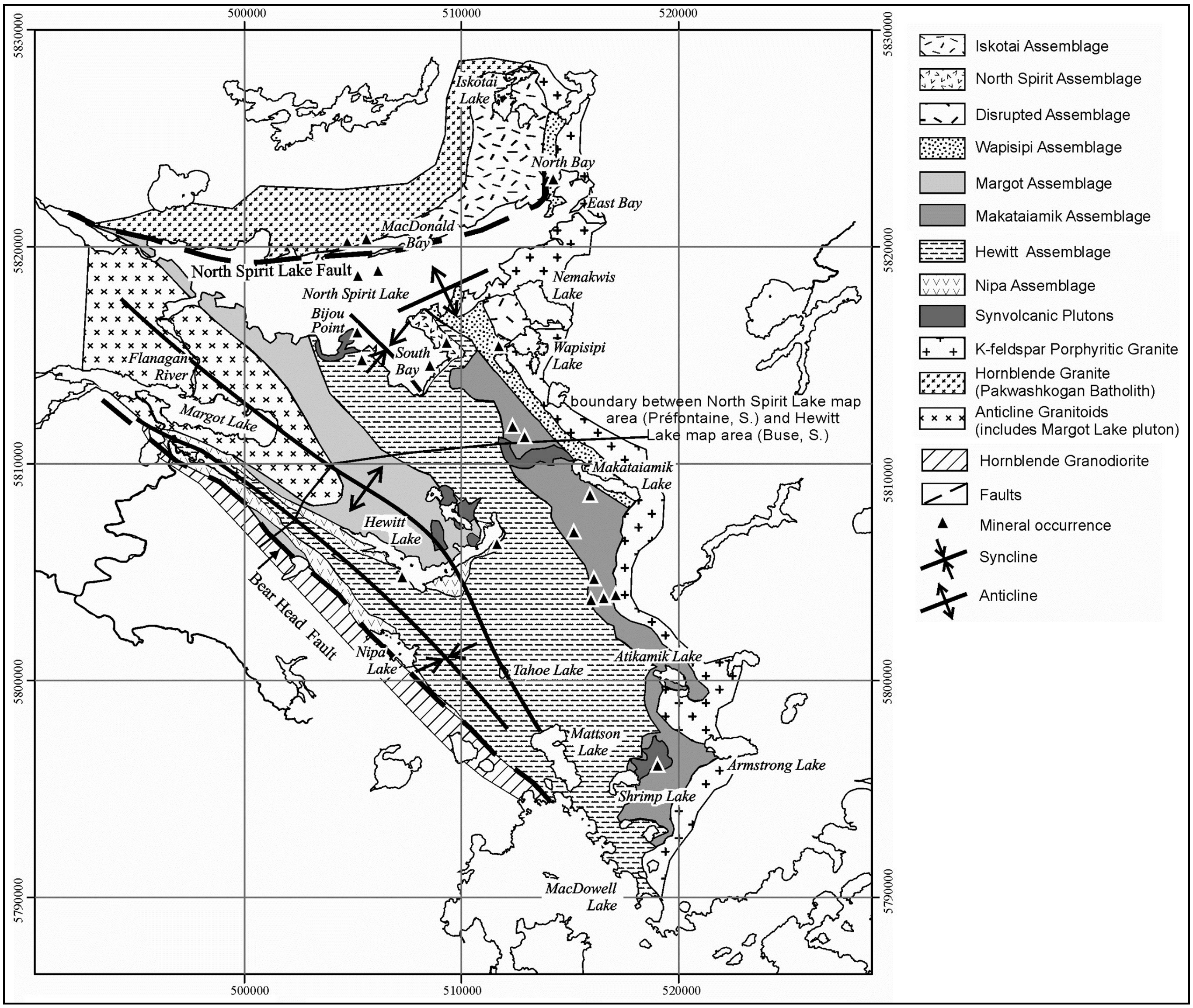

Figure 1: North Spirit Lake greenstone Belt (from Préfontaine and Williams 2007).

Enhanced Precious and Base Metal Potential of the North Spirit Lake Greenstone Belt …cont'd

Bateman, J. D. 1938. Geology of the North Spirit Lake Area; Ontario Dept. Mines, Vol. 47, p.44-78.

Buse, S., Moss, T., Smar, L. and Henderson, A. 2007. Geology of the Hewitt Lake and Mattson Lake Areas, Northwestern Ontario: New Insights into the Structure, Metamorphism and Mineralization of the North Spirit Lake Greenstone Belt; *in* Summary of Field Work and Other Activities 2007, Ontario Geological Survey, Open File Report 6213, p.35-1 to 35-8.

Houlé, M.G., Gibson, H.L. and Préfontaine, S. 2008. Komatiitic Rocks in the North Spirit Lake Greenstone Belt, Northwestern Ontario; *in* Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, p.43-1 to 43-9.

Préfontaine, S. and Williams, M. 2007. Geology of the North Spirit Lake Area located in North Spirit Lake Greenstone Belt, Northwestern Ontario.; *in* Summary of Field Work and Other Activities 2007, Ontario Geological Survey, Open File Report 6213, p.36-1 to 36-10.

Puumala, M. A., 2007. Mineral Occurrences of the Central and Eastern Uchi Domain and the orth Spirit Lake Greenstone Belt; *in* Summary of Field Work and Other Activities 2007, Ontario Geological Survey, Open File Report 6213, p.41-1 to 41-14.

Thurston, P.C., Osmani, I.A. and Stone, D. 1991. Northwestern Superior Province: review and terrane analysis; *in* Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 1, p.81-142.

Wood, J. 1977. Geology of the North Spirit Lake Area, District of Kenora (Patricia Portion); Ontario Division of Mines, Geoscience Report 150, 60p.

HIGHLIGHTS

- **potential for orthomagmatic ore association mineralization in the English River Subprovince**
- **MDI records indicate 37 Cu-Ni-Co-PGM occurrences are located in the Rex-Werner lake area**
- **mafic intrusions in other parts of the English River Subprovince could contain similar mineralized zones**

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Copper-Nickel-Cobalt-Chromium-Platinum Group Element Potential in English River Subprovince

Copper-nickel-cobalt-chromium-platinum group element mineralization is located in the Werner–Rex lakes area. The following is summarized from Parker's (1998) evaluation of the mineral potential of the area. Mineralization is hosted in numerous mafic intrusive pods associated with the extensive Werner–Rex fault system. The ultramafic to mafic rocks, that are host to mineralization, were part of a syntectonic stratiform intrusion that was deformed after emplacement. The present pods of mafic intrusive rocks are tectonic fragments of these stratiform intrusive body/bodies.

Mineralization is associated with 3 deposit-model types:

1. magmatic mineral deposits: disseminated and remobilized Ni-Cu sulphide, Cr and PGE mineralization (Norpax and Gordon Lake deposits)
2. cobalt-copper skarnoid mineral deposits (Werner Lake cobalt deposit)
3. remobilized sulphide mineralization in migmatite, pegmatite and gneissic mineral deposits (Rex–Lower Fortune occurrences)

Historical (non-NI43-101 compliant) estimated mineral resources include

1. Norpax deposit: 1 million tonnes grading 1.2% Ni and 0.5% Cu (Parker 1998);
2. Gordon Lake deposit: 170 420 tonnes grading 0.85% Ni and 0.25% Cu (Parker 1998);
3. Werner Lake cobalt deposit: 232 316 tonnes grading 0.36% Co and 0.28% Cu (Harper, 2008).

There are approximately 37 Cu-Ni-Co-Cr-PGE mineral showings in the Werner–Rex lakes area. Additional mafic intrusive bodies may be present as tectonic fragments within the under-explored Werner–Rex fault system. Ultramafic to mafic bodies distributed throughout the English River Subprovince are associated with metasedimentary assemblages and can be aligned with large regional fault systems. These intrusive bodies should be examined for similar mineralized environments to the Werner–Rex lakes area.

Harper, H. 2008. Independent technical report on the Werner Lake Mineral Belt Properties; unpublished report, Puget Ventures Inc., 42p.

Parker, J.R. 1998. Geology of nickel-copper-chromite deposits and cobalt-copper deposits at Werner–Rex–Bug lakes, English River Subprovince, northwestern Ontario; Ontario Geological Survey, Open File Report 5975, 178p.

HIGHLIGHTS

- **mafic intrusions can host gold**
- **strain zones and hydrothermally altered rocks, internal to the mafic intrusion body, can be gold potential areas**

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Gold Mineralization within Mafic Intrusions

The Angel Hill Gold Zone (AHGZ) is hosted by a large gabbroic intrusion that is one of the extensive Kakagi Lake Sills. Exploration efforts by Houston Lake Mining Inc. have been successful in identifying gold mineralization that is unique for a mafic intrusive body.

The AHGZ is defined by "a zone of intense shearing and alteration. The gold zone lies at the contact between ultramafic rocks and the gabbroic rocks of one of the Kakagi Lake Sills. The zone varies in width from 7m to 20m" (Houston Lake Mining Inc., press release, March 24 2004). The strike length of the zone is presently 225 m. High grade gold mineralization is associated with silicified pods or lenses. Recent sampling of the larger pods has returned up to 115 g/t Au (Houston Lake Mining Inc., news release, December 15, 2004).

The alteration has "mainly affected the upper portions of the ultramafic rocks in the footwall and also impinges on the hanging wall gabbro. Alteration consists of ubiquitous carbonatization accompanied by serpentinization, chloritization, fuchsitization and silicification" (Houston Lake Mining Inc., news release, March 24, 2004). Surface expression of the gold zone is evident by the extensive carbonate alteration. Mafic intrusive rocks adjacent to this zone have low evidence of alteration and contain low gold tenor. The unaltered wallrock has elevated magnetite content while the altered portions are devoid of magnetite.

The lithological contact of a mafic intrusion is historically the area examined for gold mineralization. The mineralizing event at the AHGZ is confined to a tabular zone at the boundary between mineralogical phases within the gabbro sill. Quartz veins and hydrothermal alteration localized along mineralogical boundaries between differentiated phases within the interior parts of mafic intrusions should be examined for gold mineralization.

HIGHLIGHTS

- **MDI records indicate >210 rare-element occurrence in the Superior Province**
- **rare-element bearing pegmatites are located in a variety of rock types and geological settings**
- **recognition of parental granites can be critical in the examination of rare-element potential of an area**

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Rare-Element Pegmatite Potential of Superior Province

The Superior Province contains at least 201 rare-element mineral occurrences that are hosted by the following: metavolcanics rocks (52%), clastic metasedimentary rocks (23%), peraluminous granite plutons (20%) and tonalite-granodiorite rocks (5%) (Breaks, Selway and Tindle, 2005).

Breaks, Selway and Tindle (2003) have proposed there is a linkage between peraluminous, S-type, fertile parent granites and rare-element pegmatites. Recognition of peraluminous granites is critical in the exploration for rare-element pegmatites. Rare-element (Li, Cs, Rb, Be, Ta, Nb, Ga, Tl and Ge) pegmatites derived from a fertile, parent granite pluton are typically distributed over an area of 10 to 20 km^2 within 10 km of the fertile granite. Breaks, Selway and Tindle (2003) provide summaries of the geochemistry, mineralogy and texture characteristics of rock types associated with rare-element pegmatites.

Breaks, Selway and Tindle (2005) have grouped rare-element occurrences in the Superior Province, as illustrated in Figure 2, based on rock type and pegmatite classification. The following is a summary of the geological setting of rare-element occurrences in the Superior Province:

- Peraluminous, S-type and pegmatite granites are typically situated along the boundaries of high-grade (amphibolite-granulite facies), metasedimentary-dominant subprovince boundaries such as the English River, Quetico and Opatica subprovinces.
- Fertile S-type granites situated in medium-grade (greenschist-amphibolite facies) parts of the subprovince, such as the Dryden and Separation Rapids pegmatite fields, are not located adjacent to high-grade metamorphism rocks.
- Rare-element pegmatites and potential parental granites can be confined to major regional faults such as the Pakeagama Lake pegmatite in the Sachigo subprovince.
- Lithium-bearing rare-element pegmatites, such as the Raleigh Lake lithium occurrences, are located within greenstone belts and are not related to high-grade metamorphic rocks or major fault systems.

The diversity of geological settings which are known to host rare-element bearing pegmatite indicates there is high-potential for additional mineralized zones in various areas of the Superior Province. Unexplored areas situated adjacent to the known rare-element occurrences are prime locations to identify additional pegmatite. The trend related to the geological setting of known rare-element occurrence should also be examined; there could be unidentified areas of peraluminous, S-type, fertile parent granites and rare-element pegmatite.

Rare-Element Pegmatite Potential of Superior Province …cont'd

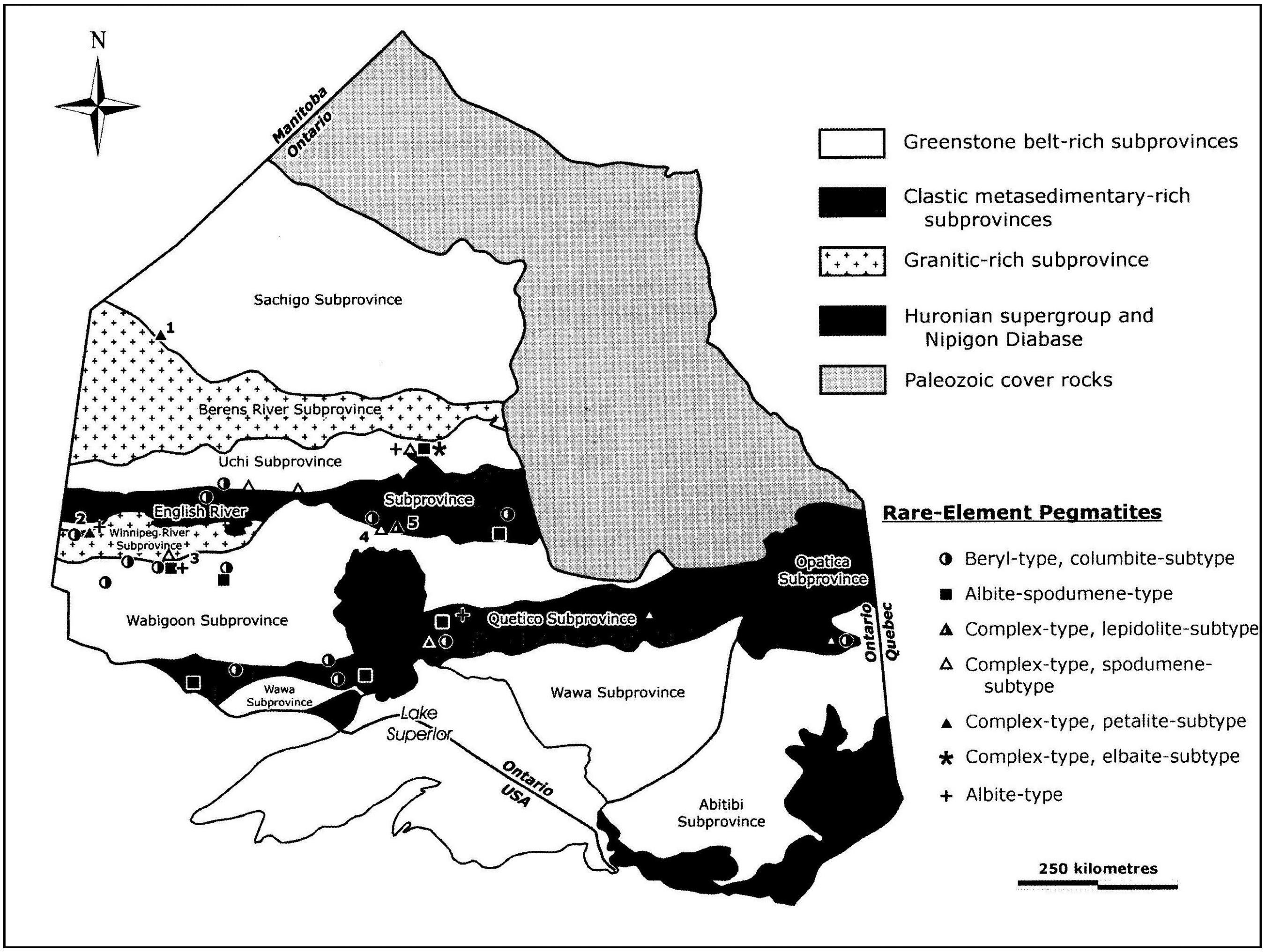

Figure 2: Rare-element pegmatite groups and fields in the Superior Province of Ontario. Localities: 1. Pakeagama Lake pegmatite group, 2. Separation Rapids pegmatite group, 3. Dryden pegmatite field, 4. North and South Aubry pegmatites, 5. Swole Lake pegmatite.

Breaks, F.W., Selway, J.B. and Tindle, A.G. 2003. Fertile peraluminous granites and related rare-element pegmatite mineralization, Superior Province, northwest and northeast Ontario: Operation Treasure Hunt; Ontario Geological Survey, Open File Report 6099, 179p.

Breaks, F.W., Selway, J.B. and Tindle, A.G. 2005. Fertile peraluminous granites and related rare-element pegmatites, Superior Province of Ontario, in Linnen, R.L., and Samson, I.M., eds., Rare-Element Geochemistry and Mineral Deposits, Geological Association of Canada, GAC Short Course Notes 17, p. 87-125.

HIGHLIGHTS

- **similar rock types that host Cu-Ni mineralization of the past producing INCO Shebandowan Mine occur in Conmee Township**
- **assessment file research of historical drill holes indicate a peridotite intrusion ~0.5 km northeast of Marble Lake**
- **preliminary field evaluation of an airborne magnetic anomaly represents an ultramafic intrusion ~1.4 km north of Bateman Lake**

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Ni-Cu-PGE Potential in Conmee Township - Eastern Shebandowan Belt

In the Shebandowan area, Cu-Ni mineralization at the past producing INCO Shebandowan Mine is associated with synvolcanic sepentinized peridotite and gabbro sills. Several peridotite intrusions indicated by high magnetic responses (OGS, 2003) occur within the Shebandowan greenstone belt. In particular, two peridotite intrusions in Conmee Township merit further exploration:

- Acorn Asbestos Occurrence (MDI52A05NE00007) occurs ~0.5 km northeast of Marble Lake on crown land and is open for staking. In May 1969, Acorn Mining Syndicate drilled two holes and reported peridotite in both holes. Drill hole #2 intersected over 300 feet of peridotite with small sections of serpentine on slips, dunite and pyrrhotite. Bajc (1999) reports strong Ni anomalies in till occurring to the north and southwest of the drill holes. No other exploration is known in the vicinity of the Acorn occurrence, other than exploration to the northwest by Winslow Gold Corp (1995) and International Nickel Company of Canada Ltd (1966) indicating sub-economic base metal results.

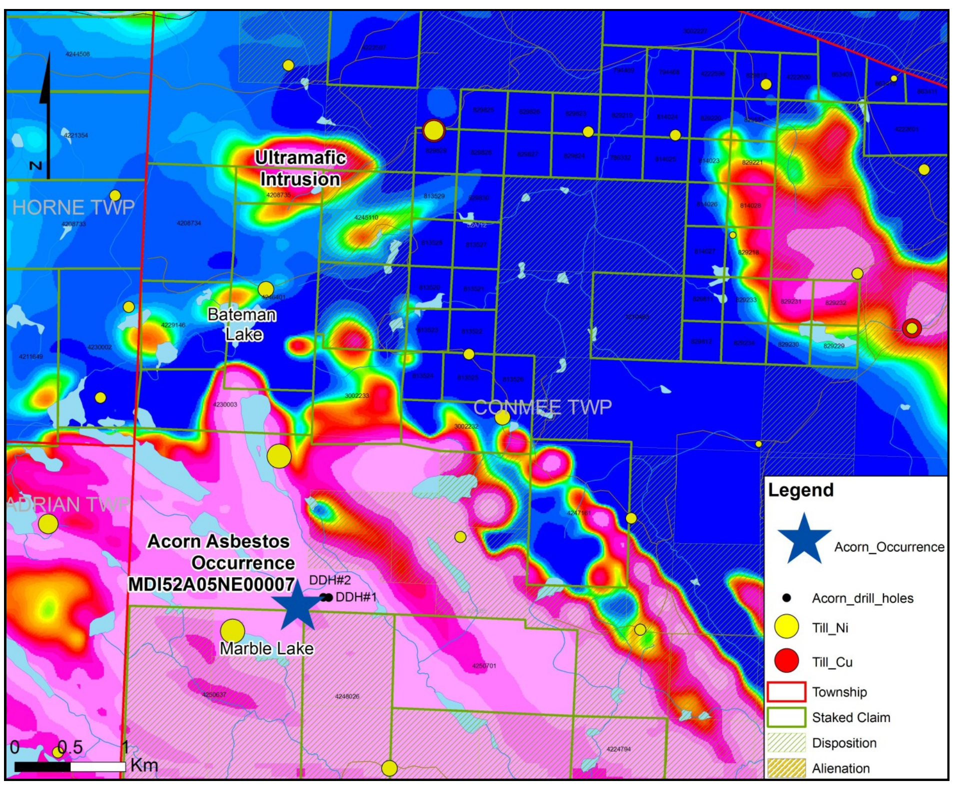

Figure 3: Conmee Township - OGS airborne magnetic survey (1999)

Ni-Cu-PGE Potential in Conmee Township - Eastern Shebandowan Belt …cont'd

- Preliminary field examination of an oval-shaped airborne magnetic feature ~1.4 km north northeast of Bateman Lake indicates the magnetic anomaly represents a peridotite intrusion. A series of airborne electromagnetic anomalies (OGS, 1991) occur on the north flank of the magnetic anomaly and Bajc (1999) indicates both Ni and Cu till geochemical anomalies occur to the northeast of the intrusion. Little exploration has been carried out in the vicinity of this peridotite; however, in 2008, Linear Metals mapped altered mafic and ultramafic intrusives and komatitic flows to the south, with grab samples retuning up to 1.3% Ni, 0.2% Cu, 0.03%Co, 0.65g/t Au+PGE.

Acorn Mining Syndicate, 1969. Assessment report [AFRI 52A05NE0008, AFRO# 63.2811]

Bajc, A.F., 1999. results of Regional Humus and Till Sampling in the Eastern Part of the Shebandowan Greenstone Belt, Northwestern Ontario; Ontario Geological Survey, Open File Report (OFR 5993, 92p).

Linear Metals Corporation, 2008. Assessment report [AFRO# 2.3969]

Ontario Geological Survey 1991. Airborne electromagnetic and total intensity magnetic survey, Shebandowan Area; Ontario Geological Survey, Map 81590.

Ontario Geological Survey 2003. Ontario Airborne Geophysical Surveys, Magnetic and Electromagnetic Data, Shebandowan area; Ontario Geological Survey, Geophysical Data Set 1021b.

Iron Prospects near Thunder Bay - Jean Township, Matawin Iron Range and Kaministikwia River

HIGHLIGHTS

- **there are known deposits of iron in the Thunder Bay South District that need to be re-evaluated in light of the world wide growing demand for iron**

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With the increased attention being paid to iron deposits in the region by mineral exploration companies from Asia and elsewhere, a re-evaluation of existing deposits and prospects is recommended. Iron deposits in the Kenora and Thunder Bay South Districts, are currently being evaluated; none of the following referred to resources are NI 43-101 compliant and should be considered historical resources.

In the Kenora District, the Bending Lake Iron project is currently being evaluated by the Bending Lake Iron Group. The Bending Lake Iron Deposit is located north of Atikokan, 280 km northwest of Thunder Bay and is easily accessible by Highway 622 and by well maintained logging roads.

Bending Lake Iron Group is evaluating and bringing the resource to current NI43-101 standards. In 1977, Steep Rock Mines Ltd released a historical resource of 249 Mt of 28.19% Fe. Bending Lake Iron Group plans to produce Merchant Pig Iron using a process technology, available from Kobe Steel, known as ***Ironmaking Technology Mark Three*** (ITmk3®) to produce a high quality iron nugget product that contains essentially pure iron and carbon.

In the Thunder Bay District, the Mount Edna Prospect recently acquired by Canada Iron Inc., located in Jean Township and north of Whitefish Lake, hosts a historic estimated resource of 270 M tons averaging 26.29% Fe (Shklanka, 1968). The deposit consists of Superior-type oxide facies iron formation containing both hematite and magnetite. The deposit is within the Gunflint Iron Formation and is equivalent to the Biwabik Formation in Minnesota, host to the legendary iron mines of Minnesota. The property is situated about 70 km southwest of the City of Thunder Bay. Similar prospects exist along strike to the southwest of Mount Edna and should be evaluated.

Other prospects in the Thunder Bay District that deserve to be re-evaluated include the deposits of the Matawin Iron Range and those in the Kaministikwia River area.

The Matawin Iron Range Prospect is located in the northern sector of Duckworth Township, central Laurie Township and in the west central portion of Horne Township. Geological work on the prospect dates back to the early 1900's. In 1968, the property was owned by Monpre Mining Co. Ltd. (Shklanka, 1968). The iron formation is hosted by Timiskaming-type metasedimentary rocks, and consists of easterly trending faulted segments of magnetite with minor hematite in a slatey metasedimentary rock. Widths have been estimated up to 900 feet. The economic features as reported by Shklanka (1968) include historical resource estimated at 120 M tons grading 29.56% Fe.

The main prospect in the Kaministikwia River area is the one owned by the Inland Steel Company. The prospect, known as the Kaministikwia Prospect, is located in the northeast corner of Conmee Township and in the southwest corner of Ware Township, south of the vicinity where Highway 102 crosses the Kaministikwia River. The deposit consists of magnetite-hematite-jasper iron formation hosted by

Iron Prospects near Thunder Bay - Jean Township, Matawin Iron Range and Kaministikwia River …cont'd

Archean volcanic rocks. Shklanka (1968) reports estimated historical resource of 190 M tons in three zones. Inland Steel Company conducted a magnetometer survey coupled with 16 diamond drill holes for 9431 feet in 1957 to 1958.

Shklanka, Roman , 1968 Iron Deposits of Ontario. Ontario Department of Mines Mineral Resources Circular 11; 489 pages

HIGHLIGHTS

- **the extension of the Beardmore-Geraldton greenstone belt in the Highway 527 corridor west of Lake Nipigon should be explored for gold**
- **gold mineralization associated with iron formation assayed as high as 2.59 oz/t Au**

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Gold Potential - Southwest Extension of the Beardmore-Geraldton Greenstone Belt

With the continued high mineral exploration activities in the Beardmore – Geraldton area, prospectors and mineral exploration companies who are looking for gold should not ignore the southwestern extension of the Beardmore – Geraldton greenstone belt in the Highway 527 corridor west of Lake Nipigon. The area has been explored for VMS base metals, Cu-Ni-PGM, as well as Mo and Au.

Geological mapping of the area by government geologists has been an ongoing effort commencing with Swanson (1923) and culminating with Hart et. al. (2001a, b). In between, workers such as Jollife (1933), Milne (1964), Pye (1968), and Kaye (1969) mapped various sectors of the area between Garden Lake and Eaglehead Lake. All of this work, together with a regional magnetometer survey by the GSC, positively suggested that the Beardmore-Geraldton belt extends into the Highway 527 area.

Mineral exploration companies started to show an interest in the area in the late 1950's and searched for Cu-Ni-PGM and for Au; this resulted in the discovery of the Lac des Iles deposit. Many VMS base metal targets as well as gold occurrences were explored. Lavigne and Scott (1995) detail some of the major exploration work that was being conducted to 1995. Highlights include the discovery of gold mineralization that assayed as high as 16.7 g/ton Au associated with iron formation near Geddes Lake by Canamax; re-sampling by G. Lafleche of some older trenches, located ~ 600 m south of the Rinker Lake-Jolly Lake Narrows, yielded assays of up to 2.189 oz/t Au (Thunder Bay Assessment Files). This occurrence was again re-sampled by D. Christianson in 1995 resulting in several assays better than 1 oz/t Au with the best assay being 2.59 oz/t Au (Thunder Bay Assessment Files). The property is currently owned by R. Heitapakka and A. Siltamaki, two Thunder Bay prospectors.

Based on this, the area has excellent potential for further discoveries of gold and should not be neglected.

Hart, T. R., MacDonald, C.A.K. and Lepine, C.D. 2001a. Precambrian Geology, Heaven Lake Greenstone Belt, Northwestern Ontario; Ontario Geological Survey, Preliminary Map P 3434, scale: 1:20K

Hart, T. R., MacDonald, C.A.K. and Lepine, C.D. 2001b. Precambrian Geology, Lac des Iles Greenstone Belt, Northwestern Ontario; Ontario Geological Survey, Preliminary Map P 3435, scale: 1:20K

Joliffe, F. 1933. Block Creek Map Area, Thunder Bay District, Ontario; Canada Department of Mines, Geological Survey Summary Report 1933, Part D, p 7-15.

Kaye, L. 1969. Geology of the Eayrs-Starnes Lakes Area, District of Thunder Bay, Ontario Department of Mines Geological Report 77, 29 p.

Lavigne, M. and Scott, J 1995. Thunder Bay District Report of Activities 1995, Ontario Geological Survey Open File Report 5943, p 138-164.

Gold Potential - Southwest Extension of the Beardmore-Geraldton Greenstone Belt …cont'd

Milne, V. G. 1964. Geology of the Garden Lake Area, District of Thunder Bay; Ontario Department of Mines Geological Report 25, 21 pages.

Pye, E. G. 1968. Geology of the Lac des Iles Area, District of Thunder Bay; Ontario Department of Mines Geological Report 64, 47p.

Swanson, W. L. 1923. Geology of certain base and meridian lines west of Lake Nipigon; Ontario Department of Mines, Annual Report V32, Pt 3, p8-22

HIGHLIGHTS

- **the majority of the shear zone-hosted lode gold in the central and eastern Uchi domain have a close spatial association with major northwest- or northeast-striking deformation zones**
- **gold occurrences are hosted by quartz veins; altered and sheared porphyries and associated supracrustal rocks; or sulphidized banded iron formation**
- **much of the gold-prospective ground remains unstaked or inactive**

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Gold Exploration Targets in the Central and Eastern Uchi Domain

The Archean Uchi Domain (formerly Uchi Subprovince) extends for over 625 km in northwestern Ontario. It hosts the active Red Lake gold camp and the past-producing mines at Pickle Lake that have collectively produced more than 25 million ounces of gold. Greenstone belts in the Red Lake, Pickle Lake and Fort Hope areas are situated in the western, central and eastern portions of the Uchi Domain, respectively. The latter two are the subject of the following recommendations for exploration.

A compilation of mineral occurrences and a synopsis of mineralization styles in the Uchi Domain were recently completed by Puumala (2009) in the Ontario Geological Survey (OGS) Open File Report 6228, *Mineral Occurrences of the Central and Eastern Uchi Domain*. Gold occurrences (yellow diamonds) and major structures are shown in Figure 4. Puumala (2009) stated that:

> *"The majority of the shear zone-hosted lode gold and polymetallic deposits in the central and eastern Uchi domain have a close spatial association with major northwest- or northeast-striking deformation zones. Although the major structures may play a significant role in mineralization, it should be noted that the most significant deposits (e.g., past-producing Central Patricia, Golden Patricia and Pickle Crow mines) are typically hosted within splay structures that are oblique to the major deformation zones. Therefore, it is recommended that prospecting efforts along the major deformation zones focus on the identification of crosscutting structures and lithologic contacts. Prospective lithologic contacts include those where significant competency contrasts occur and/or where the mineralogy of a rock type(s)is favourable for the precipitation of gold (e.g., oxide-facies banded iron formation)."*

The **Pickle Lake area** has hosted several past-producing mines (Pickle Crow, Central Patricia, Dona Lake, Golden Patricia) which collectively produced over three million ounces of gold. In the Pickle Lake and neighbouring Meen-Dempster and Lang Lake greenstone belts, quartz vein- and banded iron formation-hosted gold deposits are located in separate strain domains, related in part to the intrusion of local felsic plutonic rocks. Several discoveries made in 2008 and 2009 by PC Gold Inc. on the Pickle Crow property underscore the relatively unexplored nature of these belts, even in the vicinity of past-producing mines. The Conduit Zone consists of a thick package of highly deformed stockwork and breccia-style veins with distinctive alteration halos. It is a north-northwest trending, shallowly plunging, pipe-shaped body which had not been intersected by any historical drilling. It returned values such as 3.17 g/t Au over 35.6 m. Gold was also recently discovered in Temiskaming-like sedimentary rocks and rocks ascribed to the Confederation Assemblage. Ultramafic metavolcanic rocks were also recognized at Pickle Crow for the first time.

The Fort Hope area and its gold occurrences compare favourably in structural and tectonic setting, not only to the other Uchi gold camps, but also to the Beardmore-Geraldton belt to the south. Gold mineralization is associated with deformation zones and regional transcurrent faults at or near domain boundaries. Local gold occurrences have been documented in OGS Open File Report 5926, *Mineral Occurrences and Prospects in the Fort Hope-Winisk River Area* (Mason and White 1995). Gold occurrences are hosted by quartz veins; altered and sheared porphyries and associated supracrustal rocks; or sulphidized banded iron formation. Much of the gold-prospective ground remains unstaked or inactive.

Gold Exploration Targets in the Central and Eastern Uchi Domain …cont'd

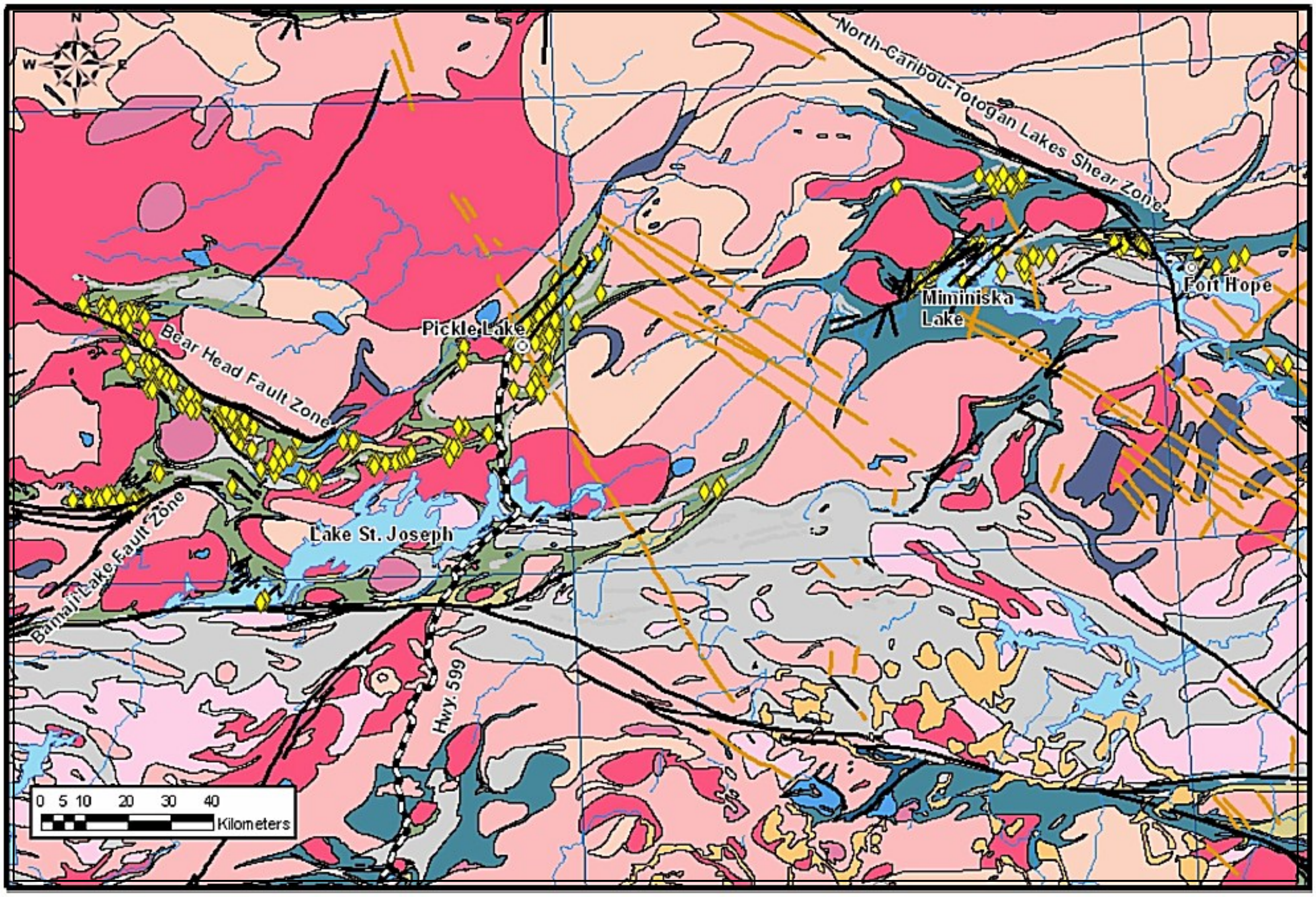

Figure 4: Gold occurrences and major structures of the Central and Eastern Uchi Domain.

Mason, J.K. and White, G.D. 1995. Mineral Occurrences and Prospects in the Fort Hope-Winisk Area; Ontario Geological Survey, Open File Report 5926, 225p.

Puumala, M.A. 2009. Mineral Occurrences of the Central and Eastern Uchi Domain; Ontario Geological Survey, Open File Report 6228, 294p.

HIGHLIGHTS

- **a cluster of first order lake sediment Cr – Ni anomalies are co-incident with magnetic highs in the Kinago Lake – Parks Lake area**
- **the northern portion of the Quetico – Wabigoon Subprovince boundary is known to host mafic to ultramafic intrusive bodies**

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Magmatic Cu-Ni-PGE Mineralization, Southeast Lake Nipigon Area

In April 2009, the Ontario Geological Survey released lake sediment geochemical survey data for a 4400 km' area southeast of Lake Nipigon, situated between the communities of Beardmore and Nipigon. Much of this region lies within the northern portion of the Quetico Subprovince, which is dominated by metasedimentary gneiss and felsic to mafic intrusive rocks. Until recently, these granitic subprovinces were considered highly unfavorable for potential gold and base metal mineralization. The Tashota-Geraldton metasedimentary-metavolcanic belt occupies the southern portion of the Wabigoon Subprovince and has undergone extensive exploration since the 1930's. Exploration companies have continued to discover new gold and base metal occurrences across the belt, in particular during the last 3-year surge in activity. However, south of the metavolcanic boundary within the Quetico Subprovince, exploration activity has been rare to non-existent.

The northern boundary of the Quetico Subprovince is known to host mafic intrusive rocks with magmatic Cu-Ni mineralization, both in the Atikokan-Mine Centre area and east of Longlac. In the 2009 Nipigon - Beardmore Lake Sediment Geochemical Survey report, Dyer (2009) indicates "…a very broad multi-site anomalous area with respect to chromium and nickel" exists in the Kinago Lake to Parks Lake area, south of Vincent and McComber townships. Numerous 'first order' anomalies (>68 ppm Cr and >60 ppm Ni) occur along a southeast trend for approximately 30 km from the southern portion of McComber Township. Some co-incident, lesser order copper and cobalt anomalies were also noted within this anomalous corridor. As further evidence for the existence of mafic to ultramafic intrusive rocks, Dyer (2009) describes satellite imagery which shows a circular feature in the Masinabik Lake area.

A close examination of the 1962 airborne magnetic maps (Ontario Department of Mines – Geological Survey of Canada 1962a,b) covering the anomalous corridor, indicates two parallel, roughly south-trending, magnetic high features, which are interpreted as Keweenawan diabase on the 1965 Tashota-Geraldton Geological Compilation map (Map 2102). Potentially mineralized zones within these interpreted diabase dikes, may account for some of the anomalous lake sediment signatures and are legitimate exploration targets for Cu-Ni-PGE. Specifically, the area along the western shore of Masinabik Lake and north through Beartrap Lake should be prospected in detail. In addition, although no anomalies are shown on the 1962 airborne map in the Parks Lake – Leopard Lake area, the strength and concentration of the Cr-Ni anomalies from the 2009 survey cannot be ignored.

The Kinago Lake – Parks Lake area can be accessed via the Leopard Lake road south from Highway 11, approximately 10 km east of Jellicoe. Detailed prospecting combined with modern day airborne and/or ground magnetic – electromagnetic surveys, may lead to the discovery of mafic to ultramafic intrusive rocks. Most of this area remains available for staking.

Magmatic Cu-Ni-PGE Mineralization, Southeast Lake Nipigon Area …cont'd

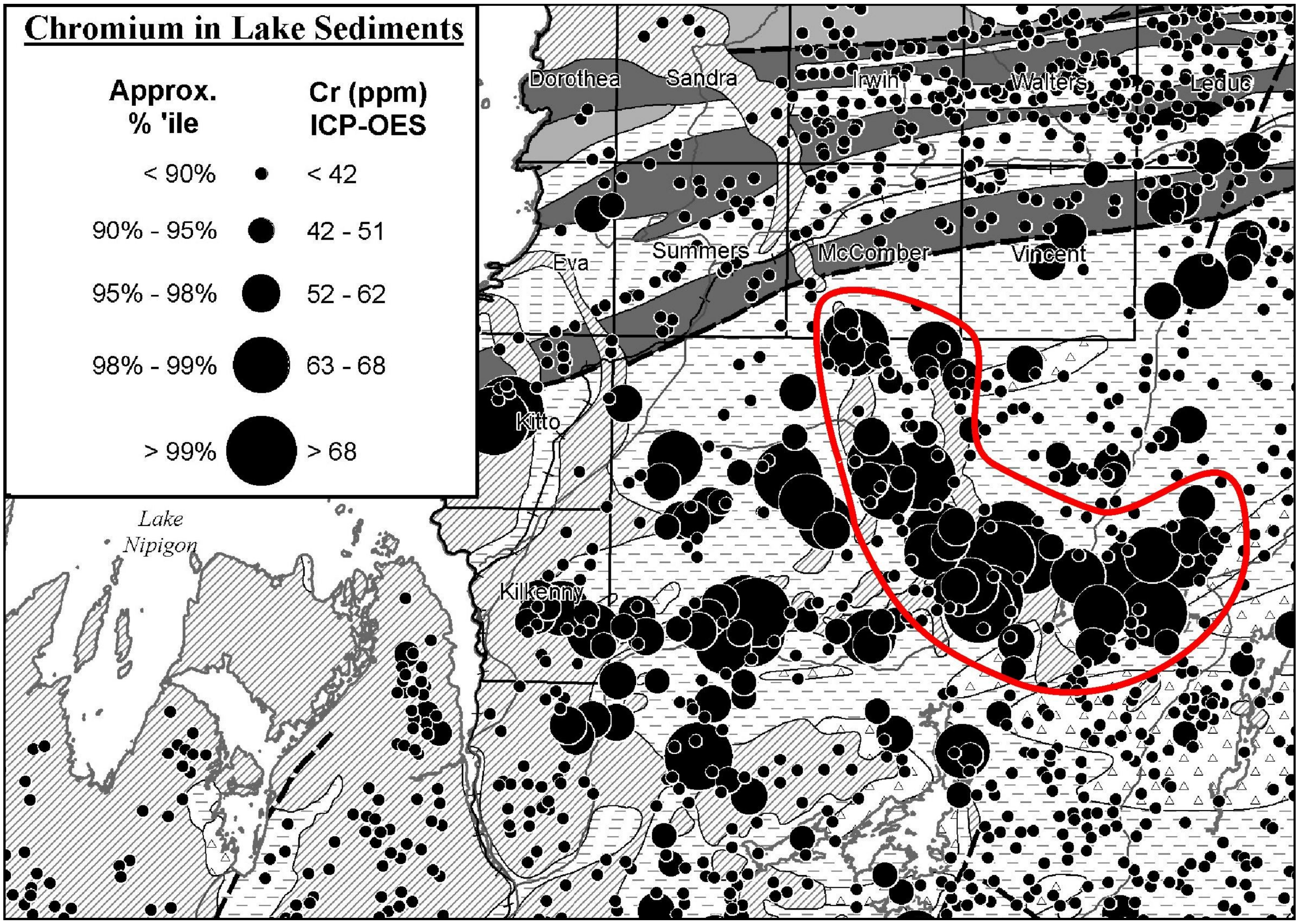

Figure 5: Anomalous area.

Dyer, R.D. 2009. Nipigon – Beardmore area lake sediment geochemical survey, northwestern Ontario; Ontario Geological Survey, Open File Report 6231, 89p.

Ontario Department of Mines – Geological Survey of Canada. 1962a. Barbara Lake sheet, Thunder Bay District, Ontario; Map 2134G, Airborne Magnetic Survey, scale 1: 50,000.

Ontario Department of Mines – Geological Survey of Canada. 1962b. Beardmore sheet, Thunder Bay District, Ontario; Map 2135G, Airborne Magnetic Survey, scale 1: 50,000.

HIGHLIGHTS

- **compilation of lake sediment copper and gold analyses by the Geological Survey of Canada, indicates a west trending copper and gold anomaly coincident with the Flack Lake structure**
- **a structural framework controlling the mineralized Cu-Au vein systems developed as a result of tension related to post-Nipissing diabase regional structures**
- **fracturing and brecciation are of interest as they may reflect a possible "blow out" scenario fed by a large deep-seated intrusive**

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Cu-Au-Ag Potential in the Huronian Supergroup

The Flack Lake–Endikai Lake area, and specifically, the townships of Albanel and Nicholas are situated 60 km north of the town of Iron Bridge. The area straddles the boundary between the Superior and Southern Provinces of the Canadian Shield. The Cu-Au mineral occurrences are hosted by the Protorezoic-aged Huronian Supergroup, consisting mainly of fluvial, glacial and clastic sedimentary rocks (Card et al., 1972, Figure 1).

The Flack Lake–Endikai Lake fault systems trace the unconformable boundary between the Huronian (2.4 Ga–2.2 Ga) sedimentary rocks of the Southern Province and Archean (>2.5 Ga) volcanic and granitic rocks of the Superior Province to the north. These fault systems are east-west trending regional structures and are considered to be reverse thrust faults that originally were early Proterozoic (~2.4 Ga) normal faults reactivated during the Penokean Orogeny (1.86 Ga) (Bennett et al., 1991 and Fyon et al., 1992).

These faults parallel another major regional structure to the south, the Murray fault. The Murray fault is characterized by a series of splay faults trending ESE. Siemiatkowska and Guthrie (1976) have suggested that for the Flack and Endikai fault systems that parallel the Murray fault may also have ESE trending splays They have also suggested that the Flack Lake fault was active for long periods of time, and that movement along the fault controlled both the deposition of the Huronian Supergroup sedimentary rocks and the intrusion of the Nipissing Diabase (2.2 Ga) (Siemiatkowska and Guthrie, 1976).

This may suggest that a structural framework controlling the mineralized vein systems developed as a result of tension related to the post-Nipissing diabase regional structures. These tensional structures, which are accompanied by silicification and brecciation, may be the result of a brittle-ductile deformational event that provided passage ways for mineralizing fluids to channel their way upwards and deposit the metals found in vein-hosted copper and gold occurrences. A compilation of lake sediment copper and gold analyses by the Geological Survey of Canada, indicating a significant west trending copper and gold anomaly coincident with the Flack Lake structure (Fiske et al., 1994), supports this idea.

The host rock for much of the area of interest is limestone of the Espanola Formation intruded by large sills of Nipissing Diabase. The strong deformation in the host rock is characterized by brittle fracturing and brecciation. The fracturing and brecciation are of particular interest because they may reflect a possible "blow out" scenario fed by a large deep-seated intrusive.

Hydrothermal alteration of the host limestone has altered it enough to demonstrate brittle fracturing rather than the ductile deformation more typical of limestone.

The main sulphides observed were disseminated and as massive pyrite and chalcopyrite, with albite and sericite appearing as alteration minerals.

Cu-Au-Ag Potential in the Huronian Supergroup …cont'd

Results from channel samples conducted by previous exploration programs in the townships of Albanel and Nicholas include:

1.) 3.46 opt Ag, 0.10 opt Au, 1.56% Cu
2.) 15.6% Cu, 0.24% Zn, 0.36 opt Ag, and 0.02 opt Au
3.) 7.45% Cu, 0.28 opt Ag.

Further exploration is warranted in the townships of Albanel and Nicholas to establish a structural framework that can help determine the controls of known mineralization, and aid in the discovery of other mineralized zones.

Other areas south of the townships of Albanel and Nicholas, where potential for similar Cu-Au vein mineralization may occur are also indicated on the accompanying map (Figure 6).

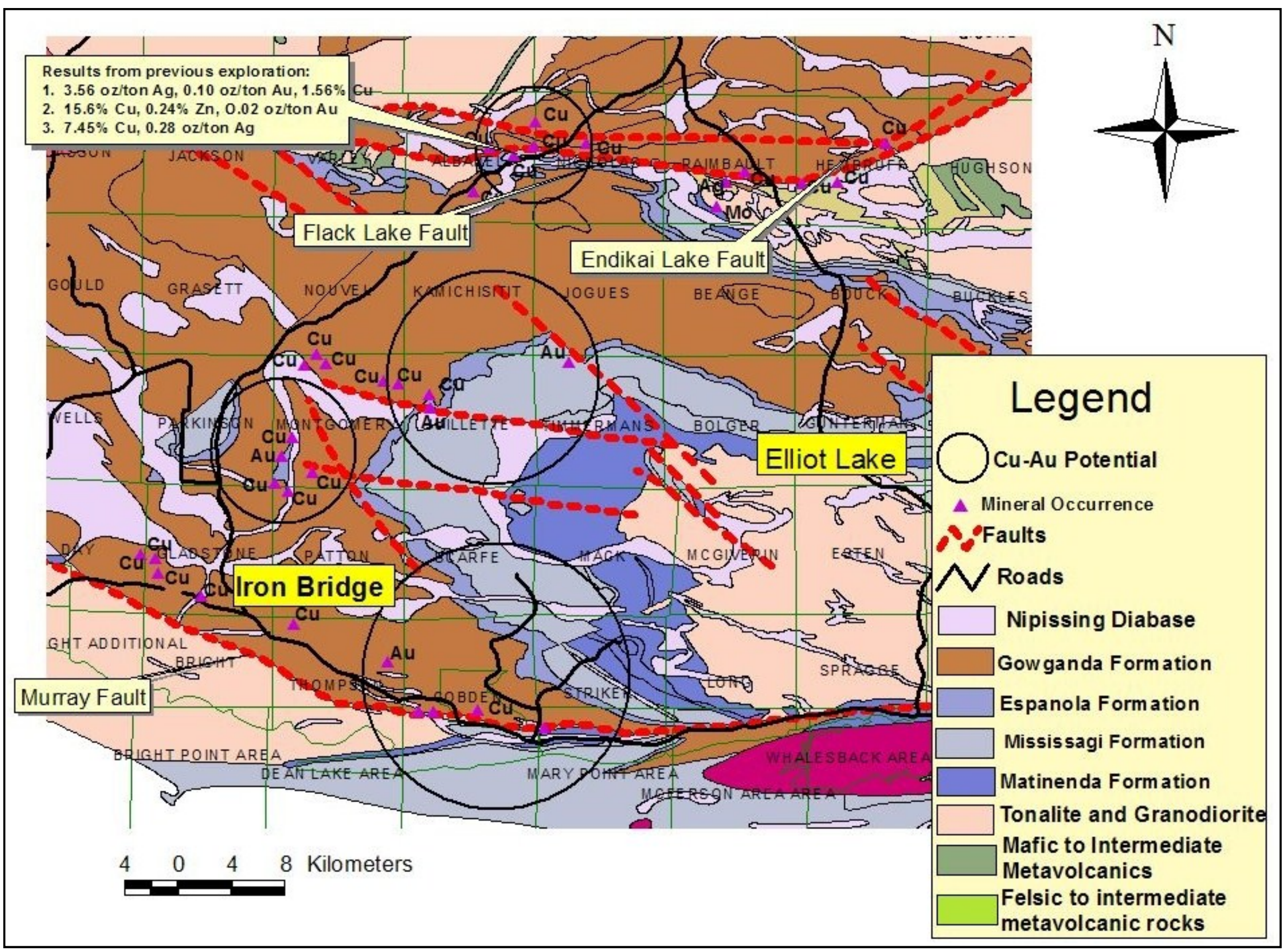

Figure 6: Map illustrating Cu-Au mineral potential associated with east-west to northwest-southeast structures along the contact between the Archean Superior Province and Proterozoic Southern Province.

Cu-Au-Ag Potential in the Huronian Supergroup …cont'd

Card, K.D, Church, W.R., Franklin, J.M., Frarey, M.J., Robertson, J.A., West, G.F., and Young, G.M., 1972: The Southern Province, p.335-338 in Variations in Tectonic Styles in Canada, R.A., Prince and J.W. Douglas Editors, Geol.Assoc. Canada Spec. Pap. N.11, 688p.

Ontario Geological Survey 2003: Precambrian Geology Compilation Series, Sault Ste. Marie–Blind River Sheet, Map 2670, scale 1:250,000.

Pollard, P.J., 2000: Evidence of a Magmatic Fluid and Metal Source for Fe-Oxide Cu-Au Minerlization; in Porter, T.M., Hydrothermal Iron Oxide Copper-Gold and Related Deposits: A Global Perspective, Australian Mineral Foundation, Adelaide, p 27-41.

Roy, J.A., 1994: Report on the Geology and Copper-Precious Metal Mineralization on the Jentina Mine Property, Albanel and Nicholas Townships. Assessment Files, Albanel Township, Sault Ste. Marie District Office, Ministry of Northern Development, Mines and Forestry.

Siemiatkowska, K.M., and Guthrie, A.E., 1976: Kirkpatrick Lake Area, District of Algoma; Prelim. Map P.1088, scale 1 inch to ¼ mile.

Siemiatkowska, K.M., 1978: Geology of the Endikai Lake Area, District of Algoma; GR 178, p45-62. Accompanied by Map 2399, scale 1 inch to 50 miles.

Zolnai, Andrew, S, 1982: Regional cross section of the Southern Province adjacent to Lake Huron, Ontario; Implications for the significance of the Murray Fault Zone; Unpublished, M.Sc. Thesis, Queen's University, 1982, 93p.

HIGHLIGHTS

- **a new conceptual model for McFaulds Lake "Ring of Fire"**
- **mantle plume-crustal interaction gives rise to a diverse mineral endowment of chrome, nickel, PGE, gold, VMS, and diamonds**

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McFaulds Lake "Ring of Fire", Vestige of an Archean Mantle Plume?

The McFaulds Lake "Ring of Fire" in the Sachigo Subprovince presents intriguing opportunities for mineral exploration and geological reflection. Already a number of significant and contrasting mineral discoveries have been made by some of the 35 junior mining companies exploring in the area. The original "Ring of Fire" attribution was for a peridotitic sill located west of McFaulds Lake where Noront Resources Inc. discovered the Eagle One magmatic nickel sulphide deposit. Located at the contact of a narrow, arcuate remanent of the Sachigo greenstone belt and a felsic pluton, the sill is host to very high grade massive magmatic sulphide mineralization with precious metal content and significant chromite mineralization.

Previous work in the area is limited, in part due to a lack of outcrop, so very little is known about the geology. McInnes (1912) reported on the Winisk River area and noted "hypersthene gabbro, similar to the Sudbury nickel-bearing irruptive." Thurston et al. (1979) completed reconnaissance mapping in the Winisk Lake area at 1:253 440 scale. Hudec (1964) completed mapping at a scale of 1:126 720 in the Big Trout Lake area (Thunder Bay North District) and, more recently, Buse and Smar (2007) did reconnaissance mapping in the Winisk Lake area. As part of the Ontario Geological Survey Far North Mapping Initiative, airborne geophysical survey data were acquired over Webequie and the Winisk Lake area (OGS 2008). Stott and Rainsford (2006), and Stott (2008a, 2008b) presented a geological interpretation of the Precambrian geology of the northern part of the province based on aeromagnetic surveys and limited diamond drill hole data.

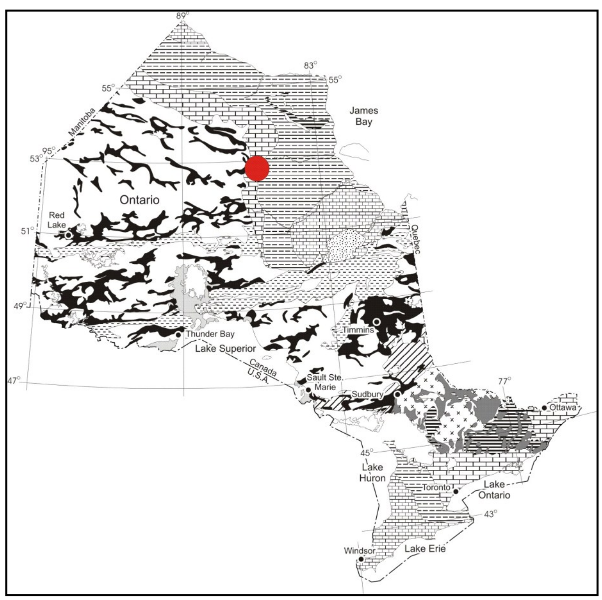

Figure 7: Location of the McFaulds Lake "Ring of Fire"

Initial exploration in the area resulted in the discovery of a series of 5 kimberlites in the Kyle Lake area by drilling geophysical targets. Subsequent diamond drilling by De Beers Canada Inc. in a joint venture program with Spider Resources Inc. and KWG Resources Inc. led to the discovery of volcanic-hosted massive sulphide mineralization at McFaulds Lake. This discovery attracted much interest and land acquisition, followed by numerous other discoveries reported by various companies,

McFaulds Lake "Ring of Fire", Vestige of an Archean Mantle Plume? …cont'd

including MacDonald Mines Exploration Limited, Metalex Ventures Ltd. and Probe Mines Limited, but exploration waned until the discovery of the Eagle One deposit. Following that discovery, Freewest Resources Canada Inc. drilled into a 100 m thick horizon of disseminated to massive chromite mineralization hosted by peridotite.

The variety of styles and environments of mineralization, combined with the high exploration success rate by junior mining companies, has contributed to the largest acquisition of mining lands by claim staking in the history of the province. The presence of very large layered mafic intrusions, including the High Bank Lake, the Fishtrap Lake and the Big Trout Lake intrusions, is noteworthy. The intrusions and the diverse mineralogical endowment of the area may be the crustal expression of an underlying Archean mantle plume. Plume-crust interaction, driven by fluid buoyancy, could account for both the scale and shape of the Sachigo greenstone belt and the elliptical distribution of the large mafic intrusions. Figure 8 presents the proposed surface outline of an Archean mantle plume underlying the McFaulds Lake "Ring of Fire" area. In this mantle plume model, the noted intrusions occur as crustal leakage of ascending mantle magma. The "Ring of Fire" defines the surface trace of a mantle plume with dimensions of 150 by 300 km, covering an area of 45 000 km^2.

If the area is indeed underlain by a mantle plume, several features should be evident, including:

i) a central regional gravity high;

ii) outward facing layered intrusions consistent with a domal form;

iii) evidence of high heat flow and voluminous fluid movement with attendant widespread hydrothermal alteration;

iv) primitive chemical composition of volcanic rocks devoid of subduction signatures;

v) restricted age range of the mafic intrusions;

vi) thin overlying crust as a result of a mantle bulge;

vii) increased seismic velocity over the plume head;

viii) plume scale dimensions in the order of thousands of square kilometres; and

ix) elevated metal endowment.

On the scale of the South African Bushveld complex, the McFaulds Lake "Ring of Fire" area is emerging in its own right as having an intriguing metallogenic endowment, and may prove to be equally prospective for a wide variety of mineral deposits. Additional exploration may be merited for several different ore deposit types.

Close attention should be paid to any chromitite rocks for potential Merensky-reef-style platinum group metal mineralization. All of the mafic intrusions are prospective for magmatic sulphide mineralization. The identification of VMS mineralization at McFaulds Lake and other occurrences discovered to date hold promise for economic copper-zinc deposits. A number of the base metal discoveries made to date are gold enriched, enhancing the prospectivity for that precious metal. Finally, kimberlites need an escape route from the mantle. A rising plume offers that exit, hence, the area may be equally prospective for diamonds. The high diamond content of the nearby Kyle Lake kimberlites indicates that conditions in the area are favourable for diamond preservation and discovery.

McFaulds Lake "Ring of Fire", Vestige of an Archean Mantle Plume? …cont'd

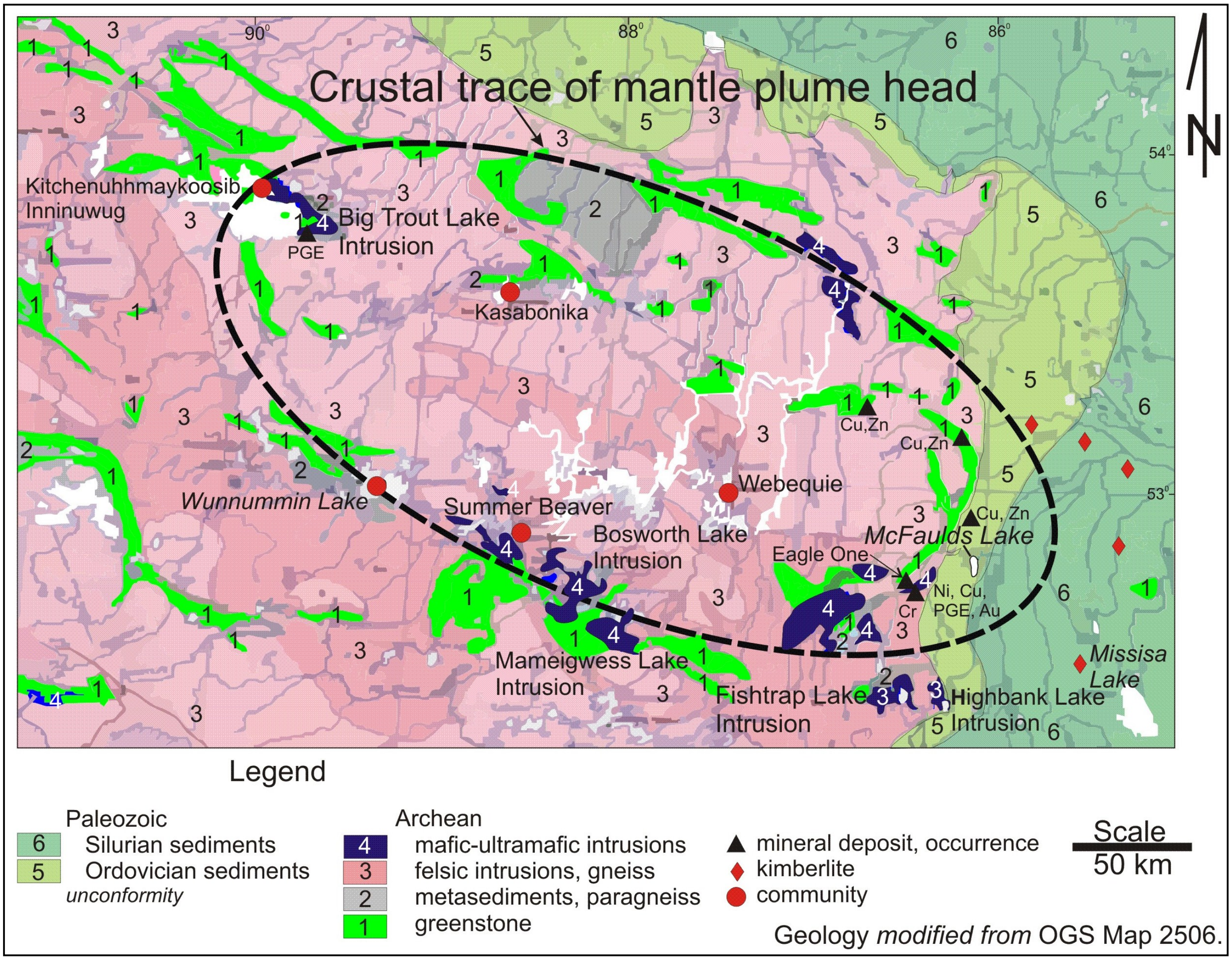

Figure 8: Inferred crustal trace of a mantle plume head linking separate large layered mafic-ultramafic intrusions to a single magmatic upwelling event in the McFaulds Lake "Ring of Fire" area of northern Ontario.

Buse, S. and Smar, L. 2007. Geology of the Winisk Lake area, northwestern Ontario: a fresh look at a granitoid and gneissic terrane; *in* Summary of Field Work and Other Activities 2007, Ontario Geological Survey, Open File Report 6213, p.30-1 to 30-6.

McInnes, Wm. 1912. Report on a part of the North-West Territories of Canada drained by the Winisk and Attawapiskat rivers; Ontario Bureau of Mines, v.21, pt.2, p.108-138.

Ontario Geological Survey 1987. Geological highway map, northern Ontario; Ontario Geological Survey, Map 2506, scale 1:1 600 000.

McFaulds Lake “Ring of Fire”, Vestige of an Archean Mantle Plume? …cont’d

Ontario Geological Survey 2008. Airborne magnetic and electromagnetic surveys, colour-filled contours of the residual magnetic field and electromagnetic anomalies, Ekwan River area—Purchased data; Ontario Geological Survey, Maps 60 302 to 60 313, scale 1:20 000.

Stott, G.M. 2008a. Precambrian geology of the Hudson Bay and James Bay lowlands region interpreted from aeromagnetic data – east sheet; Ontario Geological Survey, Preliminary Map P.3598–Revised, scale 1:500 000.

Stott, G.M. 2008b. Precambrian geology of the Hudson Bay and James Bay lowlands region interpreted from aeromagnetic data – west sheet; Ontario Geological Survey, Preliminary Map P.3597–Revised, scale 1:500 000.

Stott, G.M. and Rainsford, D.R.B. 2006. The Precambrian geology underlying the James Bay and Hudson Bay lowlands as interpreted from aeromagnetic data and a revised terrane map for northwestern Ontario; *in* Summary of Field Work and Other Activities 2006, Ontario Geological Survey, Open File Report 6192, p.13-1 to 13-10.

Thurston, P.C., Sage, R.P. and Siragusa, G.M. 1979. Geology of the Winisk Lake area, District of Kenora, Patricia Portion; Ontario Geological Survey, Geological Report 193, 169p.

HIGHLIGHTS

- **a new high-sensitivity airborne total magnetic field and transverse gradient survey was recently flown in the Burntbush area**
- **geochronological results indicate that the area is underlain by rocks that correlate with units hosting the past-producing Normetal, Estrades and Selbaie VMS deposits and the currently producing Casa Berardi gold mine located in Quebec**
- **detrital zircon ages of clastic metasedimentary units are Porcupine in age; Porcupine assemblage boundary contacts are commonly the locus of regional thrusts, a good location to search for epigenetic gold mineralization**

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Gold Exploration Targets in the Northern Burntbush Area

A new high-sensitivity airborne total magnetic field and transverse gradient survey was recently flown in the Burntbush area, north of Lake Abitibi (area L, Figure 9). The survey, results of which were released in October 2008, was funded by the Geological Survey of Canada's Targeted Geoscience Initiative III and Discover Abitibi Initiative.

The survey description below is provided by Ayer et al. (2008). The Burntbush airborne geophysical survey was flown by Geoscience Data Solutions GDS Inc. and Oracle Geoscience International. The survey comprises 34 000 line-kilometres and includes total field magnetic and transverse horizontal gradient measurements. The survey traverse line spacing was 100 m and the control line spacing was 500 m. The traverse line orientation was north to south with orthogonal control lines. The aircraft flew at a nominal terrain clearance of 80 m.

Digital versions of these maps are available for download at no cost from the Geoscience Data Repository (MIRAGE) (Natural Resources Canada) at http://gdr.nrcan.gc.ca/mirage and from GeologyOntario at http://www.mndm.gov.on.ca/mines/geologyontario/default_e.asp. Corresponding digital profile and grid data are available from the Geoscience Data Repository for Aeromagnetic and Electromagnetic Data at http://gdr.nrcan.gc.ca/aeromag. Digital map files and data sets may also be downloaded from GeologyOntario (see URL above) or the OGS Geophysical Atlas at http://www.mndm.gov.on.ca/mines/ogs/gpxatlas/default_e.asp.

The Burntbush belt is characterized by mafic to felsic metavolcanic rocks with some metasedimentary rocks and granodiorite intrusive rocks. This area in Ontario represents the western extension of the northern Abitibi greenstone belt, which extends over 400 km to the east in Québec. Geological compilation by the Ontario Geological Survey updating the geology, structure and stratigraphy of the Detour and Burntbush greenstone belt is nearing completion. Outcrop is very sparse in the area and geological interpretation depends greatly on diamond drill hole records and geophysical surveys.

Geochronological results indicate that the area is underlain by volcanic rocks that correlate with the volcanic units in northwestern Québec that host the past-producing Normetal, Estrades and Selbaie VMS deposits, as well as the sedimentary units and fault zones that host the currently producing Casa Berardi gold mine (Ayer et al. 2008). Figure 2 on a poster presented by J. Ayer, B. Berger, J. Chartrand, M. Houlé and N. Trowell at the Ontario Exploration Geoscience Symposium in Sudbury in December 2008 shows the geochronology. The poster is available on the Ontario Geological Survey website at http://www.mndm.gov.on.ca/mines/ogs/Posters/OEGS_2008/Ayer_OEGS08.pdf

The northern part of the Burntbush geophysical survey area hosts the westerly extension, in Bradette Township, of the Casa Berardi tectonic zone, fault or break, which can be traced over 200 km. The Casa Berardi fault is defined by a stratigraphic contact between a graphite-rich sedimentary sequence, northern continuous mafic fragmentary volcanic units, and a southern polymictic conglomerate unit.

Gold Exploration Targets in the Northern Burntbush Area …cont'd

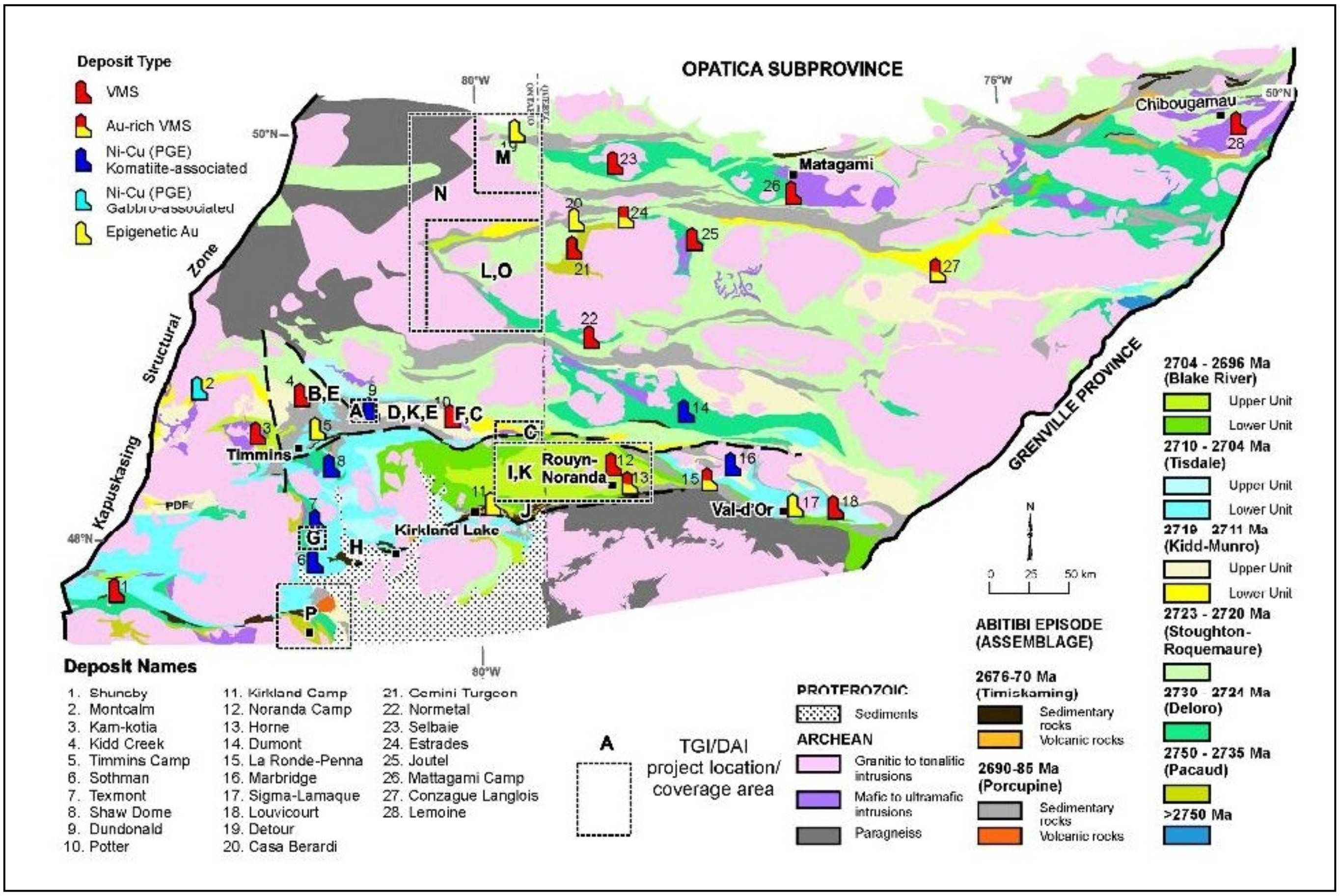

Figure 9: Burntbush area survey (L) and mine locations in Québec (from Ayer et al. 2008).

The detrital zircon ages of the clastic metasedimentary units in the Detour–Burntbush area suggest they are all members of the Porcupine assemblage (2690–2685 Ma), a widespread clastic sedimentary-dominated assemblage identified in the southern Abitibi greenstone belt. The Porcupine assemblage boundary contacts are commonly the locus of regional thrust faults with older metavolcanic units thrust over younger metasedimentary units. These thrust faults represent ground-preparation structures that set the stage for subsequent epigenetic gold mineralization events (e.g., Detour Lake and Casa Berardi gold mines) and, thus, are important regional exploration targets for gold mineralization (as discussed in Ayer et al. 2007, p.3-7).

The Casa Berardi gold deposits are located along a five-kilometre long, east-trending mineralized corridor. The mineralized zones are closely associated with the Casa Berardi fault and are found on both sides of the fault. This corridor is intimately associated with conglomerate and follows the same structural pattern. The mineralized corridor and the conglomerate are located close to the contact between the basement and the sedimentary basin. This contact plunges slightly to the west. Mineralization is also associated with banded iron formation. Mine production at Casa Berardi spanned 10 years between 1988 and 1997, at first by Inco Gold Ltd. and then by TVX Gold Inc., and totalled 688 400 ounces of gold recovered from 3.5 million tonnes of ore (Clow et al. 2005). In 2007 Aurizon Mines Ltd. reopened the mine with annual production of about 160 000 ounces.

Gold Exploration Targets in the Northern Burntbush Area …cont'd

Figure 10 (below) presents shadow magnetic data of the northern portion of the Burntbush survey. A comparable presentation was used to illustrate the possible extension of the Larder Lake–Cadillac Break west of Matachewan (Meyer et al. 2004). Similarly, the shadow magnetic data can be used to trace iron formation horizons, which are a significant feature of the Casa Berardi break, in the Burntbush area. More than 80 gold occurrences that have been recorded along this horizon are also shown on Figure 10. Figure 2 on the poster mentioned previously (see above) shows an interpretation of the aeromagnetic anomalies that could be attributed to iron formation.

Many gold occurrences are also associated with splay faults or structures that emanate in various directions from the Porcupine–Destor Fault Zone (PDFZ) and the Larder Lake–Cadillac Break (LLCB). The Pipestone, Munro, Arrow, Ghostmount and McKenna faults are some of the more important PDFZ splays, while the Kirkland Lake, Upper Canada and Benson Creek faults are associated with the LLCB. Similar splay structures can be seen in the magnetic pattern of the Burntbush survey.

Exploration efforts, using deposit models based on those found within the PDFZ and LLCB, should be carried out within this relatively unexplored area.

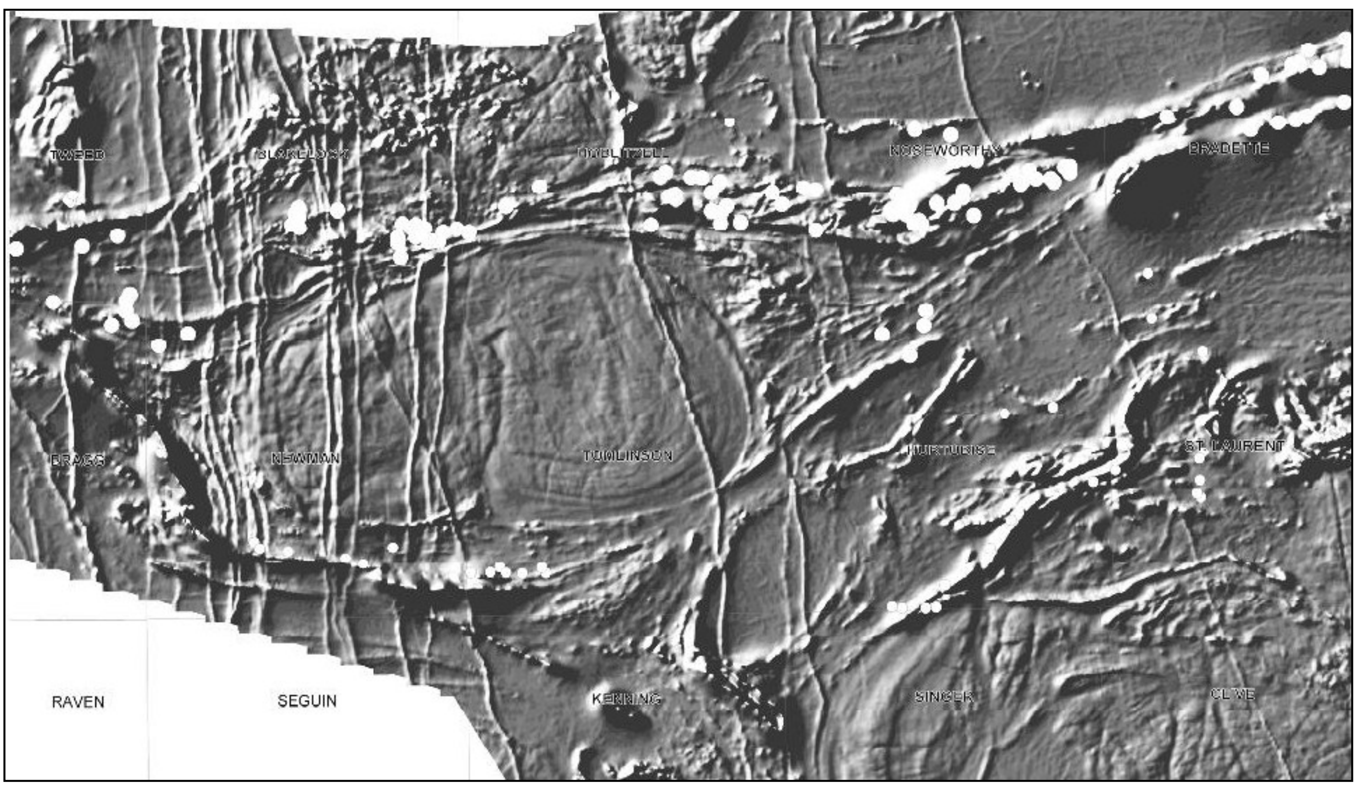

Figure 10: Shadow magnetic map of the northern Burntbush area with MDI points. Larger dots are gold MDI points near the Casa Berardi fault.

Gold Exploration Targets in the Northern Burntbush Area …cont'd

Ayer, J.A., Dubé, B. and Calhoun, R.F. 2008. The Abitibi Greenstone Belt: Update of the Targeted Geoscience Initiative III Abitibi Project, the Deep Search and the Discover Abitibi Initiative Projects; in Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, p.3-1 to 3-8.

Ayer, J.A., Dubé, B., Friedman, R. and van Breemen, O. 2007. Detour-Burntbush Area; in Summary of Field Work and Other Activities 2007, Ontario Geological Survey, Open File Report 6213, p.3-3 to 3-7.

Clow, G.G., Cox, J.J., Hayden, A., Knapp, R. and Salmon, B. 2005. Technical Report on the Casa Berardi Project, Quebec, Canada, prepared for Aurizon Mines Ltd., NI 43-101 Report, Roscoe Postle, Associates Inc., Toronto, Ontario.

Meyer, G., Grabowski, G.P.B., Guindon, and Chaloux, E. 2004. Report of Activities 2003, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts; Ontario Geological Survey, Open File Report 6131, 52p.

HIGHLIGHTS

- **significant past and current Ni-Cu-PGE production from Offset Dikes**
- **offset dikes are associated with Sudbury Breccia**
- **Sudbury Breccia found 80 km from Sudbury Basin and remains open for staking**

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Sudbury Quartz Diorite Offset Dikes and Sudbury Breccia

Quartz diorite is a variety of the Sublayer of the Sudbury Igneous Complex (SIC). It comprises the largest part of the offset dikes that extend radially from the SIC, or lie concentrically about it in the Footwall. Many of the large Ni-Cu sulphide deposits associated with the SIC are hosted by the offset dikes (Grant and Bite 1984).

Sudbury Breccia, a pseudotachylite of varying composition, occurs around the SIC in both radial and concentric patterns. It has been identified as far as 80 km from the SIC in the northeast. Many offset dikes are associated with Sudbury Breccia. Radial offsets project outward from embayments along fractures that are commonly filled with Sudbury Breccia; the Frood–Stobie offset is entirely within Sudbury Breccia (Farrow 2007).

Exploration activity for undiscovered offset dikes of the SIC has been strong in the past few years. This trend still continues. Recent work has resulted in Inco Limited’s discovery of the Kelly Lake deposit on the Copper Cliff Offset and additional mineralization at the Totten Mine on the Worthington Offset. More recently, Wallbridge Mining Company Limited has discovered hitherto unknown sections of the Parkin Offset and the Trill Offset.

Another mineralized extension of the Worthington Offset was discovered by an independent prospector in 2001. Discovered first around 1900, it was classified geologically as Nipissing diabase and as such, not prospective for massive Ni-Cu sulphide deposits. Only recently was it redefined as a mineralized extension of the Worthington Offset.

Offset dikes are composed of fine- to medium-grained norite (quartz diorite) with inclusions of mafic to ultramafic composition. The inclusions vary in size from several millimetres to more than one metre. These dikes may be mineralized or unmineralized; those that are mineralized display a characteristic pockmarked weathered surface that distinguishes them from other types of dikes. The commonly weathered minerals are chalcopyrite and pyrrhotite (Meyer et al. 2002).

In summary, offset dikes of the SIC may be found by methods including, but not necessarily limited to:

i) prospecting and geological mapping belts of Sudbury Breccia;

ii) examining previously mapped mafic dikes, particularly in the North and West ranges of the Sudbury Structure;

iii) geophysical surveys (magnetic and magnetotelluric methods have been proven successful); and

iv) locating and identifying the mining rights holders of properties not currently held by active mineral exploration companies (through the Provincial Recording Office and the Land Titles Office).

Sudbury Quartz Diorite Offset Dikes and Sudbury Breccia …cont'd

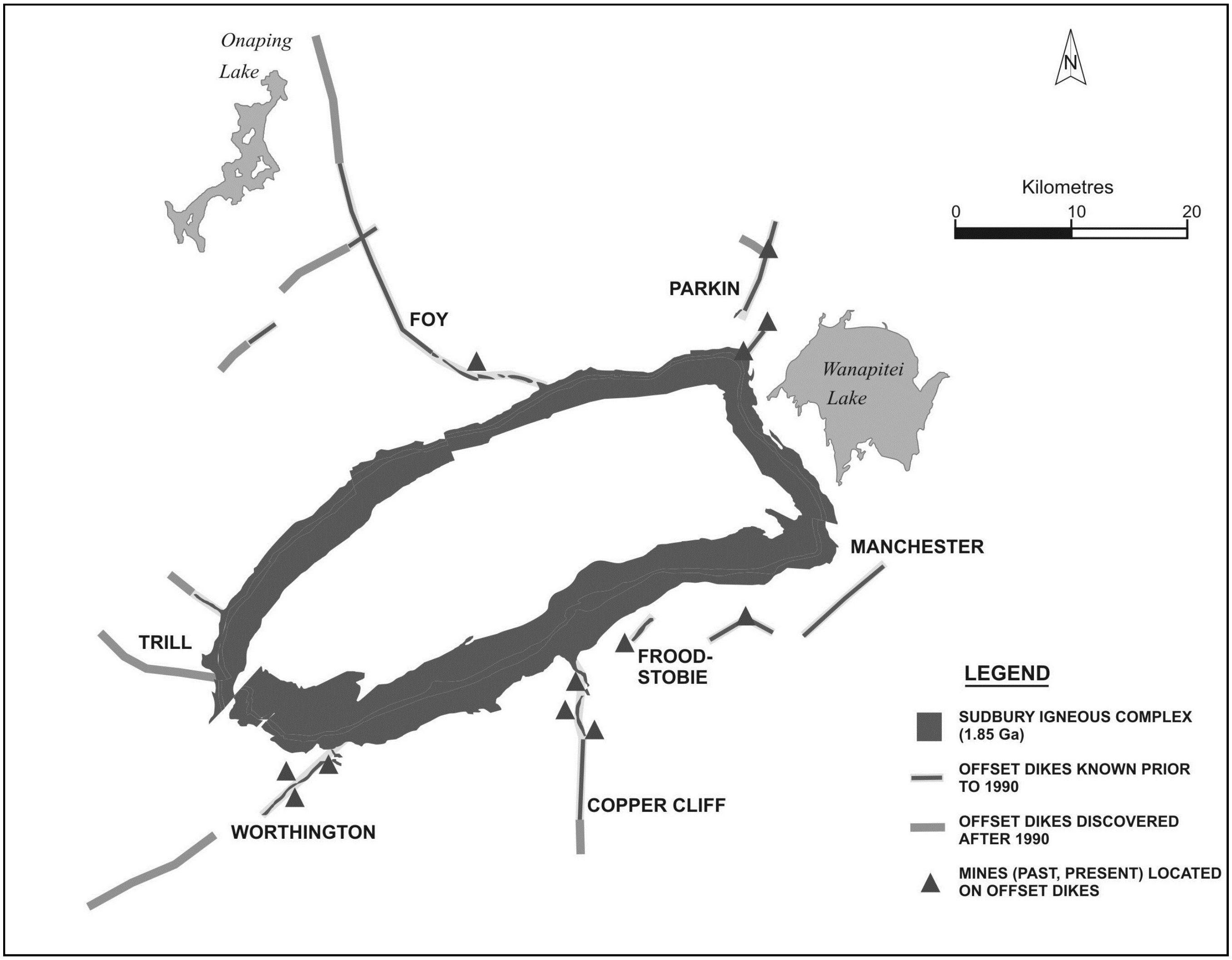

Figure 11: Sudbury offset dikes.

Farrow, D. 2007. Recommendations for Exploration 2007-2008; in Ontario Geological Survey, Resident Geologist Program, MNDM, 2007.

Grant, R.W and Bite, A. 1984. Chapter 12, Sudbury Quartz Diorite Offset Dikes; in The Geology and Ore Deposits of the Sudbury Structure, edited by E.G. Pye, A.J. Naldrett, and P.E. Giblin, Ontario Geological Survey, Special Volume 1, p.275-300. Accompanied by Map 2491, at a scale of 1: 50 000, Map NL-16/17-AM Sudbury, at a scale of 1: 1 000 000, and 3 charts.

Meyer, G., Cosec, M., Grabowski, G.P.B., Guidon, D.L., Chaloux, E.C., and Stewart, J.M. 2002. Report of Activities 2001, Kirkland Lake Regional Resident Geologist Report, Kirkland Lake and Sudbury Districts; Ontario Geological Survey Open File Report 6083, 94p.

Epigenetic Pb-Zn-(Ag) Vein Deposits: Indicators of Stratabound, Carbonate-hosted Deposits in SE Ontario?

HIGHLIGHTS

- **post-Ordovician Pb-Zn-calcite veins occur within marbles of the Grenville Province Stratabound carbonate-hosted zinc deposits with minor galena occur in Grenville marbles in SE Ontario and NY State**
- **epigenetic Pb-Zn veins combined with dolomitic and brecciated marbles may be an indicator of stratabound Pb-Zn mineralization**

Numerous unconformable, calcite-galena-sphalerite veins have been documented in southeastern Ontario, most of which are hosted by marbles of the Grenville Supergroup.

The veins occupy northwest trending, post-Ordovician faults of the Ottawa-Bonnechere graben system and may also contain barite, fluorite, celestite, pyrite, and silver. Locally, the veins extend from the Proterozoic basement rocks into the overlying Paleozoic limestones. Some of the deposits were mined in the early 1900s. The Hollandia Mine in Madoc Township produced 2.6 million pounds of lead between 1903 and 1905 (Malczak et al. 1985) and the Kingdon Mine in Fitzroy Township produced 905 000 tons of ore grading 3.32% Pb between 1915 and 1931 (Carter et al. 1980).

Carter et al. (1980) suggest that the mineralizing fluid was probably metal-bearing connate brine released from the Potsdam (Nepean) sandstones at the base of the Paleozoic sequence, which migrated along the Precambrian/Paleozoic unconformity to deposition sites within faults associated with the graben system. However, some of the veins extend to considerable depth within the Precambrian marbles (the Kingdon vein was traced to a depth of 400 m), suggesting the possibility that the source of metals may have been from within the host marbles. Stratiform, marble-hosted zinc deposits are known within the Central Metasedimentary Belt in southeastern Ontario: the Renprior occurrence near Renfrew is estimated to contain 16 000 tons grading 10.5% Zn and the Long Lake zinc mine in Olden Township produced about 100 000 tons of ore averaging 11.6% Zn. In the Balmat-Edwards district of New York State, Grenvillian dolomitic marbles host pods and lenses of sphalerite and pyrite with minor galena which are believed to have been deposited as disseminated sulphides contemporaneously with the host carbonates in a shallow basin, and later concentrated during metamorphism and deformation into structurally favourable areas.

The search for stratabound, carbonate-hosted sulphides in areas of epigenetic Pb-Zn veins should also focus on brecciated, dolomitic marbles - possible evidence of early faults within the carbonate basins that may have channelled metal-bearing fluids associated with an earlier phase of mineralization.

Carter, T.R., Colvine, A.C. and Meyn, H.D. 1980. Geology of base metal, iron, and molybdenum deposits iin the Pembroke-Renfrew area; Ontario Geological Survey, Mineral Deposits Circular 20, 186p.

Malczak, J., Carter, T.R. and Springer, J.S. 1985. Base metal, molybdenum and precious metal deposits of the Madoc-Sharbot Lake area, southeastern Ontario; Ontario Geological Survey, Open File Report 5548, 374p.

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HIGHLIGHTS

- **the 33-carat Peterborough diamond, the first found in Canada, was found during railway construction pre-1920**
- **two kimberlite dykes have been found in southeastern Ontario associated with the Ottawa-Timiskaming Rift. Potential exists for more discoveries.**

Kimberlite Occurrences in Southeastern Ontario

In the late 1800's, reports of diamonds found by a resident of Cobourg were published in local newspapers in Southern Ontario. A 33-carat alluvial diamond was discovered near Peterborough during construction of a railway line between Ottawa and Toronto prior to 1920. Diamonds have been found in bedrock in Ontario with kimberlite being the most common host for diamond deposits. Exploration in recent years identified micro diamonds in altered volcanic rocks north of Madoc.

There are two documented kimberlite dikes in Southern Ontario. They are located approximately 44 kilometres apart. The kimberlite dikes in southeastern Ontario are associated with the Ottawa-Timiskaming Rift, one of three structural zones in Ontario. Both Picton and Varty Lake dikes intrude Paleozoic limestone formations. South of Lake Ontario in the Finger Lakes area of New York State at least 65 dikes and one small diatreme of Jurassic – Lower Cretaceous age are known to occur.

The Picton kimberlite dike is located in the Essroc Canada Ltd. limestone quarry near the town of Picton (MDI31C03SE00035). On a fresh surface the kimberlite is coarse to fine-grained, green in colour and contains fragments of grey limestone. The dike intrudes limestone along joint planes. Although the dike was recognized as waste by the cement company for many years, it was not identified as kimberlite until recognized as such by a visiting professor from the University of Western Ontario in the 1980's.

The Varty Lake kimberlite dike is exposed intermittently in 5 prospect pits over a distance of 150 m near the northwest corner of Varty Lake northeast of Napanee (MDI31C07NW00007). Limestone rock in the area is flat-lying but dips 15° on either side of the dike. This dike is green and contains abundant phlogopite phenocrysts.

Both dikes are of Jurassic age and appear to be located on a southwest - northeast topographical trend from Picton to Varty Lake. Parallel structures are visible on bedrock geology and topographic maps. Systematic field investigations for kimberlite dikes in abandoned or working quarries along these trends are recommended. In the field, prospective features and textures that may indicate the presence of kimberlite are recessive weathering surfaces, disintegration of bedrock forming bluish grey mud and unusual weathering colours in bedrock and in soil, for example, yellow, brown soils. Kimberlites in New York are known to weather to an orange-brown soil.

There are numerous operating and historic limestone quarries throughout the Belleville - Picton - Napanee area; most have good outcrop and rock face exposure and they have seen little or no known investigation for kimberlite. In late 2009, workers in another cement quarry near Belleville mentioned seeing a greenish dyke that weathers to clay. Investigation of this report is planned for 2010.

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Kimberlite Occurrences in Southeastern Ontario …cont'd

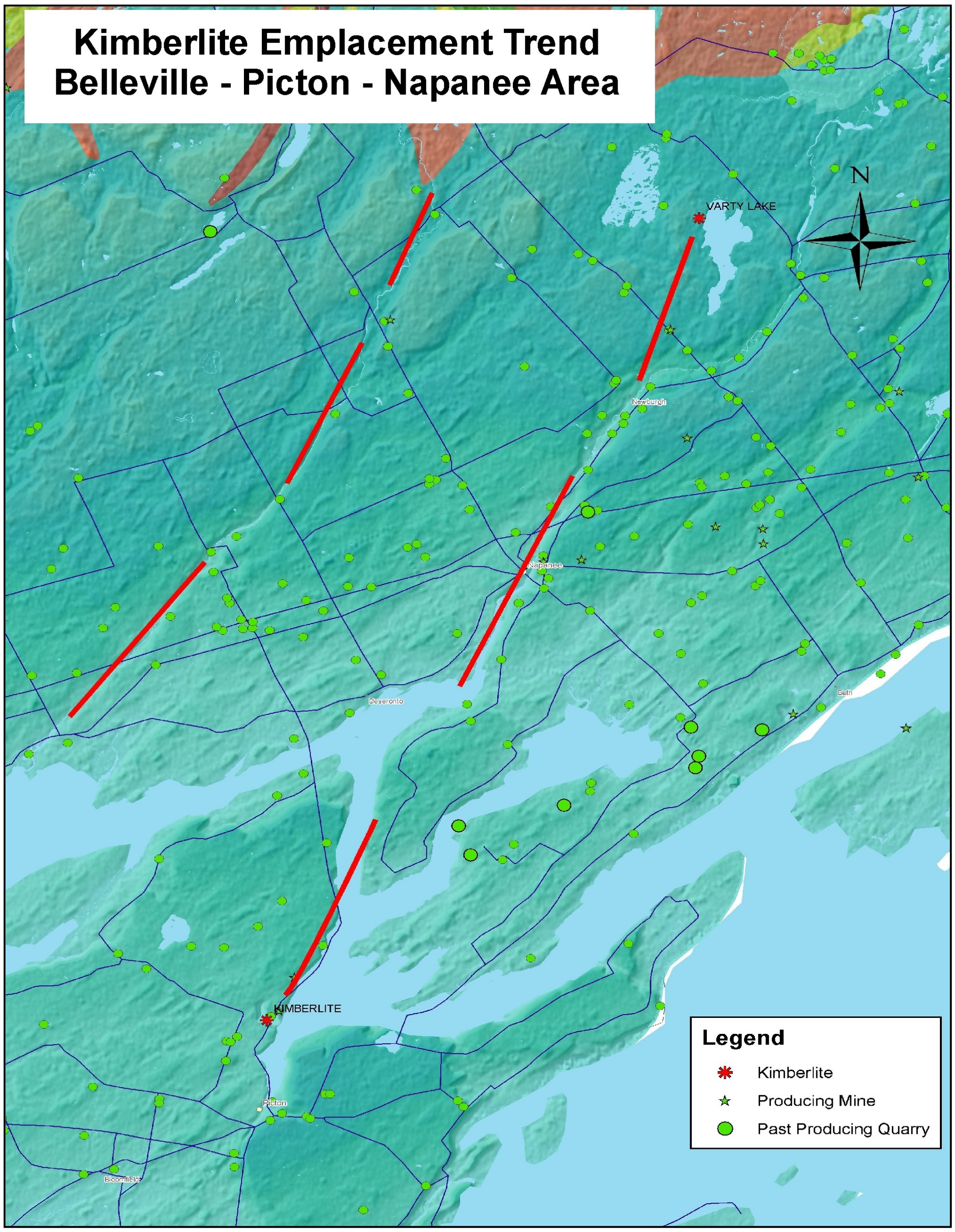

Figure 12: Kimberlite emplacement trend: Belleville - Picton - Napanee area.

Barnett, R.L., Arima, M., Blackwell, J.D., and Winder, C.G. 1984. The Picton and Varty Lake ultramafic dikes: Jurassic magmatism in the St. Lawrence Platform near Belleville, Ontario. Canadian Journal of Earth Sciences, 21, pp. 1460-1472.

HIGHLIGHTS

- **new opportunity has been created for a wide variety of mineral commodities needed to construct “green” solutions to environmental problems**
- **environmental concerns dictate that the source of these mineral commodities be as close to the end user as possible**
- **there are documented occurrences and high potential for new discoveries for many of these minerals in southern Ontario**

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Towards a Green Stone Age

New applications for mundane materials can help society work toward solutions to complex problems like alternate energy sources, environmental protection and climate change.

New opportunity has been created for a wide variety of mineral commodities needed to construct these “green” solutions and environmental concerns dictate that these mineral commodities be extracted as close to the end user as possible.

There are documented occurrences and high potential for new discoveries for many of these minerals in southern Ontario.

Energy

The high price of oil and its products, supply shortages and environmental concerns with fossil fuels will create new demands for minerals. There is a growing need to develop new energy sources including nuclear, solar, wind, hydro and geothermal. Accompanying the need to develop new energy sources is the need to develop new methods of energy movement (e.g. batteries, fuel cells, supercapacitors, etc.). Likewise, new means of energy storage and energy utilization will require a growing supply of minerals, including silica, graphite, lithium, manganese, cobalt, titanium dioxide, tin oxide, nickel and rare earths. In addition, accessory mineral products including heavy aggregate for nuclear shielding will be required.

Silica

Southeastern Ontario has long history of silica production. Over 150 years ago, Mallorytown, the first glassworks in Canada used high purity silica from Cambrian sandstone as a local source of raw material. Since that time southeastern Ontario vein quartz, sandstone, quartzite and pegmatite deposits have been exploited for a wide variety of silica applications. Currently, southeastern Ontario Potsdam Formation sandstone deposits are quarried for dimension stone and aggregate. Rose quartz is extracted from pegmatite bodies in Renfrew County for use as decorative stone, landscaping stone, specimens and gemstones.

Unimin Canada Ltd. is the largest producer of silica in Ontario with a capacity of about 500 000 t/y. Lump quartzite from Badgeley Island (150 000-t/y capacity) is shipped by boat to Canadian destinations for the manufacture of ferrosilicon. Finer material produced by grinding is shipped to Unimin’s plant at Midland (400 000-t/y capacity), where it is further processed to a glass-grade silica sand and to silica flour for ceramic and other uses.

The following summary of silica specifications for high-purity applications is compiled from Harburn and Kuzvart (1996). It is important to note that with higher purity applications the presence of certain impurities even in parts per billion concentrations can be critical.

There is currently a global shortage of metallurgical grade silicon.

Changing technology and environmental concerns have seen an increased demand for metallurgical grade silicon to be converted to photovoltaic silicon for use in solar energy technology.

Towards a Green Stone Age …cont'd

Application	Specification % SiO2
Iron casting	85%
Steel casting	95%
Flux	90% *
Any glass grade	98.5%
Silicon metal	98%
Silicon carbide	99.7%
Refractories	95-99%
Photovoltaic (PV) Silica	99.9999% (6n)

**absolute minimum, usually 95%*

The Mineral Deposit Inventory database documents over 200 occurrences of silica in southeastern Ontario including sandstone, quartzite and pegmatite hosted deposits. Further examination of these as potential sources of high purity silica is recommended.

Photocatalytic Cement Additive – TiO_2

In 2006, after several years of research, ESSROC Italcimenti developed self-cleaning cement containing an active agent that, in presence of light, breaks down air pollutants such as carbon monoxide, nitrogen oxide, and benzene. Cement has been successfully used in Japan and Europe and found to successfully lower levels of these contaminants in high traffic areas. The active ingredient is titanium dioxide. There are several documented occurrences in southeastern Ontario including the Methuen Township deposit with a historic published resource of 13Mt at 21.7 % TiO_2.

Mineral Fillers and Extenders

Mineral fillers and extenders are used to replace costly or unsustainable materials in common products. As an example, in the paper industry, the increasing use of mineral fillers is moving the industry towards a fibreless paper.

An ideal mineral filler substance is inert, has consistent properties, a low specific gravity, is non-toxic, non-hazardous, non-abrasive and can be produced at a relatively low cost. The use of finely ground minerals as fillers and extenders in manufactured products has rapidly grown to become a multi-billion-dollar industry in North America alone.

Recently, the OGS released results of a study evaluating the potential of approximately 200 mica occurrences found in southern Ontario. The study was successful in identifying both a market for Ontario muscovite and highly prospective areas for muscovite in southeastern Ontario. With major production of calcium carbonate, talc and nepheline syenite, southern Ontario is already the site of a vital mineral filler industry. Further evaluation of other minerals as fillers and extenders including, but not limited to mica, titanium, wollastonite, calcite, and vermiculite is recommended.

Conference Proceedings, Industrial Minerals 2008, Toronto, October 21-22, 2008 Blendon Information Services, Victoria, B.C.

Harben, P.W. and Kuzvart, M. 1997. Industrial Minerals, A Global Geology, Industrial Minerals Information Ltd., Surrey, U.K.

Rare Earth Elements in the Central Metasedimentary Belt, Southeastern Ontario

Demand for rare earth elements has grown substantially in recent years, primarily due to increased use of permanent magnets and rechargeable batteries. Long range projections of market demand predict that 2 million tonnes of rare earth oxides will be required by 2025 to meet the requirements of hybrid, electric and hydrogen vehicles. Forecast demand for 2010 is about 150,000 tonnes (Benecki 2007).

Rare earth magnets are the world's strongest permanent magnets. Neodymium magnets are key components in electric motors and regenerative braking systems used in hybrid, electric and hydrogen vehicles, as well as in miniaturization of high-technology applications such as hard disc drives, DVDs, cell phones as iPods. Nickel metal hydride (NiMH) rechargeable batteries, used in hybrid and electric vehicles, contain cerium and lanthanum. A typical hybrid vehicle may contain 20 kg of REEs. Niobium is used in steel and superalloys for such applications as jet engines and heat -resistant and combustion equipment. Tantalum is used primarily in the production of electronic components such as cell phones, computers and automotive electronics.

Table 1 lists the rare earth elements, niobium and tantalum along with average abundance (ppm) in granite.

Within the Central Metasedimentary Belt of the Grenville Province in southeastern Ontario, uranium, molybdenum, and REE- bearing pegmatites, skarns, and fluorite-apatite-calcite veins (some of which are carbonatite "vein-dikes") are most abundant in the Bancroft and northern Elzevir terranes (Easton 1992). Several of these have been mined in the past for apatite, feldspar, molybdenum, mica, beryllium, and uranium, but to date, the deposits have been sub-economic with respect to REE content. Hewitt (1967) lists 128 Ontario pegmatites, 100 of which are located in southeastern Ontario, containing rare earth-bearing minerals such as uraninite, pyrochlore, betafite, ellsworthite, euxenite, and allanite, among others. The pegmatites of southeastern Ontario should also be considered as targets for niobium and tantalum in the minerals columbite and tantalite, often found in association with the rare earth-bearing minerals.

There are few records of rare earth element content of southeastern Ontario pegmatites despite the common occurrence of rare earth minerals. Ellsworth (1932) stated that the MacDonald Mine, a former feldspar producer in Monteagle Township, which contains allanite, cyrtolite and ellsworthite (Ce, Y, and Nb-Ta bearing minerals, respectively), could have been operated for its rare earth content alone. Other major pegmatite rare earth occurrences are the Woodcox Mine in Monteagle Township, the Comet Quartz Mine in Murchison Township, and the Wal-Gem East and West quarries (now known as the Beryl Pit and the Rose Quartz Quarry) in Lyndoch Township (Storey and Vos 1981). Sampling of the feldspar pegmatite at the Rose Quartz Quarry by Linear Resources Inc. in 2001 returned values of up to 0.87% tantalum oxide and 13.35% niobium oxide in areas of strong columbite-tantalite mineralization (Linear Resources Inc., news release May 28, 2001).

HIGHLIGHTS

- **high demand for REE expected for hybrid vehicles and miniaturization of high-tech devices**
- **REE, niobium, and tantalum bearing minerals occur in pegmatites, skarns, and carbonatites within the CMB of SE Ontario**
- **granites of the Methuen Suite are elevated in REE, F, U, and Th but have little history of REE exploration**
- **the Melancthon windfarm near Shelburne, about 2.5 hours north of Toronto, was brought into production in 2006. The project will generate enough power to supply more than 75,000 households each year. It is the largest wind generation project in Canada and over 1 million tonnes of aggregate from local sources were used in its construction.**
- **many communities in the United States and several in Canada have adopted policies requiring LEED certification for new public buildings and major renovations. In Ontario, several municipalities, including Ottawa, Kingston, Waterloo, and Cambridge, have adopted policies requiring LEED silver certification for all new public construction projects.**

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Rare Earth Elements in the Central Metasedimentary Belt, Southeastern Ontario …cont'd

Element	Symbol	Atomic No.	Avg. in granite (ppm)
Niobium	Nb	41	24
Tantalum	Ta	73	1.5
Light Rare Earths			
Lanthanum	La	57	101
Cerium	Ce	58	170
Praseodimium	Pr	59	19
Neodymium	Nd	60	55
Samarium	Sm	62	8.3
Europium	Eu	63	1.3
Heavy Rare Earths			
Gadolinium	Gd	64	5
Terbium	Tb	65	0.54
Dysprosium	Dy	66	2.4
Holmium	Ho	67	0.35
Erbium	Er	68	1.2
Thulium	Tm	69	0.15
Ytterbium	Yb	70	1.1
Lutecium	Lu	71	0.19
Yttrium	Y	39	13

Table 1: Rare earth elements, niobium and tantalum: average abundance in granite (Mason and Moore 1987).

The Deloro anorogenic igneous complex in the southern part of the Elzevir terrane near Marmora, part of the Methuen Suite of alaskitic granites (Easton 1992), consists of syenite, peralkaline granite and granophyric granite enriched in REEs and fluorite (Abdel-Rahman and Martin 1987). This complex shows similarities to the Blachford Lake intrusive complex, NWT, which hosts significant REE mineralization at the Thor Lake deposit (A. Davidson, personal communication, 2009; Davidson 1978). On the property of Robert Ross in Concession 10, lot 11, Marmora Township, a diamond drill hole intended to test gold mineralization within the granite intersected a 5.3 m width of dark dike material identified by N. McKay, Lakefield Research, as lamprophyre, and by L. Bailey, Queen's University, as carbonatite (diamond drill log, assessment file 2.19266, R. Ross, Resident Geologist's Office, Tweed). There are no records of REE exploration within the granitic rocks of the Deloro complex and the possible presence of carbonatite suggests further investigation is warranted.

Other granites of the Methuen Suite that should be considered for REE potential are the Methuen and Coe Hill granites, Elzevir Terrane; the Cheddar Granite, Bancroft Terrane; and the Barber's Lake granite, Sharbot Lake Terrane, which is also fluorite-bearing and elevated in U and Th (Easton 1992).

Rare Earth Elements in the Central Metasedimentary Belt, Southeastern Ontario …cont'd

Two new prospects for REEs in southeastern Ontario show anomalous values. In lots 1 and 2, concession 6, Cavendish Township, D. Ross obtained values of up to 341ppm Nb and 68.8ppm Ta from a beryl and fluorite bearing granitic pegmatite (Assessment file 2.26507, Tweed Resident Geologist office). From a property in lots 8 and 9, concession 6, Lyndoch Township, samples brought to the District Geologist by A. Dubblestein in 2008 were anomalous in Ce (>310ppm), Dy (6.9ppm), Er (4.46ppm), La (161.8ppm), Y (36.85ppm) and U (35.0ppm) (District Geologist's files, Tweed Resident Geologist office).

Airborne radiometric anomalies in medium to high grade metamorphic regions of the Bancroft and northern Elzevir terranes may indicate concentrations of pegmatites or carbonatites containing rare earth elements associated with uranium-thorium mineralization. Ground radiometric surveys are frequently successful in tracing individual pegmatites and in locating radioactive zones within the pegmatites. Overburden geochemical surveys and mineral dispersion train mapping may assist in prospecting for REEs, as beryl and other rare earth minerals are relatively resistant to both chemical and mechanical weathering and should remain as small fragments in soils and till. Lithogeochemistry may indicate halos of rare elements in host rocks surrounding REE-bearing pegmatites and carbonatites (Storey and Vos 1981).

A search of the Ontario Geological Survey's Mineral Deposits Inventory database, using "titanium", "tantalum", "rare earth elements" and "southeastern Ontario" as search criteria, gave 127 records. The rare earth potential of the pegmatites, carbonatite dikes, and has been largely overlooked in the past, and warrants renewed exploration.

Phosphate

Phosphorus is an essential element for plant and animal nutrition. Phosphorus is consumed as a principal component of nitrogen-phosphorus-potassium fertilizers used on food crops throughout the world. Phosphate rock minerals are the only significant global resources of phosphorus. Southern Ontario has seen historic production of phosphate rock and hosts potential for new deposits types and new discoveries.

High quality crushed stone aggregate

Green or sustainable building is the practice of designing, constructing, operating, and maintaining buildings in ways that conserve natural resources and reduce environmental impacts. In 2000, the United States Green Building Council (USGBC) introduced a rating system for sustainable construction projects called Leadership in Energy and Environmental Design (LEED). The LEED system awards points for reaching environmental standards with respect to site selection, water and energy efficiency, materials selection, and indoor environmental quality. Canada has followed with a green building council (CaGBC) and its own LEED system, tailored for Canadian climates, construction practices, and regulations, offering four levels of certification: certified, silver, gold, and platinum.

One of the main criteria for accumulating LEED points for construction projects is the use of local building products. The intent is to "increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation" (LEED version 2.2, USGBC, 2005). The "region", as defined by LEED Canada, lies within a radius of 800 km from the project site (LEED Canada for New Construction and Major Renovations, version 1.0, CaGBC, September 2007).

Southern Ontario, between Windsor and Cornwall (800 km) and south of Sudbury (about 400km), is host to:

- 64 dimension stone quarries (limestone, sandstone, granite, and marble)
- 6 limestone quarries and 7 plants for cement production
- 7 shale quarries and 6 plants for brick and tile production
- 1 gypsum quarry and wallboard manufacturer

Rare Earth Elements in the Central Metasedimentary Belt, Southeastern Ontario …cont'd

- Numerous quarries producing crushed stone for coloured aggregate and terrazzo
- Several producers of quartzite and sandstone for glass, solar energy applications, and composite stone

Natural stone as a construction material, in addition to qualifying for LEED points as a local material, features other advantages that can earn LEED points with respect to environmental quality and energy efficiency. It is a durable and low-maintenance material; an abundant natural resource; requires relatively little processing after quarrying, often simply cutting or splitting; is recyclable as building stone or crushed stone; and improves energy efficiency by acting as a thermal mass, moderating extremes in temperature (passive heating and cooling).

Initially introduced only as a recognition of leadership in "green building", LEED certification is now often accompanied by a variety of direct and indirect financial rewards, the results of government incentive programs.

Abdel-Rahman, A.M. and Martin, R.F. 1987. The Deloro anorogenic igneous complex, Madoc, Ontario: 1. Geochemistry and feldspar mineralogy of the felsic plutonic rocks; Canadian Mineralogist, v.25, p.321-336.

Benecki, W. 2007. Rare earths are becoming rare; *in* Magnetics Business & Technology Magazine, November 2007, www.waltbenecki.com

Davidson, A. 1978. The Blachford Lake Intrusive Suite: An Aphebian alkaline plutonic complex in the Slave Province, Northwest Territories; *in* Current Research, Part A, Geological Survey of Canada, Paper 78-1A, p.119-134.

Easton, R.M. 1992. The Grenville Province and the Proterozoic history of central and southern Ontario; in, Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 2, p.714-904.

Ellsworth, H.V. 1932. Rare-element minerals of Canada; Geological Survey of Canada, Economic Geology Series, Number 11, 272p.

Hewitt, D.F. 1967. Pegmatite mineral resources of Ontario; Ontario Department of Mines, Industrial Mineral Report 21, 83p.

Storey, C.C. and Vos, M.A. 1981. Industrial minerals of the Pembroke-Renfrew area, part 2; Ontario Geological Survey, Mineral Deposits Circular 22, 214p. Accompanied by Preliminary Map P.2209, scale 1:126 720.