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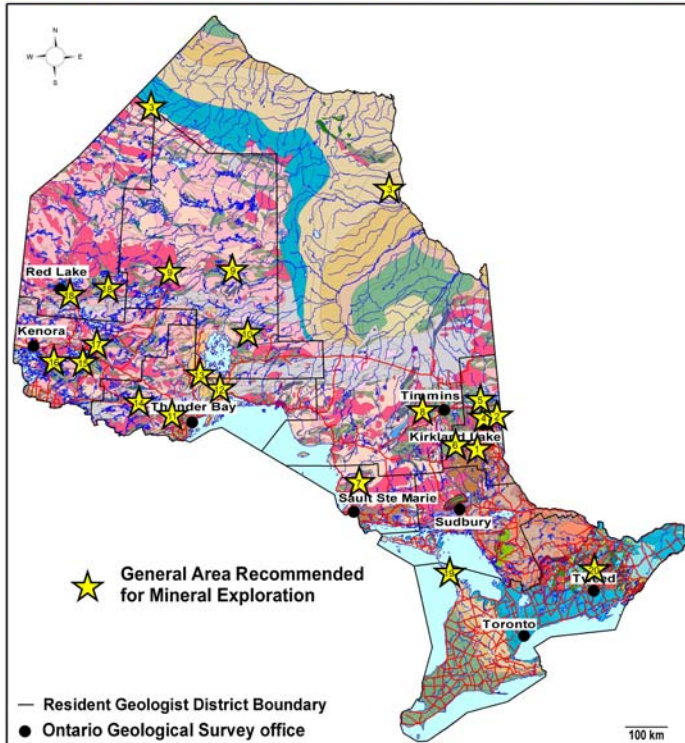
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The Ontario Resident Geologist's Program

The role of the Ontario Geological Survey's Resident Geologist Program is to monitor, stimulate and facilitate mineral exploration and the sustainable development 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 48 through a network of 10 field offices strategically located across the province. Six Regional Resident Geologists, supported by 14 District Geologists, 13 District and Regional Support Geologists 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.

Program services and functions are grouped into the following 6 key areas:

- **Provide expert geological consultation and advisory services to promote and stimulate mineral exploration**
- **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 maximize the land base available for mineral exploration and development**
- **Participate in public education forums to promote the mineral sector**

The Resident Geologist Program also provides support to MNDM's Mining Lands Section front-counter client services, plays a significant role in attracting mineral resource investment to Ontario and assists in fostering relations between the mineral industry and First Nation communities through the role and activities of the First Nations Minerals Information Officer based in Thunder Bay.

The Senior Manager for the Resident Geologist Program is Johial Newsome. Mr. Newsome and the Resident Geologist Program's headquarters are based in Sudbury.

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http://www.mndm.gov.on.ca/mndm/mines/resgeol/default_e.asp

2005-2006 RECOMMENDATIONS FOR MINERAL EXPLORATION—ONTARIO

1) EXPLORATION FOR KIMBERLITE AND DIAMONDS IN KIRKLAND LAKE—NEW LISKEARD AREA

As early as 1900, the idea of finding a diamond mine in Ontario has been a subject of Ontario government reports (Blue 1900). Every Kirkland Lake District Report of Activities published since 2000 has included a recommendation for exploration that included diamonds. New airborne geophysical surveys identifying new magnetic anomaly target areas were discussed and recommended in 2000 and 2003. The Discover Abitibi Round Lake Batholith airborne magnetometer survey released in 2004 identified additional new targets. Follow-up exploration by Tres-Or Resources Ltd. and Arctic Star Diamond Corp. led to the discovery of the **Lapointe 1** kimberlite pipe in the northeast corner of Sharpe Township. This kimberlite pipe, estimated to be 20 ha in size, lies 10 km west of kimberlite dikes drilled by Dianor Resources Ltd. in 2003 and 2004.

In 2001 it was suggested that work done to date was insufficient to adequately test the potential of the known pipes. In fact, only 3 of the more than 30 kimberlites identified in the district had greater than one tonne of material tested.

In his reports on the kimberlites of the **Lake Timiskaming Structural Zone**, R.P. Sage (Sage, 1996 and 2000) pointed out:

- “The location of additional kimberlites along the Lake Timiskaming Structural Zone trend is excellent.”
- “The kimberlites display wide variations in mineral compositions and relative kimberlite indicator mineral abundances.”
- “The diamond potential of a kimberlite can not be determined until all the phases are properly tested.”
- “The recognition that magnetic lows may reflect the presence of kimberlite pipes as well as magnetic highs has doubled the number of potential targets in the region. The Kirkland Lake area has not yet been prospected for kimberlites displaying magnetic low signatures.”
- “It is anticipated that only a small fraction of the kimberlite pipes that actually exist have been found. Most of the known kimberlite pipes have not been

- recent Discover Abitibi airborne survey led to discovery of Lapointe 1 kimberlite pipe
- 30 kimberlites discovered to date, but insufficient work done to adequately test their potential
- extensive Lake Temiskaming Structural Zone continues to offer promising targets

adequately tested for diamond content, considering these are complex multi-phase intrusions in which diamond content could vary drastically.”

- “In addition to finding more pipes in the known areas of emplacement, the region between Kirkland Lake and Cobalt-New Liskeard would appear to be a very promising area to explore.”
- “Another large area worthy of much greater exploration effort is the region between Cobalt-New Liskeard and North Bay. The general area stretching northwest from Kirkland Lake to the known kimberlite intrusions near Attawapiskat could conceivably host unknown clusters of kimberlite pipes.”

Recently, Contact Diamonds (formerly Sudbury Contact Mines Ltd.) reported the discovery of another kimberlite pipe in the New Liskeard area. In 2004, the company found two kimberlite pipes in Klock and Van Nostrand townships. These are the first kimberlite pipes found west of the **Montreal River Fault**. They are located about 20 km southwest of the 95-2 kimberlite pipe, from which Contact Diamonds processed a 652 tonne mini-bulk sample that recovered diamonds totalling 67 carats. As well, Temex Resources Corp. and Tres-Or Resources Ltd. each recently reported the recovery of a diamond from till samples collected near Temagami.

New innovations in geochemical techniques including Mobile Metal Ion (MMI), Soil Gas Hydrocarbon (SGH) and selective leach signatures provide additional tools to pinpoint new areas to explore within the Lake Timiskaming Structural Zone.

As Ontario moves closer to commissioning its first diamond mine (De Beer's Victor pipe in Attawapiskat, or perhaps even Contact Diamond's 95-2 pipe), there remain many more targets to be tested in the Kirkland Lake Resident Geologist District.

Blue, A. 1900. Are There Diamonds in Ontario; Ontario Bureau of Mines, Annual Report, Volume 9, p.119-124.

Sage, R. P. 2000. Kimberlites of the Lake Timiskaming Structural Zone: Supplement; Ontario Geological Survey, Open File Report 6018, 78p.

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2) DIAMONDS IN LAMPROPHYRE—KIRKLAND LAKE AREA

In 1996, diamonds were reported in lamprophyric dikes and associated breccias in the Wawa area (Sage 2000). These discoveries instilled an interest to determine if the Kirkland Lake lamprophyric dikes are likewise diamondiferous. Since 2000, more than 80 lamprophyre dikes in the Kirkland Lake - Cobalt area have been sampled by Kirkland Lake MNDM staff and more than 250 whole rock and trace element analyses were done on these samples. Preliminary observations from these analytical results indicated that lamprophyre dikes in **Kirkland Lake-Cobalt** area are chemically similar to those in the Wawa area and warranted further investigation for their diamond potential (Meyer et. al. 2000 and 2002). Subsequently, diamonds were found in a lamprophyre dike and a heterolithic breccia in Lorrain Township, south of Cobalt.

A project proposal to sample lamprophyre dikes in the Timmins - Kirkland Lake - Cobalt area to evaluate their diamond-bearing potential was approved by Discover Abitibi Initiative. G. Grabowski, District Geologist with the Ontario Geological Survey Resident Geologist Program in Kirkland Lake, developed and carried out the project. During the fall of 2004, a total of 45 lamprophyre dikes in the Timmins - Kirkland Lake - Cobalt area were sampled as part of a project under the **Discover Abitibi Initiative**. Samples were shipped to SGS Lakefield Research Ltd. in Lakefield, Ontario for analysis. The samples (twenty-four kilograms each) were tested for diamond content using caustic dissolution.

Six of the 45 samples submitted returned diamonds. Samples GGDA0402 (Chamberlain

- diamondiferous lamprophyre dykes in Kirkland Lake area chemically similar to Wawa area occurrences
- 6 of 45 samples collected during Discover Abitibi Initiative contain diamonds

Township) and GGDA0432 (Pacaud Township) each returned 1 microdiamond. Samples GGDA0433 (Pacaud township) and GGDA0435 Pacaud Township) and GGDA0441 (Coleman Township) returned 5, 3 and 23 microdiamonds, respectively. Sample GGDA0410 (McVittie Township) contained one 0.011 carat (2.214 mg) macrodiamond.

Whole rock and trace element analyses were also completed to compare with the existing analytical data. Sufficient sample was collected and retained from each site for future petrographic studies. The results have been released (Grabowski and Wilson 2005).

The results of this project demonstrate that diamonds occur in the lamprophyric rock from the Kirkland Lake-Cobalt area. A 25 kg sample represents about one cubic foot of rock. Although every attempt was made to collect as representative a sample as possible from each exposure, the relatively small volume sampled may have easily missed a diamond. Therefore, sample locations that did not return a diamond should not be considered to be barren. There are numerous lamprophyre locations that were not sampled in this project. Published Ontario Geological Survey (and its predecessors) reports can be used to locate these exposures.

Grabowski, G.P.B. and Wilson, A.C. 2005. Sampling lamprophyre dikes for diamonds: Discover Abitibi Initiative; Ontario Geological Survey, Open File Report 6170, 262p.

Meyer, G., Cosec, M., Grabowski, G.P.B., Guindon, D.L., Hailstone, M., Stephenson, C. Wallace, L.M., Debicki, R. and Yule, G. 2001. Report of Activities 2000, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts; Ontario Geological Survey, Open File Report 6051, 113p.

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

Sage, R. P. 2000. The “Sandor” diamond occurrence, Michipicoten greenstone belt, Wawa, Ontario: a preliminary study; Ontario Geological Survey, Open File Report 6016, 49p.

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3) WHERE ARE THE KIMBERLITES IN NW ONTARIO?

Kimberlite pipes are being actively explored and discovered in various parts of Ontario, notably along and near the **Lake Timiskaming fault system** in northeastern Ontario. Much less is known about their potential distribution in northwestern Ontario. Kimberlite clusters are known to occur in two episodes in Ontario – Early to Middle Jurassic (circa 180 to 160 Ma) and Mesoproterozoic (circa 1100 Ma – Keweenawan).

In northwestern Ontario, Mesoproterozoic kimberlite pipes appear to follow close to north-trending Marathon (circa 2110 Ma) diabase dykes under the western edge of the James Bay Lowlands and on strike with the north-trending **Trans-Superior Tectonic Zone** (TSTZ) farther south, which includes a series of Keweenawan age diatreme breccias, carbonatite and the Coldwell complex north of Lake Superior. It is recommended that the entire length of this northward trending, broad, poorly defined TSTZ be investigated from Lake Superior to the James Bay Lowlands.

The Jurassic kimberlite pipes occur under the James Bay Lowlands and tend to cluster close to the northwest-trending (circa 2450 Ma) Matachewan diabase dykes and possibly near northeast-trending faults or dykes. Further exploration is ongoing in the James Bay Lowlands but less consideration has been placed on the potential for kimberlite pipes in the

- Trans-Superior Tectonic Zone prospective for Mesoproterozoic kimberlite dykes
- Proterozoic and Jurassic age kimberlite pipes may be clustered near Stull-Wunnummin and North Kenyon faults

vicinity of major Archean faults that lie along the boundary between Archean terranes. Two faults are of interest and should be considered because of their deep lithospheric significance:

1. The **Stull-Wunnummin fault**, which passes through the Wunnummin greenstone belt just north of two carbonatite pipes. This fault lies between the Oxford-Stull terrane and North Caribou superterrane (see Figure 3-1 and Rayner and Stott 2005).
2. The **North Kenyon fault**, which appears to form the boundary between the Northern Superior superterrane and the Oxford-Stull terrane. This fault merges eastward into the Winisk fault and lies close to a carbonatite pipe near James Bay. Farther west, near the Manitoba-Ontario border, the North Kenyon fault lies close to a set of north-striking diabase dykes which lie northeast from kimberlite indicator mineral concentrations discovered by Stone (2005). The length of the vicinity of the North Kenyon fault from Manitoba to James Bay and the Stull-Wunnummin fault should be

investigated in reconnaissance fashion for Proterozoic and Phanerozoic kimberlite pipes.

Field Work and Other Activities 2005, Ontario Geological Survey, Open File Report 6172, p.10-1 to 10-21.

Rayner, N. and Stott, G.M. 2005. Discrimination of Archean domains in the Sachigo Subprovince: A progress report on the geochronology; in Summary of

Stone, D. 2005. Geology of the Northern Superior Area, Ontario; Ontario Geological Survey, Open File Report 6140, 94p.

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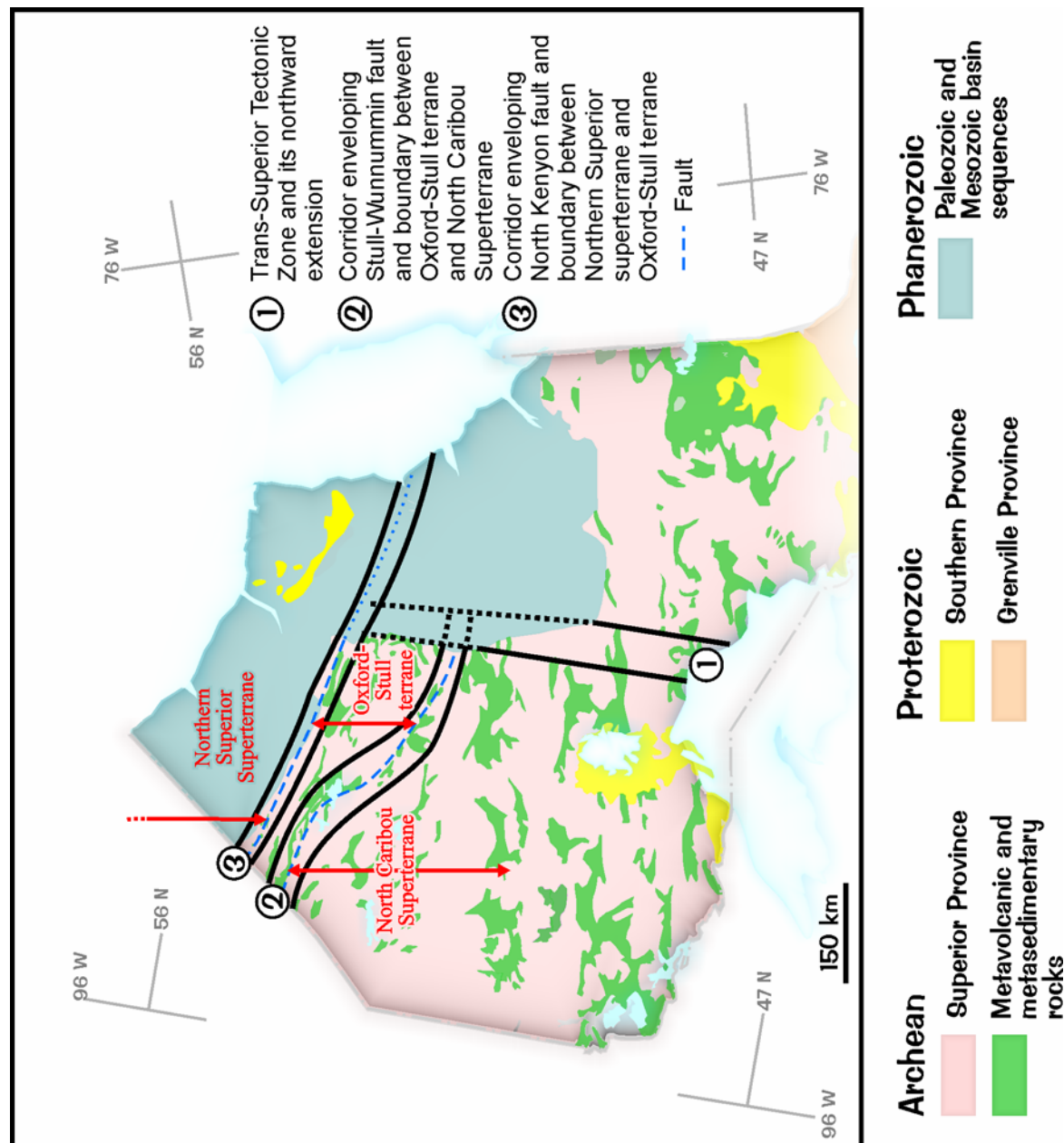


Figure 3-1

4) NORTH-TRENDING AURIFEROUS AND NON-AURIFEROUS QUARTZ VEINS AND STRUCTURES IN THE KIRKLAND LAKE AREA

To date, **Kirkland Lake Gold Inc.** discovered at least five new gold-bearing veins/structures predominantly striking to the north. The veins and structure are oriented approximately perpendicular to the east-trending, gold-bearing Kirkland Lake Main Break and subsidiary, sub-parallel structures. North-trending gold-bearing zones were previously not recognized in the Kirkland Lake gold camp and the discovery adds a new dimension to gold potential in the area. The **Upper D Zone**, which is in the early stages of exploration contains 162 212 tons grading 0.8 ounce gold per ton, equivalent to 129 370 ounces of gold. The lower D Zone occurs about 2000 feet below and down-plunge from the Upper D Zone and the area between the two zones needs to be explored.

A north trending auriferous structure was discovered approximately 0.6 km southeast of the Macassa No.2 shaft, 1400 feet south of the South Break and 2000 feet south of the Main Break. The mineralized zone is composed of greywacke and conglomerate with about 15% finely disseminated pyrite and visible gold. Diamond drill hole SV 04-08, which tested the zone near surface, intersected **29 feet of core grading 0.5 ounce per ton gold.**

Recently, the company intersected, in diamond drill hole 50-627, a 90.4 foot core length grading 2.3 ounce per ton gold and a wedged hole from it grading 1.43 ounces of gold over 124.5 feet. This new zone occurs 1600 feet south of the Macassa mine workings. The configuration of the zone is unknown and at present it is speculated that it does not follow the traditional trend of the main breaks.

A gold-bearing quartz-tourmaline vein with a similar crosscutting relationship to the general gold trend was discovered at Battle Mountain Gold's, now Newmont Mining Corporation's, **Holloway Mine**. The vein, which occurs on the 505 West level, was intersected in 14 underground holes. The average of the drill intercepts was 5.8 feet grading 0.415 ounce per ton gold (The Northern Daily News, August 1, 2000, p.3).

The north trending fissures in which auriferous quartz veins precipitated, and shear/fracture zones along which metasomatic replacements including gold

- newly discovered north-striking gold veins add new dimension to exploration
- significant potential of near-surface barren quartz veins becoming gold-bearing with depth

occurred, most likely existed prior to and/or developed contemporaneously as gold was introduced along the Kirkland Lake Main Break fault system. These sites could have developed as follows:

1. Step-over faulting from one fault plane to another
2. Differential movement of blocks of rock between two parallel fault planes
3. Or a combination of the two

It has yet to be determined if the new gold zones terminate against the Kirkland Lake Main Break and associated fault splays or if they extend across them. A number of unmineralized north trending faults cut across the Kirkland Lake Main Break and associated gold mineralization. These are younger in age than the gold mineralizing event and merely caused displacements.

The above considerations bring up the question: what if a north trending, gold-rich quartz vein occurs in isolation proximal to major east-trending structures, thus far barren of gold? For example at the **Croesus Mine** in Munro Township, 14 859 ounces of gold were recovered from 5333 tons of a north-trending quartz vein. Apparently the vein was cut-off by faulting. The Pipestone fault with several parallel fault splays occurs approximately 1.2 km to the northeast and strikes east-southeast. In this area no significant gold mineralization has been discovered. Based on the above reasoning, should the southeast trending **Pipestone fault** be further explored in this area?

Gold in Archean metasomatic replacement environments appear to have precipitated within limited temperature/pressure ranges as is evident at the Holloway Mine, where the ore body tops out ~200 m from surface. Less intense alteration continues in the same plane towards surface without appreciable gold content. In transposing this concept to quartz veins, it could suggest that certain

strategically located, virtually non-gold bearing veins at surface could become economical at depth?

Traditionally, quartz veins lacking ore-grade material at surface are not explored at depth. If this possibility could be proven, then samples of quartz vein material should be tested for relevant trace elements at various depths. This could then provide a geochemical tool for exploring some quartz veins in other locations.

The Township of Teck geology map (Map No. 1945-1) shows three north-trending quartz veins up to 1 km south of the Kirkland Lake Main Break. Considering the intense prospecting the township was subjected to in the past, it can perhaps be assumed that they are sub-economic at surface. Bearing the above considerations in mind, one is curious to know if they become economical at depth.

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5) MILLIGAN AURIFEROUS QUARTZ BOULDERS—COMMENTS AND RECOMMENDATIONS

The **Milligan auriferous quartz boulders**, located near Lake Abitibi in the northwest corner of Milligan Township, prompted several follow-up exploration projects by mining companies. The boulders occur on the Munro Esker and so far the source for them has eluded discovery.

The boulders were originally located and described by U.L. Vagners in a private report for W.G. Wahl Limited (Ferguson and Freeman 1978). Samples from **11 quartz boulders averaged 0.328 ounce gold per ton**. Other subsequent assays were: five samples averaging 0.1888 ounce gold per ton (Meyer et al. 1992) and four samples averaging 0.278 ounce gold per ton (Meyer et al. 2001). A sample of a newly discovered quartz boulder, just south of the other quartz boulders, assayed 3.01 ounces of gold per ton (Meyer et al. 2004).

The auriferous quartz boulders vary considerably in size and the largest one, based on a photo prior to it being blasted, is estimated to measure approximately 1.5 x 1.5 x 1.0 m and is located at UTM NAD83 Zone 17 563211E 5393829N. The boulders are all well rounded, suggesting that they traveled independently over a considerable distance. For differently sized boulders to end up at the same general site could only have been achieved by individual boulders moving along in tandem, possibly at the base of a glacier. If

- MMI survey highly recommended up-ice of high-grade auriferous quartz boulders
- Munro Esker should also be sampled between Catherine Tp. and Lake Abitibi
- gold-bearing esker sand and auriferous boulders in the Lake Abitibi area show potential for new gold camp

water was involved as the transporting agent then the smaller boulders should have traveled further downstream (under ice) than the larger ones. An ice sheet floating on water would have dispersed boulders in a more erratic manner, minimizing the likelihood of multiple boulders from the same source occurring together.

The Lake Abitibi area was subjected to several glacial events; the question arises whether one or more ice ages and advances were involved in the dispersion of the boulders. A single large quartz boulder could initially have been moved during an older ice age and disintegrated into smaller pieces during the last glacial event. The quartz material is too brittle to have survived as a single large boulder without breaking into smaller pieces. It is perhaps more likely that the quartz boulders were dislodged from the same bedrock source during the last ice age at the same time or else as a large boulder that broke up into smaller pieces soon after removal from its source.

A vertical sonic drill hole (Hole 85-12 - OGS 1986) was drilled near the eastern-most large quartz boulder (this boulder has subsequently been removed by persons unknown). The hole intersected 61.6 m of sand with some gritty sections and occasional pebbles. The sand of the **Munro Esker** at this site was essentially deposited by water in an ice-flanked “river”. The absence of boulders within the sand and gritty sand layers suggest relative slow flow of water. The dilemma is how a veneer of large boulders became draped over the top of the sand. Two explanations are considered:

1. An iceberg(s), dislodged from the ice sheet floated down the “river” became hung up and dropped contained boulders upon melting at the present site of the boulders.
2. An ice advance over the frozen esker deposited erratic boulders upon melting back.

If the latter is the case, what was the ice direction? The Munro Esker in this area trends due north to Lake Abitibi where it cuts out near Lake Abitibi’s outlet into the Abitibi River. U. Vagners on a field trip (Lovell 1983) suggested a possible Cochrane re-advance of the last ice age over-rode it almost to Eastford Lake. Based on the direction of the Munro Esker south of Lake Abitibi one would assume an ice-flow direction to the south, however, there is ample evidence suggesting an advance at about 130°.

With a possible complex interplay of ice movements during the last ice age, first in the 160° direction and then possibly followed by the Cochrane advance at 130°, the following is recommended as a follow-up of the Milligan auriferous quartz boulders:

1. MMI surveys should be performed up ice from the Milligan boulder field at approximately 340° and approximately 310°. These surveys should also be performed in the Trail Lake area, where diamond drill holes have intersected promising carbonate alteration zones as well as a follow-up to the strike extension of Boulder Mining’s reverse circulation hole, WALP-04-20. MMI surveys can be an effective exploration tool in this outcrop-poor environment as was demonstrated by Queenston Mining Inc. The company detected coincident weak **MMI gold anomalies** with previously determined magnetic low features in the vicinity of fault and shear zones (Queenston Mining Inc.

Annual Report 2003 and W. Benham, personal communication, 2005).

2. The esker, which trends to the northwest from **Lake Abitibi to and beyond Trail Lake**, should be explored using Lee’s (1965) method (Lee performed a sampling program of bell-shaped ridges of the Munro Esker from Catharine Township southeast of Kirkland Lake to Lake Abitibi).
3. North of Trail Lake, several sericitized metasediments and/or tuffs suggest possible **hydrothermal alteration**, e.g. Utah Mines Ltd. DDH JL-85-NWC (KL1855), which should also be followed up with MMI surveys.

It should be noted that several gold-bearing quartz boulders and gold grains, panned from esker gravels at several sites and extracted from material recovered in reverse circulation drilling and sonic drilling, are indicative of a potential for a “**new gold camp**” in the Lake Abitibi area (Meyer et al. 2000, 2001 and 2004).

- Ferguson, S.A. and E.B. Freeman. 1978. Ontario Occurrences of Float, Placer Gold, and Other Heavy Minerals; Ontario Geological Survey, Mineral Deposits Circular 17, p.10
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Ontario Geological Survey, Miscellaneous Paper 158,
p.261-284

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6) BASE & PRECIOUS METAL POTENTIAL OF BANNOCKBURN, MONTROSE AND POWELL TOWNSHIPS

This summer's mapping identified favourable geological environments in the three townships for gold, nickel - copper and copper-molybdenum-precious metal mineralization. Recent exploration by Mustang Resources Inc. outlined a small deposit of high grade nickel – copper mineralization (C-zone) that is hosted in a komatiite flow/intrusion in Bannockburn Township (see Figure 6-1). A number of nearby komatiite bodies host disseminated mineralization and there is potential for additional discoveries in the area especially to the southeast under the Paleo-Proterozoic Gowganda Formation where gravity and magnetic anomalies have been detected by airborne geophysical surveys.

Several previously unmapped komatiite units were outlined in Powell Township and their potential to host nickel-copper mineralization is largely unknown. Gold mineralization occurs in several areas where komatiites are in contact with younger Timiskaming metasedimentary rocks. Widespread carbonate and green mica alteration is common in several locations, pyrite and weakly disseminated base metal mineralization indicates that this contact should be more thoroughly explored.

- potential for komatiite-hosted Ni-Cu mineralization below Gowganda Formation
- widespread alteration and sulphide mineralization near unconformable komatiite-Temiskaming contact prospective for gold
- known gold deposits and Cu-Mo mineralization in a string of underexplored alkalic intrusions in Powell Tp.

The past-producing Matachewan Consolidated and Young-Davidson gold mines are located in Powell Township and both are associated with a syenite intrusion (see Figure 6-2). This syenite is one of a number of alkalic intrusions that comprise a north trending string in the township. The intrusions are probably cogenetic and there appears to be a mineral zonation associated with the string. Gold with lesser amounts of base metals are more common in the most northerly and southerly intrusions, copper and molybdenum mineralization with lesser precious metal tenor is more common in the central intrusions. All these intrusions and surrounding area remain attractive exploration targets.

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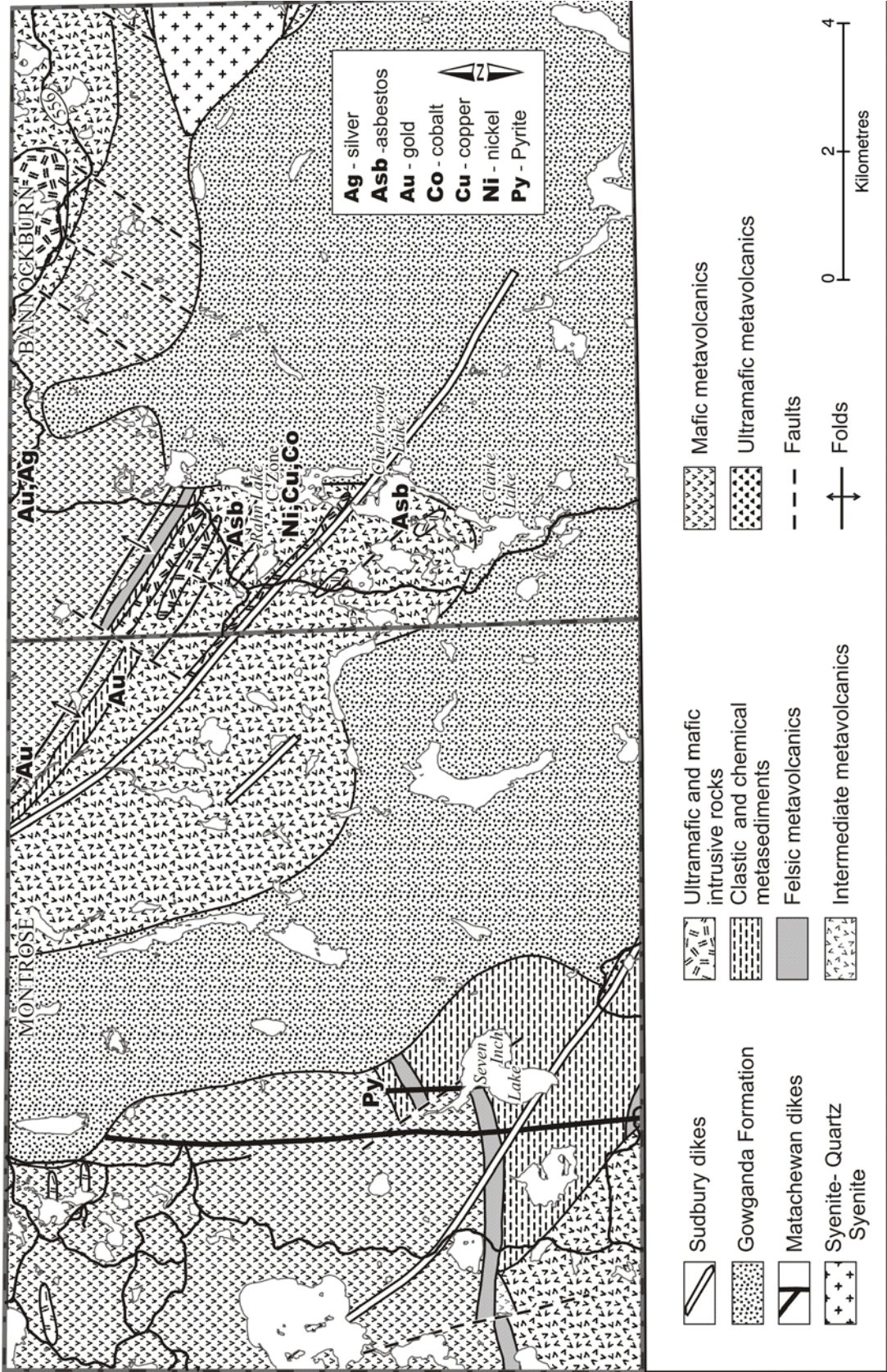


Figure 6-1

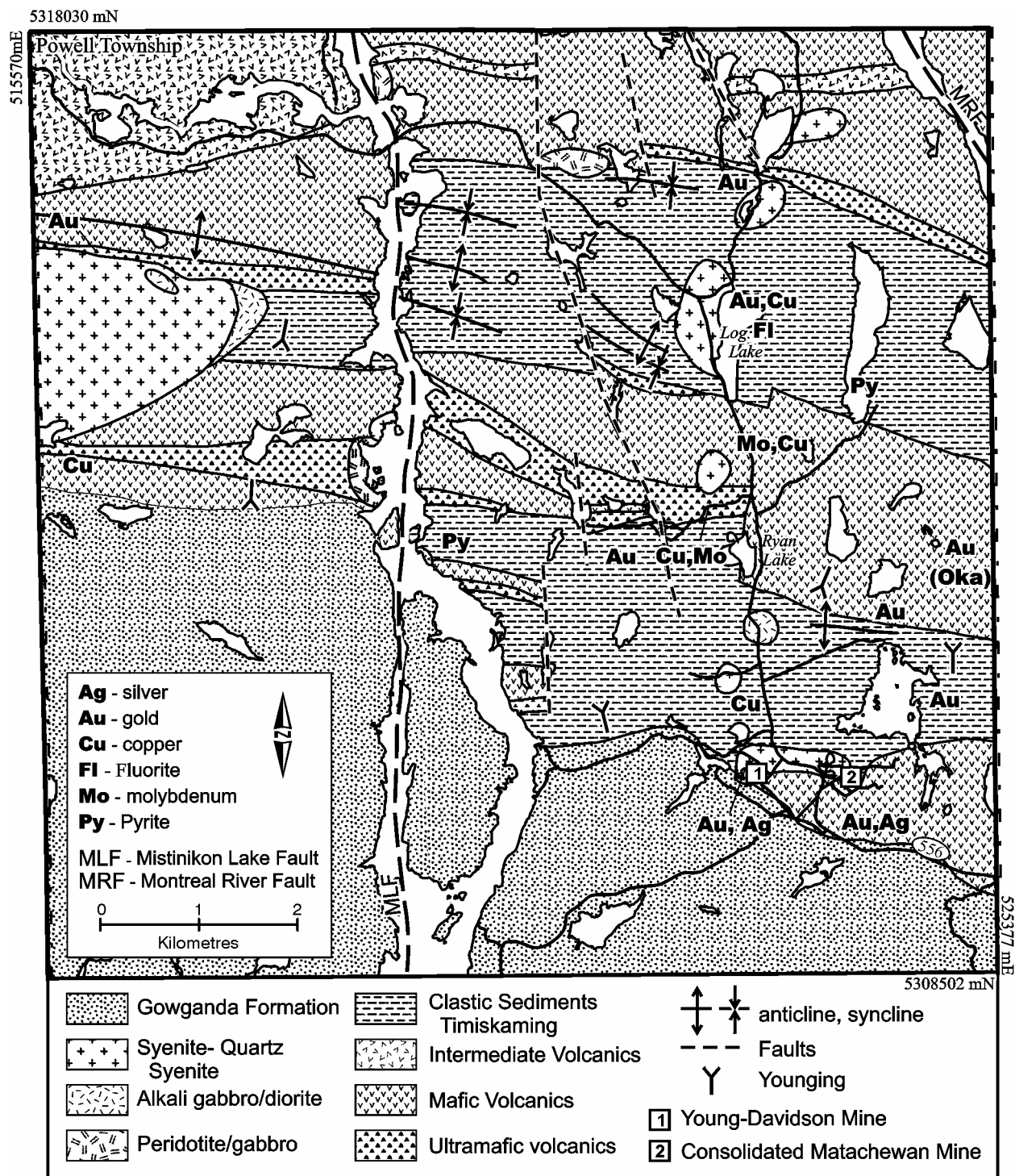


Figure 6-2

7) BATCHAWANA GREENSTONE BELT UNDER EXPLORED FOR BASE METALS AND GOLD MINERALIZATION

The northeast trending Batchawana Greenstone Belt is 95 km long and averages 20 km wide; it is located approximately 50 km north of Sault Ste. Marie Ontario and can be accessed on the west side of the belt by logging roads leading off the Trans Canada Highway (see Figure 7-1). Access to the northeast portion of the Belt can be found along the Pineal Lake road immediately south of Chapleau.

Active logging within and marginal to the belt continues to provide **additional new access** to the greenstone belt for prospecting and mineral exploration.

Two major power lines cut southeast across the greenstone belt in the Western and Eastern domains. An active CNR railway line linking Wawa and Sault Ste. Marie trends north through the central portion of the belt.

The extreme western end of the belt, near Lake Superior, has been overlain by Keweenawan volcanic rocks of the Mid Continental Rift.

The belt has been extensively described by Grunsky (1991) and has been divided into two domains the younger Western Domain and the older Eastern Domain. The Western Volcanic subdomain is dominantly tholeiitic volcanic rocks, with south and north facing units. The Eastern Volcanic subdomain is mixed **tholeiitic/calc-alkalic volcanic rocks**, with southwest facing units and northwesterly dipping foliations. This overturning provides evidence for a thrust event from the northeast. The northeast part of the Eastern Volcanic subdomain forms a syncline

plunging to the west from Moen, Moggy to Runnalls townships. A sedimentary basin occupies the centre of the belt and has been intruded by late to **post tectonic felsic intrusives**: the Grey Owl Lake intrusion and the Mongoose Lake intrusion.

The Batchawana Greenstone Belt by comparison to the Michipicoten Greenstone Belt has been under explored for gold and base metal mineralization. The chart summarises the number of mineral occurrences and deposits (MDI) in both belts and clearly illustrates the under explored nature of the Batchawana greenstone belt. This under exploration is also illustrated by the number of assessment files (AFRI) submitted (to 2001) for each belt (does not include airborne geophysics).

Mineral Occurrences and Deposits

COMMODITY	BATCHEWANA	MICHIPICOTEN
AU	7	251 (incl. 7 past producers)
AG	3	24
MO	1	5
CU	52	68
ZN	2	33
PB	4	7
NI	0	6
Total # MDI	86	459
# AFRI files	1140	2954
AREA	1405 sq km	2542 sq km

Grunsky, E. C. 1991. Geology of the Batchawana Greenstone Area, District of Algoma; Ontario Geological Survey, Open File Report 5791, 214p.

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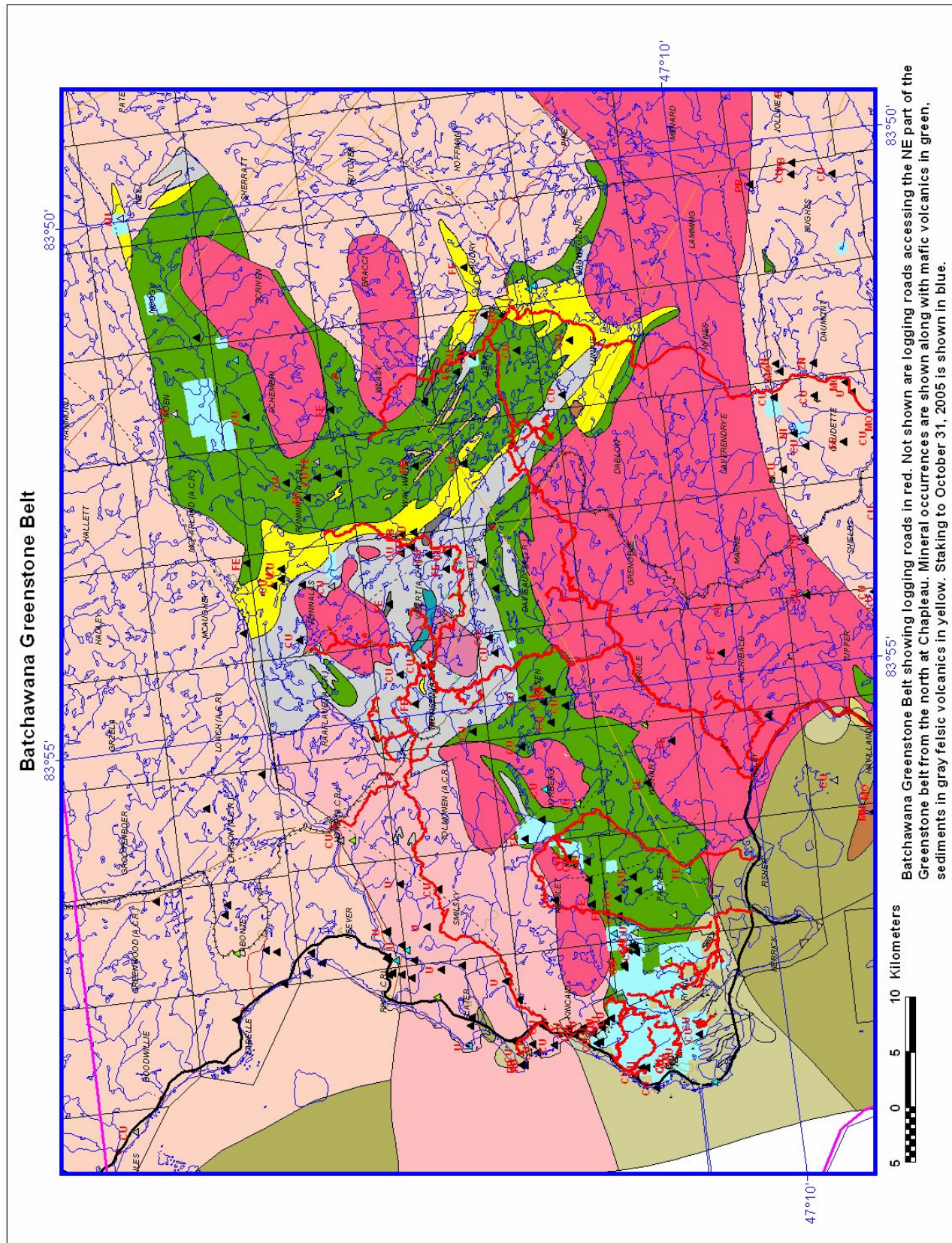


Figure 7-1

8) GRAPHITIC ARGILLITES & EXHALITES—KEYS TO GOLD & VHMS EXPLORATION

Over the past 40 or so years, much exploration resulted in diamond drill intersections of graphitic argillites and exhalite/iron formation. Graphite and associated sulphide mineralization often adequately explained the target electromagnetic anomalies which, for the most part, were then written off. On occasion, additional diamond drilling followed when sampling returned anomalous to subeconomic copper and zinc assays. Interest in these horizons usually quickly waned. This no longer need be the case.

C.T. Barrie (2005) developed separate geochemical indices for graphitic argillites and exhalites. The **Exhalite Index**, which vectors VHMS mineralization in the Kamiskotia camp near Timmins, is expressed as

$$\text{Log}[(\text{Cu} \times \text{Zn} \times \text{S})/\text{Na}_2\text{O}]$$

For this index, Cu, Zn and S are in ppm values and Na₂O is wt.%. Barrie (2005) reports that the index yields values ranging from 4 to 10 in the Kamiskotia area, with values >7 resulting from samples within 200 m of the Kam Kotia deposit and within 500 m of the smaller Canadian Jamieson deposit. Further, Barrie determined that exhalites having arsenic values <15 ppm are not prospective.

The **Graphitic Argillite Index** which vectors gold mineralization around the Owl Creek and Hoyle Pond deposits in Timmins and around the Holloway and

- Exhalite Index developed that vectors to sulphide deposits on a scale of hundreds of metres
- Graphitic Argillite Index vectors to gold deposits
- sampling of intersections of graphitic argillite and exhalite stored in public-access drill core libraries is highly recommended

Holt-McDermott deposits east of Matheson, is expressed as

$$\text{Log}[(\text{Au} \times \text{As} \times \text{Hg} \times \text{Sb})/(\text{C}^* \times \text{S})]$$

For this index, C* is graphite and carbonaceous (non-carbonate) carbon.

For his studies, Barrie (2005) sampled graphitic argillites and exhalites contained in both proprietary drill core and in drill core found in the Timmins Drill Core Library. The **drill core libraries across Ontario** contain numerous drill holes containing intersections of graphitic argillite and/or exhalite. Geochemical sampling of these cores and use of these “Barrie Indices” may yield vectors to as yet undiscovered gold or VHMS deposits.

Barrie, C.T., 2005. Geochemistry of Exhalites and Graphitic Argillites near VMS and Gold Deposits; an Ontario Mineral Exploration Technologies (OMET) project, Final Report, February 29, 2005; Ontario Geological Survey, Miscellaneous Release Data 173.

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9) GOLD IN THE CENTRAL AND EASTERN UCHI SUBPROVINCE

The Archean 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

- Pickle Lake belt produced over 3M ounces gold
- dozen companies active in Fort Hope and Pickle Lake area belts
- appreciable amount of open ground remains
- recent mapping and airborne geophysics by the OGS

the Uchi Subprovince, respectively. The latter two are the subject of the following recommendations for exploration.

The **Fort Hope area** and its gold occurrences have been favourably compared in structural and tectonic setting, not only to the other Uchi gold camps, but also to the nearby Beardmore-Geraldton belt in the eastern Wabigoon Subprovince (Figure 9-1). Gold mineralization is associated with deformation zones and regional transcurrent faults at or near subprovince boundaries. These structures have produced “belts” of intercalated metavolcanic and clastic metasedimentary rocks. Local gold occurrences have been documented in Ontario Geological Survey (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. Several exploration companies, including Landore Resources Inc., Eastmain Resources Inc., MetalCORP Limited and Canstar Resources Inc., are actively investigating the gold potential of the belt.

The **Opik eigen Lake area** was mapped by Lindsay Hall of the OGS in 2004. Mapping is planned to continue in the Fort Hope belt in 2006.

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. Although companies like King’s Bay Gold Corporation, Canadian Golden Dragon Resources Ltd., MetalCORP Limited, Continuum Resources Ltd. / Prospector Consolidated Resources Inc., Queenston Mining Inc., McVicar Resources Inc., Millennium Minerals and Troon Ventures Ltd. have recently been active in the area, much highly prospective ground remains unstaked.

The geology of the Fort Hope and Vickers (Lang Lake belt) areas has been greatly elucidated by the release of airborne geophysical surveys that were flown as part of the Ontario Geological Survey’s **Operation Treasure Hunt** and released in 2003 and 2000, respectively.

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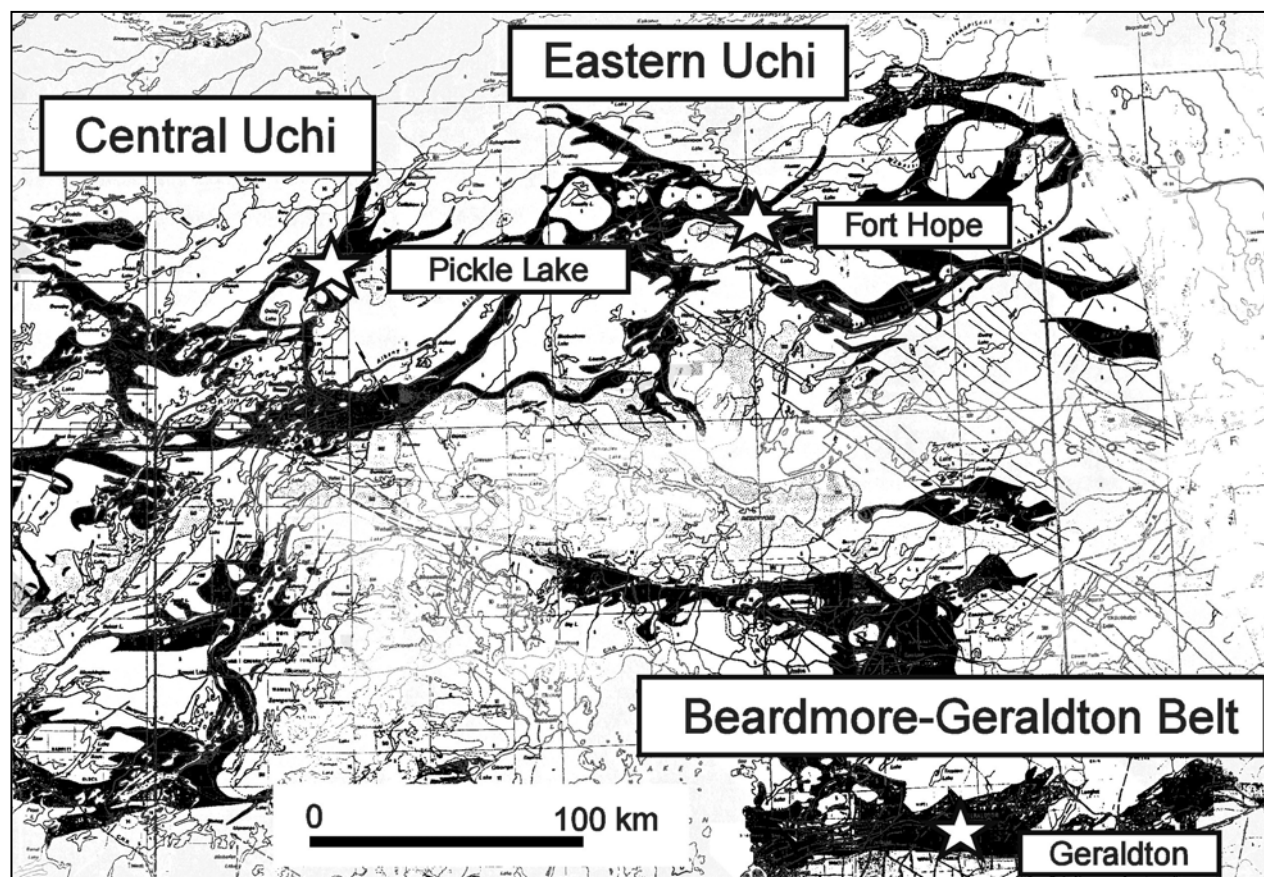


Figure 9-1

10) GOLD TARGETS IN THE BEARDMORE–GERALDTON BELT

The Beardmore-Geraldton belt, along the southern margin of the eastern Wabigoon Subprovince, has produced over four million ounces of gold (Figure 9-1). Gold exploration is recommended on the central and eastern extensions of the **Paint Lake–Burrows River fault**, a transcurrent fault associated with gold deposits in the belt. Further detailed prospecting for gold is recommended between Geraldton and the Kinghorn Road, on the Paint Lake–Burrows River fault, and along secondary and tertiary faults and/or lineaments. A parallel, regional structure to the south, the Watson Lake Fault, also has a number of gold occurrences (e.g. Archie Lake, Angle Lake, Nora Lake) associated with it. This structure may be, in part, related to the formation of the **Leitch Mine** and neighbouring deposits, serving as an important hydrothermal fluid conduit. The Archie Lake and Nora Lake properties are currently being explored by Alto Ventures Ltd. and Spruce Ridge Resources Ltd., respectively.

- produced over 4M ounces gold
- gold deposits associated with transcurrent fault, splay structures and iron formation
- strained and altered rocks associated with the Paint Lake–Burrows River fault, Pagwachuan Lake are recommended for gold exploration
- sheared and altered zones associated with the Paglamin Lake stock are also highly recommended for exploration

Recent work by Teck Cominco Limited, Freewest Resources Canada Inc. and Novawest Resources Inc. east of Longlac has reinforced the gold potential of this largely overlooked portion of the Beardmore-Geraldton belt. Previous mappers have recommended the area for gold exploration, citing similarities to the Geraldton camp. The continuity of the banded iron formation from the Macleod-Cockshutt-Hardrock mines area to north of Pagwachuan Lake is revealed

on the regional airborne magnetic survey (Ontario Geological Survey 1989).

Most of the observed shear zones and other key structures were noted in the vicinity of known gold occurrences. It is recommended that these shear zones be traced by prospecting and stripping. Strained and altered rocks within and flanking these zones have been converted into biotite-, chlorite-, sericite- and/or carbonate-bearing schists.

The eastern extension of the **Burrows River Fault / Deformation Zone** may extend through the Pagwachuan Lake area. Although such major faults are not commonly mineralized, subordinate splay structures typically host gold occurrences. Deformed and altered rocks and any quartz-carbonate veins in the vicinity of such structures should be systematically

sampled. Arsenopyrite is locally a good pathfinder mineral for gold. It has been noted in association with gold mineralization in sulphidized banded iron formation, clastic sedimentary rocks, quartz porphyry and quartz-carbonate veins.

The **Paglam Lake granodiorite stock** and its environs is also recommended as a focus for exploration. Gold occurrences (e.g. Caramat Gold Mines; Adel Lake; west of Secon Lake) are associated with sheared and altered zones in felsic intrusive rocks and flanking clastic metasedimentary rocks with quartz-carbonate veining. This stock may be analogous to the Croll Lake Stock which is regarded by some researchers as the source of mineralizing fluids in the Geraldton camp. This relatively under-explored area warrants further investigation.

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11) GOLD AND BASE METAL POTENTIAL IN THE WEST-CENTRAL SHEBANDOWAN GREENSTONE BELT

The west-central Shebandowan greenstone belt, 100 km west of Thunder Bay, lies within the Wawa Subprovince and borders the Quetico Subprovince to the south. The belt has hosted past-producing mines such as the **Shebandowan Mine** (8.6 Mt @ 2.0% Ni, 1% Cu and 2.68 g/t Pt + Pd), the **North Coldstream Mine** (2.7 MT (@ ~1.89% Cu), yielding 102 million pounds Cu; 440 000 ounces Ag and 22 000 ounces Au) and the **Ardeen Mine** (~30 000 oz Au). The belt has excellent exploration potential for both gold and base metals. With a history of metal production and a host of known resources, this belt remains under-explored and poorly researched.

Gold mineralization, is associated with felsic intrusive rocks, intruding clastic metasedimentary rocks, formerly thought to represent Quetico metasedimentary rocks, and requires mineral exploration. In addition, major zones of

- past precious and base metal production
- newly discovered Larose occurrence lies within 3.5 km-long altered and sulphidized shear zone
- recent drilling on Sungold property intersected Cu-Zn stringer and massive sulphide mineralization

carbonatization and quartz veining related to structural deformation remain excellent gold exploration targets. Recent exploration by prospectors and junior exploration companies has led to the discovery of numerous new gold occurrences in the west-central Shebandowan greenstone belt. Prospecting and exploration by R. Kwiatkowski and Freewest Resources Canada Inc. has led to the discovery of the **Larose Occurrence**. Preliminary stripping and sampling has exposed a number of *en échelon* shear zones within clastic metasedimentary rocks that have been intruded by quartz-feldspar porphyry.

Gold mineralization occurs in silicified, sericitized, carbonatized, hematitized and sulphidized shear zones along a 3.5 km strike length.

Volcanogenic massive sulphide base metal exploration should include stratigraphic, structural and lithogeochemical mapping to unravel complex lithologic relationships and further delineate prospective targets. Recent drilling by Freewest Resources Canada Inc. on the Wye Lake base metal horizon on their **Sungold property** returned values up to 6.21% Zn over 4.43 m and 1.22% Cu over 5.74 m

in zones characterized by stringer and massive sulphide mineralization (News Release, Freewest Resources Canada Inc., October 12, 2005). Other active companies include East West Resource Corporation and Maple Minerals Corp. who own joint interests in eight base metal and gold properties in the Shebandowan Belt.

Recent logging and road development has provided new access to much of the belt and further prospecting and exploration is warranted!

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12) URANIUM IN THE THUNDER BAY AREA

The most recent upsurge in uranium exploration in the Thunder Bay area started in 2004 with the acquisition of property in the **Mesoproterozoic Sibley Basin**, south of Lake Nipigon, by Rampart Ventures Ltd. and New Shoshoni Ventures Ltd., among others. The exploration model draws upon local similarities with unconformity-related uranium mineralization in the Athabasca Basin of northern Saskatchewan.

Scott (1987) described four major categories of uranium mineralization in the Sibley Basin and the underlying Archean basement of the Quetico Subprovince. Uranium is:

- 1) associated with albite-quartz-muscovite pegmatites in the Quetico Subprovince;
- 2) associated with the Proterozoic-Archean unconformity;
- 3) associated with Mesoproterozoic alkalic and carbonatitic rocks; and
- 4) associated with Paleoproterozoic Gunflint Formation accretionary lapilli tuff and in radioactive nodules in Sibley Group sedimentary rocks.

Iron oxide-copper-gold (IOCG)-style (*a.k.a.* **Olympic Dam-type**) mineralization also warrants consideration in the Sibley Basin.

The following criteria should be considered when generating targets for uranium mineralization:

- unconformity-related uranium occurrences in the Mesoproterozoic Sibley Basin
- mapping, lake sediment and airborne survey data available from recently completed Lake Nipigon Region Geoscience Initiative
- targets for IOCG-style mineralization warrant exploration

- 1) a source of uranium (*e.g.* Quetico pegmatites);
- 2) a means of releasing any available uranium (*e.g.* Neoarchean to Paleoproterozoic weathering);
- 3) a mechanism for transporting uranium (mechanical / geochemical);
- 4) the deposition of uranium in structural and/or geochemical traps (*e.g.* graphitic Archean units at the unconformity); and
- 5) preservation of the deposit (*e.g.* underneath Sibley sedimentary cover and diabase sills).

Recent studies and surveys undertaken as part of the **Lake Nipigon Region Geoscience Initiative** should be utilized. These include geological mapping; mineral occurrence compilation; lake bottom sediment and till sampling surveys, as well as magnetometer, electromagnetic and radiometric airborne geophysical surveys.

Scott 1987. Uranium Occurrences of the Thunder Bay-Nipigon-Marathon Area; Ontario Geological Survey,

Open File Report 5634, 158p.

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13) PGE POTENTIAL OF THE NIPIGON EMBAYMENT

There are a series of gabbro to olivine gabbro sills scattered through the **Nipigon Embayment**, including the 1) Jackfish Sill in the north west portion of the Embayment (MacDonald and Tremblay 2005), 2) the McIntyre Sill southwest of Lake Nipigon (Richardson and Hollings 2005), 3) the Shillabeer Sill (Richardson and Hollings 2005), and a number of sills in the Kama Hill area on Lake Superior (Hart 2005).

These sills generally have rare earth element ratios comparable to the mafic to ultramafic intrusions of the Nipigon Embayment (e.g. Disraeli, Seagull, Hele and Kitto intrusions) (Hart 2005; MacDonald and Tremblay 2004), and some samples have elevated Cu/Pd ratios that overlap with the ratios observed in the mafic to ultramafic intrusions. These elevated Cu/Pd ratios suggest that these sills may also be part of mineralized magmatic systems (e.g. Barnes et al. 1993) indicating a potential for additional platinum group element mineralization in the Nipigon Embayment.

The **Jackfish**, **McIntyre**, and **Shillabeer** sills, along with the sills at **Kama Hill**, are targets for further

investigation to determine if they may be peripheral portions of larger intrusions with a potential to host PGE mineralization.

Barnes, S.J., Couture, J.-F., Sawyer, E.W. and Bouchaib, C. 1993. Nickel-copper occurrences in the Belleterre–Angliers Belt of the Pontiac Subprovince and the use of Cu-Pd ratios in interpreting platinum group element distributions; *Economic Geology*, v.88, p.1402-1418.

Hart, T.R. 2005. Precambrian Geology of the Southern Black Sturgeon River and Seagull Lake Area, Nipigon Embayment, Northwestern Ontario. Ontario Geological Survey, Open File Report 6165, 63p.

MacDonald, C.A. and Tremblay, E. 2005. Precambrian Geology of the west-central map area, Nipigon Embayment, northwestern Ontario; Ontario Geological Survey, Open File Report 6164, 49p.

Richardson, A. and Hollings, P. 2005. Rare Earth and Isotopic Geochemistry of the Keweenaw Nipigon Sills; Geological Association of Canada-Mineralogical Association of Canada, Joint Annual Meeting, Halifax 2005, Program with Abstract

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14) POTENTIAL FAULT-CONTROLLED GOLD MINERALIZATION AT CROOKED PINE LAKE

Recent mapping by the Ontario Geological Survey (Stone 2005) has delineated a series of northeasterly trending secondary faults emanating from the **Quetico fault** in the area of Crooked Pine Lake located 40 km east of Atikokan, Ontario. The secondary faults (Figure 14-1) extend for several kilometres and attain

widths of up to a few tens of meters across which country rocks are intensely sheared, and cut by quartz veins. Several known gold occurrences including the Pothole and Trench 2 (*see* Figure 1) occur within the secondary faults. The mineralization typically

consists of gold associated with minor sulphide minerals in quartz veins.

Although several gold showings have been explored previously (*see* summary of exploration in Stone 2005), the exploration appears to have been focused locally on individual quartz veins with the result that insufficient resources were defined for economic mining. The association of **gold with the secondary faults** provides an impetus for exploration at a more regional scale. By systematically exploring the

kilometre-scale secondary faults, it may be possible to define larger volumes of gold mineralization.

Stone, D. 2005. Geology and soil geochemistry of the Crooked Pine and western Steep Rock lakes areas of the Wabigoon Subprovince: implications for gold exploration; *in* Summary of Field Work and Other Activities 2005, Ontario Geological Survey, Open File Report 6172, p. 11-1 to 11-11.

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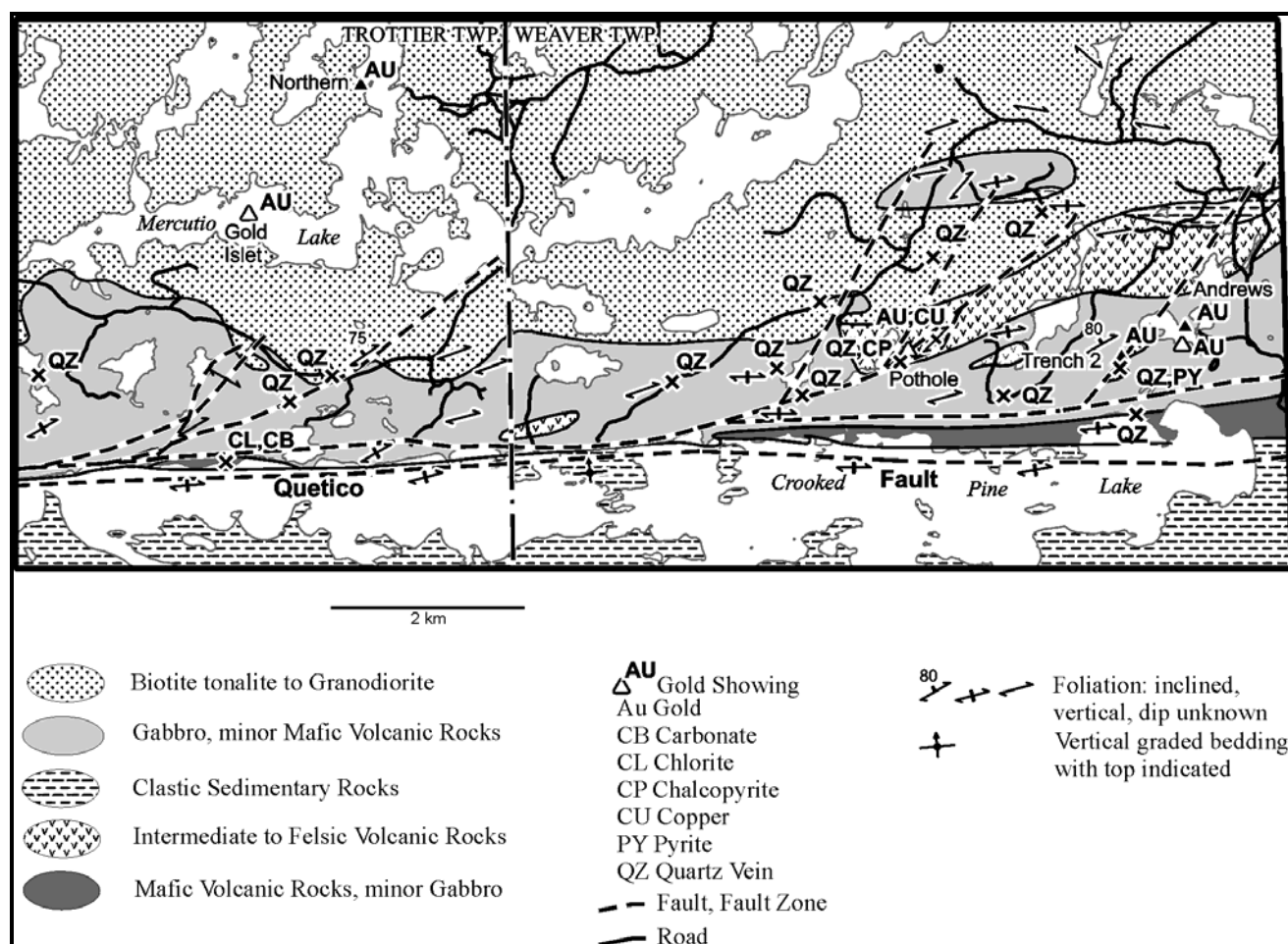


Figure 14-1

15) DINORWIC LAKE STRUCTURAL DOMAIN

Recent mapping by the Ontario Geological Survey (Beakhouse 2002, 2005) has delineated patterns of alteration and deformation that may have a positive bearing on the gold potential of the area. In particular, well-foliated, intensely altered rocks characterize the Dinorwic Lake area, located 25 km east of Dryden. This regional-scale area, referred to informally as the **Dinorwic Lake Structural Domain (DLSD)**, parallels Dinorwic Lake and can be interpreted as a northern extension of the **Manitou Straits fault**.

Weak, pervasive, regional calcite-chlorite alteration is overprinted by more intense **Fe-carbonate alteration** within the DLSD. This style of alteration is locally modified by introduction of silica either as quartz-carbonate veins or diffuse silicification and these zones may be favourable gold exploration targets. This pattern of alteration and veining is similar in many respects to that occurring in the Red Lake gold camp.

The exposures created by recent construction on Highway 17, near the north-end of Dinorwic Lake, exhibit high strain indicators within the DLSD. The rocks in this area have **elevated arsenopyrite** content. Sheared mafic intrusive rocks from the HW 123 occurrence commonly contain massive arsenopyrite comprising <5% to 50% of the rock. Grab samples returned up to 1000 ppb Au and 7.5% As (Parker 1989).

- proximal Fe-carbonate and silica alteration overprints regional calcite-chlorite alteration
- locally very high As concentrations associated with Au occurrences

The Johnson-Whitewater Lake occurrences located near the south-end of Dinorwic Lake consist of gold-bearing quartz veins within wide, intense, north trending shear zones. Grab samples of quartz vein from an open cut returned 2.27 g/t Au and 4.74 g/t Au (Parker 1989).

Beakhouse, G.P. 2002. Precambrian geology of the Wabigoon area; in Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p.10-1 to 10-6.

Beakhouse, G.P., 2005. Precambrian Geology of the Dinorwic – Butler Lake area, Wabigoon subprovince; in Summary of Field Work and Other Activities 2005, Ontario Geological Survey, Open File Report 6172, p.9-1 to 9-6

Parker, J.R. 1989. Geology, gold mineralization and property visits in the area investigated by the Dryden–Ignace Economic Geologist, 1984–1987; Ontario Geological Survey, Open File Report 5723, 306p.

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16) PROPERTIES AVAILABLE FOR OPTION IN THE KENORA DISTRICT

A number of the prospects have received exploration activity but in the past few years have been dormant and are presently available for option.

The **Marchington Road** property (A, Fig 16-1), held by Commander Resources Ltd. is located in the Savant Lake Greenstone Belt. The deposit reserves are 96,456 tons at 2.20% Cu, 1.18% Zn, 2.81% Pb and

- gold, base metal and PGE occurrences available for option
- known deposits with historic resource estimates of gold, silver, copper, zinc and lead

2.81 opt Ag (www.commanderresources.com). The rocks in the area are comprised of intermediate to felsic volcanic rocks that display evidence of

widespread effects of hydrothermal alteration. Five zones of base metal and precious metal mineralization have been identified on this property. This part of the greenstone belt has high base metal mineral potential.

The **Minnitaki** property (B), held by Southern Rio Resources, is located in the Tak felsic intrusion within the Minnitaki Lake Greenstone Belt. This intrusion is silicified, carbonatized and contains sulphides. Drilling and trenching has indicated the presence of a stockwork of quartz-carbonate veins within an extensive deformation zone in the Tak felsic intrusion. Grab samples from the trenches have returned up to 3.5 opt Au.

The **Sakoose** property (C) is owned by Dryden Prospector Alex Glatz. The Sakoose prospect contains an historic resource of 50 000 tonnes at 0.41 opt Au (Beard, R.C. and Garratt, G.L. 1976) in a quartz vein system that has been traced for 400 m, can be up to 6.5 m wide and has been tested to a depth of 200 m). Four shafts are located on the property. Past production has occurred from the No.1 and No.2 shafts. The southwest extension of the quartz vein system has not been tested by drilling.

The **Canamerica** property (D) is located in the Manitou greenstone belt, where it is cut by a 3-5 km wide deformation zone. The Canamerica E zone contains a historic resource of 529 659 tonnes at 0.103 opt Au (Assessment file, 52F107NE YY-5, Resident Geologist's Office, Kenora). The zone has been traced 350 m along strike and is 5 to 8 m wide, comprising quartz-pyrite, silicified stockwork/breccia in felsic volcanic rocks.

Trenching and sampling yielded assays up to 2.012 opt Au over 7.74 m true thickness (Assessment file, 52F107NEYY-5, Resident Geologist's Office, Kenora). There are numerous mineralized zones identified on the property. Parts of the mineralized zones are held by Kenwest Mines. The southern parts are open crown land as of October 1, 2005.

The **Mulcahy Lake Intrusion** (E) is located in the Eagle-Wabigoon lake Greenstone Belt. The intrusion is a northeast trending, vertical-dipping layered mafic

intrusive body that has the potential to host a "reef-type" PGE mineralization environment. The *Marginal and Lower zones* are 2.5 km thick and consist of layered gabbro and gabbro-norite. The *Middle Zone* is 3 km thick at the widest part and consists of norite, gabbro-norite, troctolite and magnetite-bearing rocks. The *Upper Zone* is 1.5 km thick and consists of gabbro-norite to ultramafic rocks. Past exploration efforts have concentrated near the Marginal-Lower Zone boundary where past studies have identified sulphur-saturation. Samples of gabbroic rocks taken in the western part of the intrusion have returned up to 1.8% Cu.

The **Dubenski** property (F), held by Kenora prospector Paul Dubenski, is located in the Cedartree Lake area of the Kakagi-Rowan lakes greenstone belt. The prospect hosts a resource of 355 000 tonnes at 6.32 g/t Au (Assessment file, 52F05SW WWW-5, Resident Geologist's Office, Kenora). Gold mineralization is present in zones of sericite schist and lenses of quartz in highly strained felsic volcanic rocks within the Pipestone-Cameron fault. The Cedartree Lake area has been the focus of numerous exploration programs and has high potential for gold mineralization.

The **Wendigo** property (G), held by Witch Bay Camp owner Steve Hockett, is located in the Gibi Lake assemblage, part of the Lake of the Woods greenstone belt. The Wendigo prospect is associated with quartz veining in strained and folded mafic volcanic rocks north of the Andrew Bay-Witch Bay fault. Of three known quartz veins, the most prominent (100 m long, 0.8 m wide and drilled to a depth of 230 m) has seen historic production of 206 054 tons at 0.327 opt Au, 0.071 opt Ag and 0.42% Cu (Davies, J.C. and Smith P.M., 1988). There are numerous gold and base-metal occurrences in this part of the greenstone belt.

Beard, R.C. and Garratt, G.L., 1976. Gold Deposits of the Kenora-Fort Frances Area, District of Kenora and Rainy River: Ontario Div. Mines, MDC 16, 46p.

Davies, J. C. and Smith P.M., 1988. The Geological Setting of Gold Occurrences in the Lake of the Woods Area: Ontario Geological Survey, Open File Report 5695, 381p.

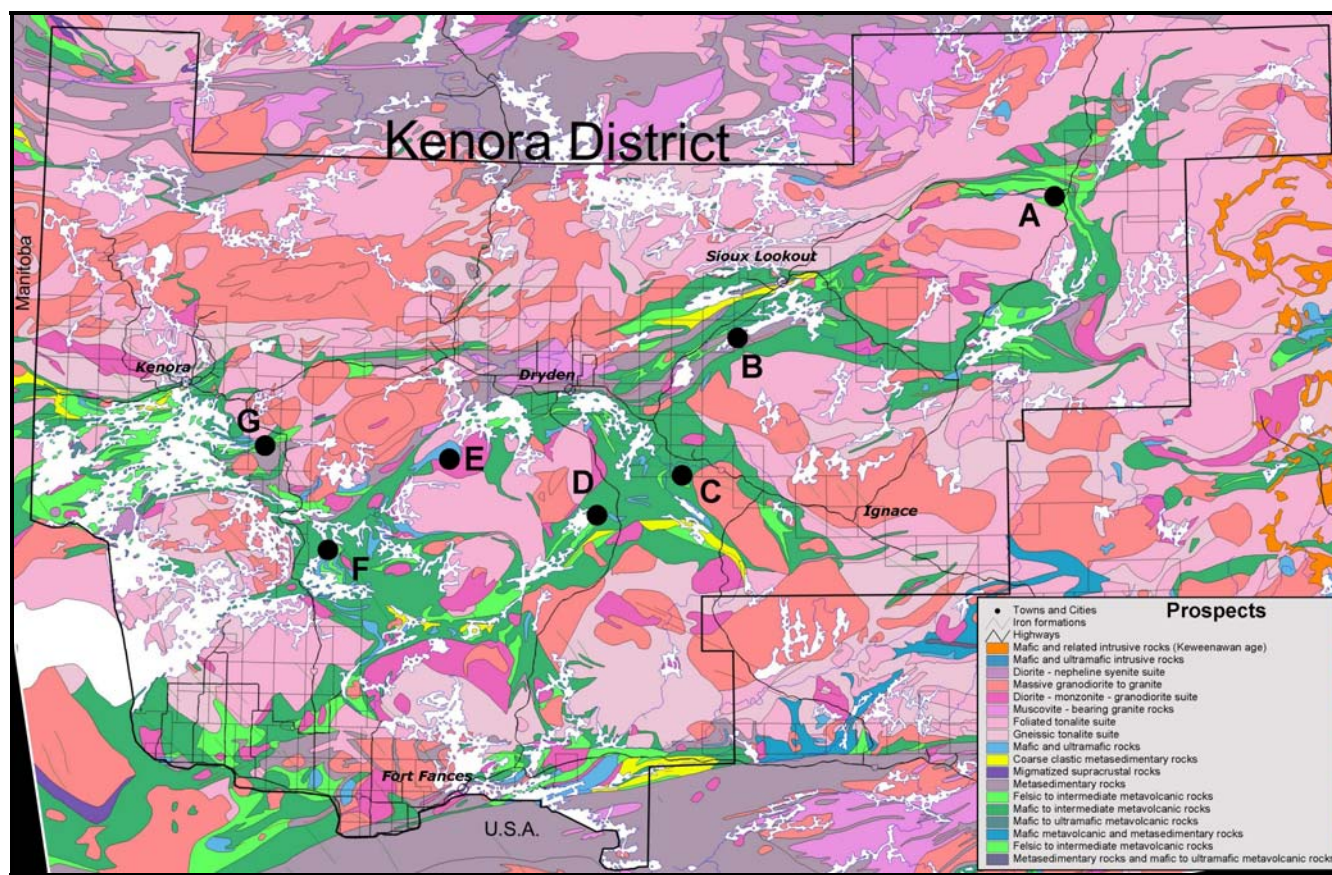


Figure 16-1

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17) MOLYBDENUM SHOWINGS IN THE KENORA DISTRICT

In the Kenora District, molybdenum showings may be associated with three styles of mineralization:

1. porphyry copper mineralization
2. quartz vein hosted fractures and shears; and
3. pegmatite-aplite dikes associated with felsic intrusions.

The demand for molybdenum has grown significantly in the past three years, with the price surpassing US\$30/lb. The following showings (see Table, below) are open Crown land as of October 1, 2005.

2005-2006 Recommendations for Mineral Exploration—Ontario

No.	Occurrence	Geology / Mineralization	Assay / Value
1	Ena Lake Mo-U	Small pods of disseminated Mo +/- cp-py in hornblende schist, quartz feldspar porphyry and pegmatites. Uranium minerals associated with pegmatite dikes (trending 075°) in test pit (MDF).	3-5% Mo +/- cp over 0.15m in quartz veins hosted by altered hornblende schist (Thompson 1947, ODM). Average assay of 0.17% U ₃ O ₈ in pit (MDF).
2	Gundy Lake	Mo in quartz veins and stringers within fractures along a 3km strike length. (GR 41, p.52).	Assays of 0.10-0.30% Mo over 1.8m to 3.0m assay widths (GR 41, p.52).
3	Squaw Lake	Py-po-cp-sph-Mo mineralization is hosted by shears and quartz-carbonate filled, north trending fractures, over a 6m by 30m wide zone of the Canoe Lake Stock (MDF, Map 2423).	Trench sampling returned 0.44% Cu, 0.01 opt Au and 0.5 opt Ag over 5m but no Mo assays given (MDF).
4	Ottertail Lake	Cp-Mo mineralization occurs in quartz veins and stringers associate with a 1m wide granite dike; this dike occurs at the contact of the Ottertail intrusion with the iron-bearing mafic volcanics (MDC29, p55).	North showing- 0.1 to 0.76m quartz vein with 10% py, <5% cp and <2% MoS ₂ . Drill hole assays of 0.15% Cu, 0.25 opt Ag and 0.10% Zn over 7.6m (MDF).
5	Olsen Bay	Disseminated Mo and associated fluorite occurs in quartz and quartzose pegmatites veins near the contact of Atikwa batholith with the surrounding metavolcanics (GR142, p.73, P816).	No assays given and no other data in Kenora Office.
6	Navimar Lake	A 3-4m wide quartz-rich pegmatite, trending NE, was traced over 30m (and trenched) in diorite with Mo +/-bis-py mineralization (GR 189, p.64, Map P961).	Grab sample from pit yielded 1.48% MoS ₂ (MDF).
7	Van Houten	A shaft was sunk on a sheared and altered granite (carb-ser), trending 330°/75°NE, with quartz veins and quartz stringers with Fe carb-py-cp-Mo mineralization (MDF).	Hole SHD-1 intersected 3m of 4-5% py-cp-Mo in tourmaline-bearing altered quartz diorite (KAF 52F10SE JJ-1).
8	Wilson, A.L.	A ridge-trending 055-070° has 3 trenches within banded impure quartzite (metagreywacke). The trenches contain silicified zones with semi-massive to massive po and minor Mo-Ser (Annual Rep. 1941, p.61-62, Map P3360).	Grab samples by Wilson have yielded assays of 1.11% and 1.80% MoS ₂ (MDF).
9	Olson East	Test pit revealed two quartz filled stringers in 3m wide, rusty biotite granite dike within the amphibolitized basalt. Course crystals of MoS ₂ (<2cm) in the stringers (Annual Rep. 1941, p.61)	Inco drill hole intersected several small sulphide zones (0.15-0.5m) with >1% py or >1% cp or >1% sph but no Mo assays given (KAF 52G05SE B-3).
10	Addick Dev. Co - McNamara Lake: Hole 3	Granitized amphibolite gneiss with sporadic Mo mineralization (0.02-0.04% MoS ₂) over 8.1m (MDF).	Drill hole OB3 intersected 3.5m assaying 0.05% Cu, 0.20% Zn and 0.03% MoS ₂ (MDF).
11	Addick Dev. Co - McNamara Lake: Hole 6	Altered (silicified) and foliated diorite – banded appearance with variable sulphide mineralization (MDF).	Drill hole OB6 intersected 2.1m assaying 0.07% Cu, 0.20% Zn and 0.015% MoS ₂ (MDF)
12	Harvey	Mo-py mineralization hosted within granite; bulk sample taken in 1919 (MDI TB0384, P326).	Bulk sample yielded 0.40% MoS ₂ from 454 kg sample (MDI TB0384, P326).

GR—geological report, KAF—Kenora assessment file, MDC—mineral deposit circular, MDF—mineral deposit file

MDI—mineral deposit file, P—preliminary map, sph—sphalerite, py—pyrite, cp—chalcopyrite, po—pyrrhotite, bis—bismuthite

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18) PRECIOUS AND BASE METAL POTENTIAL OF THE RED LAKE DISTRICT

Gold

Recent gold discoveries in the heart of the Red Lake camp by Sabina Resources Limited and Wolfden Resources Inc. have emphasized the fact that inactive, and what may have been thought of as sufficiently explored properties can be successfully brought to life by the application of new ideas and state of the art technologies (deep, directional drilling; 3-D modeling; gravity and seismic surveys). On-going research emphasizes the importance of proximity to the **Neo-Mesoarchean unconformity**: all major deposits of the camp (Campbell-Red Lake, Cochenour and Madsen) occur within Mesoarchean rocks a few hundred metres below the regional unconformity. It can be traced in bedrock exposures and is interpreted to have an unfolded length of approximately 105 km in the central Red Lake belt. Within ferroan-dolomite altered mafic footwall rocks, the potential for significant gold mineralization may increase with proximity to the unconformity.

Proximity to major batholiths should not be considered a negative factor; Madsen, the second largest gold deposit of the belt, interpreted to be a high-temperature disseminated-replacement-style gold skarn deposit within or immediately below the unconformity, lies in the metamorphic aureole, and within 2 km of surface exposures, of the Killala-Baird batholith. In recent years, only grassroots-style exploration work has been done in areas west of Madsen: several kilometres of prospective strike extent remain to be followed-up by more intensive geophysical and geochemical surveys and diamond drilling.

Molybdenum and Uranium

There are numerous reported molybdenum and uranium occurrences along the **Bearhead Fault** between the Sachigo and Berens River subprovinces (Ayres 1970, Ayres et al. 1973, Stone 1998b). There is a reported molybdenum resource in the Setting Net Lake area (100 000 000 tons of 0.09% MoS₂) and uranium at the Bearhead Lake prospect (978 810 tons of 0.06% U₃O₈ to a depth of 500 feet). There has been no exploration activity for these commodities for

- 105 km extent of unconformity underexplored
- known Mo and U deposits and prospects
- unexplored mafic intrusive rocks and sanukitoids
- high potential F-II and F-III rhyolites with known deposits

many years. The Setting Net Lake area is highly prospective for both commodities. Molybdenum is also reported from the north side of the Lingman Lake greenstone belt, the east side of the Birch-Uchi greenstone belt at the southeast corner of McNaughten Township and at Senior Lake and near Fawthrop Lake.

Base Metals

Copper-nickel has not been produced from the Red Lake or Birch-Uchi greenstone belts, but copper-nickel (and associated PGE) mineral occurrences have been reported from several mafic intrusive bodies. Sanukitoid-type intrusive bodies have been identified in the Red Lake greenstone belt (Faulkenham Lake stock, Sanborn-Barrie, Skulski and Parker 2004) and in some parts of the Berens River and Sachigo subprovinces to the north (Stone 1998a, 2005). Their potential to host copper-nickel-PGE mineralization is unknown at the present.

Volcanogenic massive sulphide (VMS) deposits and prospects, and associated proximal chloritic and aluminosilicate alteration, are well documented in the Red Lake, Birch-Uchi and Confederation greenstone belts hosted in Confederation assemblage rocks. Confederation assemblage rocks are exposed on the eastern and southern flank of the Birch-Uchi greenstone belt, the area between the Red Lake and Birch-Uchi greenstone belts and both the southern edge and northern edge of the Red Lake greenstone belt.

FII-type and FIII-type rhyolites occur throughout a 100 km band extending east from Red Lake to the past-producing South Bay Mine (1.6 million tons grading 11.06% Zn, 1.8% Cu and 2.12 ounces Ag per ton). World-class deposits, such as the Mattabi and Geco, are associated with FII-type rhyolite; the Kidd Creek deposit is associated with FIII-type rhyolite. A heightened awareness now exists in the Red Lake

District of the potential of discovery of a major base metal sulphide deposit. In particular, the area mentioned, between Red Lake and South Bay Mine, is of prime exploration potential, but the other areas of Confederation assemblage rocks deserve attention to locate FII- and FIII-type rhyolites and possible VMS-type mineralization.

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19) HIGH-PURITY LIMESTONE AND DOLOSTONE – SOUTHWESTERN ONTARIO

Market/Use

Carbonate rocks are widespread across southwest Ontario and provide raw material for many industries and uses, including lime, chemical and metallurgical stone, environmental applications, fillers, cement and construction aggregates. Exploitation and development of these rocks are dependent upon chemical composition, market demand, transportation infrastructure and proximity to markets.

Projections suggest that there is a growing future market for high-purity limestone and dolostone, particularly for steel manufacture, environmental, chemical and filler uses.

Areas

One target source for high-purity limestone is the Formosa Reef complex of the Amherstburg Formation. The bioherms consist of hard, very fossiliferous and very pure limestone (99% calcite or 55.5% CaO). The Formosa Reef complex of the Amherstburg Formation outcrops in Greenock and Culross townships.

- increasing demand in steel manufacture, environmental and chemical uses
- preliminary results from OGS study of the Guelph Formation indicate 21.4% Mg and low impurities
- potential quarry development in northern Bruce Peninsula

A target source for the production of high-purity dolomite and calcined products, and already supplying products to the steel industry, is the Guelph Formation. The bank reef complex and inter-reef depositional environments within the Guelph Formation form good targets for very high-purity dolomite deposits. Analyses of Guelph Formation drill core indicate intervals of extremely pure, nearly 100% dolomite.

A regional assessment of the Guelph Formation dolostone purity by Dow Chemical USA of Ludington, Michigan, throughout parts of the Bruce Peninsula during the early 1990s has revealed encouraging magnesium values (21.8% MgO),

combined with low averages for impurities such as SiO₂, Fe₂O₃ and Al₂O₃ (averaging 0.03%).

The Ontario Geological Survey is currently undertaking investigations into the industrial mineral potential of the Guelph Formation, including the analyses of over 500 samples. Preliminary laboratory results confirm a regional geochemistry consistency, whereby magnesium weight percent values average 21.4% and calcium values average 30.2%. Impurity values are consistently low.

Areas of Guelph Formation with potential for quarry development include the northern Bruce Peninsula, the Beachville–Ingersoll region, and lands between Owen Sound and Woodstock.

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20) HARLOW GOLD

Gold was first discovered in Ontario in 1866 near the community of Eldorado north of Madoc. Between 1895 to 1908, gold production in the area peaked with 12 mines in production. In the 1930's Cominco Ltd. undertook extensive underground exploration at both the **Cordova and Addington** gold mines. By 1939 all gold production and exploration activity in the region had ceased. It was not until the late 1970's that exploration for gold recommenced in this area, due to the commodity's increased price. Exploration capital raised by "flow through financing" and gold price, combined with new discoveries, fueled renewed gold exploration activity during the 1980's. In 1990, gold exploration activity diminished once again, only to be revived in 1996. Positive results from previous exploration have identified areas of high potential where further investigation is warranted.

In the **Harlowe area**, a 2 km wide belt of tightly folded mafic metavolcanic and metasediments hosts a

- 12 historic producers in the Eldorado area of southern Ontario
- renewed activity and new gold discoveries have increased the potential of the area

number of gold occurrences. The belt trends northeast along the margin of a granodiorite pluton.

In 1990-91, Rio Algom Exploration Limited completed geological and geochemical surveys, trenching and diamond drilling on 2 blocks of patented land acquired through option agreements. The company examined previously known gold showings and identified a new occurrence. Gold values of up to 32 g/t but more commonly 10 g/t Au were returned from surface sampling. **Drill core and logs** from the program are on file with the Tweed Resident Geologist Office. Further examination of this area to evaluate its potential is recommended.

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