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Open File Report 6286

# Report of Activities, 2012 Resident Geologist Program

## Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts

2013

Ontario

ONTARIO GEOLOGICAL SURVEY

Open File Report 6286

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# Resident Geologist Program

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# Timmins and Sault Ste. Marie Districts

by

B.T. Atkinson, P. Bousquet, A. Pace, R.L. Debicki, G.P.B. Grabowski, H.C. Lockwood, A.C. Wilson, S.E. Halet, C. Larche, R. McMillan, and D.M. Draper

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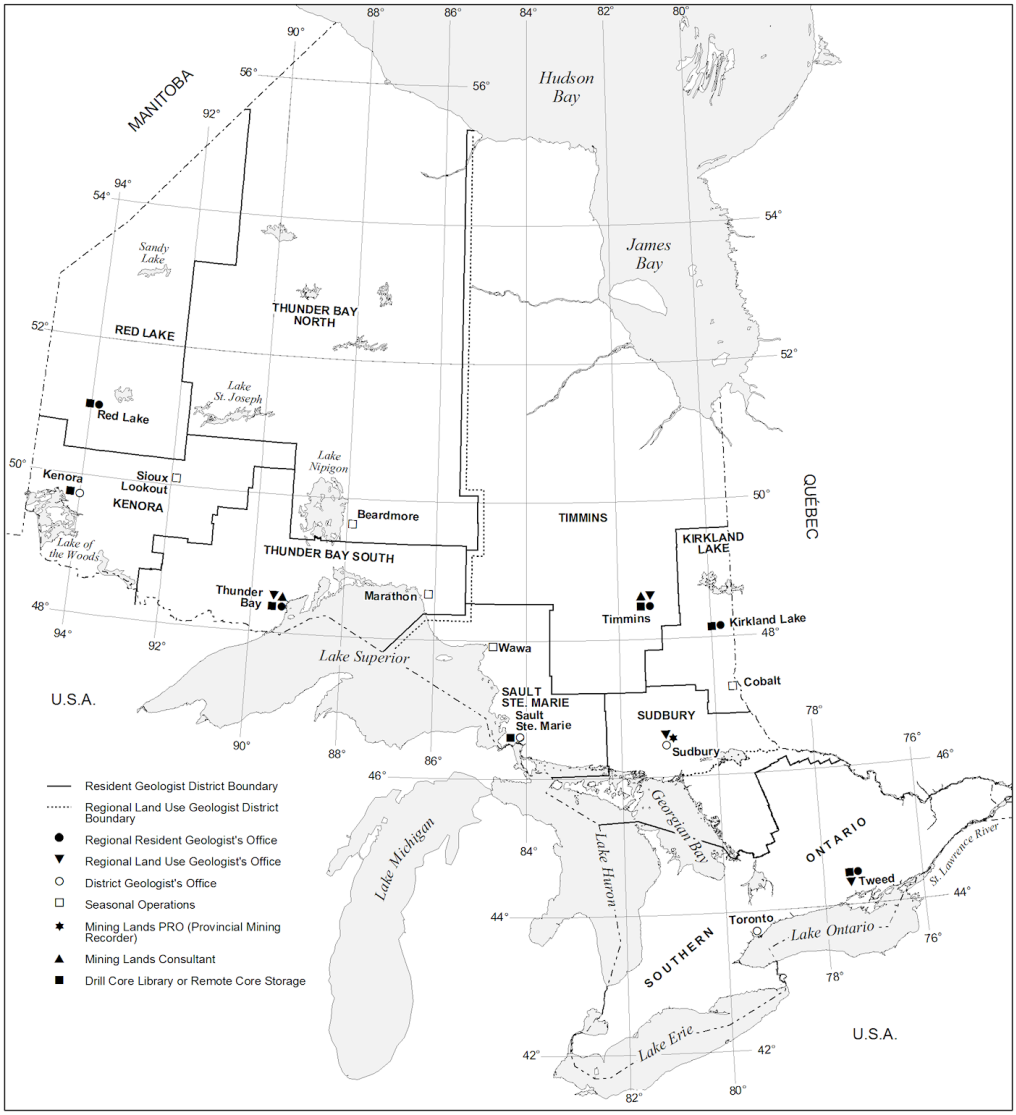


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# Ontario Geological Survey

# Resident Geologist Program

# Report of Activities—2012

## TIMMINS REGIONAL RESIDENT GEOLOGIST REPORT

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Ontario

# Ontario Geological Survey
# Regional Resident Geologist Program

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**by**

**B.T. Atkinson, P. Bousquet, C. Larche, D.M. Draper, A.C. Wilson, R.L. Debicki, G.P.B. Grabowski, H.C. Lockwood and S.E. Halet**

**2013**

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# Timmins Regional Resident Geologist—2012

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## INTRODUCTION

The Timmins District (Figure 1) continued to produce gold, copper, zinc, nickel, phosphate, talc and diamonds from the region's mines. Two industrial mineral projects underway continued to advance work to bring new sources of talc and magnesite to the production stage. Gold continued to be the most sought after commodity and mine construction at Detour Lake was the single largest mining investment in the district. Work progressed on the Hollinger Mine, with the aim of returning that site back to production status. International concerns over mounting debt and fiscal deficits ensured that the price of gold remained at near historic high levels throughout the year. For Ontario gold mining operations, the advantage of the high gold price was partly offset by the high value of the Canadian dollar exchange rate with the US dollar, in which currency, gold is traded.

In the corporate world, mergers and acquisitions continued to bring change to a number of mining and exploration operations. Xstrata Copper's parent company Xstrata PLC is being acquired by Glencore International PLC in a $33 billion dollar merger that will make the new entity the fourth largest mining company in the world with an $80 billion capitalization. Anglo American acquired an additional 40% interest in De Beers Consolidated Mines Limited at a cost of $5.2 billion to increase their ownership in the world's largest diamond miner to 85%. IAMGOLD Corporation completed the acquisition of Trelawney Mining and Exploration Inc. in June for $608 million to obtain control of the Côté Lake gold deposit and large land holdings in the Swayze greenstone belt.

Victor Mine continued to extract high quality diamonds and the Victor Extension Project continued work to evaluate the Tango kimberlite pipe located 7 km northwest of Victor Mine. The U1 and T1 kimberlites in the James Bay Lowlands continued to be evaluated for their diamond contents.

As a result of lower nickel prices, several nickel mining operations remained in temporary suspension or postponed development.

Changes to the boundaries of the Timmins District transferred the Wawa area, including the Michipicoten greenstone belt, to the Sault Ste. Marie District (*see* Figure 1). As a result, gold production from 2 mines and exploration activities for the Wawa area are now reported in the Sault Ste. Marie District Report of Activities.

First Nations involvement and participation in mining and exploration activities increased through the year and this was augmented with changes to the Ontario *Mining Act* that made it mandatory for companies to consult with affected First Nations communities in advance of conducting exploration activities.

Claim staking activity for the Timmins District included 9672 claim units in 928 claims staked and 12 941 claim units cancelled resulting in 76 227 active claims. The value of assessment work filed with the Provincial Mining Recorder amounted to $83 707 312 in 206 reports of work. A yearly comparison of claim staking activities is provided in Table 1.

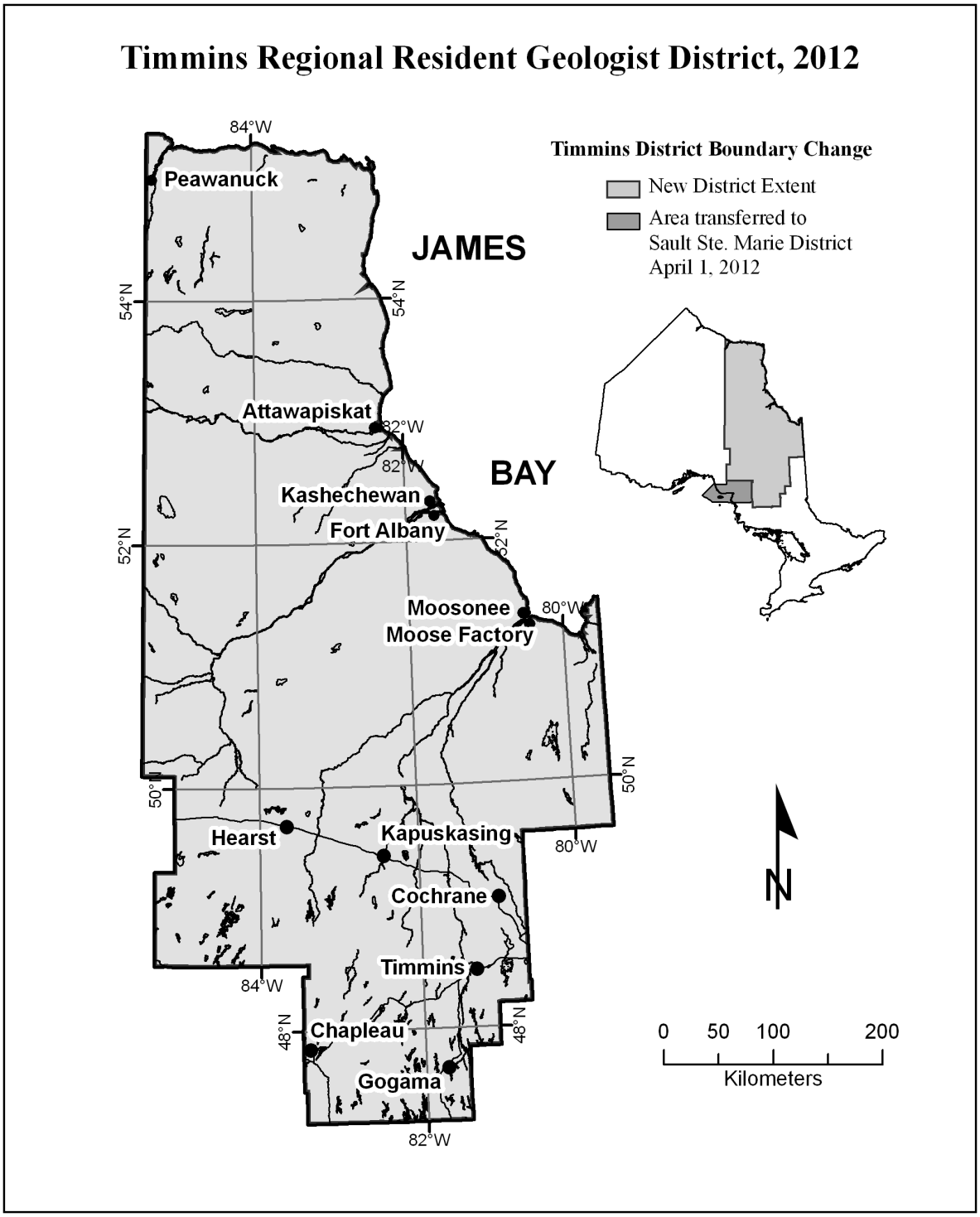


**Figure 1.** Timmins Regional Resident Geologist District.

**Table 1.** Summary of statistical claims information in the Timmins District, 1955–2012.

| Year | Claim Units Recorded | Claim Units Cancelled | Claim Units Active | Assessment Work Credits ($) | Man Days* |
|---|---|---|---|---|---|
| 2012 | 9672 | 12941 | 76 227 | 83 707 312 | N/A |
| 2011 | 13 519 | 16 330 | 79 139 | 35 303 634 | N/A |
| 2010 | 16 116 | 29 540 | 85 501 | 24 592 810 | N/A |
| 2009 | 18 018 | 14 318 | 97 506 | 41 270 807 | N/A |
| 2008 | 32 625 | 9789 | 93 675 | 19 504 181 | N/A |
| 2007 | 23 028 | 7261 | 66 423 | 18 406 983 | N/A |
| 2006 | 16 588 | 16 254 | 64 432 | 6 981 017 | N/A |
| 2005 | 16 069 | 13 147 | 64 889 | 6 258 661 | N/A |
| 2004 | 17 377 | 1280 | 56 478 | 14 269 311 | N/A |
| 2003 | 28 154 | 18 860 | 57 384 | 5 728 049 | N/A |
| 2002 | 11 423 | 14 705 | 39 964 | 5 419 054 | N/A |
| 2001 | 18 258 | 11 759 | 42 835 | 4 996 755 | N/A |
| 2000 | 11 035 | 15 723 | 35 905 | 4 946 371 | N/A |
| 1999 | 12 312 | 16 557 | 42 270 | 10 665 577 | N/A |
| 1998 | 12 642 | 11 300 | 46 515 | 17 308 110 | N/A |
| 1997 | 10 771 | 16 908 | 45 173 | 10 707 864 | N/A |
| 1996 | 13 859 | 15 876 | 50 739 | 8 418 072 | N/A |
| 1995 | 14 376 | 7769 | 60 705 | 5 052 359 | N/A |
| 1994 | 19 738 | 6689 | 47 497 | 3 186 244 | N/A |
| 1993 | 7852 | 3191 | 34 779 | 4 437 645 | N/A |
| 1992 | 10 474 | 2248 | 28 987 | 2 323 218 | N/A |
| 1991 | 4682 | 4367 | 19 879 | 1 067 217 | 279 806 |
| 1990 | 4864 | 10 431 | 19 472 | N/A | 313 085 |
| 1989 | 4724 | 12 347 | 24 715 | N/A | 522 490 |
| 1988 | 5867 | 6117 | 34 553 | N/A | 532 820 |
| 1987 | 8934 | 4402 | 34 474 | N/A | 807 277 |
| 1986 | 17 889 | 8689 | 33 181 | N/A | 717 522 |
| 1985 | 6052 | 10 024 | 23 207 | N/A | 503 338 |
| 1984 | 7633 | 11 040 | 27 179 | N/A | 738 038 |
| 1983 | 11 859 | 4967 | 30 586 | N/A | 407 161 |
| 1982 | 5420 | 6457 | 23 694 | N/A | 596 097 |
| 1981 | 8934 | 2934 | 24 731 | N/A | 471 827 |
| 1980 | 10 742 | 1778 | 18 753 | N/A | 296 852 |
| 1979 | 3975 | 2504 | 9597 | N/A | 151 003 |
| 1978 | 3623 | 4429 | 8126 | N/A | 94 045 |
| 1977 | 2438 | 4336 | 8932 | N/A | 228 090 |
| 1976 | 5837 | 3621 | 10 830 | N/A | 97 258 |
| 1975 | 4162 | 4142 | 8614 | N/A | 200 034 |
| 1974 | 3456 | 3692 | 7594 | N/A | 142 136 |
| 1973 | 2258 | 3728 | 6460 | N/A | 114 917 |
| 1972 | 2980 | 3509 | 7939 | N/A | 149 387 |
| 1971 | 3840 | 3708 | 8500 | N/A | 195 457 |
| 1970 | 3903 | 3916 | 8600 | N/A | 167 465 |
| 1969 | 3482 | 3687 | 8700 | N/A | 143 303 |
| 1968 | 3935 | 4906 | 9000 | N/A | 74 580 |
| 1967 | 2944 | 8356 | 9800 | N/A | 117 299 |
| 1966 | 5724 | 10 352 | 15 250 | N/A | 227 732 |
| 1965 | 47 900 | 9922 | 19 000 | N/A | 486 246 |
| 1964 | 20 823 | 931 | 25 000 | N/A | 146 633 |
| 1963 | 1971 | 1326 | 5250 | N/A | 40 370 |
| 1962 | 1440 | 1425 | 4500 | N/A | 35 000 |
| 1961 | 1443 | 1578 | 4500 | N/A | 30 000 |
| 1960 | 1321 | 2296 | 4750 | N/A | 39 000 |
| 1959 | 2247 | 1803 | 5600 | N/A | 30 000 |
| 1958 | 1451 | 2147 | 5280 | N/A | 30 000 |
| 1957 | 2456 | 2440 | 5800 | N/A | 25 000 |
| 1956 | 1536 | 958 | 5800 | N/A | 45 000 |
| 1955 | 1793 | 757 | 5250 | N/A | 10 000 |

** Before 1992, assessment work credits were filed as man days. After revision of the Ontario Mining Act, assessment value is reported in dollars.*

# MINING ACTIVITY

Timmins District had production from 4 gold mines, 2 base metal mines, 1 diamond mine and 2 industrial mineral mines in 2012. Production statistics and brief descriptions of the individual mining operations are presented below. Mine locations are indicated on Figures 2, 3a, 3b, 3c, and current mine production and reserves are indicated in Table 10. Historical gold production for Timmins is presented in Table 11; base metal production is presented in Table 12 and Ontario diamond production, entirely sourced from Victor Mine is listed in Table 13. A list of mineral deposits not being mined in Timmins is presented in Table 38 (*see* Appendix).

## Base Metal Mining

### LIBERTY MINES INC. – REDSTONE MINE

The Redstone Mine is located 22 km south of South Porcupine. Ore reserves at the mine are shown in Table 2. The mine remained in temporary suspension and on care and maintenance throughout the year with no production. The on-site mill continued to operate and concentrate nickel ore delivered from the McWatters Mine.

Surface exploration diamond drilling amounted to 1564 m.

**Table 2.** Ore reserves at the Redstone Mine, 2012.

| Category | Tonnes | Grade Nickel (%) | Contained Nickel (Tonnes) |
|---|---|---|---|
| Proven + probable | 737 000 | 1.57 | 11 571 |

*Source: B. Zuidema, Liberty Mines Inc., written communication, January 30, 2013.*

### LIBERTY MINES INC. – McWATTERS MINE

The McWatters Mine is located 9.5 km east of the Redstone Mine, in Langmuir Township. Ore reserves at the mine are shown in Table 3.

Production amounted to 140 586 tonnes mined including 135 767 tonnes milled at a grade of 0.559% Ni, 0.025% Cu and 0.015% Co. The daily milling rate was 887.37 tonnes and metal recovery as concentrate was 76.29%. Mining was carried out on 11 headings on 4 levels and ore was extracted by blast hole open stoping.

**Table 3.** Ore reserves at the McWatters Mine, 2012.

| Category | Tonnes | Grade Nickel (%) | Contained Nickel (Tonnes) |
|---|---|---|---|
| Proven + probable | 430 767 | 0.70 | 3015 |

*Source: B. Zuidema, Liberty Mines Inc., written communication, January 30, 2013.*

The combined labour force at the Redstone Mine and McWatters Mine includes 87 employees. B. Zuidema is the Mine Manager and R. Allard is Chief Geologist.

### XSTRATA COPPER – KIDD CREEK MINE

Kidd Creek Mine production during 2012 amounted to 2 268 672 tonnes ore milled at a grade of 1.59% Cu, 4.21% Zn. 0.20% Pb and 56 g/t Ag. The daily milling rate was 6319 tonnes over 359 days of operation. The mill achieved a recovery of 95.07% Cu, 81.74% Zn, 0.0% Pb and 70.76% Ag. Tonnes mined for the year totalled 2 260 452 at a grade of 1.59% Cu, 4.23% Zn, 0.21% Pb and 56 g/t Ag.

Ore reserves and resources at the Kidd Creek Mine are reported in Table 4.

**Table 4.** Ore reserves and resources at the Kidd Creek Mine, 2012.

| Category | Tonnes | Copper (%) | Zinc (%) | Lead (%) | Silver (g/t) |
|---|---|---|---|---|---|
| Proven | 11 240 000 | 1.96 | 4.38 | 0.16 | 56 |
| Probable | 3 804 000 | 1.72 | 5.21 | 0.13 | 53 |
| Measured and Indicated | 4 335 000 | 1.61 | 2.51 | 0.09 | 28 |
| Inferred Resources | 3 402 000 | 1.66 | 7.00 | 0.13 | 62 |

*Note: all reserves are below 1830 m depth.*

Underground mining operations included 3515 m of drifting. Ore extraction took place on 20 active headings on 29 levels. Mining was carried out utilizing blasthole open stoping with delayed backfill, of which 97% was cemented pastefill and 3% was uncemented development waste rock. Stoping commenced on the 9500 level and evaluation of the 9600 level for potential mining continued.

The Kidd Creek Mine has a work force of 1100 employees in both the mine and mill and has an additional 164 contract workers. T. Semadeni is General Manager of Kidd Operations, P. Calloway is Chief Mine Geologist and G. Maxwell is Manager of Exploration.

# Gold Mining

The 4 operating gold mines in the Timmins District produced 373 110 ounces of gold from 4 881 734 tonnes of ore for an average grade of 2.5 g/t gold.

## GOLDCORP INC. – PORCUPINE GOLD MINES

Goldcorp Inc. operates 2 mines in the Timmins District, including the Dome Mine in Tisdale Township and the Hoyle Pond Mine in Hoyle Township. Ore from the Dome Mine stockpile continued to provide additional material to the company's milling operations. Production from the combined operations was 284 057 ounces of gold from 4 162 438 tonnes milled, at an average grade of 2.260 g/t gold. The daily milling rate was 11 404 tonnes and the overall recovery was 92.95%. Mine ore reserves and resources for the combined operations are listed in Table 10.

Goldcorp's Timmins mining operations collectively employ 742 people. M. Lauzier is the Mine Manager overseeing all operations and A. Mainville is the Chief Geologist (Stephen Price, Goldcorp Inc., written communication, January 28, 2013).

### Dome Mine

The Dome Mine produced 155 358 ounces gold from 3 856 050 tonnes of ore obtained from underground operations and from surface stockpiles previously extracted from the open pit. The underground operations contributed 67 717 ounces of gold from 480 666 tonnes, with a grade of 4.382 g/t gold. Mill recovery was 93.30%. A total of 87 641 ounces of gold was recovered from 3 375 384 tonnes of stockpiled ore with a grade of 0.808 g/t gold and mill recovery on that was 90.27%.

Mining was carried out on 9 levels with 13 active headings utilizing long hole stoping methods. Underground ore definition drilling amounted to 6246 m. A total of 2774 m of drifting was completed in support of mining operations along with 313 m of raising.

The Dome Mine employs 118 workers in the underground operations and 73 at the surface stockpile.

### Hoyle Pond Mine

The Hoyle Pond Mine is operated as an underground mine. Production for 2012 was 128 699 ounces of gold from 306 388 tonnes, with a grade of 13.065 g/t gold. Mill recovery was 94.59%. Mining methods included drifting, paste cut and fill, mechanized cut and fill and long hole stoping. There were 174 active headings on 66 levels. Drifting

amounted to 8139 m and raising totalled 269 m. Underground drilling of 28 770 m was for ore definition and additional 68 680 m was completed for exploration. Winze construction to access ore at depth beneath the existing mine workings continued throughout the year.

Hoyle Pond Mine has 263 employees.

## LAKE SHORE GOLD CORP. – TIMMINS OPERATIONS

Lake Shore Gold Corp. operates the Timmins Mine and the Bell Creek Mine. The combined production from the mines amounted to 89 053 ounces gold from 719 296 tonnes milled, with a grade of 3.86 g/t gold. Gold ore is transported by 40 tonne truck from Timmins Mine in Bristol Township to the Bell Creek Mine, located 35 km to the northeast in Hoyle Township for milling.

The daily milling rate at the Bell Creek mill was 1968 tonnes and gold recovery rate was 95.9%. The company achieved a 25% expansion capacity at the Bell Creek mill and ongoing efforts are expected to increase throughput from the current 2500 to 3000 tonnes per day.

Lake Shore Gold has a workforce of 410 employees. D. Battiston is the Mine Manager for both mines.

### Timmins Mine

The Timmins Mine is located 20 km west of Timmins in Bristol Township at the intersection of Highway 101 and Highway 144. Timmins Mine produced 66 313 ounces of gold from 536 947 tonnes of ore milled, with a grade of 3.84 g/t gold. Mill recovery was 96.7%. Ore reserves and resources are indicated in Table 5.

**Table 5.** Ore reserves and resources at the Timmins Mine, 2012.

| Category | Tonnes | Grade (g/t) | Contained Gold (ounces) |
|---|---|---|---|
| Probable | 4 922 000 | 5.21 | 823 800 |
| Indicated | 5 826 000 | 5.99 | 1 122 500 |
| Inferred | 4 272 000 | 5.76 | 791 500 |

Underground mining was carried out by long hole stoping and shrinkage stope methods. Underground mine development amounted to 1767 m with an additional 4835.1 m of drifting and 254.9 m of raising. Mining was carried out on 16 levels. Underground drilling for ore definition totalled 58 687 m with an additional 2034 m of surface exploration drilling. In-fill drilling was carried out between the 500 m to 900 m level along the down plunge extents of the mineralized zones.

The mine has a work force of 316 employees. M. Ross is the Chief Geologist.

### Bell Creek Mine

Gold production from the Bell Creek Mine amounted to 22 739.54 ounces from 182 349.3 tonnes milled, with a grade of 3.90 g/t gold. Mill recovery of gold in ore was 93.5%. Gold resources are listed in Table 6.

**Table 6.** Gold resources at the Bell Creek Mine.

| Category | Tonnes | Grade (g/t) | Contained Gold (ounces) |
|---|---|---|---|
| Measured | 224 500 | 4.20 | 30 300 |
| Indicated | 4 025 000 | 4.76 | 616 111 |
| Measured + Indicated | 4 249 500 | 4.73 | 646 400 |
| Inferred | 6 088 500 | 4.87 | 953 800 |

Ore extraction was done by long hole mining. Underground development included 2404 m with an additional 3740 m of drifting, 283.6 m of raising and ramp extension of 1190 m. Mining was active on 22 headings on 11 levels. Underground drilling of 27 466.7 m included 15 962.7 m for ore definition and 11 504 m of exploration drilling. Exploration diamond drilling on surface totalled 2773 m with an additional 464 m of diamond drilling on the neighbouring Schumacher property.

The labour force at Bell Creek Mine is 94 people. I. Langlois is the Chief Geologist.

# Diamond Mining

## DE BEERS CANADA INC. – VICTOR MINE

The De Beers Canada Inc. Victor Mine is located 90 km west of the community of Attawapiskat in the James Bay Lowland, approximately 500 km north of Timmins. It is operated as a year-round open-pit operation. Access is by winter road from Moosonee via Attawapiskat and by aircraft to the mine site runway. Employees work on a rotational fly-in, fly-out basis.

Production amounted to 688 794 carats of diamonds from 3 048 807 tonnes of processed kimberlite. Diamond grade was 0.226 carats per tonne and the mill operated at a rate of 8353 tonnes per day and achieved a recovery of 97%. Ore resources for the Victor Mine are listed in Table 7. Life-of-mine diamond production is indicated in Table 13.

**Table 7.** Victor Mine ore reserves, 2012.

| Category | Tonnes | Carats | Grade (carats per tonne) |
|---|---|---|---|
| Proven | - | - | - |
| Probable | 12 100 000 | 2 300 000 | 0.194 |

*Source: B. Wood, De Beers Canada Inc., written communication, January 25, 2013.*

A new slope monitoring system was installed in the Victor open pit along with wire meshing of the east pit wall to reduce rock fall hazards.

The Victor Mine employs 420 people. J. Kirby is the Mine General Manager and B. Wood is the Ore Extraction Manager. B. Rameseder is the Chief Geologist (B. Wood, De Beers Canada Inc., written communication, February 3, 2011).

# Industrial Minerals

## AGRIUM INC. – KAPUSKASING PHOSPHATE OPERATIONS

Agrium Inc.'s Kapuskasing Phosphate Operations, located 40 km southwest of Kapuskasing, operated throughout the year. Ore reserves are shown in Table 8.

The Kapuskasing Phosphate Operations produced 782 115 tonnes of phosphate concentrate from 1 890 246 tonnes mined. The ore grade was 36.27% phosphate and the mill operated at a rate of 6320 tonnes per day. Mill recovery was 63.3%.

The Kapuskasing Phosphate Operations utilize open pit shovel and truck mining methods and the ore concentrate is transported by rail to the company's fertilizer production facilities in Redwater, Alberta. Ore definition drilling amounted to 12 008 m. Exploration drilling amounted to 4475 m. The mine is projected to exhaust resources and close in March 2013 but will continue milling stockpiled ore until June.

**Table 8.** Ore reserves at the Kapuskasing Phosphate Operations, 2012.

| Category | Tonnes | Grade (% $P_2O_5$)* |
|---|---|---|
| Proven + probable | 4 201 813 | 24.03 |

** 907 638 tonnes grading 25.46% $P_2O_5$ representing the East pit reserves have been removed because of economic revisions. These alterations were post-reserve reporting.*

The Kapuskasing operations currently employ 89 full time employees and 200 contractors. G. Baril is the Plant Manager, N. Armstrong is the Mine Manager and P. Marenghi is Chief Geologist.

## IMERYS – PENHORWOOD MINE

The Penhorwood Mine is located 70 km west of Timmins in Penhorwood Township. Operations continued throughout the year. Ore reserves are listed in Table 9.

**Table 9.** Ore reserves at the Penhorwood Mine, 2012.

| Category | Tonnes | Grade (% talc)* |
|---|---|---|
| Proven | 5 886 000 | N/A |
| Probable | 719 000 | N/A |
| Total | 6 605 000 | N/A |

** Imerys reports proven and probable category as product sold, so no grade is reported.*

Imerys Talc operates the Penhorwood Mine and concentrator, a micronizing facility in Timmins and a bulk loading facility at Foleyet. Open pit mining is conducted on a seasonal basis in winter and talc-magnesite ore is stockpiled in the open pit for use throughout the year. Overburden stripping is carried out in summer months in advance of mining operations which use contract miners and conventional open pit methods. Ore is blasted and trucked to the primary crusher where it is reduced to minus 4 inch size then conveyed and stacked into 4 grades on segregated stockpiles according to colour. The concentrator plant operates year-round and produces a dry talc concentrate. Further crushing occurs according to product requirements, and cyclone and floatation processes are used to tailor the concentrate. Tailings are transported hydraulically by pipeline and deposited in the nearby open pit of the former Reeves asbestos mine. Talc is either trucked to the Foleyet railroad siding or delivered to the Timmins micronizing plant for further processing. The mine has been in operation since 1976 and has identified ore reserves for 30 years at the current production rate. The mill processed 660 tonnes per day with a grade of 48.4% talc. Mill recovery was 58% talc. A total of 66 477 tonnes talc concentrate was produced from 220 048 tonnes milled. Imerys completed 909.3 m of diamond drilling for ore definition on the deposit.

Imerys has 25 full time employees at the Penhorwood Mine and 39 in the Timmins plant. D. Marek is the Mine Manager.

# MILLING ACTIVITY

## Brigus Gold Corp.

Brigus Gold Corp. has several operating mines in the Kirkland Lake District including the Black Fox Mine and the Hislop open pit. Ore is trucked from both operations to the Black Fox Mill located in Stock Township, Timmins District. The Black Fox Mill underwent expansion to increase capacity to 2200 tonnes per day.

**Table 10.** Mine production and reserves in the Timmins District, 2011–2012.

| Mine | Production in 2012 | | Production in 2011 | | Reserves/Resources at End of 2012 | |
|---|---|---|---|---|---|---|
| | Tonnage @ Grade | Total Commodity | Tonnage @ Grade | Total Commodity | Tonnage | Grade |
| Agrium Inc., Kapuskasing Phosphate Operations | 1 890 246 tonnes | 782 115 concentrate @ 36.27% $P_2O_5$ | 1 992 483 | 854 391 concentrate @ 36.6% $P_2O_5$ | 4 201 813 incl: 3 294 175 proven and 907 638 probable | 24.03 % $P_2O_5$ |
| De Beers Canada Inc. Victor Mine | 3 048 807 tonnes @ 0.226 carats per tonne | 688 794 carats | 2 731 299 @ 0.286 carats per tonne | 780 114 carats | 12 100 000 | 0.194carats per tonne |
| Goldcorp Inc. Porcupine Gold Mines, Dome Mine | 3 856 050 @ 1.34 g/t gold | 155 358 ounces gold | 868 576 @ 2.618 g/t gold | 73 120 ounces gold | 27 790 000[1] proven and 80 980 000 [1] probable,<br>37 200 000[1] measured,<br>132 020 000[1] indicated,<br>18 850 000[1] inferred | 1.57 g/t gold proven<br>1.13 g/t gold probable<br>1.25 g/t gold measured<br>1.16 g/t gold indicated<br>1.95 g/t gold inferred |
| Goldcorp Inc. Porcupine Gold Mines, Hoyle Pond Mine | 306 388 @ 13.065 g/t gold | 128 699 ounces gold | 314 680 @ 13.957g/t gold | 141 202 ounces gold | | |
| Imerys – Penhorwood Mine | 220 048 tonnes @ 48.4% talc | 66 477 tonnes talc conc. | 65 000 tonnes talc conc. @46% talc | N/A | 6 605 000 tonnes incl: 5 886 000 tonnes proven, 719 000 tonnes probable and 9000 tonnes indicated | ~46% (reported on basis sold) |
| Lake Shore Gold Corp. Bell Creek Mine | 182 349.3 tonnes @ 3.9 g/t gold | 22 739.54 ounces | 178 677 @ 4.88 g/t gold | 24 585 ounces gold[2] | 224 500 tonnes measured,<br>4 025 000 tonnes indicated<br>6 088 500 tonnes inferred | 4.2 g/t gold measured,<br>4.76 g/t gold indicated<br>4.87 g/t gold inferred |
| Lake Shore Gold Corp. Timmins Mine | 536 947 tonnes@ 3.84 g/t gold | 66 313 ounces gold | 492 790 @ 4.88 g/t gold | 59 003 ounces gold[2] | 4 922 000 tonnes probable,<br>5 826 000 tonnes indicated and<br>4 272 000 tonnes inferred | 5.21 g/t gold probable,<br>5.99g/t gold indicated and<br>5.76 g/t gold inferred |
| Liberty Mines Inc. McWatters Mine | 140 586 @ 0.559% Ni, 0.025% Cu, 0.015% Co | | 209 388 @ 0.45% Ni | 17 936 | 430 767 proven and probable | 0.70% Ni |

| Mine | Production in 2012 | | Production in 2011 | | Reserves/Resources at End of 2012 | |
|---|---|---|---|---|---|---|
| | Tonnage @ Grade | Total Commodity | Tonnage @ Grade | Total Commodity | Tonnage | Grade |
| Xstrata Copper, Kidd Creek Mine | 2 268 672 @ 1.59% Cu, 4.21% Zn, 0.20% Pb, 56 g/t Ag | 34 400 tonnes Cu conc.<br><br>78 100 tonnes Zn conc.,<br><br>2 900 000 ounces Ag | 2 238 269 @ 1.97% Cu, 3.99% Zn, 0.14% Pb, 48g/t Ag | 162 758 tonnes Cu conc.<br><br>42 322 tonnes Cu<br><br>134 413 tonnes Zn conc., 71 497 tonnes Zn | 15 044 000 tonnes incl: 11 240 000 proven,<br><br>3 804 000 probable<br><br>Also:<br><br>4 335 000 measured and indicated and<br><br>3 402 000 inferred | Proven grade: 1.96% Cu, 4.38 % Zn, 0.16% Pb, 56g/t Ag<br>Probable grade: 1.72% Cu, 5.21% Zn, 0.13% Pb, 53g/t Ag<br><br>measured and indicated grade : 1.61% Cu, 2.51% Zn, 0.09% Pb and 28 g/t Ag<br>Inferred grade: 1.66% Cu, 7.00% Zn, 0.13% Pb and 62 g/t Ag |

***Notes***: *[1]Goldcorp Inc. Porcupine Gold Mines reserves and resources are for all Porcupine mines combined.*
*Abbreviations: conc. – concentrate; N/A – data not available; g/t – grams per tonne.*

**Table 11.** Gold production in the Timmins District to the end of 2012.

| Mine | Township | Years of Production | Tons Milled | Production (ounces gold) | Grade[1] (oz./ton) |
|---|---|---|---|---|---|
| Ankerite/March | Deloro | 1926–1935 | 317 769 | 61 039 | 0.19 |
| Aquarius | Macklem | 1984, 1988–1989 | 139 634 | 27 117 | 0.19 |
| Aunor Pamour (#3) | Deloro | 1940–1984 | 8 482 174 | 2 502 214 | 0.30 |
| Banner | Whitney | 1927–1928, 1933, 1935 | 315 | 670 | 0.13 |
| Bell Creek | Hoyle | 1987–1991, 1992–1994,<br>2011-2012 | 576 017<br>383 476 | 112 739<br>47 325 | 0.196<br>0.131 |
| Bonetal | Whitney | 1941–1951 | 352 254 | 51 510 | 0.15 |
| Bonwhit | Whitney | 1951–1954 | 200 555 | 67 940 | 0.34 |
| Broulan Porcupine | Whitney | 1939–1953 | 1 146 059 | 243 757 | 0.21 |
| Broulan Reef Mine | Whitney | 1915–1965 | 2 144 507 | 498 932 | 0.23 |
| Buffalo Ankerite | Deloro | 1926–1953, 1978 | 4 993 929 | 957 292 | 0.19 |
| Cincinnati | Deloro | 1914, 1922–1924 | 3200 | 736 | 0.23 |
| Clavos | Stock | 2005–2007 | 188 743 | 24 609 | 0.13 |
| Concordia | Deloro | 1935 | 230 | 16 | 0.07 |
| Coniarum/Carium | Tisdale | 1913–1918, 1928–1961 | 4 464 006 | 1 109 574 | 0.25 |
| Crown | Tisdale | 1913–1921 | 226 180 | 138 330 | 0.61 |
| Davidson–Tisdale | Tisdale | 1918–1920, 1988 | 53 221 | 9739 | 0.18 |
| Delnite<br>(open pit) | Deloro | 1937–1964<br>1987–1988 | 3 847 364<br>56 067 | 920 404<br>3602 | 0.24<br>0.064 |
| DeSantis | Ogden | 1933, 1939–1942, 1961–1964 | 196 928 | 35 842 | 0.18 |
| Detour Lake[2] | Sunday Lake Area | 1983–1999 | 17 643 085 | 1 781 858 | 0.10 |
| Dome | Tisdale | 1910–2012 | 110 344 865 | 16 206 547 | 0.147 |
| Faymar | Deloro | 1940–1942 | 119 181 | 21 851 | 0.180 |
| Fuller (Vedron) | Tisdale | 1940–1944 | 44 028 | 6566 | 0.15 |

| Mine | Township | Years of Production | Tons Milled | Production (ounces gold) | Grade[1] (oz./ton) |
|---|---|---|---|---|---|
| Gillies Lake | Tisdale | 1921–1931, 1935–1937 | 54 502 | 15 278 | 0.28 |
| Goldhawk | Cody | 1947 | 636 | 53 | 0.08 |
| (open pit) | | 1980 | 40 000 | 3967 | 0.10 |
| Halcrow–Swayze[3] | Halcrow | 1935 | 211 | 40 | 0.19 |
| Hallnor (Pamour #2) | Whitney | 1938–1968, 1981 | 4 226 419 | 1 645 892 | 0.39 |
| Hollinger–Schumacher | Tisdale | 1915–1918 | 112 124 | 27 182 | 0.24 |
| Hollinger | Tisdale | 1910–1968 | 65 778 234 | 19 327 691 | 0.29 |
| Pamour Timmins property | | 1976–1988 | 2 615 866 | 182 058 | 0.07 |
| Hoyle–Falconbridge | Whitney | 1941–1944, 1946–1949 | 725 494 | 71 843 | 0.10 |
| Hoyle Pond | Hoyle | 1985–2012 | 8 823 987 | 3 078 329 | 0.35 |
| Hugh–Pam | Whitney | 1926, 1948–1965 | 636 751 | 119 604 | 0.19 |
| Jerome[3] | Osway | 1941–1943, 1956 | 335 060 | 56 893 | 0.17 |
| Joburke[3] | Keith | 1973–1975, 1979–1981 | 440 117 | 43 571 | 0.10 |
| Kingbridge/Gomak[3] | Chester | 1935–1936 | 1387 | 98 | 0.07 |
| Marlhill | Hoyle | 1989–1991 | 156 800 | 30 924 | 0.197 |
| McIntyre Pamour Schumacher | Tisdale | 1912–1988 | 37 634 691 | 10 751 941 | 0.29 |
| (ERG tailings recovery) | | 1988–1989 | 2 549 189 | 18 260 | 0.007 |
| McLaren | Deloro | 1933–1937 | 876 | 201 | 0.23 |
| Moneta | Tisdale | 1938–1943 | 314 829 | 149 250 | 0.47 |
| Naybob (Kenilworth) | Ogden | 1932–1964 | 304 100 | 50 731 | 0.17 |
| Nighthawk | Macklem | 1995–1999 | 1 479 607 | 175 803 | 0.12 |
| Owl Creek | Hoyle | 1981–1989 | 1 984 400 | 236 880 | 0.12 |
| Pamour # 1 (incl. pits 3, 4 and | Whitney | 1936–1999 | 45 795 863 | 4 078 525 | 0.09 |
| 7 and Hoyle) | | 2005–2011 | 17 750 312 | 698 771 | 0.036 |
| Pamour (other sources) | Whitney | 1936–1999 | 7 416 634 | 676 645 | 0.091 |
| Paymaster | Deloro | 1915–1919, 1922–1966 | 5 607 402 | 1 192 206 | 0.21 |
| Porcupine Lake (Hunter) | Whitney | 1937–1940, 1944 | 10 821 | 1369 | 0.13 |
| Porcupine Peninsular | Cody | 1924–1927, 1940, 1947 | 99 688 | 27 354 | 0.27 |
| Preston | Tisdale | 1938–1968 | 6 284 405 | 1 539 355 | 0.24 |
| Preston NY | Tisdale | 1933 | 2800 | 153 | 0.05 |
| Preston/Porcupine Pet | Deloro | 1914–1915 | N/A | 314 | N/A |
| Preston/Porphyry Hill | Deloro | 1913–1915 | 46 | 312 | 6.78 |
| Stock | Stock | 1989–1994, 2000 | 821 304 | 129 856 | 0.16 |
| Timmins | Bristol | 2009–2012 | 1 284 673 | 201 198 | 0.11 |
| Tionaga/Smith Thorne[3] | Horwood | 1938–1939 | 6653 | 2299 | 0.35 |
| Tisdale Ankerite | Tisdale | 1952 | 14 655 | 2236 | 0.15 |
| Tommy Burns/Arcadia | Shaw | 1917 | 21 | 14 | 0.66 |
| Triple Lake | McArthur | 1932 | 155 | 121 | 0.78 |
| Vipond | Tisdale | 1911–1941 | 1 565 218 | 414 367 | 0.26 |
| Young Shannon[3] | Chester | 1937, 1975 | 3265 | 91 | 0.028 |
| | | **Total** | **370 802 982** | **69 757 299** | **0.188** |

***Notes**: [1] Grade: ounces of gold per ton; [2]Detour Lake greenstone belt; [3]Swayze greenstone belt; N/A = data not available.*

**Table 12.** Base metal production in the Timmins Regional Resident Geologist District to the end of 2012.

| Mine | Township | Years of Production | Ore Milled | Grade |
|---|---|---|---|---|
| Alexo | Dundonald | 1912–1919 | 51 857 tons | 4.5% Ni, 0.55% Cu |
| | | 1943–1944 | 4923 tons | |
| Alexo / Kelex | Dundonald, Clergue | 2004–2005 | 17 398 tonnes | 2.3% Ni, 0.23% Cu, 0.07% Co |
| Canadian Jamieson | Godfrey | 1966–1971 | 816 173 tons | 2.44% Cu, 4.22% Zn |
| Genex | Godfrey | 1966 | Produced 240 tons Cu concentrate | |
| Jameland | Jamieson | 1969–1972 | 509 356 tons | 0.99% Cu, 0.88% Zn |
| Kam Kotia | Robb | 1943–1944 | 6.6 million tons | 1.1% Cu, 1.17% Zn, |
| | | 1961–1972 | | 0.10 oz/t Ag, 0.00085 ounce/ton gold |
| Kidd Creek | Kidd | 1966–2012 | 147 364 977 tonnes | 2.24% Cu, 6.06% Zn, 0.21% Pb, 83.5 g/t Ag |
| Langmuir #1 | Langmuir | 1990–1991 | 111 502 tons | 1.74% Ni |
| Langmuir #2 | Langmuir | 1972–1978 | 1.1 million tons | 1.43% Ni |
| McIntyre | Tisdale | 1963–1982 | 10 million tons | 0.67% Cu |
| McWatters | Langmuir | 2008 | 15 361 tonnes | 0.55% Ni |
| | | 2010 | 148 921 tonnes | |
| | | 2011–12 | 153 703 | 0.50% Ni |
| Montcalm | Montcalm | 2004–2009 | 3 931 610 tonnes | 1.25% Ni, 0.67% Cu, 0.051% Co |
| Redstone | Eldorado | 1989–1992 | 294 895 tons | 2.4% Ni |
| | | 1995–1996 | 10 228 tons | 1.7% Ni |
| | | 2006–2008 | 133 295 tonnes | 1.92% Ni |
| | | 2009-2010 | 78 956 tonnes | 1.11% Ni |

**Table 13.** Diamond production in the Timmins District 2008–2012.

| Year | Tonnes Milled | Carats | Carats/tonne |
|---|---|---|---|
| 2008 | 1 787 046 | 713 992 | 0.40 |
| 2009 | 2 048 622 | 696 484 | 0.34 |
| 2010 | 2 636 489 | 797 505 | 0.29 |
| 2011 | 2 731 299 | 780 114 | 0.29 |
| 2012 | 3 048 807 | 688 794 | 0.226 |
| Total | 12 252 263 | 3 676 889 | 0.30 |

**Table 14.** Exploration activity in the Timmins Regional Resident Geologist's District—2012 (keyed to Figures 3a, 3b, 3c and 3d).

**Abbreviations**

AEM ..... Airborne electromagnetic survey
AMAG ..... Airborne magnetic survey
Anlys ..... Analysis
Comp ..... Data compilation
DD ..... Diamond drilling
DGP ..... Down-hole geophysics
EM ..... Electromagnetic survey
Env ..... Environmental studies
GC ..... Geochemical survey
GL ..... Geological survey
IP ..... Induced polarization survey
Lc ..... Linecutting
Mag ..... Ground magnetic survey
Met ..... Metallurgical testing
OVD ..... Overburden drill holes
Pr ..... Prospecting
Rcalc ..... Resource calculations
REE ..... Rare Earth Elements
Samp ..... Sampling (other than bulk)
Str ..... Stripping
Tr ..... Trenching

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 1 | 1571925 Ontario Ltd. (Champagne Grid) | Champagne | EM, Mag |
| 2 | 1571925 Ontario Ltd. | Kenogaming (Au, Cu) | Assays, Str, Samp, Tr |
| 3 | 6070205 Canada Inc. | Clergue | Mag |

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 4 | 6070205 Canada Inc. (Aconda Lake property | Godfrey | Samp |
| 5 | 6070205 Canada Inc. | Godfrey | EM |
| 6 | 6070205 Canada Inc. | Loveland, Thorburn | IP, Mag |
| 7 | 6398651 Canada Inc. and K. Pye | Tisdale | Mag |
| 8 | Alchemist Mining Inc. (Carscallen property) | Carscallen (Au) | DD |
| 9 | Canadian Arrow Mines Ltd. (Alexo/Kelex property) | Dundonald, Clergue (Ni, Cu, Co, Pt, Pd) | Dewatering, Samp, Str |
| 10 | Caribou King Resources Ltd. (Nursey property) | Nursey (Au) | GL, IP, Samp |
| 11 | Cascadero Copper Corporation (Swayze greenstone belt property) | Benton, Edith, Esther, Fingal, Groves, Hong, Kong, Marion, Osway | Assays, GC |
| 12 | China Metallurgical Explorations Corp. (Canadian Jamieson Mine property) | Godfrey | DGP |
| 13 | Claude Rundle Gold Mines Ltd. (Swayze River property) | Silk (Au, Ag) | Assays, GL, GC, Pr, Samp |
| 14 | Constantine Metal Resources Ltd. (Golden Mile property) | Dundonald, Evelyn (Au) | AEM, AMAG, GC |
| 15 | Crown Gold Corporation Ltd. | Byers | DD-1-299 m |
| 16 | Daxl, H. | Musgrove (Au) | Assays, GC, Samp |
| 17 | De Beers Canada Inc. (Alpha Kimberlites) | BMA 526 834 (diamond) | DD-4-1625 m |
| 18 | Debut Diamonds Inc. (Beaver Tail Claim Group) | English (Au) | IP, Pr |
| 19 | Debut Diamonds Inc. (Otter Claim Group) | Hutt, Semple (Au) | Pr |
| 20 | Der Weduwen, J., Gervais, L. and Rescoskie, D. (Bean Lake property) | Whitesides | Mag |
| 21 | Detour Gold Corporation (LLDZ property) | Lower Detour Lake Area (Au) | DD-17-5061 m, IP, MMI |
| 22 | Detour Gold Corporation (Conquest Joint Venture) | Sunday Lake Area (Au) | DD-2000 m |
| 23 | Detour Gold Corporation (Block A property) | West of Sunday Lake Area (Au) | DD-155-49 171 m, GL, IP |
| 24 | Entourage Metals Ltd. (October gold property) | Benton (Au) | GL, IP, Pr, Samp |
| 25 | Excellon Resources Inc. (DeSantis project) | Ogden (Au) | Assays, Comp, DD-12, Samp |
| 26 | Explor Resources Inc. (Timmins Porcupine West property) | Bristol, Ogden (Au) | DD-51-30 000 m, Rcalc |
| 27 | Explor Resources Inc. (Carnegie project) | Carnegie | IP, Mag |
| 28 | Explor Resources Inc. (Kidd North property) | Kidd | Mag |
| 29 | Falcon Gold Corp. (Burton property) | Esther (Au) | Assays, DD-13-1528 m, IP, GC |
| 30 | Fancamp Exploration Ltd. (Desolation Lake property) | Desolation Lake area (Fe) | Assays, DD-8-3424 m |

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 31 | Fletcher Nickel Inc.<br>(Otter Claim Group) | Hutt, Semple<br>(Au) | AEM, AMAG |
| 32 | Geomark Exploration Ltd. | Mountjoy | EM, Mag |
| 33 | Geomark Exploration | Tisdale | EM, IP |
| 34 | Geomark Exploration | Whitney | EM, IP |
| 35 | Giyani Gold Corp.<br>(Shaw property) | Shaw | EM, Mag |
| 36 | Globex Mining Enterprises Inc.<br>(Timmins talc-magnesite property) | Adams, Deloro<br>(Mg, talc) | Env, GL, Rcalc, Samp |
| 37 | Gold Dynamics Corp.<br>(Hoyle North) | Hoyle<br>(Au) | Assays, AEM, AMAG, GC, Samp |
| 38 | Goldcorp Porcupine Gold Mines<br>(Hoyle Pond Mine property) | Hoyle<br>(Au) | DD-32-425 m |
| 39 | Goldcorp Porcupine Gold Mines<br>(Dome Mine property) | Tisdale<br>(Au) | DD-32-425 m |
| 40 | Gowest Gold Ltd.<br>(Pipestone East project) | Evelyn, Prosser, Wark<br>(Au) | DD-3-1291 m |
| 41 | Gowest Gold Ltd.<br>(Tully East property) | Tully<br>(Au) | DD-5-1172 m |
| 42 | Gowest Gold Ltd.<br>(Frankfield East project) | Tully<br>(Au) | Assays, DD-7-4582 m, Met, Rcalc |
| 43 | Harte Gold Corp.<br>(Sugar Zone) | Hambleton, Odlum, Strickland<br>(Au) | AEM, DD-7000 m, Rcalc |
| 44 | Harte Gold Corp.<br>(Wolf Zone) | Hambleton<br>Au | AEM, DGP, IP |
| 45 | IAMGOLD Corporation<br>(Trelawney property) | Benneweis<br>(Au) | Assays, Samp |
| 46 | IAMGOLD Corporation<br>(John Sheridan property) | Champagne<br>(Au) | Assays, Samp |
| 47 | IAMGOLD Corporation<br>(Côté Lake deposit) | Chester<br>(Au) | Assays, DD-79-44 856 m, GL, Pr, Rcalc, Samp |
| 48 | IAMGOLD Corporation<br>(West Côté Lake) | Chester<br>(Au) | DD-4-2704 m |
| 49 | IAMGOLD Corporation<br>(Trelawney property) | Neville<br>(Au) | Assays, Samp |
| 50 | IAMGOLD Corporation<br>(TAAC property) | Osway<br>(Au) | DD-18-4956 m, EM, IP, Mag |
| 51 | IAMGOLD Corporation<br>(Trelawney property) | Yeo<br>(Au) | Assays, Samp |
| 52 | International Explorers and Prospectors Inc.<br>(Godfrey–Mountjoy property) | Godfrey | EM, Mag |
| 53 | International Explorers and Prospectors Inc.<br>(Halfmoon Lake property) | Robb | Mag |
| 54 | Knick Exploration Inc.<br>(Triple Lake property) | Bartlett, McArthur, Musgrove<br>(Au, VMS) | Assays, Pr, Samp |
| 55 | Lake Shore Gold Corp.<br>(RT Minerals Corporation and Adventure Gold Inc. option) | Bristol<br>(Au) | DD-1-3444 m |
| 56 | Lake Shore Gold Corp.<br>(Bell Creek Mine) | Hoyle<br>(Au) | DD-3237 m |

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 57 | Lake Shore Gold Corp. (Gold River Trend) | Thorneloe (Au) | Assays, DD-7-1440 m, Rcalc |
| 58 | Lake Shore Gold Corp. (TC-144 property) | Thorneloe (Au) | Assays, DD-37-27 411 m |
| 59 | Larche, C. (Eldorado nickel property) | Eldorado (Ni) | Assays, GC, Samp |
| 60 | Lexam VG Gold Inc. (Buffalo ankerite property) | Deloro (Au) | Assays, DD-5-5922 m, Rcalc |
| 61 | Lexam VG Gold Inc. (Fuller property) | Tisdale (Au) | Assays, DD-16-4077 m |
| 62 | Lexam VG Gold Inc. (Paymaster West property) | Tisdale (Au) | Assays, DD |
| 63 | Liberty Mines Inc. (Hart project) | Eldorado (Ni, Cu) | Assays, DD-15-6047 m, GC |
| 64 | Liberty Mines Inc. (Redstone Mine) | Eldorado (Ni, Cu) | Assays, DD-3-1544 m |
| 65 | McLaren Resources Inc. (TimGinn property) | Tisdale (Au) | Assays, DD-8-1453 m |
| 66 | Melkior Resources Inc. (Carscallen gold property) | Carscallen, Denton (Au, Cu) | Assays, DD-6-4452 m, Samp |
| 67 | Melkior Resources Inc. | Eldorado (Ni, Zn) | Assays, DD-1-158 m |
| 68 | Metalex Ventures Ltd. (Kyle Lake property – U2 Kimberlite) | BMA 528 844 (diamond) | Env |
| 69 | Metals Creek Resources Corp. (Gryba property) | Ogden (Au) | Assays, DD-3-637 m |
| 70 | Metals Creek Resources Corp. and Goldcorp Canada Ltd. (Ogden gold project) | Ogden (Au) | Assays, DD-11-2368 m |
| 71 | Moran, J.D. (GM project) | Matheson | EM, Mag |
| 72 | Nat River Gold Inc. (Nat River East Extension property) | Reeves | EM, Mag |
| 73 | Nat River Gold Inc. (Nat River West Extension property) | Reeves | EM, Mag |
| 74 | Nebu Resources Inc. (Mallard property) | Mallard (Au) | DD-6-1137 m |
| 75 | Nebu Resources Inc. (Cork Lake property) | Nursey (Au) | DD-4-961 m |
| 76 | Noble Mineral Exploration Inc. (Lucas gold target) | Lucas (Au) | Assays, DD-6-3059m, IP |
| 77 | PhosCan Chemical Corp. (Martison Lake project) | South of Ridge Lake Area (Nb, phosphate, REE) | GT, DGP, OVD-9-858 m, Anlys |
| 78 | Probe Mines Limited (Borden Gold project) | Cochrane, Gallagher (Au) | Assays, DD-296 m, Env, GC, GL, Pr, Rcalc |
| 79 | Probe Mines Limited (Borden Lake North) | Cochrane (Au) | GC, GL, Pr, Samp |
| 80 | Probe Mines Limited (Claim 4249711) | Cochrane | GC, GL, Pr |
| 81 | Probe Mines Limited (Borden Lake South) | Gallagher, McNaught (Au) | GC, GL |

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 82 | Rapier Gold Inc.<br>(Pen gold project) | Penhorwood, Reeves | GL, Str, Samp, Tr |
| 83 | Red Pine Exploration Inc.<br>(Ava–Claire property) | Crockett, Raney, Sandy | GC, Samp |
| 84 | Ring of Fire Resources Inc./Noble Mineral Exploration Inc.<br>(project 81) | Kingsmill<br>(Ni) | Assays, DD-12-4922 m, IP, Met |
| 85 | Robert, J.<br>(JR property) | Hoyle<br>(Au) | Pr |
| 86 | Robert, P. | Ogden | EM, Mag |
| 87 | Rogue Iron Ore Corp.<br>(Radio Hill iron project) | Keith, Penhorwood<br>(Fe) | Assays, DD-10,500 m, Mag, Met |
| 88 | Rogue Iron Ore Corp.<br>(Nat River iron project) | Penhorwood<br>(Fe) | Mag |
| 89 | Rogue Iron Ore Corp.<br>(Montpre property) | Sothman<br>(Au) | Assays, Pr, Samp |
| 90 | Rousseau, R. | Robb | EM |
| 91 | St Andrew Goldfields Ltd and Goldcorp Canada Inc. | Clergue | Lc |
| 92 | Sage Gold Inc.<br>(Clavos project) | Clergue<br>(Au) | Assays, DD-5-2100 m, Rcalc |
| 93 | Sanatana Resources Inc.<br>(Watershed property) | Chester, Yeo<br>(Au) | Assays, DD-21-10 517 m, DGp, GC, Mag |
| 94 | Sedex Mining Corp. | Reeves | EM |
| 95 | SGX Resources Inc.<br>(Nighthawk property) | German, Matheson<br>(Au) | DD-1-167 m, Mag, EM, IP |
| 96 | SGX Resources Inc.<br>(Nighthawk East Zone) | Macklem, Thomas<br>(Au) | DD-3-606 m |
| 97 | SGX Resources Inc.<br>(Edleston Zone) | Sothman<br>(Au) | Assays, AEM, AMAG, DD-75, GL, Mag, EM, IP |
| 98 | SGX Resources Inc.<br>(Northwest Tisdale project) | Tisdale<br>(Au) | DD-3-714 m |
| 99 | SGX Resources Inc.<br>(Zavitz East property) | Zavitz<br>(Au) | Pr, Tr, Samp, Assays |
| 100 | Temex Resources Corp. and Goldcorp Canada Ltd.<br>(Upper Hallnor deposit, Whitney property) | Whitney<br>(Au) | Assays, DD-32-5295 m, Rcalc |
| 101 | Trelawney Mining and Exploration Inc.<br>(Côté Lake deposit) | Chester<br>(Au) | DD-129-65 866 m, Rcalc |
| 102 | Trelawney Mining and Exploration Inc. | Neville<br>(Au) | DD-8-1678 m |
| 103 | Zenyatta Ventures Ltd.<br>(Albany project) | Pitopiko River Area<br>(Ni, Cu, graphite) | Assays, DD-9, Met, Mineralogy |

**DD-8-2196 m = 8 diamond-drill holes totalling 2196 m.*

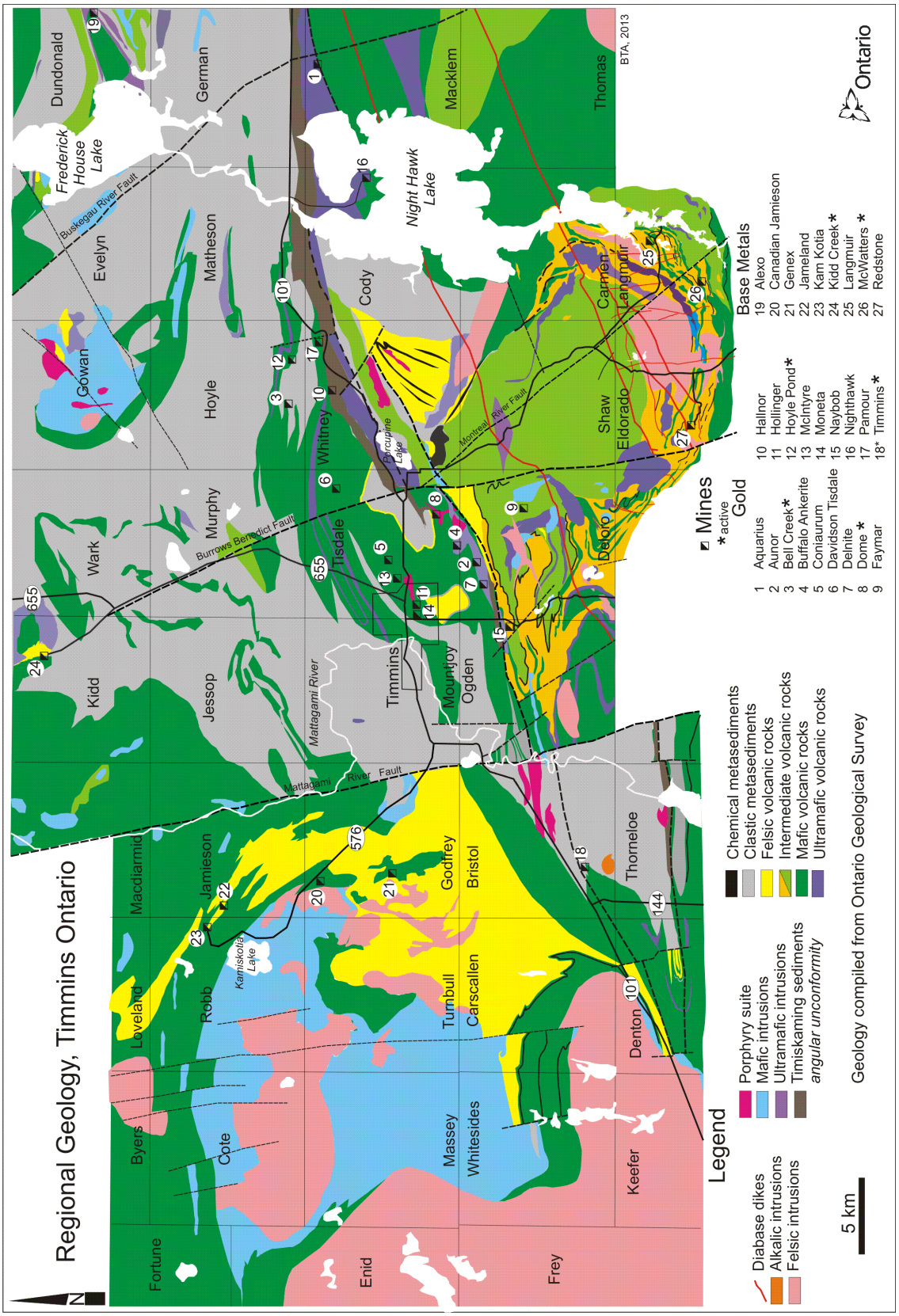


**Figure 2.** Regional geology of the Timmins area with location of major mines. Geology *from* Ontario Geological Survey (2011).

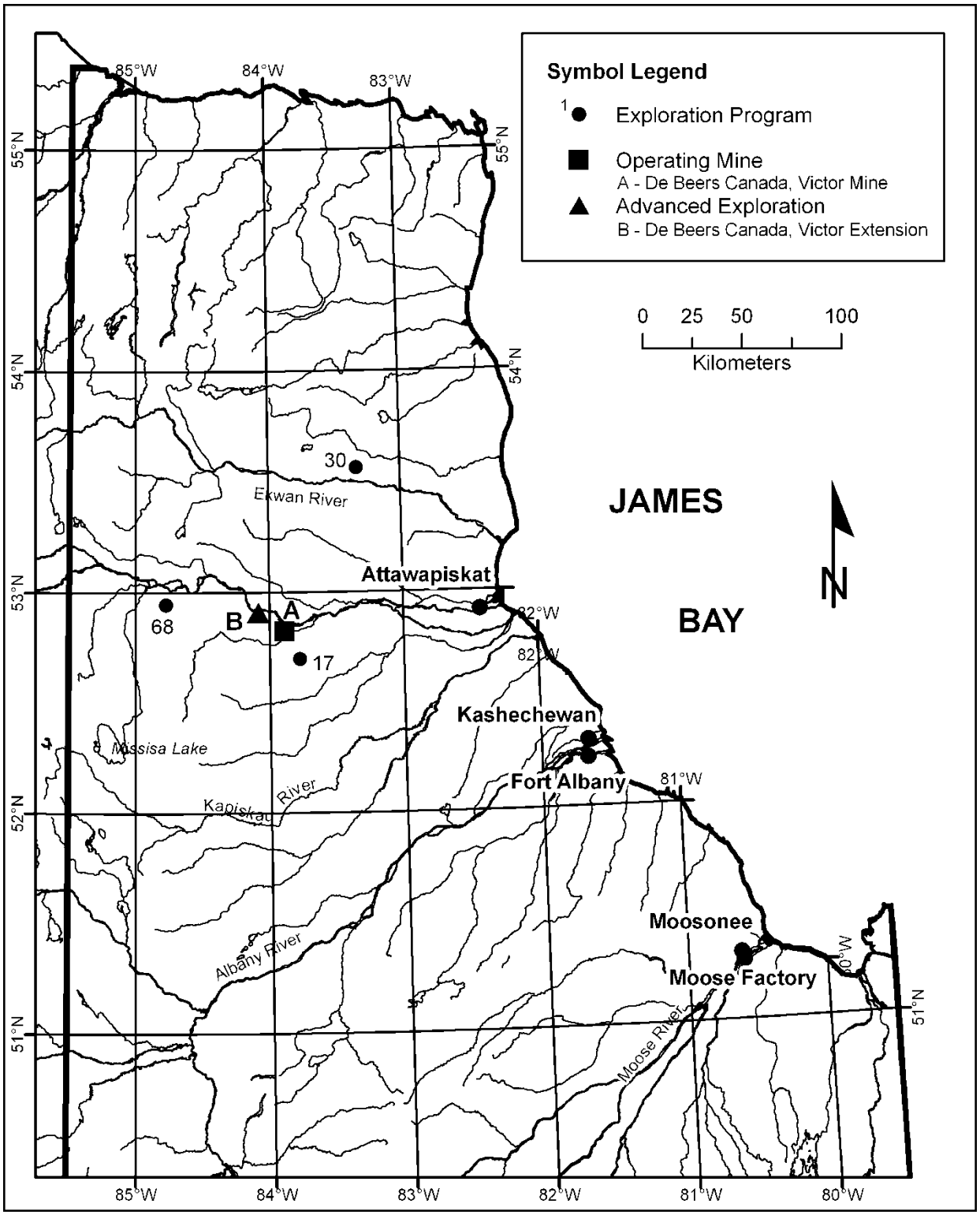


**Figure 3a.** Exploration programs (keyed to Table 14), advanced exploration and operating mines in the Timmins Regional Resident Geologist District (north part).

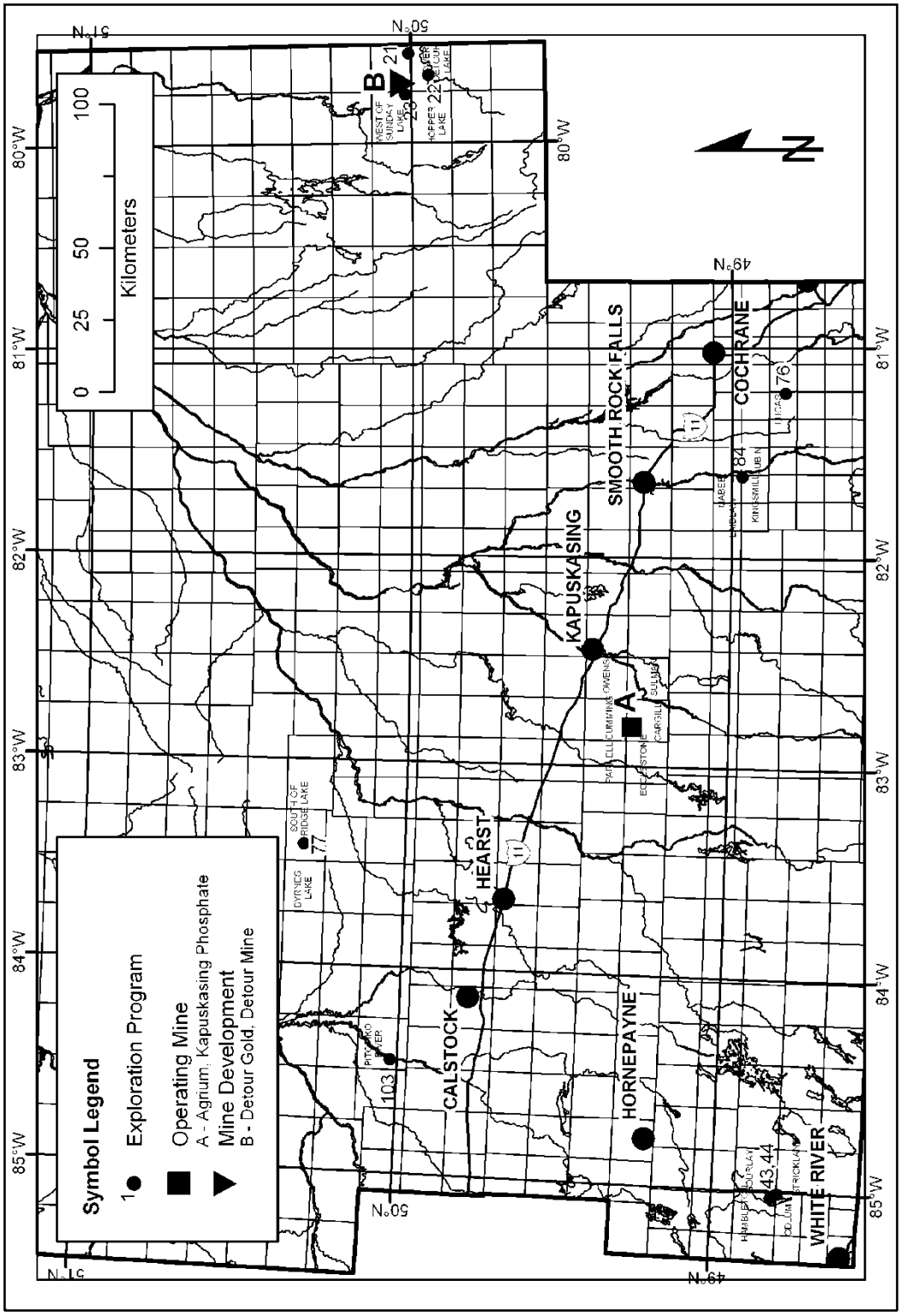


**Figure 3b.** Exploration programs (keyed to Table 14), advanced exploration, mine development and operating mines in the Timmins Regional Resident Geologist District (central part).

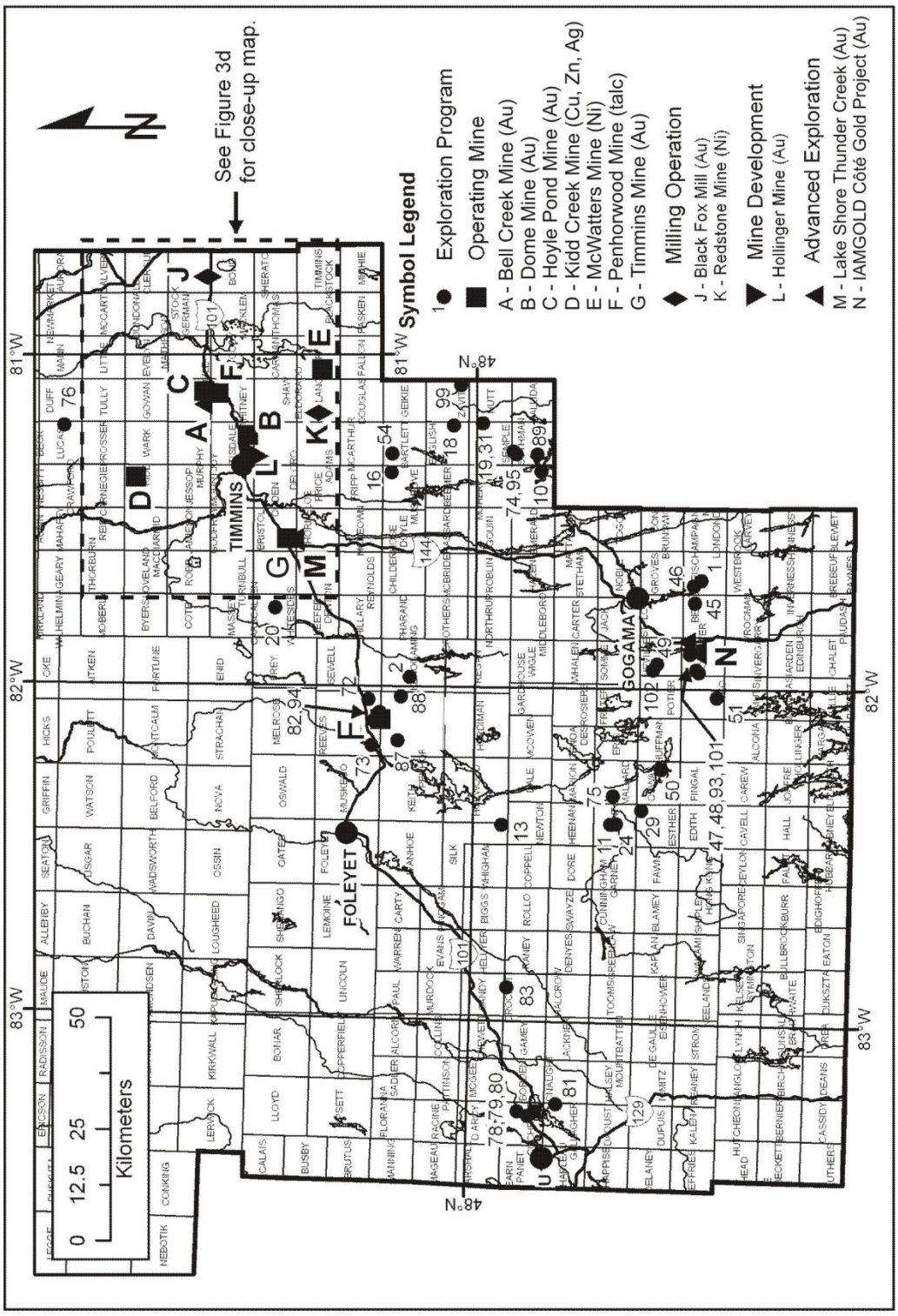


**Figure 3c.** Exploration programs (keyed to Table 14), advanced exploration, mine development, operating mines and milling operations in the Timmins Regional Resident Geologist District (south part).

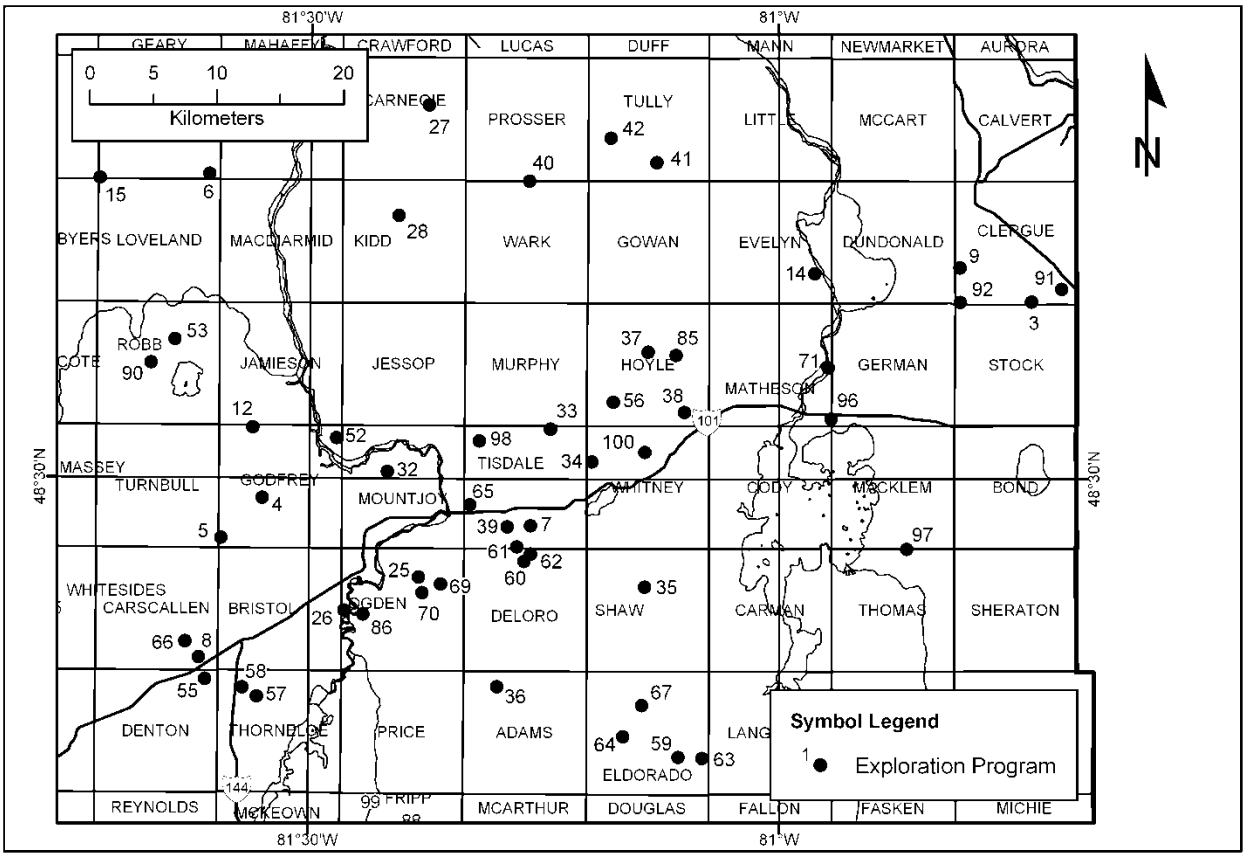


**Figure 3d.** Exploration programs (keyed to Table 14), in the Timmins Regional Resident Geologist District (Timmins area).

# MINE DEVELOPMENT

## Detour Gold Corporation

Detour Gold Corporation's project at the Detour Lake Mine is located 185 km northeast of Cochrane. Access is by way of paved Highway 652. Construction of the Detour Mine as a large bulk tonnage open pit operation was largely completed during the year. Overburden stripping and stockpiling of ore mineralization continued throughout the year and the first circuit of the milling operations was commissioned in October. Primary crushing is done in a 60 inch by 113 inch gyratory crusher supplemented by 2 secondary crushers to reduce ore to 75 mm size prior to feed into the grinding circuit. The grinding circuit incorporates 2 parallel lines. Each circuit contains a 36 feet by 20 feet SAG (semi autogenous grinding) mill and twin pinion ball mills (26 feet by 40.5 feet). A gravity recovery circuit, cyanidation treatment, carbon in pulp and carbon stripping followed by electro-winning complete the milling circuit and gold recovery. While the first circuit was commissioned and commenced milling, construction of the second circuit continued.

By year end a total of 2.6 million tonnes of ore at a grade of 0.81 g/t gold had been stockpiled from the Calcite Zone and pre-stripping of overburden amounted to 20.3 million tonnes. Large-scale mining equipment on site and which are involved in the initial mining operations include 20 ore trucks with a capacity of 320 tonnes and six 100 tonne trucks. Four electric shovels include 2 that have a bucket capacity of 28 to 34 $m^3$ and 2 with 48 $m^3$ capacity. Dewatering of the original open pit mine is underway and the first tailing pond is nearing completion. At peak construction employment was about 1500 employees and contractors while present mine start-up employment is 396 people.

Mineral resources at the Detour Mine are reported in Table 15.

**Table 15.** Mineral reserves and resources at the Detour Mine, 2012.

| | Category | Tonnes | Grade (g/t gold) | Contained Gold (ounces) |
|---|---|---|---|---|
| Reserves* | Proven | 101 635 000 | 1.29 | 4 222 000 |
| | Probable | 368 407 000 | 0.96 | 11 351 000 |
| | Proven + Probable | 470 042 000 | 1.03 | 15 573 000 |
| Resources* | Measured | 111 900 000 | 1.35 | 4 859 000 |
| | Indicated | 383 500 000 | 0.99 | 12 157 000 |
| | Measured + Indicated | 495 400 000 | 1.07 | 17 016 000 |
| | Inferred | 208 500 000 | 0.86 | 5 785 000 |

**Reserves and resources are determined using a 0.5 g/t gold cut-off grade.*

## Goldcorp Inc. – Hollinger Project

Goldcorp Inc. continued work on returning the Hollinger mine in Tisdale Township to producing status. Road construction from the Hollinger Mine to the Dome mill, where ore will be processed, was completed during the year. This included construction of 2 bridge overpasses at Vipond Road and Gold Mine Road to allow large mine trucks unimpeded access between mine and mill.

# ADVANCED EXPLORATION

## De Beers Canada Inc. – Victor Extension

De Beers Victor Extension Project includes the 16 kimberlite pipes discovered by De Beers in the Attawapiskat cluster. De Beers Canada Inc. initiated a conceptual study on the Tango Extension kimberlite and a notice of the project was made to initiate permitting for possible development of the deposit.

Exploration core drilling of 4 holes with a total length of 1625 m was completed on the Alpha kimberlites.

The locations of the kimberlite pipes are indicated in Figure 4, where several of the pipe sizes have been enlarged to emphasis their shapes. Tango Extension is located 7 km northwest of Victor Mine, and Alpha and Alpha North kimberlites lie 10 km to the southeast.

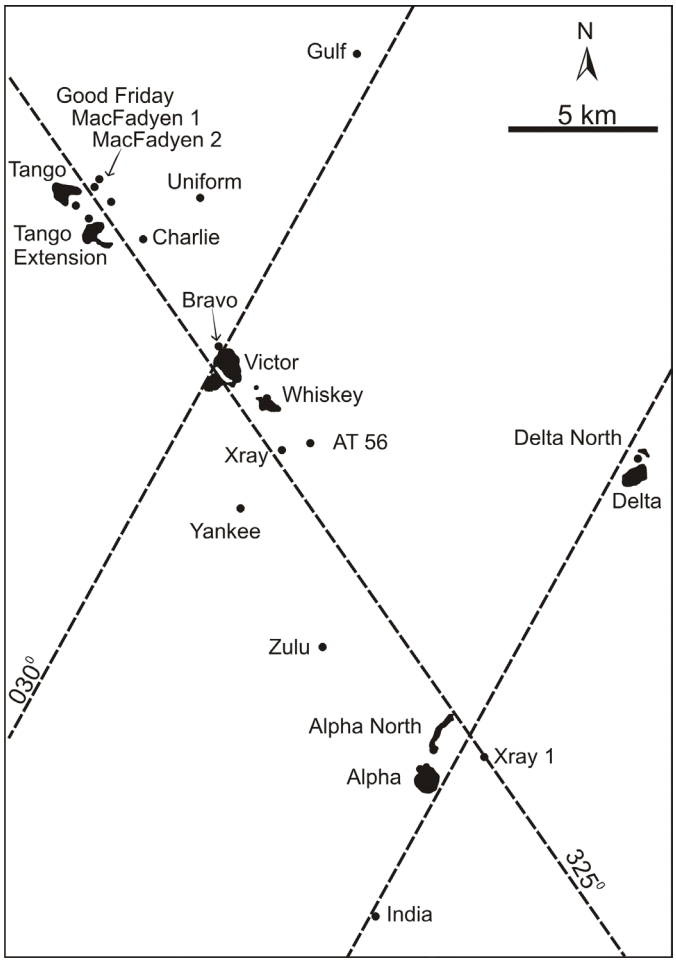


**Figure 4**. Location of the Attawapiskat kimberlite pipes showing the best fit lines at 030°N and 325°N, suggesting controlling structural trends on their emplacement. Pipe sizes have been enlarged to highlight shapes.

## IAMGOLD Corporation – Côté Gold Deposit

IAMGOLD acquired Trelawney Mining and Exploration Inc. in June. The company continued with a major exploration diamond-drilling campaign on the Côté Lake Zone using up to 13 diamond drills to define mineral resources on the property and to test additional gold targets. As a result of the extensive diamond-drilling program on the Côté Gold deposit, IAMGOLD has identified indicated resources of 7.6 million ounces of gold and an additional 1.04 million ounces gold inferred.

## Lake Shore Gold Corp. – Thunder Creek Zone

The Thunder Creek Zone is a gold-bearing zone that lies subparallel to ore bodies of the Timmins Mine. It is located from 650 to 800 m south of the Timmins Mine with which it shares common access by way of the Timmins Mine shaft and ramp. Presently undergoing development in step with mining at the Timmins Mine, Thunder Creek Zone underground work included 4005.3 m of drifting and 1632.1 m of raising. Exploration and resource definition diamond drilling amounted to 51 914 m. Much of the drilling was directed toward ore grade estimation and to explore the down plunge extent of the gold-bearing zone.

## Liberty Mines Inc. – Hart Nickel

Liberty Mines' Hart nickel deposit is located in Langmuir Township approximately midway between the company's Redstone and McWatters mines. The mine road between the 2 operations crosses the Hart property.

Liberty completed surface exploration diamond drilling of 5268 m on the Hart nickel deposit. A preliminary economic assessment of the deposit was completed. Mineral resources for the Hart Nickel project are indicated in Table 16.

**Table 16**. Mineral resources at the Hart Nickel deposit.

| Category | Tonnes | Grade Nickel (%) | Contained Nickel (pounds) |
|---|---|---|---|
| Indicated | 1 546 000 | 1.40 | 47 779 000 |
| Inferred | 322 000 | 1.27 | 8 990 000 |

*Source: B. Zuidema, Liberty Mines Inc., written communication, January 30, 2013.*

Diamond-drill hole H-12-31A intersected 0.96% Ni over a width of 0.89 m at 780 m below surface, and a shallower intersection of 0.6% Ni over 3.5 m. The company followed up with borehole geophysics which identified 2 conductors: one west of drill hole H-11-23, at an approximate depth of 580 m, and one below drill hole H-12-31A, at an approximate depth of 800 m. Additional drilling returned interceptions of 3.41% Ni and 0.06% Cu over 1.96 m in hole H-12-35 and 1.19% Ni and 0.07% Cu over 3.97 m in hole H-12-36 (Liberty Mines Inc., press releases, May 14, and October 18, 2012).

## Metalex Ventures Ltd. – Kyle Lake Property - U2 Kimberlite

Metalex Ventures Ltd. proposes to collect a 10 000 tonne bulk sample of the U2 kimberlite in early 2013. The proposed bulk sample will be collected by 48 large-diameter reverse circulation holes, and the kimberlite will be processed at a custom plant on site. Drilling and processing of the bulk sample is expected to take 1 year.

During the year, the company undertook geological and geotechnical logging of 25 pilot holes drilled at the site in 2011. Sepro Mineral Systems Corp. has been selected as the supplier of the processing plant and has commenced construction of the 20 ton per hour plant. The plant and other equipment will be mobilized to the site in early 2013 by winter road (Metalex Ventures Ltd., press release, December 7, 2012).

# EXPLORATION ACTIVITY

Over 55 companies were active on a wide variety of projects and programs throughout the Timmins District in 2012. Although this is a significant decline from over 80 active companies last year, the reduction in numbers is largely the result of the boundary adjustment between the Timmins and Sault Ste. Marie districts, so all companies exploring in the Wawa area are now reported in the Sault Ste. Marie section. A complete listing of exploration activities known to have occurred in the Timmins District in 2012 is presented in Table 14. Highlights of select company exploration projects are summarized below.

## Adventure Gold Inc. – Meunier JV Property

Adventure Gold Inc., Lake Shore Gold Corp. and RT Minerals Corporation completed their Deep Hole in Bristol Township. The Deep Hole was designed to test for the down plunge extension of the Timmins Mine onto the adjacent Meunier JV property to the immediate northwest of the Timmins Mine. The diamond drilling was successful in intersecting the Timmins West Mine Fold Nose structure at a depth of 1.9 km. However, no gold

mineralization was encountered on the Meunier JV property, represented by the last 462 m drilled out of the full 3444 m core length of the Deep Hole (Adventure Gold Inc., press release, March 2, 2012).

## Entourage Metals Ltd. – October Gold Property

Entourage Metals Ltd. started a surface exploration campaign over their October gold property (formerly known as Benton gold property) in Benton Township. The work consisted of geological mapping, prospecting and lithogeochemical surveys. The exploration targeted gold anomalies identified during a soil-gas hydrocarbon campaign completed in 2011 (Entourage Metals Ltd., press releases, March 21 and October 18, 2012).

## Excellon Resources Inc. – DeSantis Property

Excellon started a 5000 m diamond-drilling program on their DeSantis property in October 2012 to test undrilled areas east and below the known Albitite Zone (Excellon Resources Inc., press releases, May 30 and October 31, 2012). The drill program was a continuation of work initiated by Lateegra Gold Corp. following a corporate amalgamation of the 2 companies the previous year.

Twelve diamond-drill holes were completed, including 3 that tested the Hydrothermal Zone (Figure 5), and returned minor gold assays. Four holes tested the De Santis West portion of the property but returned no significant assays. The 5 remaining holes tested the down-dip and plunge extensions of the Albitite Zone east of the DeSantis No.2 shaft. One hole returned an assay of 10.39 g/t gold over 1.5 m. The other 4 holes did not return any significant assays. The historic total mineral resources estimate (not NI 43-101 compliant) for the DeSantis Mine is 182 505 tonnes at a grade of 8.64 g/t gold (Blanchflower 2012).

Sporatic mining was carried out in 1933, 1939–1942 and 1961–1964. Gold mineralization is hosted by altered, pillowed mafic flows that are mineralized with pyrite and gold. Iron carbonate, quartz, biotite and sercitite alteration is noted. The Hydrothermal Zone is characterized by mafic volcanic rocks that are altered with chlorite, ankerite, quartz, sericite and pyrite. The Albitite Zone comprises a broad breccia stock with angular fragments of pink to white felsic porphyry altered to aphanitic albite, quartz, iron carbonate and ubiquitous pyrite enveloped in a dark matrix of chlorite, iron carbonate and fine-grained acicular, felted tourmaline. Narrow quartz veins occasionally cross-cut the Albitite Zone. Dunbar (1948, p.445) noted "…the single albitite stock at the DeSantis Porcupine mine pitches steeply west".

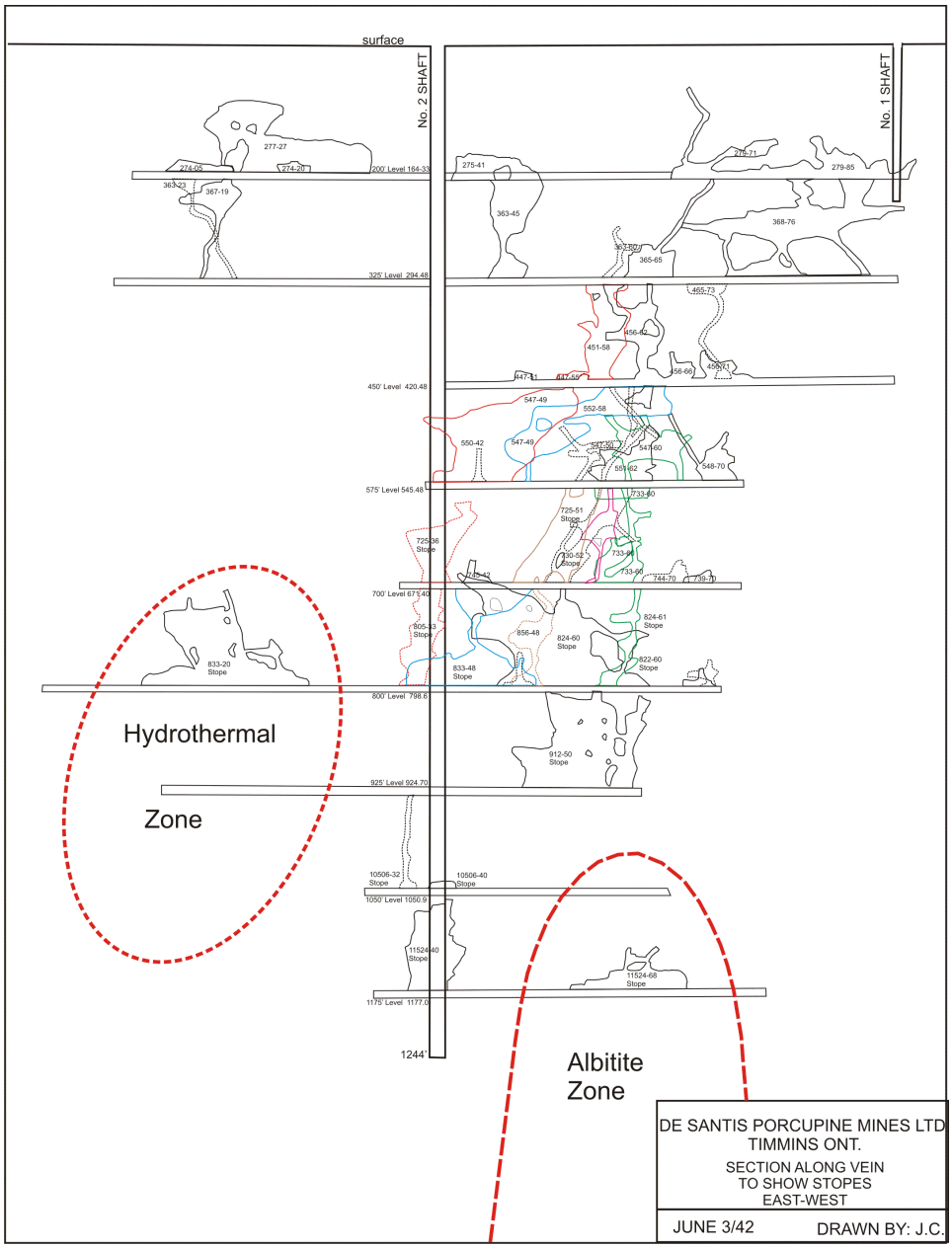


**Figure 5.** Longitudinal section of the DeSantis Mine, *modified from* DeSantis Porcupine Mines Ltd. (1942).

## Explor Resources Inc. – Timmins Porcupine West Gold Property

Explor Resources Inc. continued a diamond-drilling program on the Timmins Porcupine West gold property. The property consists of 185 unpatented mining claim units in Bristol and Ogden townships. The 30 000 m drilling program was designed to test the continuity of the mineralization first discovered in 2010. In the early part of 2012, diamond-drill holes Nos. 12-62W1, 12-62W2 and 12-62W3 were completed and returned gold values up to 7.364 g/t gold.

The drilling program confirmed the association of gold mineralization with quartz feldspar and syenite porphyries and defined a synclinal structural aspect of the property geology. As depicted in Figure 6, the property is situated at the intersection of the Porcupine Destor Fault Zone and the north-trending Mattagami River fault. At this location,

geological evidence, including the offset of lithologies, indicates a displacement of the geology on the west side of the Mattagami River fault southwards by about 4 km. Nonetheless, a major structure is recognized west of the Mattagami River fault along the Porcupine–Destor Fault trace, referred to as the Bristol fault (Ferguson 1957), and a number of gold occurrences, deposits and the Timmins Mine lie along this structure. Overburden depths vary from 20 to 60 m over Explor's target zone; the bedrock does not outcrop.

Table 17 summarizes the best diamond-drilling assay results from the company's exploration program.

**Table 17.** Best intersections for Explor Resources Inc. Timmins Porcupine West 2012 drilling program.

| Hole # | From (m) | To (m) | Interval (m) | Gold (g/t) |
|---|---|---|---|---|
| TPW-12-65 | 95.7 | 99.0 | 3.30 | 28.461 |
| TPW-12-73W5 | 841.3 | 874.5 | 33.20 | 7.647 |
| TPW-12-76 | 301.5 | 306.0 | 4.50 | 6.14 |
| TPW-12-86 | 241.5 | 247.5 | 6.00 | 7.641 |

*(Explor Resources, press releases, February 23, March 27, May 15, August 21, September 26, October 25 and November 19, 2012).*

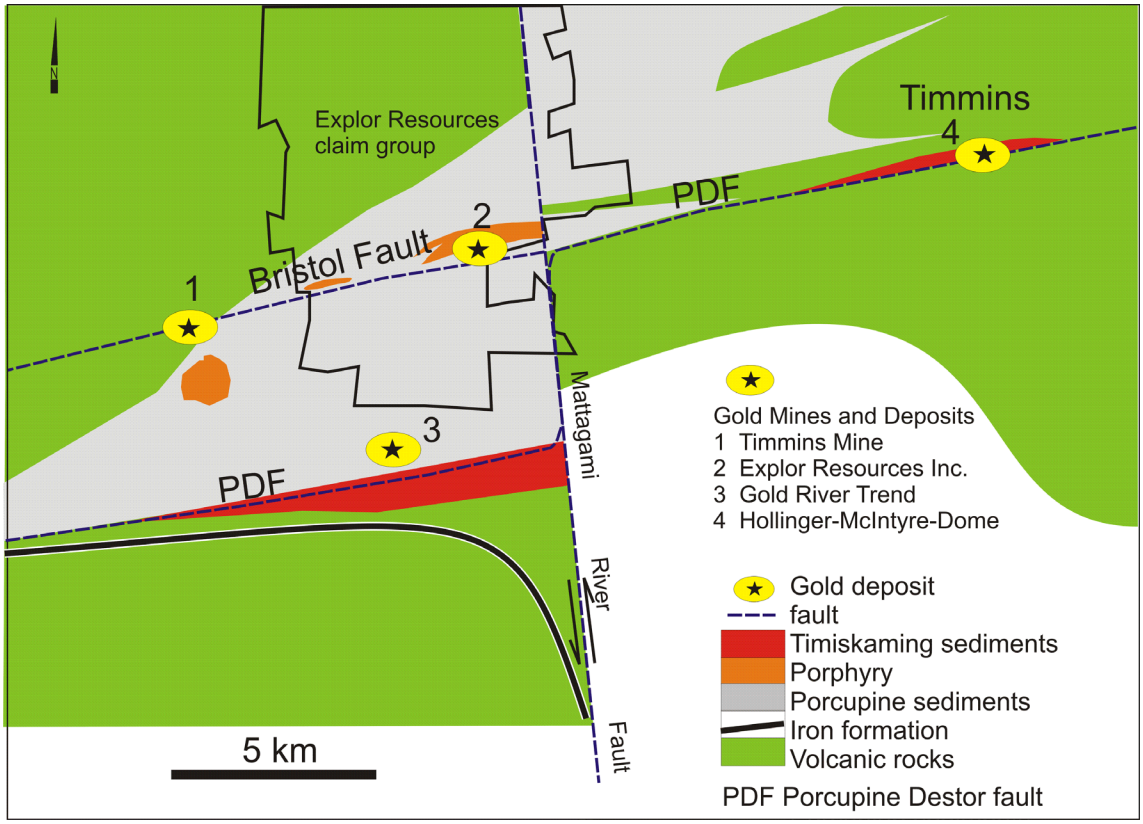


**Figure 6**. Regional geology of the Timmins area with location of major faults converging at the site of Explor Resources Inc., Timmins Porcupine West gold property.

## Falcon Gold Corp. – Burton Gold Property

Falcon Gold Corp. started work on their Burton gold property located 38 km northwest of the IAMGOLD Côté Lake Project. The work consisted initially of line cutting, an induced polarization survey and a soil sampling survey. It was followed by a 1500 m diamond-drilling program to test the targets identified during soil sampling and induced polarization surveys later in the year (Falcon Gold Corp., press releases, May 14 and December 13, 2012).

## Fancamp Exploration Ltd. – Desolation Lake Project

Fancamp Exploration Ltd. completed a 3424 m winter diamond-drilling program on their Desolation Lake Project, located 100 km northwest of Attawapiskat. The 8 holes intersected bands of magnetite-bearing iron formation covering a 3.75 km strike length. Assay results for hole DL-12-01 showed that it intersected 422 m grading 40.9% $Fe_2O_3$ (Fancamp Exploration Ltd., press release, April 30, 2012).

## General Magnesium Corporation – Whitney Talc-Magnesite Project

General Magnesium Corporation initiated a preliminary economic assessment on its Whitney talc-magnesite project located in Whitney Township, 3 km south of Porcupine. Talc and magnesite mineralization occur as a flat, to gently east-northeast dipping, altered ultramafic sill overlying and intruding into sediments comprised of black argillite, chert and banded iron formation capped by felsic volcanic rocks. The talc-magnesite deposit occurs at the northeast margin of the Shaw Dome where a major flexure causes structural repetition because of small-scale folds and thrusts. General Magnesium's diamond-drilling program tested 2 separate areas for talc-magnesite mineralization. The most favourable area identified is referred to as the South Zone Main deposit. At the contact between the South Zone mineralization and the enclosing country rock, higher grade talc mineralization occurs and this is referred to as the Selvage Zone. Mineral resources for the 2 zones are listed in Table 18, defined on the basis of 29 diamond-drill holes completed by General Magnesium in 2008–2009 and 13 holes drilled in 1999 by WMC Resources Ltd.

General Magnesium also did geochemical analyses of 177 samples of banded iron formation encountered during drill testing of the talc magnesite deposit. Total iron content of the iron formation ranged from 22.4% to 53.2% Fe. Several intervals of iron formation were encountered in the drilling; the upper most bed was 20 m thick. Magnetite was the dominant iron mineralization with lesser amounts of hematite mineralization interbedded with chert.

**Table 18.** Mineral resources on General Magnesium Corporation's Whitney talc-magnesite project.

| Zone | Category | Tonnes | Grade % Magnesite | Grade % Talc |
|---|---|---|---|---|
| South Zone Main deposit | Measured | 6 886 594 | 38.53 | 43.48 |
| | Indicated | 39 857 514 | 35.36 | 47.91 |
| South Zone selvage | Measured | 1 562 283 | 27.67 | 50.91 |
| | Indicated | 5 769 966 | 24.96 | 47.59 |

## Gowest Gold Ltd. – North Timmins Gold (Frankfield East Project)

Gowest Gold Ltd. finished a diamond-drilling campaign in January 2012 on their Frankfield East project. The campaign extended the strike length of the deposit over 1.3 km. It increased the resources estimates to 6 016 500 tonnes at an average grade of 4.88 g/t gold of indicated resources and 3 692 900 tonnes at an average grade of 4.22 g/t gold of inferred resources. The company focused on acquiring more ground contiguous to its property and performed ore processing tests (Gowest Gold Ltd., press releases, March 5, July 27, November 12 and November 20, 2012).

## Harte Gold Corp. – Sugar Zone Property

During 2012, Harte Gold Corp. continued its evaluation of the Sugar Zone property, located approximately 25 km northeast of the community of White River. The property is situated in Hambleton, Odlum and Strickland townships within the Dayohessarah Lake greenstone belt.

Harte Gold completed a 7000 m deep drilling program to investigate the Sugar Zone at depth. The purpose of the drilling was to target new resources at the 400 to 600 m level, and to test a deep geophysical target at 800 to 1000 m. Significant assays from the deep drilling include 10.50 g/t gold over 3.2 m, *including* 43.30 g/t gold over 0.7 m in drill hole SZ-12-37. This drill hole intersected the Sugar Zone at the 1100 m level (Harte Gold Corp., press releases, April 10 and August 2, 2012).

The company completed a Preliminary Economic Assessment of the property in the late summer and is presently engaged in permitting their advanced exploration program to take place in 2013. The planned advanced exploration program will include the development of an adit and the collection and processing of a 100 000 tonne bulk sample (Harte Gold Corp., press release, October 23, 2012).

The Sugar Zone deposit contains an NI 43-101 compliant resource of 1 117 000 tonnes @ 8.41 g/t gold (9 394 000 g) in the indicated resource category and 417 000 tonnes @ 7.13 g/t gold (2 968 000 g) in the inferred resource category (Buck, Hayden and LeBlanc 2012).

## Knick Exploration Inc. – Triple Lake Property

Knick Exploration Inc. did preliminary fieldwork on their Triple Lake property located in McArthur Township. Samples collected on the property returned anomalous gold values, and 1 sample returned an assay of 117 g/t gold, made out of vein material (Knick Exploration Inc., press release, May 1, 2012).

## Lake Shore Gold Corp. – TC-144 Property

Lake Shore Gold Corp. continued to investigate the TC-144 property which lies immediately to the west of their Thunder Creek deposit in Thorneloe Township. During 2012, the company completed 35 diamond-drill holes and 2 extension holes totalling 27 411 m. The drilling was designed to test the TC-144 alteration zone in 3 separate areas, including the 144 Gap, 144 North and 144 South areas.

Drilling in the 144 Gap comprised 5 holes and 1 extension hole (5456 m) drilled along a 1.6 km strike length. Significant assays from this drilling included 13.54 g/t gold over 2.0 m and 6.07 g/t gold over 3 m (Hwy-12-40). This drill hole crossed the TC-144 trend approximately 850 m south of the Thunder Creek deposit. Mineralization is associated with strong hydrothermal alteration and narrow bands of syenite, as well as increased concentrations of quartz and pyrite.

At 144 North drilling comprised 16 holes (12 514 m) and was designed to extend previously identified mineralization to depth. Significant assays included 3.59 g/t gold over 7.5 m, including 11.84 g/t gold over 1.5 m and 8.93 g/t gold over 1 m, in Hwy-11-14. Additional assays from the same zone returned 5.10 g/t gold over 3 m, including 10.35 g/t gold over 1 m, and 3.33 g/t gold over 6.9 m, including 10.18 g/t gold over 1.7 m in Hwy-12-43. The elevated assays came from depths ranging from 150 to 900 m.

Fourteen drill holes (8900 m) were completed at 144 South. This program covered a 1000 m strike length along the TC-144 trend, to a maximum vertical depth of 550 m. Most of the significant assays have been obtained from the northeastern part of a 600 m long hydrothermal alteration zone which has been intruded by a syenite stock. Significant assays from this area included 12.60 g/t gold over 1.3 m and 1.3 g/t gold over 58.7 m, including 4.06 g/t gold over 7.6 m in Hwy-11-28 and 202.00 g/t gold over 0.30 m in Hwy-11-30 (Lake Shore Gold Corp., press release, January 21, 2013).

## Lexam VG Gold Inc. – Buffalo-Ankerite Project

Lexam VG Gold Inc. completed a 2011–2012 drilling program on their Buffalo-Ankerite project designed to expand the gold-bearing North Zone and South Zone. The program ended with diamond-drill hole VBA-12-194 which intersected 45.5 m at a grade of 1.49 g/t gold and 16.6 m at a grade of 4.24 g/t gold. The NI 43-101 compliant resources for the Buffalo-Ankerite project are now estimated to 4.5 million tonnes at 3.7 g/t gold in the measured and indicated resources, and 3.5 million tonnes at 3.70 g/t gold in the inferred resources (Lexam VG Gold Inc., press releases, March 21, and September 20, 2012).

## Lexam VG Gold Inc. – Fuller Property

Lexam VG Gold Inc. completed their 2011–2012 drilling program on their Fuller property. The program was set to methodically evaluate the potential of the Fuller porphyry to host near-surface gold mineralization. The best drill intersection encountered 2.44 g/t gold over 21 m (Lexam VG Gold Inc., press release, July 11, 2012).

## McLaren Resources Inc. – TimGinn Property

McLaren Resources Inc. continued its exploration program on the TimGinn property, located contiguously to the McIntyre and Hollinger properties in Tisdale Township. It completed an eight-hole, 1453 m diamond-drilling program, where it intersected 7.41 g/t gold over 3.2 m (MGT-12-14). The holes were drilled to explore and confirm gold mineralization zones in the steeply dipping mafic volcanic flows containing pyrite and quartz stringers (McLaren Resources Inc., press release, October 3, 2012).

## Melkior Resources Inc. – Carscallen Gold Project

Melkior Resources Inc. continued to obtain favourable results from its Carscallen gold project, located in Carscallen Township. While drilling 2 deep holes over the Shenkman area, it pierced the Carlton Lake pluton felsic intrusive into mafic volcanic rocks, which hosts VMS style copper mineralization. Diamond-drill hole CAR-79-2012 returned assays to up to 1.55 g/t gold, and 3.55% copper over 1.35 m. Hole CAR-80-2012 also encountered gold zones and elevated copper, counting an intersection of 3.70 m at 51.92 g/t gold. It showed that the gold mineralization extended past the granite-volcanic contact and much deeper than earlier holes. Stringer chalcopyrite mineralization with associated chlorite alteration and anomalous copper and silver assays from the drilling were also encountered. Melkior completed down-hole geophysical surveys to test for possible massive sulphide mineralization.

The company followed with a 3 hole, 1566 m drilling program planned to extend a former hole, and check the extension of the Shenkman gold zone underlying the volcanic rocks. Diamond-drill hole CAR-61X-2012 intersected gold mineralization in the altered mafic volcanic rocks underlying the felsic intrusive. Holes CAR-81-2012 and CAR-82-2012 did not get to the Shenkman zone, because they were blocked by an unexpected fault zone. They did intersect another geological environment with anomalous values in gold.

With these results, Melkior Resources Inc. pursued drilling with a 1616 m diamond-drilling program. It intersected gold mineralization over 15 m at a grade of 1.46 g/t gold in granite and in quartz-feldspar porphyry dikes near surface. The drill holes also encountered significant synvolcanic alteration, iron formations and coarse volcanic breccias at depth.

Surface channel sampling was completed over the Jowsey and ZamZam zones. The best results from the ZamZam Zone were 5.66 g/t gold and 2.18 g/t silver over 4.2 m, and the best channel sample over the Jowsey Zone assayed 6.43 g/t gold and 6 g/t silver over 1 m (Melkior Resources Inc., press releases, March 26, April 12, August 29, November 7, and December 17, 2012).

## Metals Creek Resources Corp. – Ogden Gold Project

Metals Creek Resources Corp. completed a diamond-drilling program on the Ogden gold project located in Ogden Township. The program targeted the Thomas Ogden Zone, described as strongly altered porphyry and conglomerate

with associated pyrite, arsenopyrite and strong silicification. The best intersection obtained in drill hole TOG-12-06 assayed 5.83 g/t gold over 16.27 m (Metals Creek Resources Corp., press release, May 15, 2012).

## Nebu Resources Inc. – Cork Lake Property

Nebu Resources Inc. completed a diamond-drilling campaign on their Cork Lake property in Sothman Township. Drilling tested an IP anomaly located between 2 ultramafic bodies (Nebu Resources Inc., press release, September 26, 2012).

## Noble Mineral Exploration Inc. – Project 81- Kingsmill Nickel Anomaly

Noble Mineral Exploration Inc., formerly known as Ring of Fire Resources Inc., completed 12 diamond-drill holes totalling 4922 m on the Kingsmill nickel anomaly in Kingsmill Township. The diamond-drilling program targeted a serpentinized peridotite. The drilling showed that the entire peridotite is mineralized. The best intersection was 0.28% Ni over 437.6 m in diamond-drill hole KML 12-01. Further analysis through mineral liberation analyser–scanning electron microscopy (MLA-SEM) technique and Davis Tube Analysis showed the presence of awaurite, a natural nickel-iron alloy. The company proceeded with metallurgical testing, where it was determined that the major part of nickel in the deposit is locked up in the olivine/serpentine lattice structure (Ring of Fire Resources Inc., press releases, February 21, February 28, and March 5, 2012; Noble Mineral Exploration Inc., press releases, March 29, April 12, May 30, and August 22, 2012).

## Probe Mines Limited – Borden Gold Project

Probe Mines Limited pursued an intensive exploration diamond-drilling program on its Borden gold project, located in Cochrane Township. Four diamond drills continued to define the gold mineralized zone and a fifth drill explored outlying targets on the extensive property. The 2011–2012 drilling program provided the basis for an updated resource estimate. The Borden gold project is estimated to contain a global indicated resource of 4 051 000 ounces of gold averaging 0.71 g/t gold and an additional inferred resource of 1 796 000 ounces of gold averaging 0.62 g/t gold, using a 0.3 g/t gold cut-off grade.

The company continued the drilling program to expand the Borden gold project to depth and confirm its continuity through infill drilling. It also started a geochemical survey and geological mapping of the area. The best intersection for 2012 is from drill hole BL12-256 that encountered a 51 m interval averaging 10.3 g/t gold. The company also delineated more mineralization from the main deposit to the northeast, referred to as the Hanging Wall Zone. Diamond drilling showed significant intersections, including a 4 m interval grading 9.1 g/t gold (BL12-288) and a 35 m wide intercept averaging 0.6 g/t gold (BL12-286) (Probe Mines Limited, press releases, April 2, June 5, July 31, December 12, and December 18, 2012).

## Rapier Gold Inc. – Pen Gold Project

Rapier Gold Inc. was formed in the fall of 2012 as a spin out of Rogue Iron Ore Corp. Rapier has option agreements with Rogue Iron Ore Corp. and Rio Tinto PLC to conduct gold exploration on an extensive land package along the Destor–Porcupine Fault in Reeves and Penhorwood townships.

Rio Tinto conducted a drilling to the west of the talc mine, on the northern part of the property, in 2008. Assays from the program included 13.3 g/t gold over 0.3 m in PC08-004, 22.1 g/t gold over 0.3 m in PC08-006 and 9.96 g/t gold over 2 m in PC08-005. A follow up diamond-drilling program (7 drill holes) by the company in 2010 returned numerous shallow intersections with visible gold in quartz-carbonate veins. The quartz-carbonate veins are hosted within green carbonate alteration zones and within metasedimentary units of the Porcupine Assemblage.

Rapier Gold conducted a preliminary exploration program in late 2012. The program consisted of data compilation, preliminary mapping, overburden stripping and channel sampling of prospective targets. A follow-up diamond-drilling program of approximately 20 holes (5500 m) is planned for the spring (Rogue Iron Ore Corp., press release, November 12, 2012).

## Rogue Iron Ore Corp. – Radio Hill Project

Rogue Iron Ore Corp completed its 2011–2012 diamond-drilling program on its Radio Hill property, located 80 km southwest of Timmins, Ontario. The program had the objective to of upgrading the historical resources estimate to NI 43-101 compliancy. The best intersection came from drill hole RH-12-31 which was drilled through the thickened central portion of the iron formation. It had an intersection of 482 m at a grade of 39.9% total iron (Rogue Iron Ore Corp., press releases, January 23, and August 2, 2012).

## Sanatana Resources Inc. – Watershed Property

Sanatana Resources Inc. resumed its 2011–2012 drilling program over the Clam Lake portion of its Watershed Property. Gold mineralization is present as a low-grade disseminated zone hosted in intensely silicified, brecciated diorite-granodiorite rocks. High-grade gold mineralization occurs associated with quartz veins, structures and intense alteration, enclosed by lower grade zones of mineralization. The best intersection was from drill hole SR-12-03 that intersected 26.1 m with a grade of 3.96 g/t gold (Sanatana Resources Inc., press releases, April 20, June 19, and June 20, 2012).

Overall, Sanatana completed more than 10 000 m of drilling in 21 diamond-drill holes. The first 6 holes tested the existence of gold in the Chain of Lakes area 1.5 km west of Clam Lake. The best intersection among the six holes came from drill hole SR-12-09 which assayed 2.83 g/t gold over 1 m. Six drill holes targeted the potential for northwest-oriented extensions of gold mineralization from the 2011–2012 drilling program. Five holes targeted IP (induced polarization) anomalies in the Chain of Lakes area. The last hole was located at the Chester prospect to test an IP resistivity target (Sanatana Resources Inc., Management's Discussion and Analysis, September 30, 2012).

## SGX Resources Inc. – Edleston Zone

SGX Resources Inc. continued exploration on the Edleston Zone, located in the northwest part of Sothman Township. The host rock to gold mineralization is an altered and sheared ultramafic rock that is extensively silicified and contains quartz-carbonate in veins, veinlets and fracture fillings. Gold mineralization occurs associated with 3 to 5% pyrite, trace chalcopyrite and as native gold. Intercalated volcanic and metasedimentary rock units are located to the north and south of the Edleston Zone; large felsic and mafic intrusive units are adjacent, with the northern volcanic rocks to the east.

Over summer 2012, SGX Resources Inc. continued drilling, expanding the zone, with high grades to the east and to depth. Diamond-drill hole SL-12-50 intersected 5.43 g/t gold over 12 m, 50 m below the surface, at the eastern extension of the zone. Consistent widths and grades continued to be intersected throughout the deposit in extension and depth. Drill hole SL-12-129 extended the zone eastward by 0.1 km, with 2 intersections consisting of 57.4 g/t gold over 3.3 m, and 1.42 g/t gold over 54 m further down the hole. The precedent hole was the premise to hole SL-12-86, which intersected 68.5 g/t gold over 6.3 m (SGX Resources Inc., press releases, March 14, June 20, September 19, and November 20, 2012). Dimensions of the Edleston Zone, as defined by diamond drilling, are 400 m in strike length and 200 m deep.

## Temex Resources Corp. – Whitney Gold Project

Temex Resources Corp. continued a diamond-drilling program on the Whitney gold project, which contains the near-surface gold targets of Upper Broulan Reef Zone, C Zone, and Q Zone. Drilling encountered 2.31 g/t gold over 20 m from drill hole TW12-198 in the eastern portion of the Upper Hallnor area, 36.20 g/t gold over 1 m from drill hole TW12-208 in the Q Zone, 9.37 g/t gold over 5 m from drill hole TW12-195 in the Upper Hallnor Mine area, and 29.60 g/t gold over 0.52 m from drill hole TW12-197 in the Upper Hallnor Mine area.

Additional drilling aimed to delineate other zones amenable to mining. Drill intersections included 3.45 g/t gold over 13.5 m from drill hole TW12-205 in the Hallnor South Vein area, 9.71 g/t gold over 5 m from drill hole TW12-222 in the 1-55 Vein West Extension area, 5.05 g/t gold over 19 m, including 14.86 g/t gold over 6 m and 39.60 g/t gold

over 1 m from hole TW12-224 in the 1-55 Vein West Extension area, and 83.40 g/t gold over 1 m from drill hole TW12-227 in the Hallnor Footwall area

Temex completed a NI 43-101 report for the Upper Hallnor deposit. A mineral resource estimate for the Upper Hallnor In-pit is listed in Table 19.

**Table 19**. Pit-constrained mineral resources for the Upper Hallnor, Whitney gold project.

| Category | Tonnes* | Grade (g/t gold) | Contained Ounces Gold |
|---|---|---|---|
| Measured | 2 964 000 | 2.44 | 232 100 |
| Indicated | 8 664 000 | 1.95 | 544 000 |
| Inferred | 4 024 000 | 1.79 | 231 900 |

**based on a cut-off grade of 0.3 g/t gold.*

*(Temex Resources Corp., press releases, March 22, April 18, May 9, June 7 and October 23, 2012).*

## Zenyatta Ventures Ltd. – Albany Graphite Project

Zenyatta Ventures Ltd. continued to explore the Albany Graphite Project property, located in the Pitopiko River area, 65 km northwest of Hearst. The goal of the campaign was to test the extent of a 1400 m by 800 m airborne EM conductor with approximately 4000 m of wide-spaced drilling. The drilling campaign intersected graphitic breccia over significant widths including diamond-drill hole Z12-3 that intersected a 47.8 m thick graphitic breccia yielding 3.3% carbon, and a wider intersection of 132 m containing grades up to 11.4% carbon. Overall, the 9-hole diamond-drilling program succeeded in determining widespread vein-type graphite mineralization over the targeted conductor.

Test results of beneficiation studies using a leaching process on the graphite breccia produced a 97.2% carbon total graphite product from a rough concentrate (Zenyatta Ventures Inc., press release May 9, July 16, October 3, 2012).

# RESIDENT GEOLOGIST PROGRAM STAFF AND ACTIVITIES

The Timmins Resident Geologist office was staffed by B. Atkinson, Regional Resident Geologist and P. Bousquet, District Geologist. S. Harvey and S. Burnett worked in contract positions filling in the role of District Geological Assistant and support staff. C.M. Larche was appointed District Geological Assistant in July. A. Girard provided field and office support under the Summer Experience Program 2012.

The Timmins office serves as the regional centre for the Northeast Ontario Regional Resident Geologist Program. R. Ferguson is the Northeast Regional Manager responsible for the Timmins and Kirkland Lake regional offices and the Sudbury and Sault Ste. Marie district offices. R.F. Calhoun served in an acting capacity in the position from May to September. F. Boucher is the Regional Administrative Assistant, D.M. Draper is the GIS/Data Specialist and A.C. Wilson holds the position of Mineral Deposit Compilation Geologist for northeastern Ontario. C. Daniels, R.L. Debicki, G.P.B. Grabowski and H.C. Lockwood provided land use planning functions as the Regional Land Use Geologists for northeastern Ontario. S.E. Halet, based in Sudbury, was appointed First Nations Minerals Information Officer for northeastern Ontario in April.

The Timmins Regional Resident Geologist Office summary statistics are provided in Table 20. Assessment files received in 2012 are listed in Table 21 and publications received are listed in Table 22.

**Table 20.** Summary of staff activities, Timmins Regional Resident Geologist's Office, 2012.

| Activity | Number |
|---|---|
| Assessment files received (including donations) | 173 |
| Client visits - Office | 782 |
| Client visits - Drill Core Library | 25 |
| Geological tours given (participants) | 9 (161) |
| Geoscience library accessions | 25 |
| Property visits by staff | 33 |
| Telephone inquiries | 876 |

**Table 21.** Assessment files received in the Timmins District in 2012.

**Abbreviations**

AEM ..... Airborne electromagnetic survey
AMAG ..... Airborne magnetic survey
Anlys ..... Analysis / Analyses other than Assays
ARAD ..... Airborne radiometric survey
Beep……Beep Mat survey
Comp..... Compilation
DD..... Diamond drilling
DDS..... Diamond drill sections
DGP..... Down-hole geophysics
EM.....Ground electromagnetic survey
Env ..... Environmental studies
GC .....Geochemical survey
GL ..... Geological survey
Grav..... Gravity survey
IP ..... Induced polarization survey
Lc……..……Linecutting/Recutting
Mag ..... Ground magnetic survey
OVD ..... Overburden drilling
Pet .....Petrographic analyses
Pr ..... Prospecting
RAD ..... Ground radiometric survey
Res..... Resistivity survey
Rept ..... Report
Samp ..... Sampling (other than bulk)
Str ..... Stripping
Tr .....Trenching
UG..... Underground work (exploration/development)
UGD ..... Underground drilling

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Benneweis | Newcastle Minerals Ltd. | 2011 | Assays, Pr, Samp | 2.52062 | T-6438* |
| Benneweiss, Chester, Groves, Neville, St.Louis, Yeo, Champagne | Trelawney Mining and Exploration Inc | 2010 | AEM, AMAG | 2.50730 | T-6382* |
| Benton, Edith, Esther, Fingal, Groves, Hong Kong, Marion, Osway | Cascadero Copper Corporation | 2011-2012 | Assays, GC | 2.52636 | T-6459* |
| Benton, Garnet, Esther | Entourage Metals Ltd. | 2011 | Assays, GC, GL, Grav, Samp | 2.51538 | T-6420* |
| Bonar | Claim Post Resources Inc. | 2011 | GC | 2.50045 | T-6320* |
| Borden | Probe Mines Limited | 2012 | Assays, GC | 2.52745 | T-6460* |
| Breckenridge, Lizar | Rencore Resources Ltd. | 2011 | DD - 3 - 738 m, Assays | 2.49381 | WP Breckenridge.3* |
| Bristol | Allerston, R.E. | 1974 | Assays, GL, Tr | Donation | T-1610 |
| Bristol | Explor Resources Inc. | 2011-2012 | DD -79 - 40332 m, Assays | 2.52363 | T-6447* |
| Bristol | Probe Mines Limited/Lake Shore Gold Corp. joint venture | 2011 | DD - 1 - 529 m, Assays | 2.50683 | T-6374* |
| Bristol, Carscallen, Turnbull | Chevron Canada Resources Limited | 1985 | Grav | Donation | T-2904 |
| Bristol, Odgen | Explor Resources Inc. | 2009-2010 | DD -38 - 32527 m, Assays | 2.50279 | T-6329* |
| Brower | Haire, P.G. | 2011 | OVD - 1- 16 m | 2.50555 | T-6345* |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Carnegie | Explor Resources Inc. | 2012 | IP, Mag | 2.51346 | T-6392* |
| Carnegie | Rosario Resources Canada Ltd. | 1980 | DD - 3 - 2512 ft, Assays | Donation | T-6363 |
| Carscallen | Harron, G.A. / 6070205 Canada Inc. | 2011 | Assays, Pr, Samp | 2.51672 | T-6414* |
| Carscallen | International Explorers and Prospectors Inc. | 2011 | Assays, Pr | 2.49899 | T-6301* |
| Carscallen | Xstrata Copper Canada | 2011 | EM | 2.50050 | T-6315* |
| Carscallen, Turnbull | International Explorers and Prospectors Inc. | 2011 | IP, Mag | 2.50276 | T-6328 |
| Champagne | 1571925 Ontario Ltd | 2011-2012 | EM, Mag | 2.50897 | T-6381* |
| Chester | Augen Gold Corp. | 2010 | DD - 1 - 250 m, Assays | 2.51218 | T-6399* |
| Chester | Augen Gold Corp. | 2009 | DD - 4 - 300 m, Assays | 2.49714 | T-6312* |
| Chester | Canadian Gold Resources Limited | 1986 | Mag | Donation | T-2357 |
| Chester | Chester Minerals Limited | 1984 | EM, Mag | Donation | T-6349 |
| Chester | Gold Bar Resources Inc. | 1989 | Mag | Donation | T-6348 |
| Chester | Trelawney Augen Acquisition Corp. | 2010 | GC | 2.52492 | T-6453* |
| Chester | Trelawney Mining and Exploration Inc | 2011 | DD - 10 - 6037 m | 2.50729 | T-6384* |
| Chester | Wesport Resources Inc. | 1986 | IP | Donation | T-6350 |
| Chester, Yeo | Trelawney Augen Acquisition Corp. | 2010 | GC | 2.52690 | T-6456* |
| Chester, Yeo, Bennewis, Neville | Sanatana Resources Inc. | 2011 | AEM, AMAG | 2.51243 | T-6419* |
| Chewett | Sarissa Resources Inc. | 2011 | RAD | 2.49979 | T-6375* |
| Chewett | Sarissa Resources Inc. | 2011 | RAD | 2.50137 | T-6375* |
| Clay, Howells, Mowbray | Rare Earth Metals Inc. | 2011 | DD - 8 - 2155 m, Assays | 2.49774 | T-6311* |
| Clergue | 6070205 Canada Inc. | 2012 | Mag | 2.52528 | T-6457* |
| Clergue | St Andrew Goldfields Ltd./Goldcorp Canada Inc. J.V. | 2012 | Lc | 2.51895 | T-6428* |
| Clergue | Tarzan Gold Inc. | 1989 | EM | Donation | T-3239 |
| Cody | Moneta Porcupine Mines Inc. | 2010 | DD - 3 – 702 m, Assays | 2.50661 | T-6376* |
| Deloro | Mexivada Mining Corp. | 2011 | EM, Mag | 2.51176 | T-6405* |
| Denton | Richmont Mines Inc. | 2010 | DD - 17 - 7523 m, Assays | 2.50834 | T-6403* |
| Denton | Richmont Mines Inc. | 2011 | Assays, Beep, GC | 2.51767 | T-6427* |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Denton | Silver Shield Resources Corp. | 2010 | IP, Mag | 2.49490 | T-6330* |
| Denyes, Greenlaw | Anderson, S. | 2011 | Assays, Pr | 2.51657 | T-6425* |
| Dore, Rollo, Newton | Red Pine Exploration Inc. | 2011 | DD - 9 - 2068 m, Assays | 2.51449 | T-6409* |
| Dundonald, Evelyn, Matheson | Constantine Metal Resources Ltd. | 2012 | AEM, AMAG | 2.51427 | T-6408* |
| East of South Bluff Creek area, South Bluff Creek area, Marberg Creek area, West of Marberg Creek area, West of Attick River area, North of Glaister Lake area | Selco Exploration Company Limited | 1965-1967 | Assays, GL, Rept, Samp | Donation | T-6333 |
| East of South Bluff Creek area, West of Attick River area | Selco Exploration Company Limited | 1966 | GL | Donation | T-6334 |
| Ebbs | Flexico Resource Corp. | 1988 | Mag | Donation | T-3128 |
| Eldorado | 1571925 Ontario Ltd | 2011 | Mag | 2.50315 | T-6342* |
| Eldorado | Larche, C. | 2012 | GC | 2.51859 | T-6421* |
| Eldorado | Melkior Resources Inc. | 2012 | DD - 1 - 158 m, Assays | 2.51967 | T-6442* |
| Eldorado | Starfire Minerals Inc. | 2011 | IP | 2.50042 | T-6314* |
| Fallon, Fasken | Golden Knight Resources Inc. | 1998 | Comp, GL, GC, Samp | Donation | T-6356 |
| Fenton | Falcon Gold Corp. | 2011 | DD - 2 - 325 m | 2.50803 | T-6402* |
| Foleyet | Vendome Resources Inc. | 2011 | EM, Mag | 2.52008 | T-6424* |
| Ford, Laidlaw, Mabee, Kingsmill, Kirkland, Oke, Dargavel, Lennox, Beck, Nesbitt, Aubin, Mahaffy, Crawford, Ottaway, Fournier, Lamarche, Hanna, Reaume, Lucas, Duff, Mann, Wilhelmina, Geary, Moberly, Loveland, Byers, Little, Prosser, Tully | McIntyre–Porcupine Mines Limited | 1975 | AEM | Donation | T-6365 |
| Fripp | Portelance, J.H. | 2011 | Beep, Pr | 2.49927 | T-6347* |
| Garnet | Cascadero Copper Corporation | 2011 | GL, Pr, Samp | 2.49671 | T-6316* |
| Geary | Micon Gold Inc. | 2008, 2011 | IP, Mag, GC | 2.51251 | T-6406* |
| German, Matheson | SGX Resources Inc. | 2010 | EM, IP, Mag | 2.50450 | T-6340* |
| Godfrey | 6070205 Canada Inc. | 2012 | EM | 2.52786 | T-6464* |
| Godfrey | 6070205 Canada Inc. | 2011 | DD - 1 - 198 m | 2.52084 | T-6429* |
| Godfrey | China Metallurgical Explorations Corp. | 2011 | DD - 2 - 995 m, Assays | 2.52318 | T-6461* |
| Godfrey | Claim Post Resources Inc. | 2011 | Assays | 2.50214 | T-6322* |
| Godfrey | International Explorers and Prospectors Inc. | 2012 | Mag | 2.50928 | T-6435* |
| Godfrey | International Explorers and Prospectors Inc. | 2012 | EM | 2.51614 | T-6413* |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Godfrey, Jamieson, Jessop, Mountjoy, Ogden | Claim Post Resources Inc. | 2011 | AMAG, ARAD | 2.50178 | T-6377* |
| Godfrey, Jamieson, Robb | Canadian Jamieson Mines | 1965 | GL | Donation | T-0742 |
| Greenlaw | Gibson and Associates Inc. | 2011 | Mag | 2.50911 | T-6389* |
| Greenlaw | Sino Minerals Corp. | 2010 | AEM, AMAG, Assays, GC | 2.49375 | T-6317* |
| Greenlaw, Cunningham | Broomhead, F.A. and Broomhead, K.W. | 2009-2011 | Assays, Pr, Str, Samp | 2.49686 | T-6331* |
| Greenlaw, Cunningham | Tremblay, M.A., Robert, J. and Broomhead, F.A. | 2011 | Assays, Pr | 2.50316 | T-6379* |
| Groves | Liberty Mines Inc. | 2011 | DGP, IP, Mag | 2.49974 | T-6371* |
| Groves | Liberty Mines Inc. | 2011 | DD - 13 - 1245 m, Assays | 2.49996 | T-6321* |
| Hopper Lake Area, West of Sunday Lake Area | Patino Mines (Quebec) Limited | 1976 | DD - 3 - 1193 ft, Assays | Donation | T-6359 |
| Horwood | Blue Ridge Industries AG | 2011 | Assays, GC, Samp | 2.51266 | T-6422* |
| Hoyle | Robert, J. | 2012 | Pr | 2.52417 | T-6454* |
| Hoyle | Rosario Resources Canada Ltd. | 1980 | EM | Donation | T-6355 |
| Hoyle | Rosario Resources Canada Ltd. | 1980 | DD - 1 - 1150 ft, Assays | Donation | T-1928 |
| Huffman | Augen Gold Corp. | 2010 | GC, Samp | 2.50999 | T-6398* |
| Huffman | Augen Gold Corp. | 2009 | DD - 10 - 1831 m, Assays | 2.49911 | T-6335* |
| Huffman | Augen Gold Corp. | 2010 | EM, IP, Mag | 2.50432 | T-6397* |
| Huffman | Augen Gold Corp. | 2009 | DD - 2 - 450 m, Assays | 2.50194 | T-6336* |
| Huffman | Trelawney Augen Acquisition Corp. | 2010 | Assays, GC | 2.52010 | T-6443* |
| Huffman Twp. | Trelawney Augen Acquisition Corp. | 2010 | DD - 18 - 3358 m, Assays, Env | 2.52473 | T-6452* |
| Jamieson | Claim Post Resources Inc. | 2011 | DD - 1 - 449 m, Assays | 2.50015 | T-6319* |
| Jamieson, Robb | Daxl, H. | 2011 | GC, Samp | 2.51301 | T-6393* |
| Keefer | Mainstream Minerals Corporation | 2010 | IP, Mag | 2.50189 | T-6332* |
| Keith | Glen Auden Resources Limited | 1989 | Mag | Donation | T-3204 |
| Keith | Mining Corporation of Canada Limited | 1949-1980 | Assays, DD, GL, UG | Donation | T-6354 |
| Keith | Noranda Exploration | 1989 | Comp, DD | Donation | T-6366 |
| Kenogaming | 1571925 Ontario Ltd | 2012 | Assays, Str, Samp, Tr | 2.51559 | T-6411* |
| Kenogaming | Trillium North Minerals Ltd. | 2011 | Assays, Str, Samp | 2.52520 | T-6437* |
| Kenogaming, Penhorwood, Reeves, Sewell | Battle Mountain Canada Ltd. | 1999 | Comp, DD, IP, Res | Donation | T-6367 |
| Kidd | Explor Resources Inc. | 2012 | Mag | 2.51710 | T-6415* |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Lackner | 6378366 Canada Inc./ 6070205 Canada Inc. | 2011 | DD - 2 - 322 m | 2.50339 | T-6339* |
| Lizar | Dan Patrie Exploration Ltd. | 2011 | Assay, Pr, Tr, Samp | 2.51944 | WT Lizar-36* |
| Loveland | Western Kidd Resources Inc. | 2010 | DD - 1 - 485 m, Assays | 2.50248 | T-6324* |
| Lower Detour Lake Area | Mineta Resources Ltd. | 1987 | IP | Donation | T-6351 |
| Lower Detour Lake Area | Mineta Resources Ltd. | 1986 | EM, Mag | Donation | T-6351 |
| Lucas | Abitibi-Price Inc. | 1981 | DGP | Donation | T-2496 |
| Lucas | Abitibi-Price Inc. | 1981 | DGP, EM, IP | Donation | T-2496 |
| Lucas | Abitibi-Price Mineral Resources Division | 1982 | EM | Donation | T-3560 |
| Lucas, Duff, Prosser, Tully | Abitibi-Price Mineral Resources | 1962-1963 | AEM, AMAG | Donation | T-3529 |
| Macklem, Thomas | SGX Resources Inc. | 2011 | DD - 4 - 404 m, Assays | 2.52126 | T-6433* |
| Mallard | Bruce Durham and Associates | 2011 | IP, Mag | 2.51773 | T-6458* |
| Matheson | Moran, J.D. | 2012 | EM, Mag | 2.52124 | T-6455* |
| McArthur, Bartlett, Musgrove, Fripp | Knick Exploration Inc. | 2011-2012 | Assays, Pr, Samp | 2.51949 | T-6440* |
| McCuaig | Cool, K.S. | 2009 | GC, Mag | 2.50323 | T-6338* |
| Mountjoy | Claim Post Resources Inc. | 2011 | Mag | 2.50342 | T-6341* |
| Mountjoy | Geomark Exploration Ltd. | 2012 | EM, Mag | 2.52866 | T-6468* |
| Murphy | Bruce Presto Mines Limited | 1964 | DD - 6 - 2926 m | Donation | T-6369 |
| Musgrove | Daxl, H. | 2011-2012 | Assays, GC, Samp | 2.51155 | T-6395* |
| Neville | 1571923 Ontario Ltd. | 2011 | Assays, Pr, Str | 2.51797 | T-6418* |
| Odlum, Hambleton | Harte Gold Corp. | 2010-2011 | AEM, AMAG, Assays, DD - 74 -16703 m, DGP, IP, Mag, Str | 2.51495 | WP Odlum.10* |
| Ogden | Daxl, H. | 2011 | Assays, Samp | 2.52791 | T-6465* |
| Ogden | Explor Resources Inc. | 2011 | EM, IP, Mag | 2.50289 | T-6323* |
| Ogden | Metals Creek Resources Corp. | 2012 | DD - 3 - 637 m, Assays | 2.52279 | T-6445* |
| Ogden | Robert, P. | 2012 | EM, Mag | 2.51952 | T-6423* |
| Osway | Augen Gold Corp. | 2010 | DD - 2 - 382 m, Assays | 2.51096 | T-6385* |
| Osway | Augen Gold Corp. | 2010 | DGP | 2.51535 | T-6410* |
| Osway | Trelawney Augen Acquisition Corp. | 2010 | DD - 32 - 3840 m, Assays | 2.52025 | T-6444* |
| Osway, Huffman | Augen Gold Corp. | 2009-2010 | DD - 11 - 2107 m , Assays | 2.49817 | T-6318* |
| Penhorwood | Nat River Gold Inc. | 2010 | Assays, GL, Pr, Samp | 2.50826 | T-6390* |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Penhorwood | Rogue Iron Ore Corp. | 2011 | DD - 22 - 2596 m, Assays | 2.52795 | T-6450* |
| Penhorwood | Rogue Iron Ore Corp. | 2012 | Mag | 2.51964 | T-6432* |
| Penhorwood | Steetley Industries Limited | 1987 - 1988 | EM, IP, Mag | Donation | T-1985 |
| Penhorwood | Steetley Industries Limited | 1988 | Assays, GL, Samp, Str | Donation | T-1985 |
| Penhorwood | Steetley Industries Limited | 1989 | DD - 2 - 244 m, Assays | Donation | T-1985 |
| Penhorwood | Steetley Industries Limited | 1988 | DD - 3 - 378 m, Assays | Donation | T-1985 |
| Penhorwood | Steetley Industries Limited | 1987 | Assays, GL, Samp | Donation | T-1985 |
| Potier, Neville | Newcastle Minerals Ltd. | 2011 | Assays, Pr, Samp | 2.51029 | T-6404* |
| Price | Croxall, J.E. | 2011 | GL, Pr, Samp, Str | 2.50005 | T-6370* |
| Raney | Goldrock Resources Inc. | 1988 | AEM, AMAG, DD, GL | Donation | T-2180 |
| Raney | J-Dex Mining and Exploration Ltd. | 1984 | DD - 11 - 615 m | Donation | T-2180 |
| Reaume | 7594267 Canada Inc. | 2011 | Assays, EM, DD - 2 - 206 m, Pr, Pet, Anlys | 2.51820 | T-6449* |
| Reeves | Nat River Gold Inc. | 2012 | EM, Mag | 2.51420 | T-6400* |
| Reeves | Nat River Gold Inc. | 2012 | EM, Mag | 2.51061 | T-6383* |
| Reeves | Rio Tinto Minerals | 2010 | DD - 7 -1256 m, Assays | 2.50807 | T-6391* |
| Reeves | Sedex Mining Corp. | 2010, 2012 | EM, Mag | 2.52230 | T-6436* |
| Reeves, Penhorwood, Sewell, Kenogaming | Hemlo Gold Mines Inc. | 1994 | DD - 12 - 4095 m, Assays, GC, GL, IP, Samp | Donation | T-6358 |
| Robb | International Explorers and Prospectors Inc. | 2012 | Mag | 2.52220 | T-6434* |
| Robb | International Explorers and Prospectors Inc. | 2011 | IP, Mag | 2.50147 | T-6327* |
| Robb | International Explorers and Prospectors Inc. | 2012 | Mag | 2.51974 | T-6430* |
| Robb | Rousseau, R. | 2012 | EM | 2.52735 | T-6466* |
| Rollo | Cascadero Copper Corporation | 2011 | GL, Pr, Samp | 2.50171 | T-6337* |
| Rollo, Raney | Newmont Exploration of Canada Ltd. | 1982 | Assays, GL, IP, Samp | Donation | T-6357 |
| Rykert, Walls, Minnipuka, Pelletier | Golden Trio Minerals Ltd. | 1987 | EM, Mag | Donation | T-6352 |
| Sewell | Benton Resources Corp. | 2011 | DD - 8 - 1477 m, Assays | 2.51300 | T-6394* |
| Sewell | Benton Resources Corp. | 2011 | IP, Mag | 2.51789 | T-6417* |
| Sewell | Benton Resources Corp. | 2011 | Assays, GL, Samp | 2.50088 | T-6313* |
| Sewell | Noranda Exploration Company, Limited | 1980-1983 | Assays, DDS | Donation | T-2552 |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| Sewell | Trillium North Minerals Ltd. | 2011 | DD - 6 - 1874 m, Assays | 2.50860 | T-6387* |
| Sewell, Kenogaming, Reeves, Penhorwood | Noranda Exploration | 1994 | Comp, GL, DDP | Donation | T-3501 |
| Sewell, Reeves | American Barrick Resources Corporation | 1990 | Assays, GL, IP, Samp, Tr | Donation | T-2722 |
| Shaw | Giyani Gold Corp. | 2012 | EM, Mag | 2.51002 | T-6388* |
| Shaw | Giyani Gold Corp. | 2011 | EM, Mag | 2.50193 | T-6325* |
| Shaw | Melkior Resources Inc. | 2009 | Assays, Pr, Samp | 2.50784 | T-6380* |
| Shaw, Carman, Eldorado | Melkior Resources Inc. | 2010 | Assays, Pr, Samp | 2.50780 | T-6401* |
| Sheraton | Cross Lake Minerals Ltd. | 1998 | IP | Donation | T-6360 |
| Sheraton | Golden Knight Resources Inc. | 1997-1998 | Assays, Comp, DD, DGP | Donation | T-3576 |
| Sheraton, Bond, Macklem, Thomas | Golden Knight Resources Inc. | 1998 | EM, IP, Mag | Donation | T-6362 |
| Sothman | Rogue Iron Ore Corp. | 2012 | Assays, Pr, Samp | 2.51762 | T-6416* |
| Sothman | SGX Resources Inc. | 2010-2011 | DD - 15 - 2186 m, Assays | 2.50739 | T-6372* |
| South of Ridge Lake | Phoscan Chemical Corp. | 2012 | Assays, OVD-10-1890 m | 2.52102 | T-6448* |
| Stock | Brigus Gold Corp. | 2010 | IP, Res | 2.52927 | T-6463* |
| Stock | Emerick, J.V. | 2010 | Pr | 2.50686 | T-6373* |
| Sunday Lake Area | Amoco Canada Petroleum Co. Ltd. | 1976-1978 | Assays, DD - 21 -11696 ft, UGD-49-7680 ft, Feasibility Study, GL | Donation | T-6361 |
| Swayze | Mantis Explorations Inc. | 2010-2011 | DD - 11 - 976 m, Assays | 2.51803 | T-6441* |
| Thorburn, Loveland | 6070205 Canada Inc. | 2012 | IP, Mag | 2.52763 | T-6467* |
| Thorneloe | Geomark Exploration Ltd. | 2011 | DD - 5 - 2938 m, Assays | 2.51603 | T-6412* |
| Thorneloe | Geomark Exploration Ltd. | 2011 | IP | 2.51362 | T-6396* |
| Thorneloe | Lake Shore Gold Corp. | 2010-2012 | DD-146-58481 m, Assays | 2.52555 | T-6462* |
| Timmins | Cross Lake Minerals Ltd. | 1998 | Mag, EM, Res | Donation | T-6368 |
| Tisdale | 6398651 Canada Inc and Pye, K.W. | 2011-2012 | Mag | 2.51999 | T-6426* |
| Tisdale, Murphy | Moneta Porcupine Mines Inc. | 2011 | IP | 2.51036 | T-6386* |
| Tully | Gowest Gold Ltd | 2011 | DD - 5 - 1480 m | 2.50307 | T-6346* |
| Tully | Gowest Gold Ltd | 2010 | DD - 4 - 1343 m | 2.52612 | T-6451* |
| Tully, Little, Gowan, Evelyn | Rosario Resources Canada Ltd. | 1981 | Comp | Donation | T-6364 |
| Turnbull | 6070205 Canada Inc. | 2011 | EM | 2.50400 | T-6343* |
| Turnbull | Chevron Canada Resources Ltd. | 1985 | IP | Donation | T-2904 |
| Wark | Gowest Gold Ltd. | 2011 | GC | 2.50783 | T-6378* |
| Wark | Gowest Gold Ltd. | 2011 | GC | 2.50503 | T-6344* |

| Township or Area | Company Name | Year | Type of Work** | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| West of Sunday Lake Area | Detour Gold Corporation | 2011 | DD-111-47014 m, Assays | 2.51849 | T-6446* |
| Whalen | Hermeston, P. | 2011 | Assays, Pr, Samp | 2.50154 | T-6326* |
| Whitesides | DerWeduwen, J., Gervais, L.N. and Recoskie, D. | 2012 | Mag | 2.52023 | T-6431* |
| Whitney | Broulan Reef Mines Limited | 1964 | GL, UG | Donation | T-6353 |
| Wilhelmina | Cross Lake Minerals Ltd. | 1988 | Comp | Donation | T-3289 |
| Wilhelmina | Teck Explorations Limited | 1989 | DD - 2 - 280 m, Assays | Donation | T-3289 |
| Zavitz | Beyer, B. Sr., Beyer, B. Jr. and Beyer, N. | 2010-2011 | Assays, Pr, Samp, Str | 2.51507 | T-6407* |

**File available in office in digital format only.* ***DD - 8 - 2196 m = 8 diamond-drill holes totalling 2196 m.*

**Table 22.** Publications received by the Timmins Regional Resident Geologist's Office in 2012.

| Title | Author | Type and Year of Publication |
|---|---|---|
| The Petrology of the Ultramafic Suite Associated with the Cargill Alkaline Ultramafic-Carbonatite Complex, Kapuskasing, Ontario | Allen, C. R. | MSc Thesis, University of Toronto, 1972 |
| Report of Activities 2011, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts | Atkinson, B.T., Bousquet, P., Pace, A., Butorac, S., Harvey, S., Draper, D.M., Debicki, R.L. and Wilson, A.C. | OGS Open File Report 6274, 2012 |
| Surficial Geology of the Fort Severn Area Northeast and Winisk Area Northwest, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3632, 2012 |
| Surficial Geology of the Fort Severn Area Southeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3638, 2012 |
| Surficial Geology of the Winisk Area Southwest, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3639, 2012 |
| Surficial Geology of the Winisk Area Southeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3640, 2012 |
| Surficial Geology of the Cape Henrietta Maria Area Southwest, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3641, 2012 |
| Surficial Geology of the Cape Henrietta Maria Area Southeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3642, 2012 |
| Surficial Geology of the Clendenning River Area Northeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3648, 2012 |
| Surficial Geology of the Sutton Lake Area Northwest, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3649, 2012 |
| Surficial Geology of the Sutton Lake Area Northeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3650, 2012 |
| Surficial Geology of the Lakitusaki River Area Northwest, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3651, 2012 |
| Surficial Geology of the Lakitusaki River Area Northeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3652, 2012 |
| Surficial Geology of the Ghost River Area Southeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3740, 2012 |
| Surficial Geology of the Smoky Falls Area Northeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3748, 2012 |

| Title | Author | Type and Year of Publication |
|---|---|---|
| Surficial Geology of the Smoky Falls Area Southeast, Northern Ontario | Barnett, P.J., Yeung, K.H. and McCallum, J.D. | OGS Preliminary Map P.3755, 2012 |
| Precambrian Geology, South of Gogama Area | Berger, B.R. | OGS Preliminary Map P.3762—Revised, 2012 |
| Report of Activities 2011, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District | Campbell, D.A., Scott, J.F., Cooke, A., Brunelle, M.R., Lockwood, H.C. and Wilson, A.C. | OGS Open File Report 6273, 2012 |
| Preliminary Results from the McFaulds Lake ("Ring of Fire") Area Lake Sediment Geochemistry Pilot Study, Northern Ontario | Dyer, R.D. and Burke, H.E. | OGS Open File Report 6269, 2012 |
| Airborne Magnetic, Electromagnetic and Gamma-Ray Spectrometric Surveys, Ternary Radioelement Image, Opeepeesway Lake Area—Purchased Data | Ontario Geological Survey | Map 60 380 and Map 60 381, 2012 |
| Summary of Field Work and Other Activities, 2012 | Ontario Geological Survey, eds. | OGS Open File Report 6280, 2012 |
| Precambrian Geology of Sothman and Halliday Townships | Préfontaine, S and Magnus, S.J. | OGS Preliminary Map P.3765, 2012 |
| Report of Activities 2011, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Ontario Districts, and Petroleum Resources Centre | Sangster, P.J., LeBaron, P.S., Charbonneau, S.J., Laidlaw, D.A., Wilson, A.C., Carter, T.R. and Fortner, L. | OGS Open File Report 6277, 2012 |
| Report of Activities 2011, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District | White, G.D., Smyk, M.C., Cooke, A., Lockwood, H.C. and Wilson, A.C. | OGS Open File Report 6272, 2012 |
| Diffusion in Minerals and Melts - Reviews in Mineralogy and Geochemistry, v.72 | Zhang, Y and Cherniak, D.J. | General text, 2010 |

# PROPERTY EXAMINATIONS

A number of property visits were made during the course of the year by staff of the Timmins Regional Resident Geologist office. Several of these are described below. Property visits provide geological insight into an area and help in identifying key indicators that could be deemed favourable for the discovery of new mineral deposits. Recommendations for exploration derived from property visits are presented in a separate section of this report (*see* "Recommendations for Exploration").

## Agrium Inc. – Kapuskasing Phosphate Operations

### LOCATION AND ACCESS

Agrium's Kapuskasing Phosphate Operations are scheduled to close in 2013 as a result of depletion of the phosphate deposit. The mine site is located 36 km southwest of Kapuskasing and is accessed by Cargill Road.

A site visit was conducted in August. The deposit is hosted by the Cargill Township Carbonatite Complex (Sage 1988a) and consists of weathered, unconsolidated to loosely consolidate sovite that contains an average of 29% $P_2O_5$ as apatite. Mining operations utilize open pit extraction with hydraulic shovels and trucks to transport the ore residuum to the on-site mill. Upgrading of the apatite residuum ore is achieved in the milling process before the concentrate is shipped by enclosed rail car to Redwater, Alberta, where it is converted into fertilizer for agricultural purposes. The mill operates at a capacity of 7000 tonnes per day.

The deposit has been mined from 2 open pits referred to as the East and West pits. Glacial overburden covered the deposit to a depth of up to 50 m over the West pit. It consists of grey, fine silt to clay and overlies black, organic–rich, unconsolidated mud with numerous fragments of wood and carbonaceous material.

## GEOLOGY

Two suites of chemically similar carbonatite intrusions occur in the vicinity of the Kapuskasing Structural Zone and these have been grouped into an older phase intruded around 1.9 Ma and a younger suite intruded in late Proterozoic time, around 1.1 Ma. The Cargill Township Carbonatite Complex is part of the older suite of carbonatite and has an age range of 1891 ± 15 Ma to 1907 ± 4 Ma (Kwon 1986; Sharpe 1987).

The Cargill Township Carbonatite Complex consists of a perimeter ultramafic intrusive suite of rocks including pyroxenite, olivine clinopyroxenite, hornblende clinopyroxenite, hornblendite and late veins and segregations of ultramafic alkalic composition that enclose a core consisting of sovite to rauhaugite carbonatite. Hybridized ultramafic rocks occur where the carbonatite has reacted with the ultramafic rocks to crystallize coarse-grained phlogopite. Northwest-trending faulting has bisected and offset the carbonatite, resulting in an elongate configuration to the intrusive complex. The petrography of the ultramafic suite has been described by Allen (1972) and an overview of the deposit geology and mining operations is provided by Pressacco (2001). Details of sampling and assay results from a suite of representative samples collected from the mine workings are depicted in Table 23 and 24.

**Table 23.** Sample locations and descriptions from Agrium Inc. – Kapuskasing Phosphate Operations.

| Sample No. | Township | Location (Co-ordinates in NAD 83, UTM Zone 17) | | Description |
|---|---|---|---|---|
| | | Easting | Northing | |
| 2012 BTA 66 | Cargill | 367268 | 4661302 | sovite skarn |
| 2012 BTA 67 | Cargill | 367268 | 4661302 | sovite skarn |
| 2012 BTA 70 | Cargill | 367122 | 5461142 | A-ore, unconsolidated 125 Level South pit |
| 2012 BTA 73 | Cargill | 367441 | 5460930 | Very coarse-grained pyroxenite/hornblendite |
| 2012 BTA 74 | Cargill | 367441 | 5460930 | carbonate skarn with pyroxenite bands |
| 2012 BTA 78 | Cargill | 367122 | 5461142 | sovite, high purity, 125 Level, South pit |
| 2012 BTA 79 | Cargill | 367122 | 5461142 | rauhaugite, high purity, 125 Level South pit |
| 2012 BTA 99 | Cargill | 367122 | 5461142 | rauhaugite A-ore South pit 125 Level |

**Table 24**. Geochemical results and major oxides from select samples from Agrium Inc. – Kapuskasing Phosphate Operations.

| | Element | $Al_2O_3$ | CaO | $Fe_2O_3$ | $K_2O$ | LOI | MgO | MnO | Na2O | $P_2O_5$ | $SiO_2$ | $TiO_2$ | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Units | wt % | wt % | wt % | wt % | wt % | wt % | wt % | wt % | wt % | wt % | wt % | wt % |
| Sample No. | Detect Limit | 0.02 | 0.006 | 0.01 | 0.01 | 0.05 | 0.01 | 0.002 | 0.02 | 0.002 | 0.04 | 0.01 | |
| 2012 BTA 66 | | 0.21 | 47.338 | 3.91 | 0.17 | 40.62 | 2.68 | 0.159 | 0.1 | 1.726 | 1.43 | 0.26 | 98.6 |
| 2012 BTA 67 | | 0.47 | 45.725 | 3.34 | 0.45 | 38.64 | 3.97 | 0.164 | 0.18 | 2.472 | 3.32 | 0.17 | 98.9 |
| 2012 BTA 70 | | 3.97 | 46.665 | 2.02 | <0.01 | 4.03 | 0.11 | <0.002 | 0.19 | 37.415 | 0.46 | 1.22 | 96.08 |
| 2012 BTA 73 | | 9.11 | 12.729 | 19.07 | 1.33 | 1.12 | 12 | 0.225 | 2.31 | 0.075 | 37.85 | 3.93 | 99.75 |
| 2012 BTA 74 | | 4.63 | 28.98 | 9.58 | 2.98 | 17.73 | 8.76 | 0.169 | 0.47 | 5.294 | 16.45 | 2.61 | 97.65 |
| 2012 BTA 78 | | 0.08 | 28.518 | 3.26 | <0.01 | 48.72 | 18.1 | 0.344 | <0.02 | 0.377 | <0.04 | <0.01 | 99.41 |
| 2012 BTA 79 | | 0.1 | 28.403 | 3.27 | <0.01 | 49.01 | 18.37 | 0.344 | <0.02 | 0.176 | 0.04 | <0.01 | 99.69 |

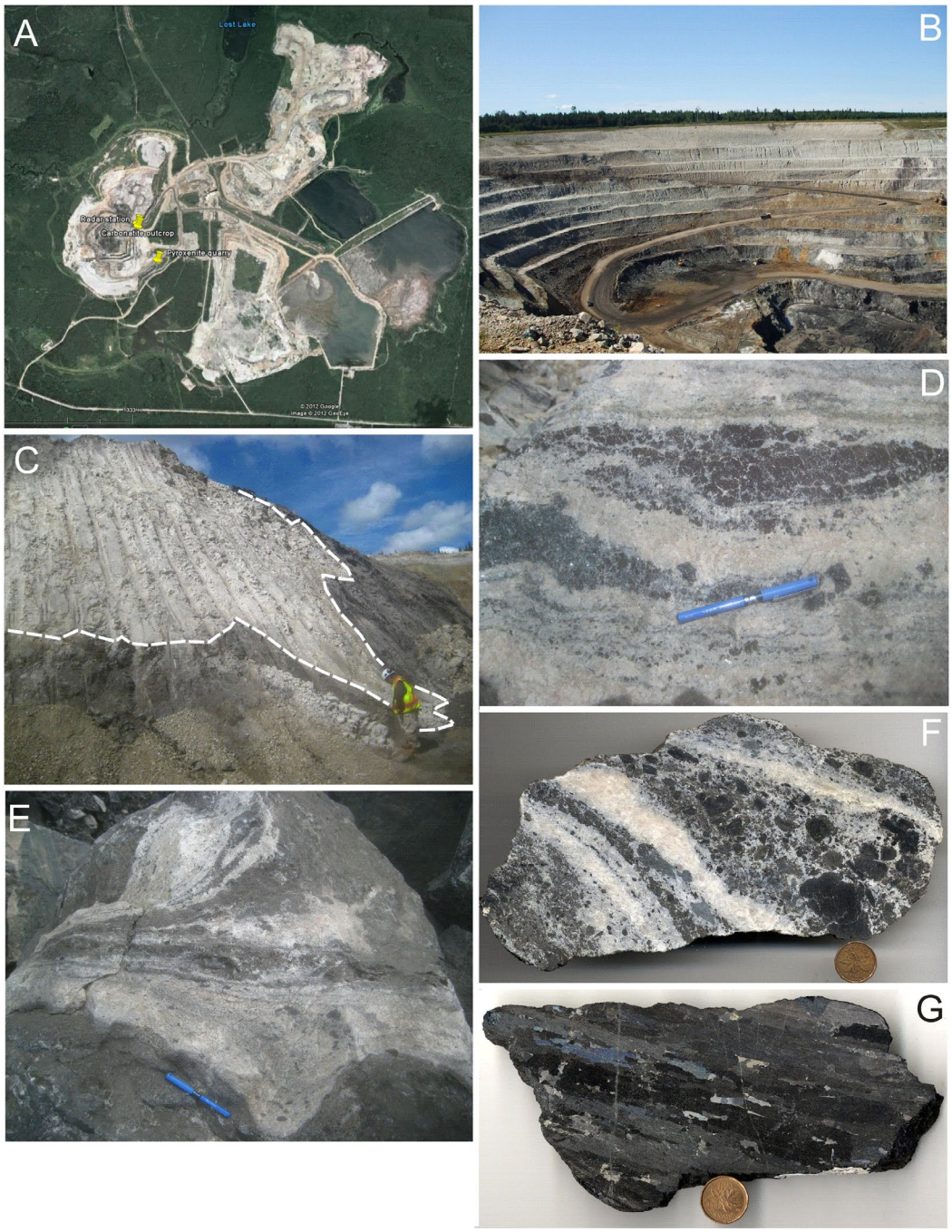


**Photo 1**. Photos of the Agrium Inc. – Kapuskasing Phosphate Operations. A) Plan view of the mine workings showing the East and West pits, the pyroxenite rock quarry, tailings impoundment areas and road and rail access. B) West pit view of the mining operations (looking north). C) Contact between unconsolidated silica sand and lignite and organic mud. The sharp and irregular contact of the units may be the result of channelized flow deposition or post-depositional slumping. D) Banded sovite skarn with bands of calcite alternating with lenses of mafic minerals including amphibole, phlogopite and chlorite. E) Contact relationship between sovite carbonatite and pyroxenite exposed in the quarry pit. The sovite displays banding intermixed with pyroxenite and porphyroblasts of phlogopite. F) Slabbed section showing development of phlogopite porphyroblasts up to 3 cm within banded sovite. G) Very coarse-grained pyroxenite occurs as narrow dikes within the main pyroxenite phase of the carbonatite complex. Aligned pyroxene crystals up to 20 cm are variably altered to amphibole. Minor sulphide mineralization includes chalcopyrite and pyrite.

# Kenogamissi Batholith Reconnaissance

## LOCATION AND ACCESS

A reconnaissance of the central part of the Kenogamissi Batholith involved examination of many readily accessible outcrops in a broad traverse extending from Sothman Township in the east through Dale Township, on the west boundary of the batholith. Townships examined included Regan, Northrup, Roblin, Hazen, Middleboro, Wigle, Gardhouse, and McOwen. A series of logging roads branch off Highway 144 and provide good access through much of the area.

Previous work included reconnaissance-scale mapping by Benn but very little exploration work has been done in the area. Over the 2012 field season, several weeks were dedicated to examining in detail the rocks of the central part of the batholith with the objective of determining the presence and location of the westward continuation of the Cadillac Larder Lake Fault (CLLF) through the batholithic complex and its possible re-emergence in the Swayze greenstone belt. This quest was supported by observations in the Newton and Dale township areas of the Swayze greenstone belt where a major east-trending structure was identified on the north side of Cinqisle Lake (*see* Atkinson et al. 2011, p.84).

The Ridout Fault Zone is a major structural zone of deformation that affects rocks in the southern part of the Swayze greenstone belt and coincides with the southern boundary of the Kenogamissi Batholith (Heather 2001). Historically this has been considered to connect with and continue the Cadillac Larder Lake Fault and the Matachewan Fault to the east, those faults being major controlling structures to large gold deposits at Matachewan and Kirkland Lake area. However, recent mapping in the Gogama area by Berger (2011) concluded that the Ridout Fault Zone has significant differences and is not the westward continuation of those faults. Berger's lines of evidence include:

1. Timiskaming sediments lie on the north side of the CLLF but occur on the south side of the Ridout Fault Zone
2. Different kinematic histories recorded along the faults
3. The fault zones occur in different parts of the regional stratigraphy
4. The faults are physically separated by up to 60 km

With this in mind, the westward projection of the Matachewan and Cadillac–Larder Lake Fault zones was sought. Evidence that it might pass through the Halliday Dome area include the presence of strongly deformed Timiskaming sediments in Midlothian and Halliday townships. Linking across the Kenogamissi Batholith, the westward projection would emerge in the vicinity of Dale and Newton townships in the Swayze greenstone belt aligned with a major east-trending deformation identified in bedrock trenching by Red Pine Resources Inc.

The geology of the Kenogamissi Batholith is depicted in Figure 7, based on, and modified from, reconnaissance mapping by Benn (2008) and Benn and Moyen (2008). The projection of the possible westward continuation of the CLLF and the Matachewan Fault (Figure 8) coincides with the Somme Granite, a late crustal melt-derived felsic intrusive phase of the batholith. An age date of 2662 ± 4 Ma (Heather and Shore 1999) indicates that the Somme Granite postdates the development of the major fault structures. Consequently evidence for a pre-existing fault in the younger granitoids of the Somme Granite may have been overprinted or destroyed entirely. However, despite the preservations of pre-existing, strongly foliated granodiorite and tonalite phases within the Somme Granite, no compelling evidence for a major west-trending, through-going structure was identified. A structural link across the Kenogamissi Batholith remains unproven. Nonetheless, the identification of gold mineralization within supracrustal rocks on either side of the Kenogamissi Batholith present an intriguing exploration target. For example, at Claude Rundle Mine, on the west side of the Kenogamissi Batholith, gold occurs associated with syenite intrusive bodies not unlike those at Matachewan and Kirkland Lake, and in Midlothian Township, gold occurs associated with Timiskaming sediments, both traits of potentially economic gold deposits elsewhere in the Abitibi Subprovince. Along the same trend in Newton Township, analysis of a grab sample from a 5 cm wide quartz vein in iron carbonate-altered mafic volcanic flows was gold bearing. Sample 2012 BTA 91 located at NAD 83, UTM Zone 17, 398669E, 5304347N, assayed 0.21 ounce per ton gold.

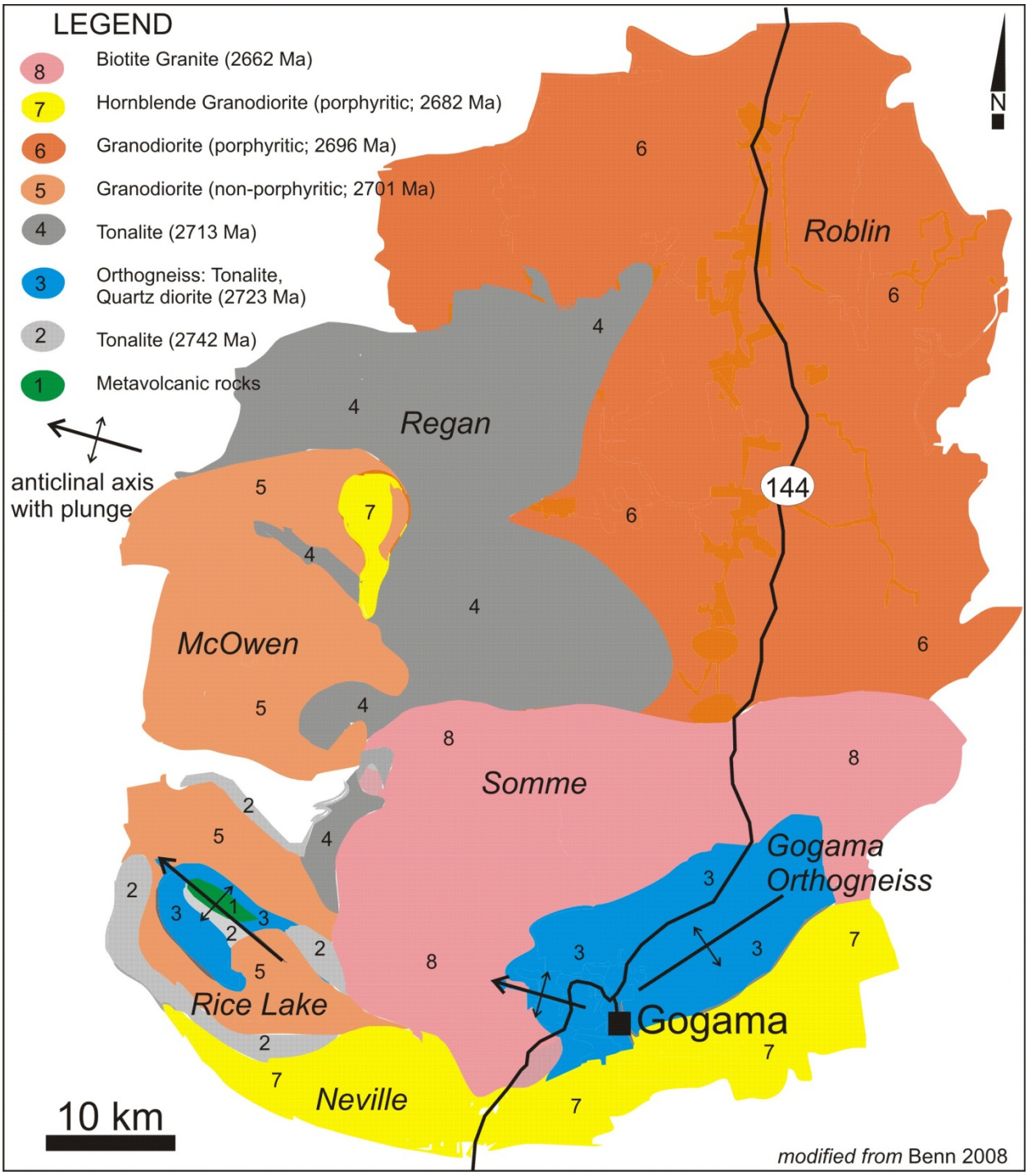


**Figure 7.** Geology of the Kenogamissi Batholith Complex, *modified from* Benn 2008.

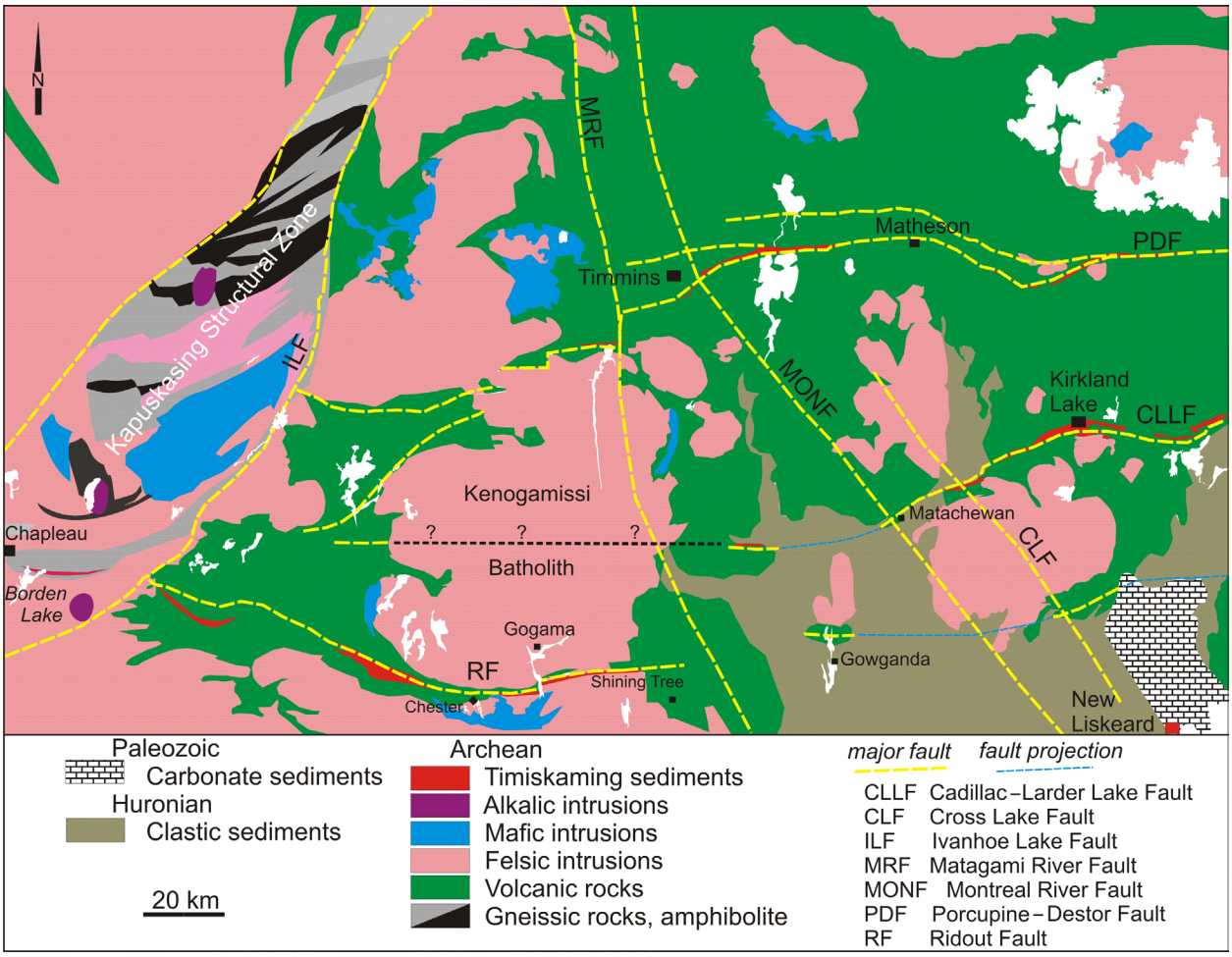


**Figure 8**. Geological setting of the Kenogamissi Batholith and major gold-bearing faults of the western Abitibi Subprovince. The dashed black line through the centre of the Kenogamissi Batholith is the postulated westward continuation of the Cadillac–Larder Lake Fault and the Matachewan Fault across the batholith, linking with a central, west-trending fault system in the Swayze greenstone belt.

# J. Robert, Fallon Township

## LOCATION AND ACCESS

Timmins prospector J. Robert holds a block of 16 claim units in the northeast part of Fallon Township that were staked on September 13, 2012, as claim number 4268741 (Figure 9). Access is by way of Langmuir Road south from South Porcupine for a distance of 31 km then east on Night Hawk Timber logging road for 8 km to a north branch road that leads to a recently logged area with extensive outcropping.

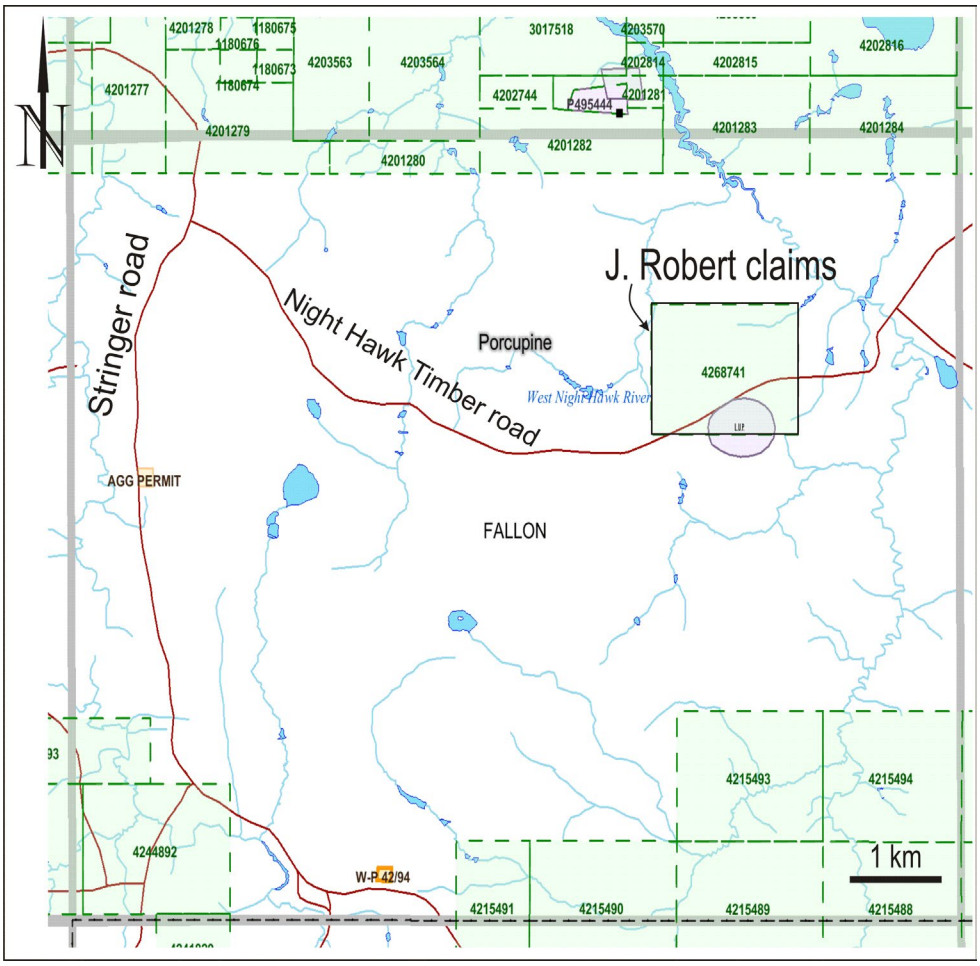


**Figure 9.** Fallon Township claim map showing the location of J. Robert claims.

## PREVIOUS WORK

In 1965 International Kenville Gold Mines Ltd. held claims in the area and completed 20.87 miles of line cutting and magnetic and electromagnetic surveys over 32 claims in the northeast part of the township on the east side of Night Hawk River. A small diamond-drilling program, summarized in Table 25, was completed by the company to test several geophysical targets.

Noranda Exploration Co. Ltd. completed 4.5 miles of line cutting, magnetic and horizontal loop electromagnetic surveys on 4 claims in the area in 1982.

**Table 25.** Summary of International Kenville Gold Mines Ltd. diamond-drilling program, 1965.

| DDH | Azimuth | Length (feet) | Depth of Overburden (feet) | Overburden Description | Geology |
|---|---|---|---|---|---|
| 1 | 180/45 | 400 | 241 | Sand, gravel, boulders | greenstone, diorite |
| 2A | NW/72 | 687 | 105 | | greenstone, diorite, trace pyrite, chalcopyrite |
| 2B | NW/72 | 494 to 569 | 105 | Wedge off hole 2A | diorite, greenstone, trace pyrite |
| 3 | vertical | 119 | 32 | | peridotite, gabbro, serpentine, pyrite |
| 4A | 112W/47 | 253 | 68 | | diorite porphyry, greenstone, granodiorite, 1% pyrite |

D.J. Meunier held a block of 196 unpatented mining claims in Fallon Township and completed airborne magnetic and electromagnetic surveys covering the entire property in 1983. An extensive basal till overburden drilling program and heavy mineral analysis was completed over electromagnetic targets on select claims identified by ground geophysical surveys. A total of 357 holes with a combined length of 3540 m were completed over the claim group using a portable percussion drill. The maximum depth of overburden encountered was 40.8 m. Details of the various phases of the exploration program are listed in Table 26.

**Table 26.** Assessment work filed on Meunier claims, Fallon Township.

| Date | Work | No. Holes Drilled | Total length (m) | No. of Claims | Line kms | Details |
|---|---|---|---|---|---|---|
| 1983 | AMAG, AEM | | | 188 | 249 | 200 m line spacing |
| 1983 | mag, VLF-EM | | | 196 | | |
| 1985 | overburden drilling, basal till sampling (OVD) | 98 | 807.2 | 14 | | |
| 1985 | OVD | 18 | 142 | 3 | | |
| 1985 | OVD | 55 | 561.3 | 5 | | |
| 1985 | OVD | 96 | 1285.4 | 9 | | |
| 1986 | OVD | 90 | 744.1 | 9 | | Maximum overburden depth was 40.8 m |
| 1986 | diamond drilling | 5 | 1083.9 | | | |

*Abbreviations: OVD, overburden drilling; AEM, airborne electromagnetic survey; AMAG, airborne magnetic survey; VLF-EM, very low frequency electromagnetic survey.*

## FIELD OBSERVATIONS

A series of outcrops were examined during the property visit and are described as sequential field stops with details listed in Table 27.

Stop 1: Pyrite-bearing, fine-grained granodiorite. Several old prospector trenches have been blasted in the vicinity of pyritic granodiorite rocks. Mottled, black, grey and white felsic volcanic rocks outcrop on the property. A northeast-trending diabase dike strikes across the claim group adjacent to a small pit on the side of a west-facing ridge. Quartz veining and heavy pyrite mineralization occur hosted in fine-grained granodiorite in and around the trench. Foliations trend 120 to 130° and dip vertically.

Stop 2: A low, rounded outcrop with a prospector trench lies at the edge of a recently cut forest line. Outcrop consists of fine-grained pink granodiorite with up to 5% pyrite. Pyrite occurs in intersecting joint sets and as disseminated crystals up to 1 cm size within the granodiorite.

Stop 3: An outcrop of aphanitic to fine-grained, silicified and epidotized granodiorite is mineralized with fine-grained disseminated pyrite.

Stop 4: Outcrop consists of fine-grained to aphanitic felsic volcanic rock including pyroclastic tuff breccia with angular felsic clasts up to 20 cm in diameter in a chloritic matrix; foliation trends 127/90.

Stop 5: Rust-stained outcrop with blasted prospector pit on hillside. The pit measures 3 m by 2 m by 2 m deep. Bedrock consists of granodiorite that has been brecciated, silicified and epidote altered followed by extensive pyrite mineralization that envelopes clasts of the granodiorite. A 30 cm wide quartz vein trending 120/90 intrudes the granodiorite in the vicinity of the prospector pit.

Stop 6: White-weathering, fine-grained to aphanitic felsic volcanic rock with a trace of pyrite form a pronounced bedrock hill to the east of the branch road.

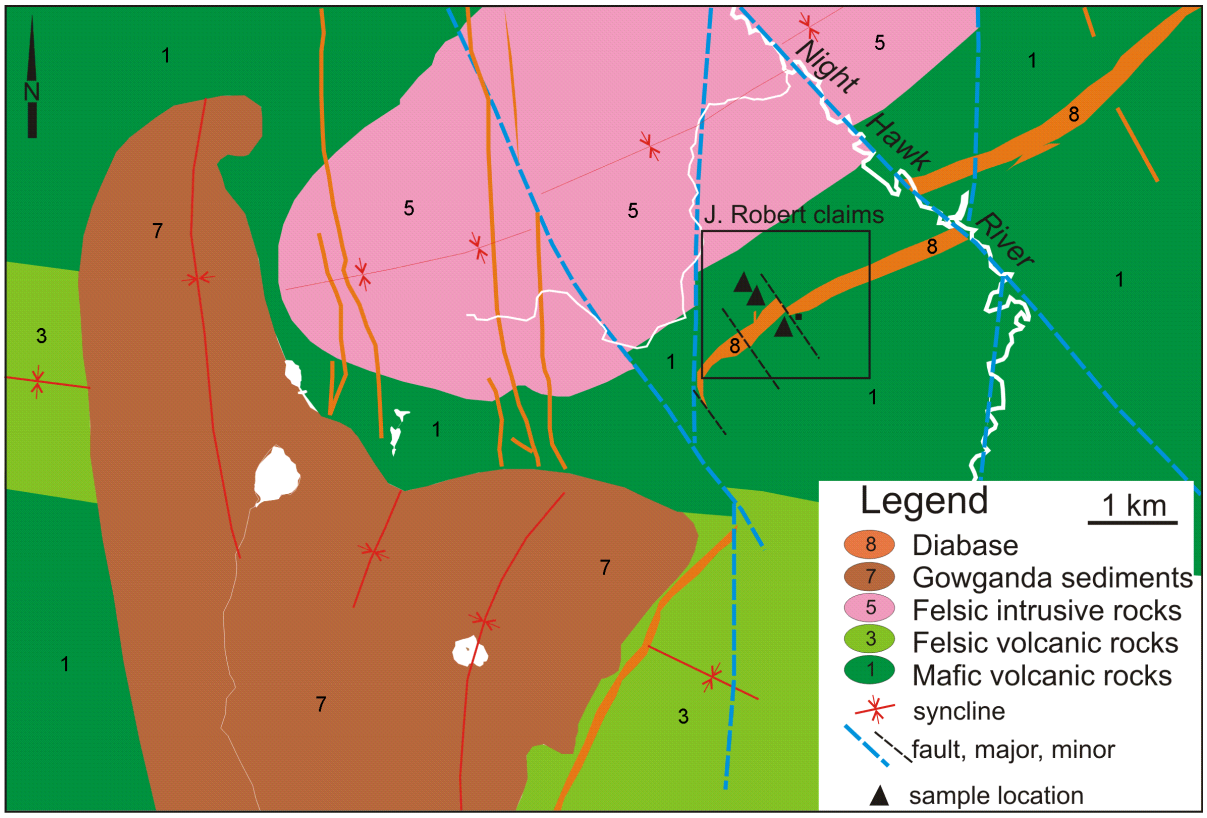


**Figure 10.** Geology of the north part of Fallon Township, *modified from* Pyke 1973.

Samples 2012 BTA 100 and 115 to 119 were collected for gold assay. Details for each sample and assay results are provided in Table 27 and analytical results for sample 2012 BTA 113 are listed in Table 28. Sample 2012 BTA 119 from a quartz vein yielded an assay of 0.09 ounce per ton gold. Sample 2012 BTA 113 exhibits unusually high Na content, suggestive of either an alkalic magma or sodium metasomatism affecting the granodiorite.

**Table 27**. Sample locations and analytical results from J. Robert's Fallon Township property.

| Field Stop # | Sample # | Description | Location (Co-ordinates in NAD 83, UTM Zone 17) | | Assay (ounce/ton gold) |
|---|---|---|---|---|---|
| | | | Easting | Northing | |
| 1 | 2012 BTA 100 | pyrite-bearing, silicified intermediate breccia | 501493 | 5344370 | <0.01 |
| 2 | 2012 BTA 113 | fine-grained to aphanitic pink, pyritic granodiorite | 501517 | 5344391 | |
| 3 | 2012 BTA 114 | silicified granodiorite or felsic volcanic | 501546 | 5344417 | |
| 4 | 2012 BTA 115 | aphanitic felsic volcanic, mottled, black, grey; pyroclastic breccia with clasts to 20 cm | 501578 | 5344423 | <0.01 |
| 5 | 2012 BTA 116 | aphanitic felsic volcanic with 20% pyrite | 501628 | 5344221 | <0.01 |
| 5 | 2012 BTA 117 | quartz vein in altered granodiorite | 501680 | 5344203 | <0.01 |
| 5 | 2012 BTA 118 | 1 foot wide quartz vein with epidote and pyrite, 120/900 | 501662 | 5344172 | <0.01 |
| 5 | 2012 BTA 119 | quartz vein for gold assay | 501699 | 5344182 | 0.09 |
| 6 | | felsic volcanic with minor pyrite | 501871 | 5344177 | |

**Table 28**. Major oxide geochemistry for sample 2012 BTA 113 from J. Robert Fallon Township property.

| Oxide | $Al_2O_3$ | CaO | $Fe_2O_3$ | $K_2O$ | LOI | MgO | MnO | $Na_2O$ | $P_2O_5$ | $SiO_2$ | $TiO_2$ | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Units** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** | **wt %** |
| **Detect Limit (wt %)** | **0.02** | **0.006** | **0.01** | **0.01** | **0.05** | **0.01** | **0.002** | **0.02** | **0.002** | **0.04** | **0.01** | |
| **Sample No.** | | | | | | | | | | | | |
| 2012BTA113 | 19.3 | 0.32 | 2.15 | 0.14 | 1.36 | <0.01 | 0.011 | 11.01 | 0.026 | 65.87 | 0.12 | 100.31 |

**Photo 2.** Fallon Township photos from the J. Robert property. A) Alteration bands of feldspar, quartz and epidote in mafic volcanic flow. B) Felsic-intermediate lapilli tuff breccia. C) Prospector pit with sulphide staining, location NAD 83, UTM Zone 17, 501618E, 5344221N. D) Slabbed sample of felsic-intermediate breccia with matrix of silica, epidote and pyrite mineralization.

## P. Dewdney and K. Weber, Langlois Township

Mr. P. Dewdney and Mr. K. Weber hold unpatented mining claim 4267923 (Figure 11) consisting of 8 claim units staked in the southwest corner of Langlois Township where a narrow band of northeast-trending greenstone has been identified on OGS Map 2419 (Figure 12).

## LOCATION AND ACCESS

The Dewdney Weber claim group is bisected by Highway 129, 50 km southeast of Chapleau (*see* Figure11).

Roadside outcrops consist of thin bands (up to 2 m thick) of sulphide-facies iron formation with minor chert, hosted by strongly folded and deformed amphibolite gneiss of probable volcanic origin. The volcanic rocks consist of biotite, hornblende, plagioclase and quartz gneissic rocks with paleosome and leucosome segregations. Fold axes trend from 010 to 45° and plunge shallowly to the northeast. Rare pyroxene megacrysts occur within leucosome gneiss bands. The metavolcanic rocks are intruded by medium- to coarse-grained and pegmatitic felsic dikes and stocks. The intrusions vary from granite to tonalite composition, whereas pegmatitic phases have a simple mineral assemblage including potassium feldspar, plagioclase, quartz and biotite. A north-trending diabase dike intrudes the gneissic rocks.

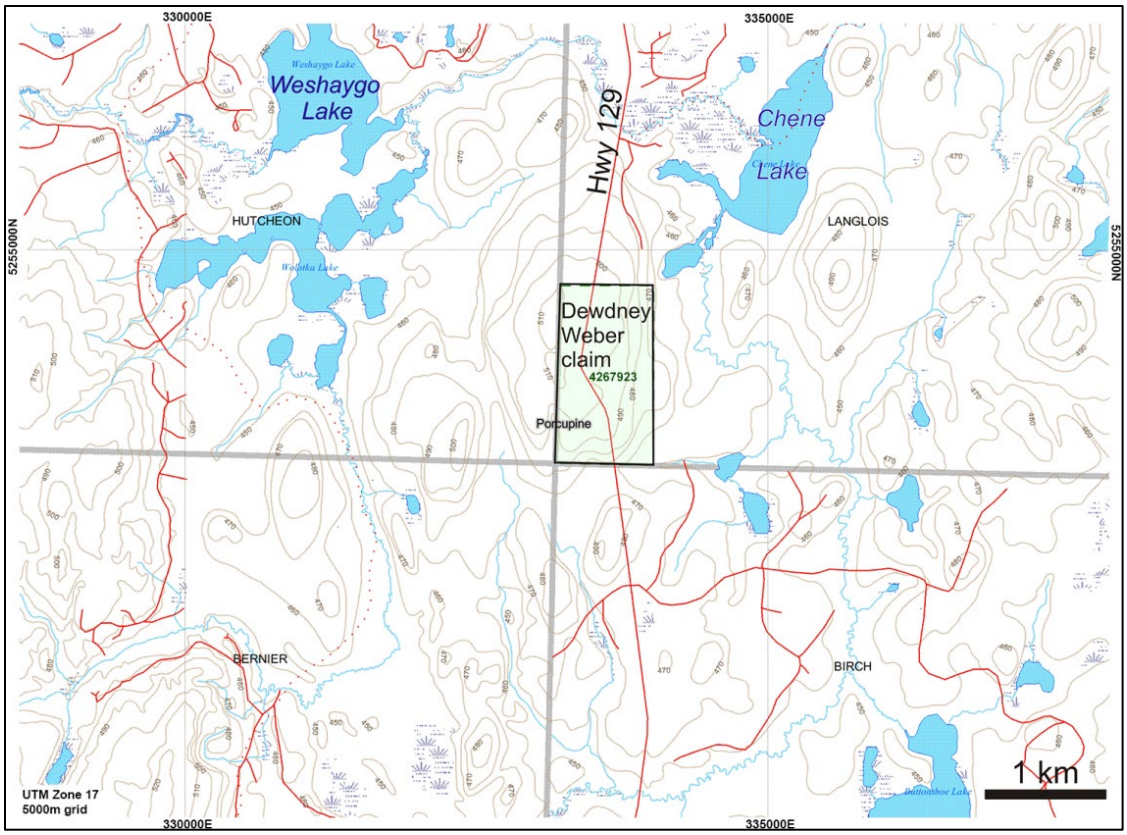


**Figure 11.** Claim map showing location of the Dewdney Weber claim group in the southwest corner of Langlois Township bisected by Highway 129.

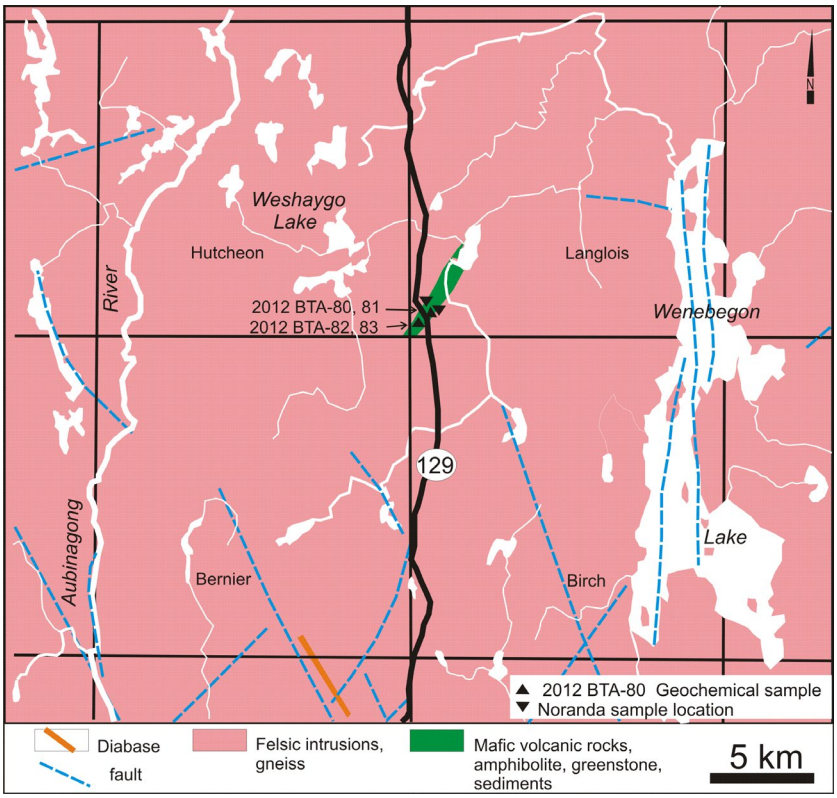


**Figure 12.** Regional geology showing the small wisp of greenstone in Langlois Township and sample locations. *Modified from* Giblin and Leahy (1978).

Roadcut outcrops expose a folded, 2 m thick banded iron formation within amphibolitized mafic gneiss. The iron formation consists of deformed, alternating beds of recrystallized chert and pyrite with recrystallized chert beneath the sulphide zone, suggesting the entire sequence of rocks is overturned. Individual beds of pyrite mineralization vary from 1 to 30 cm thick. The pyrite is massive to semi-massive in the thickest beds. Small-scale faulting affects the sulphide facies iron formation causing minor displacement of bedding planes.

Four grab samples were collected from the road cut outcrops for geochemical analyses; details of the samples are listed in Table 29. Sample 2012 BTA 82 was anomalous in gold. Previous work by Noranda Exploration Company Ltd. included geological mapping and limited sampling. Sample results from the Noranda program yielded low results in gold, silver and base metals; the assay results are indicated in Table 30. In 1955, drilling by O. Dusdal to a depth of 11 feet on the east side of Highway 129, claim 22393, Langlois Township, encountered feldspar, granite, quartz, granite and granite gneiss. No assays were reported.

**Table 29.** Grab samples collected from Langlois Township claims. UTM co-ordinates in NAD 83, Zone 17.

| Sample No. | Description | Assay | Location | |
|---|---|---|---|---|
| | | (ounce/ton Au) | Easting | Northing |
| 2012 BTA 80 | chert, massive pyrite sulphide facies iron formation | <0.01 | 333633 | 5352502 |
| 2012 BTA 81 | chert, massive pyrite sulphide facies iron formation | <0.01 | 333633 | 5352502 |
| 2012 BTA 82 | amphibolite gneiss with minor pyrite, iron staining | 0.01 | 333547 | 5253721 |
| 2012 BTA 83 | pink granitic pegmatite dike | <0.01 | 333512 | 5253820 |

**Table 30.** Noranda Exploration Company Ltd. grab sample results from Langlois Township.

| Sample # | Au (ppb) | Ag (ppm) | Cu (ppm) | Zn (ppm) | Ni (ppm) |
|---|---|---|---|---|---|
| W-84-07-12-1a | 12 | 0.2 | 152 | 27 | 60 |
| W-84-07-12-1b | 8 | 1.0 | 350 | 23 | 84 |
| W-84-07-12-1c | 2 | 0.2 | 206 | 18 | 56 |
| W-84-07-12-4 | 2 | 0.2 | 34 | 7 | 24 |

# Partridge River Greenstone Belt, James Bay Lowland

## LOCATION AND ACCESS

The Partridge River greenstone belt is the most northern exposed Archean greenstone belt in northeastern Ontario before the onlap of Phanerozoic sediments of the Hudson Bay and James Bay lowlands blanket the area.

A 1 day helicopter reconnaissance visit to the belt, located 250 km north of Timmins, was completed in October. This was a continuation of the previous year's examination of the belt to assess its mineral potential (*see* Atkinson et al. 2011). The objective was to further examine the geology of the belt, with specific emphasis on areas that had been highlighted by previous exploration work by companies exploring for gold and base metals in the 1960s and 1970s.

In advance of the trip, 7 sites were selected for geological investigation. Six of the sites were in the vicinity of previous exploration campaigns, and a return visit was included to locate the Argor Carbonatite Complex mine shaft, from which a bulk sample was obtained. Sites were chosen where outcrops have been previously documented or where they were expected to be found, or in the case of the Selco camp on McCormick Lake, where previous reports indicated diamond-drill core might be available.

The mission was successful in locating bedrock outcrop at each site or in the vicinity of the Selco camp; additionally, diamond-drill core was found and examined. Fortunately, the drill core was contained in aluminum core boxes that were in good condition after more than 45 years of exposure to the elements. However, core box number labels were lost, so the site locations for the core could not be determined. At Argor, the toppled head frame and shaft area was located and a suite of specimens was collected from the carbonatite dump rock. The geology of the Argor Carbonatite Complex has been described by Sage (1988b) and Stockford (1972) when it was referred to as the James Bay Pyrochlore deposit. The complex does not outcrop.

A series of photographs depicting various aspects of the geology are presented in Photo 3. Observations obtained for each location made during the 2012 investigations, together with geochemistry of select samples, are presented in Tables 31 and 32.

The Partridge River greenstone belt has a surprisingly good amount of outcrop but the subarctic climate has resulted in growth of vigorous lichen cover firmly attached to many of the outcrops, rendering observation difficult. For the most part, all observed outcrops show evidence of having undergone strain and several episodes of deformation are apparent in multiple foliation orientations. The overprinting of a northeast-trending fabric on an earlier west-trending fabric is probably the result of development of the Kapuskasing Structural Zone which borders the west side of the belt.

Outcrop field stops are identified on the basis of their historic name derived from the company that had previously explored in the area. At Noranda 1984, the southern limit of the greenstone belt is in contact with granitic intrusive rocks. The granitic rocks vary from granite to granodiorite, are generally medium grained with pegmatitic phases, with simple mineralogy consisting of orthoclase, plagioclase, quartz and biotite. Mafic volcanic rocks at the site are amphibolitized, and xenoliths of the mafic flows occur in the granitic intrusive rocks. Foliations trend 285/90.

At Selco camp, on the southeast shore of McCormick Lake, no outcrop is present but 2 small piles of EX (7/8 inch diameter) drill core were located in aluminum core boxes. These were badly overgrown and no box labels survived the prolonged outdoor exposure so drill core locations could not be identified, nor could the context of the drill core

be ascertained. For instance, a single 5 cm long piece of limestone of probable Paleozoic age may have been derived from a boulder in overburden or a thin bedrock veneer overlying the Archean geology at the drill site. Much of the drill core observed was nondescript, Archean intermediate volcanic rock lacking obvious diagnostic features or mineralization. Foliated felsic volcanic rocks with 4 mm quartz phenocrysts, mafic flows with narrow veinlets of iron carbonate alteration and gabbro were observed in the drill core.

At Umbrella Lake, so named for the lake's distinctive shape, mafic volcanic flows with minor pyrite mineralization preserve strongly deformed pillow selvages that are transposed into the regional 070/50S foliation. A narrow horizon of rhyolite occurs within a fragmental volcanic rock of intermediate composition and medium-grained massive melanocratic gabbro outcrops nearby.

At Conwest 25-2 site, amphibolitized mafic volcanic flows are intruded by a 60 cm wide, fine- to medium-grained mafic dike that trends 060/90, whereas the foliation in the country rock trends 114°. A recently drained beaver pond at Bog Lake presented clean outcrops of medium-grained diorite with wispy alteration bands of fine-grained epidote + feldspar + quartz intruded by a fractured, 28 cm wide, glassy, grey quartz vein oriented 306/70NE. A chip sample collected from the vein carried no gold. Intermediate volcanic tuff and mafic greywacke at the Agglomerate (twisted tree) outcrop are strongly foliated and are intruded by massive, medium-grained diorite with minor pyrite. Foliations trend 074/60S.

The Argor Carbonatite Complex site, where a bulk sample was obtained, is located 230 m east of Southbluff Creek, at UTM 526446E 5632086N. A 15 m high wooden head frame lay toppled southward of the water-filled shaft. The small pile of dump rock on the west side of the shaft area contained abundant sovite with a dark brown weathering rind and varying amounts of pyrochlore, magnetite, apatite, biotite, phlogopite and black, acicular amphibole.

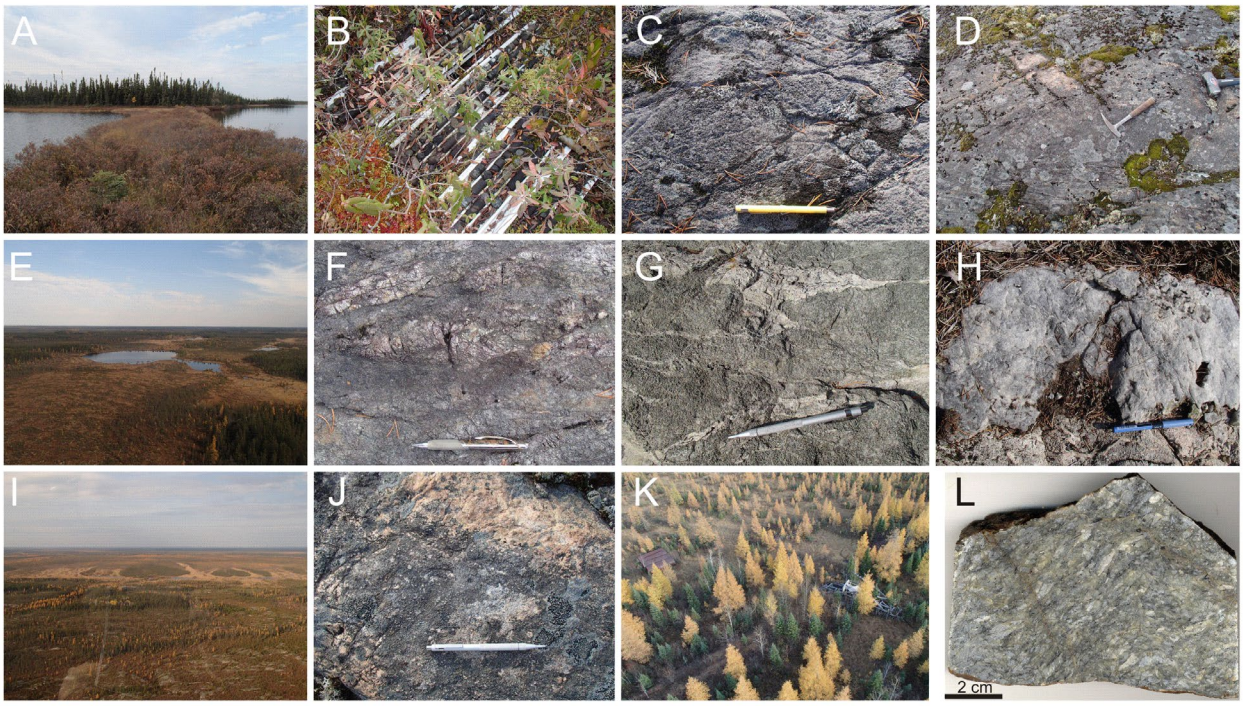


**Photo 3.** Photo plate of the Partridge River greenstone belt. A) McCormick Lake, site of the 1965 Selco exploration camp NAD 83, UTM Zone 17, 551092E 5613935N. B) Diamond-drill core from Selco's Partridge River exploration program still relatively well preserved in aluminum core boxes after nearly 50 years of exposure. C) Lichen encrusted intermediate to mafic volcanic flow. D) Contact area between mafic flows of the Partridge River greenstone belt and the south bounding batholith at UTM 553192E 5610606N. E) Umbrella Lake. F) Outcrop of tectonically fragmented felsic to intermediate volcanic rocks. G) Medium-grained diorite intrusive at Bog Lake area, UTM 558268E 5627446N. H) Glassy quartz vein intruding diorite. I) Landscape scene at the northern contact of the Partridge River greenstone belt (bottom of photo) with the subdued topography of the James Bay Lowland. J) Detail of Agglomerate outcrop. K) Site of the Argor Mine with fuel drums and toppled wooden head frame at the underground bulk sample site. L) Slabbed sample of coarse-grained wavy-textured sovite carbonatite with small red-brown crystals of pyrochlore from the Argor shaft dump rock.

**Table 31.** Geochemical results for select samples from the Partridge River greenstone belt.

| Sample No. | | | 2012 BTA 120 | 2012 BTA 121 | 2012 BTA 122 | 2012 BTA 123 | 2012 BTA 124 | 2012 BTA 125 | 2012 BTA 126 | 2012 BTA 127 | 2012 BTA 128 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | | | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River |
| **Historic Property Name** | | | Noranda 1984 | Noranda 1984 | Umbrella Lake | Umbrella Lake | Umbrella Lake | Umbrella Lake | Umbrella Lake | Conwest 25-2 | Conwest 25-2 |
| **Easting** | | | 550989 | 550989 | 542531 | 542520 | 542044 | 542436 | 542421 | 540639 | 540641 |
| **Northing** | | | 5612189 | 5612189 | 5614693 | 5614655 | 5614484 | 5614573 | 5614578 | 5616571 | 5616570 |
| **Description** | | | fine-grained amphibolite | med grained granodiorite | fine-grained mafic flow | fine-grained rhyolite | mafic flow, minor pyrite | med grained melanocratic gabbro | siliceous pyritic intermediate volcanic | mafic dike | amphibolite |
| **Precious Metals** | **Units** | **Detection Limit** | | | | | | | | | |
| **Au** | ounce/ton | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | |
| **Au** | ppb | 6 | | | | | | 10 | | <6 | |
| **Pd** | ppb | 1.3 | | | | | | <1.3 | | <1.3 | |
| **Pt** | ppb | 0.4 | | | | | | <0.4 | | 0.5 | |
| **Trace Elements** | | | | | | | | | | | |
| **Ba** | ppm | 0.8 | 89.4 | 1081.3 | 174.5 | 280.2 | 6.6 | 42 | | | |
| **Be** | ppm | 0.04 | 0.28 | 1.2 | 0.32 | 0.75 | 0.42 | 0.23 | | | |
| **Bi** | ppm | 0.15 | 0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | | | |
| **Cd** | ppm | 0.013 | 0.091 | 0.021 | 0.15 | 0.074 | 0.055 | 0.124 | | | |
| **Ce** | ppm | 0.12 | 9.13 | 25.21 | 8.31 | 19.95 | 9.18 | 4.43 | | | |
| **Co** | ppm | 0.13 | 56.73 | 3.12 | 47.56 | 6.47 | 48.36 | 48.51 | | | |
| **Cr** | ppm | 3 | 199 | 112 | 189 | 132 | 46 | 49 | | | |
| **Cs** | ppm | 0.013 | 0.484 | 1.143 | 0.476 | 1.022 | 0.132 | 0.577 | | | |
| **Cu** | ppm | 1.4 | 251.9 | 3.8 | 122.3 | 7.1 | 98 | 186.1 | | | |
| **Dy** | ppm | 0.009 | 3.911 | 0.685 | 4.162 | 1.537 | 3.716 | 2.349 | | | |
| **Er** | ppm | 0.007 | 2.523 | 0.354 | 2.712 | 0.875 | 2.318 | 1.548 | | | |
| **Eu** | ppm | 0.0031 | 0.8642 | 0.4502 | 0.9019 | 1.0154 | 1.0661 | 0.5704 | | | |
| **Ga** | ppm | 0.04 | 16.07 | 17.28 | 16.44 | 14.35 | 16.76 | 14.73 | | | |
| **Gd** | ppm | 0.009 | 3.125 | 0.99 | 3.341 | 1.754 | 3.203 | 1.928 | | | |
| **Hf** | ppm | 0.14 | 1.67 | 2.35 | 1.84 | 3.21 | 1.45 | 0.87 | | | |
| **Ho** | ppm | 0.0025 | 0.8212 | 0.121 | 0.9067 | 0.3015 | 0.7893 | 0.5053 | | | |
| **In** | ppm | 0.0018 | 0.0676 | 0.0099 | 0.0734 | 0.0365 | 0.0668 | 0.0509 | | | |
| **La** | ppm | 0.04 | 3.33 | 13.41 | 3.19 | 9.34 | 3.73 | 1.61 | | | |
| **Li** | ppm | 0.4 | 22.6 | 25.7 | 7.2 | 18.9 | 12.2 | 7.4 | | | |
| **Lu** | ppm | 0.002 | 0.3617 | 0.0521 | 0.3952 | 0.1286 | 0.3393 | 0.2294 | | | |

| Sample No. | | | 2012 BTA 120 | 2012 BTA 121 | 2012 BTA 122 | 2012 BTA 123 | 2012 BTA 124 | 2012 BTA 125 | 2012 BTA 126 | 2012 BTA 127 | 2012 BTA 128 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mo** | ppm | 0.08 | 1.06 | 1.54 | 0.65 | 1.26 | 2.33 | 0.4 | | | |
| **Nb** | ppm | 0.028 | 3.346 | 3.104 | 2.631 | 5.156 | 2.264 | 1.274 | | | |
| **Nd** | ppm | 0.06 | 7.41 | 9.98 | 6.87 | 10.34 | 7.06 | 3.84 | | | |
| **Ni** | ppm | 1.6 | 106.7 | 7.2 | 92.1 | 33.6 | 33.9 | 65.6 | | | |
| **Pb** | ppm | 0.6 | 4.1 | 16.9 | 6 | 26.9 | 1.4 | 2.3 | | | |
| **Pr** | ppm | 0.014 | 1.467 | 2.835 | 1.334 | 2.588 | 1.417 | 0.751 | | | |
| **Rb** | ppm | 0.23 | 19.44 | 69.31 | 20.25 | 43.23 | 1.17 | 13.27 | | | |
| **Sb** | ppm | 0.04 | 0.08 | 0.04 | 0.77 | 0.18 | 0.71 | 0.41 | | | |
| **Sc** | ppm | 1.1 | 50.5 | 2.8 | 49.2 | 10 | 46.6 | 49.1 | | | |
| **Sm** | ppm | 0.012 | 2.417 | 1.595 | 2.398 | 2.07 | 2.246 | 1.385 | | | |
| **Sn** | ppm | 0.16 | 0.67 | 0.52 | 0.75 | 2.18 | 0.76 | 0.44 | | | |
| **Sr** | ppm | 0.6 | 114.5 | 853.6 | 161.5 | 210.2 | 72.8 | 99.7 | | | |
| **Ta** | ppm | 0.023 | 0.205 | 0.366 | 0.173 | 0.494 | 0.142 | 0.083 | | | |
| **Tb** | ppm | 0.0023 | 0.5504 | 0.1278 | 0.6009 | 0.2588 | 0.5528 | 0.3372 | | | |
| **Th** | ppm | 0.018 | 0.35 | 2.737 | 0.374 | 3.664 | 0.278 | 0.133 | | | |
| **Ti** | ppm | 7 | 5789 | 968 | 6382 | 2343 | 5681 | 3623 | | | |
| **Tl** | ppm | 0.005 | 0.09 | 0.32 | 0.114 | 0.222 | 0.008 | 0.071 | | | |
| **Tm** | ppm | 0.0019 | 0.3653 | 0.0517 | 0.3962 | 0.1234 | 0.3397 | 0.2285 | | | |
| **U** | ppm | 0.011 | 0.118 | 0.666 | 0.095 | 0.743 | 0.074 | 0.037 | | | |
| **V** | ppm | 0.8 | 315.3 | 18.7 | 318.3 | 65.7 | 319.1 | 246.2 | | | |
| **W** | ppm | 0.05 | 0.58 | 0.11 | 0.52 | 0.85 | 0.62 | 0.32 | | | |
| **Y** | ppm | 0.05 | 21.45 | 3.48 | 23.02 | 8.17 | 20.67 | 13.15 | | | |
| **Yb** | ppm | 0.009 | 2.389 | 0.344 | 2.579 | 0.847 | 2.259 | 1.504 | | | |
| **Zn** | ppm | 7 | 72 | 26 | 80 | 20 | 54 | 79 | | | |
| **Zr** | ppm | 6 | 60 | 86 | 63 | 132 | 49 | 29 | | | |

**Table 32.** Precious metals and major oxide geochemical results for select samples from the Partridge River greenstone belt.

| Sample No. | | | 2012 BTA 129 | 2012 BTA 130 | 2012 BTA 131 | 2012 BTA 132 | 2012 BTA 133 | 2012 BTA 134 | 2012 BTA 135 | 2012 BTA 136 | 2012 BTA 137 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | | | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Partridge River | Argor | Argor |
| **Historic Property Name** | | | Bog Lake | Bog Lake | Bog Lake | Agglomerate (twisted tree) | Agglomerate (twisted tree) | Agglomerate (twisted tree) | Conwest 25-2 | Carbonatite Argor | Carbonatite Argor |
| **Easting** | | | 558268 | 558268 | 558268 | 555664 | 555659 | 555605 | 540664 | 526446 | 526446 |
| **Northing** | | | 5627446 | 5627446 | 5627446 | 5627738 | 5627747 | 5627740 | 5616514 | 5632086 | 5632086 |
| **Description** | | | quartz vein chips | med grained diorite | quartz vein 1 inch off main vein | med grained intermediate intrusive | mafic flow | mafic greywacke | cataclastite breccia, pseudotachylyte | rauhaugite carbonatite with acicular amphibole and pyrochlore | sovite carbonatite with magnetite |
| **Precious Metals** | **Units** | **Detection Limit** | | | | | | | | | |
| **Au** | Ounce / ton | 0.01 | <0.01 | | <0.01 | | | | | <0.01 | <0.01 |
| **Au** | ppb | 6 | | 13 | | <6 | 9 | <6 | <6 | | |
| **Pd** | ppb | 1.3 | | 18.3 | | <1.3 | 9.1 | <1.3 | <1.3 | | |
| **Pt** | ppb | 0.4 | | 21.9 | | 0.5 | 11.9 | 0.5 | <0.4 | | |
| **Major Elements** | | | | | | | | | | | |
| **$Al_2O_3$** | wt% | 0.02 | | 17.19 | | 18.13 | 15.65 | 15.54 | 11.46 | 0.13 | |
| **CaO** | wt% | 0.006 | | 12.238 | | 9.824 | 3.66 | 7.408 | 8.9 | 28.085 | |
| **$Fe_2O_3$** | wt% | 0.01 | | 4.09 | | 11.19 | 13.46 | 13.87 | 14.31 | 9.87 | |
| **$K_2O$** | wt% | 0.01 | | 0.63 | | 0.15 | 2.49 | 0.4 | 0.26 | 0.05 | |
| **LOI** | wt% | 0.05 | | 7.78 | | 3.62 | 7.97 | 4.11 | 2.45 | 41.17 | |
| **MgO** | wt% | 0.01 | | 4.27 | | 8.35 | 9.05 | 7.27 | 5.48 | 13.27 | |
| **MnO** | wt% | 0.002 | | 0.129 | | 0.166 | 0.182 | 0.198 | 0.22 | 0.956 | |
| **$Na_2O$** | wt% | 0.02 | | 2.02 | | 2.47 | 0.87 | 2.43 | 1.61 | 0.2 | |
| **$P_2O_5$** | wt% | 0.002 | | 0.044 | | 0.069 | 0.057 | 0.085 | 0.099 | 2.714 | |
| **$SiO_2$** | wt% | 0.04 | | 50.9 | | 45.74 | 46.07 | 47.51 | 54.01 | 1.78 | |
| **$TiO_2$** | wt% | 0.01 | | 0.6 | | 0.57 | 0.84 | 1.15 | 1.21 | 0.04 | |
| **Total** | wt% | | | 99.89 | | 100.28 | 100.3 | 99.97 | 100.01 | 98.27 | |

# R. Snelgrove, Puskuta Township

Inspired by the memory of Magnus Nyman, who many years ago prospected and trapped the area from his cabin on the bank of Fire River, R. Snelgrove recently staked 2 claims consisting of 30 claim units in Puskuta Township. These include unpatented mining claims 4241026 and 4241027, each consisting of 15 claim units.

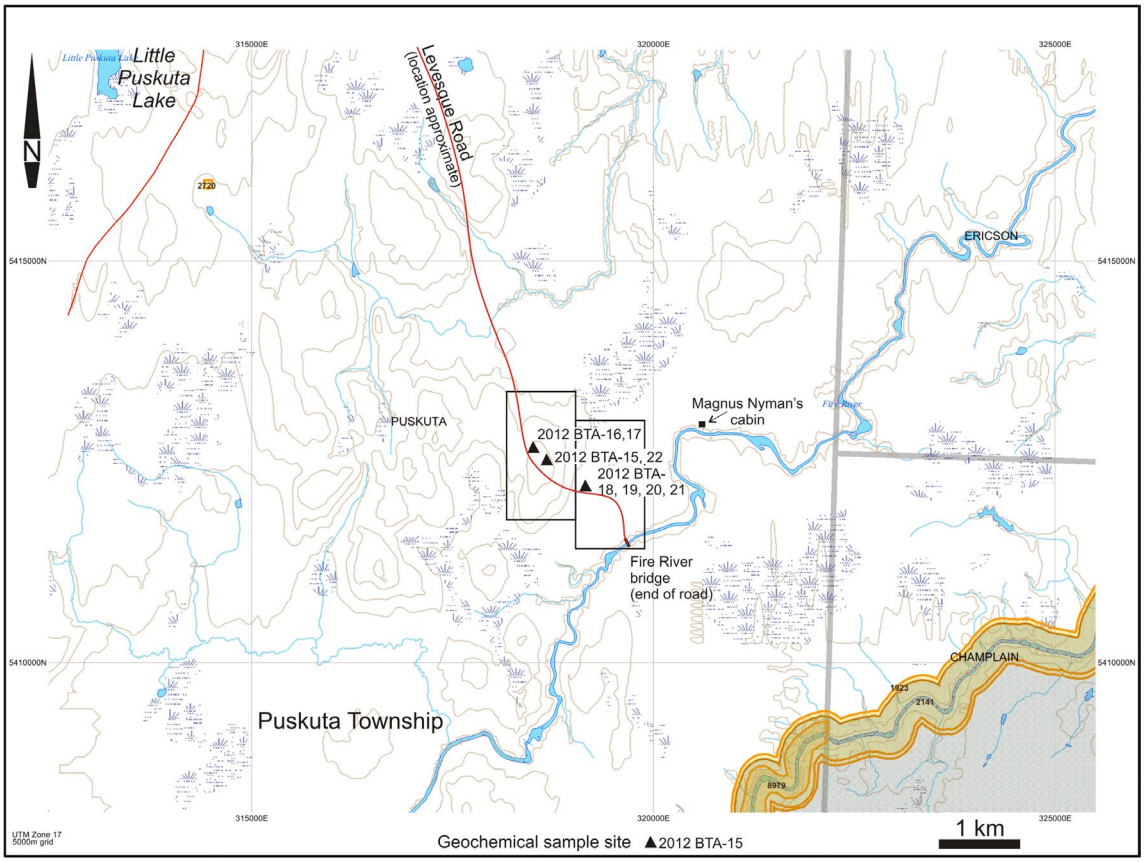


**Figure 13.** Claim and sample locations on R. Snelgrove's Puskuta Township property.

## ACCESS

Travel south from Hearst on Highway 583 for 10 km then turn south on Caithness Road and continue for 75 km to Levesque Road, which leads 36 km to the Fire River. At the time of our property visit, a new bridge crossing had just been constructed over Fire River and the road ended there. The south boundary of Mr. Snelgrove's claims crosses the river near the bridge.

## PREVIOUS WORK

Newkirk Mining Corporation Limited completed airborne magnetic and electromagnetic surveys over parts of Puskuta, Champlain, Hayward and Coderre townships in 1978 but no additional work was reported by the company. In 1981, Amax Minerals Exploration completed airborne magnetic and electromagnetic surveys over parts of Byng and Puskuta townships as part of the Fire River Project #1187. A total of 1093 line kilometres was flown with line spacing of 150 m.

In 1983 the Canamax Resources and Noranda Exploration Company Limited Fire River Joint Venture completed 8 diamond-drill holes on various conductors over widely spaced areas in Puskuta Township and encountered clastic and graphitic sediments, iron formation and felsic, intermediate and mafic volcanic rocks. Only low values in gold and base metals were reported in the drilling. None of that drilling was on Mr. Snelgrove's claims.

## REGIONAL GEOLOGY

The property is underlain by a narrow belt of north-northwest trending amphibolitized greenstone that forms the eastern arc of the Dayohessarah Lake greenstone belt.

## PROPERTY GEOLOGY

Roadside outcrops (NAD 83, UTM Zone 17, 319082E 5412443N) consist of green to black, foliated to schistose amphibolitized mafic flows and gabbro intruded by numerous, foliation parallel, white-weathering, medium-grained tonalite dikes. Phases of the amphibolite contain coarse green porphyroblasts of hornblende with enclosing phases of finer grained amphibolite as the dominant rock type of the area. Porphyroblasts are elongated parallel with the regional deformation that trends 165/70E. Fine- to medium-grained diabase dikes with narrow chill margins intrude the amphibolite, the dikes trend 010° and one dike was oriented 080°. Occasional veins in the amphibolite include abundant quartz with minor feldspar and occasionally include epidote, chlorite and apatite crystals up to 4 cm in length.

Fine-grained feldspathic rocks occur in-folded with the mafic flows in the vicinity of NAD 83, UTM Zone 17, 319087E 5412906N. Rare garnet occurs with quartz, biotite and chlorite-bearing veins along margins of fold contacts. Also in this vicinity, pebble to cobble sized, felsic clasts and rare quartz vein clasts occur within a mafic matrix.

A second area of outcrop (NAD 83, UTM Zone 17, 319368E 5412249N) on the east side of the road, located 800 m north of the new Fire River bridge, exposes amphibolitized mafic flows and medium-grained gabbro intruded by tonalite dikes and a 5 m wide zone of metasedimentary rocks on the north face of the outcrop (Photo 4). The metasediments included a 30 cm wide sulphidized zone with 2% sulphide mineralization. The north side of the outcrop had been partially excavated for road building materials as it was greatly broken up because of numerous joints and schistosity.

Except for the diabase dikes, all lithologies exhibit high strain and upper greenschist to amphibolite facies metamorphism, suggested by the presence of mineral lineations, tectonic brecciation and rare folding. Foliations and schistosities generally strike northerly and dip steeply to the east. A series of grab samples were collected from the property for assay, with details of the rocks sampled listed in Tables 33 and 34.

**Table 33.** Sample locations, outcrops and descriptions, R. Snelgrove property, Puskuta Township.

| Sample No. | Location (Co-ordinates in NAD 83, UTM Zone 17) | | Description | Orientation Foliation, Schistosity |
|---|---|---|---|---|
| | Easting | Northing | | |
| 2012 BTA 15 | 319021 | 5412896 | Amphibolitized mafic flow | 096° |
| | 319054 | 5412741 | Fine-grained diabase dike intruding amphibolite | 010/90E |
| | 319081 | 5412816 | Tectonic (?) breccia | 160/70E |
| | 319273 | 5412953 | Diabase dike with plagioclase phenocrysts intruding amphibolite | |
| | 319048 | 5413211 | Tonalite | 156/70E |
| | 319081 | 5412903 | | 164/55E |
| | 319087 | 5412906 | Folded (refolded?) tonalite dike in amphibolite | |
| 2012 BTA 16 | 319082 | 5412443 | Hydromuscovite rich tonalite dike | 165/75E |
| 2012 BTA 17 | 319082 | 5412443 | Coarse-grained amphibolite | 164/55E |
| 2012 BTA 18 | 319368 | 5412249 | Pyrite-rich horizon with quartz veining | |
| 2012 BTA 19 | 319368 | 5412249 | Quartz vein with sulphide on margin | |
| 2012 BTA 20 | 319368 | 5412249 | Amphibolite with 2% pyrite/chalcopyrite mineralization | |
| 2012 BTA 21 | 319368 | 5412249 | Carbonate-altered rock, blueish hue | |
| 2012 BTA 22 | 319021 | 5412896 | Coarse-grained dark green mineral (?) | |

**Table 34.** Precious and base metal assay results for select samples from R. Snelgrove property, Puskuta Township.

| Element | Au | Pd | Pt | Co | Cu | Ni | Zn | Ag |
|---|---|---|---|---|---|---|---|---|
| **Units** | ppb | ppb | ppb | ppm | ppm | ppm | ppm | ppm |
| **Detect Limit** | 6 | 1.3 | 0.4 | 30 | 3 | 6 | 6 | 2 |
| 2012 BTA 18 | 39 | <1.3 | 0.9 | | | | | |
| 2012 BTA 19 | 7 | <1.3 | <0.4 | | | | | |
| 2012 BTA 20 | <6 | <1.3 | 1.9 | n/a | 158 | 137 | 162 | 2 |
| 2012 BTA 21 | <6 | 4 | 9.6 | | | | | |

*n/a= no assay.*

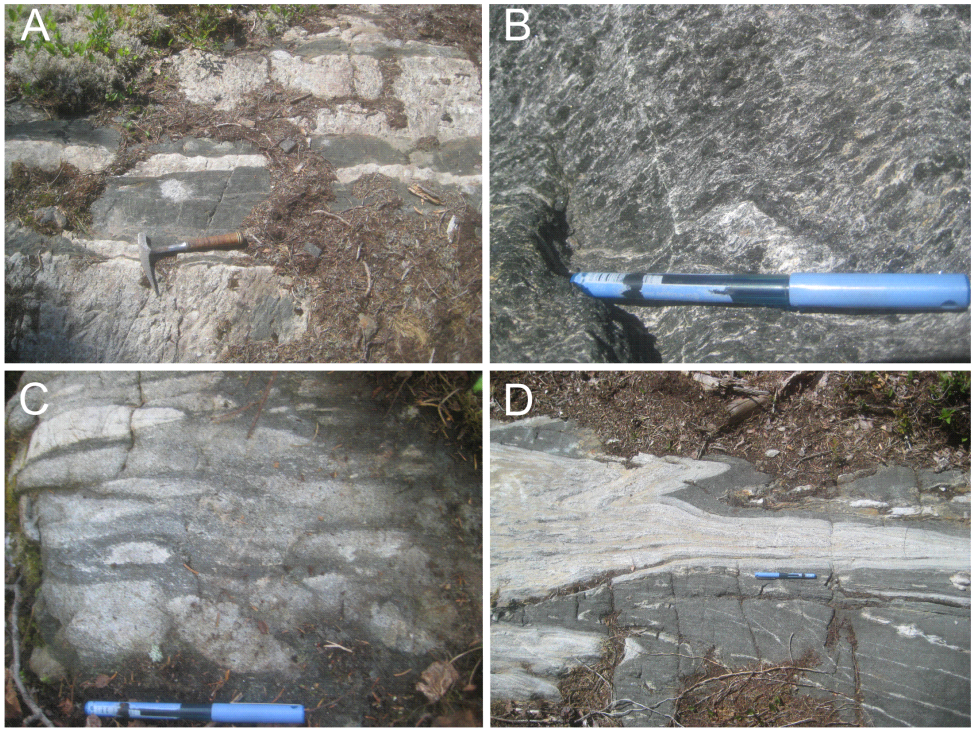


**Photo 4.** Puskuta Township geology. A) Amphibolitized mafic flow intruded by tonalite dikes. B) Foliated melanocratic gabbro with pronounced mineral lineations. C) Volcaniclastic breccia with heterolithic, angular clasts in amphibolitized green matrix. D) Pronounced fold deformation of a fine-grained felsic sill in amphibolitized mafic flow.

# RECOMMENDATIONS FOR EXPLORATION

## Kapuskasing Structural Zone

The discovery of significant gold mineralization at Borden Lake by Probe Mines Limited is a positive incentive to give more exploration attention to rocks in the Kapuskasing Structural Zone. This extensive area of elevated metamorphic grade has traditionally been overlooked as a prospective area for economic mineralization. Likewise, work by Harte Gold Corp. on the Sugar Zone property in the Dayohessarah Lake greenstone belt has outlined a significant gold resource in that area. The east-verging continuation of that greenstone belt extends through the Fire River area and into Puskuta Township where favourable geology for hosting both gold and volcanogenic massive sulphide mineralization has been exposed in recent forestry operations. Limited sampling has already returned anomalous gold values (*see* "Property Examinations", R. Snelgrove, Puskuta Township).

## Partridge River Greenstone Belt, James Bay Lowland

Previous exploration efforts in the Partridge River greenstone belt by Selco and other companies identified rock alteration and minerals suggestive of volcanogenic massive sulphide environments. Sample results obtained from this year's return visit to the belt identified favourable geochemistry for base metal mineralization. For example, sample 2012 BTA 133 has characteristic alteration patterns including high LOI, $Fe_2O_3$, and $K_2O$ coupled with $Na_2O$ depletion, suggestive of volcanogenic alteration geochemistry in an area of intermediate fragmental rocks. The sample is also slightly anomalous in precious metal content.

The belt remains entirely open and available for staking with the advantage that preliminary exploration and public domain airborne geophysical surveys are already completed. The existing data can be used as excellent guides to new mineral discovery.

## Volcanogenic Massive Sulphide Targets in the Kidd–Munro Assemblage

One of the world's largest volcanogenic massive sulphide (VMS) deposits is the Kidd Creek Mine at Timmins. The mine is hosted by the Kidd–Munro assemblage, which has an age of 2711 to 2719 Ma. The Kidd–Munro assemblage consists of a suite of volcanic rocks consisting of a lower komatiitic suite with overlying mafic and felsic volcanic suites and intermingled clastic and chemical metasedimentary rocks. Much effort has been devoted to the discovery of additional VMS mineralization in the Kidd–Munro assemblage since the discovery of the Kidd Creek Mine. This has included numerous airborne and land-based geophysical surveys as well as every ground type of survey and instrumentation technique ever devised. To date, success beyond the discovery of the giant Kidd Creek deposit has been limited to several small satellite deposits within the Kidd–Munro assemblage. This lack of discovery, combined with the numerous instances of encountering graphite-associated barren sulphides when drilling electromagnetic conductors, was the incentive for the recent "Regional Lithogeochemical Study of the Kidd–Munro MEGATEM® Survey Areas, Timmins–Kirkland Lake Region, Northern Ontario: Discover Abitibi Initiative" (Hannington et al. 2012). The objective of the study was to elucidate potential vectors to mineralization by the detailed examination of the geochemistry of graphitic sediments. As a result, a number of interesting areas for further investigation have been identified by the Lithogeochemical Shale Project.

Another approach to identifying potential VMS deposits is to carefully examine existing airborne geophysical surveys, the recent MEGATEM® II survey flown for Discover Abitibi being a good example (Dumont et al. 2002). In central Prosser Township, felsic fragmental rocks with favourable geochemical traits, including primitive rare earth element patterns and characteristic alteration signatures, outcrop at Porphyry Hill. Outcrop is exceedingly scarce in the area east of Kidd Creek Mine, including much of Prosser Township. In fact, several drill holes in the vicinity of Porphyry Hill encountered overburden thicknesses of unconsolidated glacial sediments and overlying humus and peat up to 70 m. Presently, the best airborne geophysical surveys have a depth of penetration limit of about 250 m. The combination of instrumentation limitations and thick overburden cover could effectively obscure even near-surface mineral deposits that would ordinarily be detected by electromagnetic surveys. An example of a possible exploration target blanketed by thick overburden and consequent suppression of its electromagnetic response lies south of Porphyry Hill in Prosser Township. The geology of the area encompassed in Lots 4 and 5, Concessions III and IV, is inferred to be gabbro on the basis of geophysical interpretation (Figure 14). However, a thick blanket of overburden in this area could effectively suppress any electromagnetic response of a blind ore deposit. Outcrops immediately north of the area consist of favourable felsic pyroclastic rocks and on-strike horizons of sulphide-bearing graphitic sediments. A relatively inexpensive exploration program consisting of several diamond-drill holes to probe the interpreted gabbro body could quickly determine the true nature of the geology here and might be successful in identifying volcanogenic massive sulphide mineralization akin to the Kidd Creek Mine.

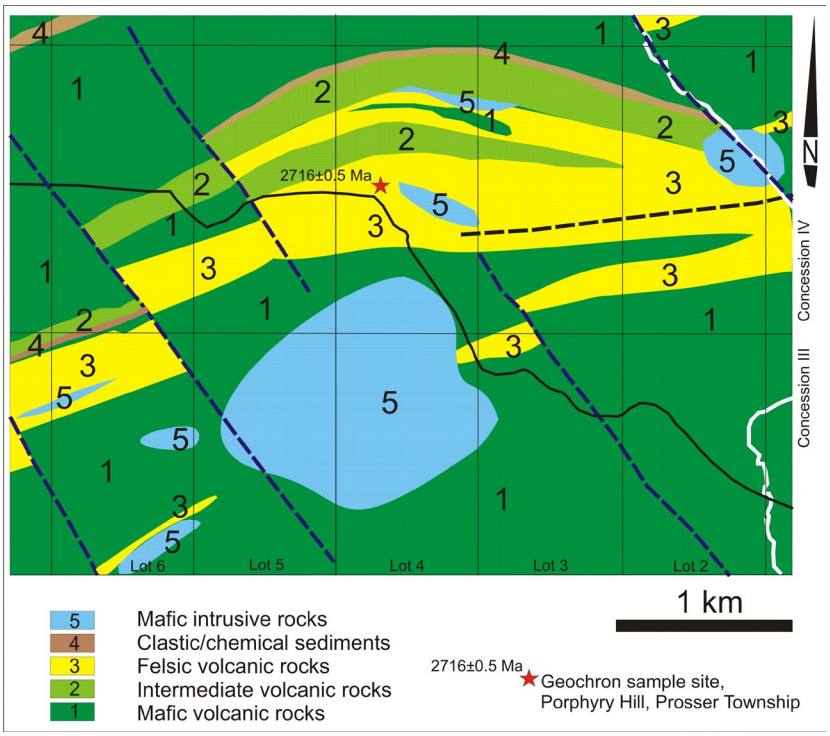


**Figure 14.** Geology of part of Prosser Township. *Modified from* Ontario Geological Survey (2007).

## Volcanogenic Massive Sulphide Targets in Fallon Township

The presence of felsic fragmental rocks with much pyrite mineralization identified on J. Robert's claims in Fallon Township (*see* "Property Examinations", J. Robert, Fallon Township) is suggestive of a favourable setting for volcanogenic massive sulphide mineralization. The Shining Tree airborne geophysical survey (Ontario Geological Survey 1990) identified several weak electromagnetic conductors in the vicinity of the Robert claims that may warrant further investigation.

# OGS ACTIVITIES AND RESEARCH BY OTHERS

Details of activities completed during the year by OGS staff based in Sudbury, Ontario, are provided in *Summary of Field Work and Other Activities 2012* (Ontario Geological Survey 2012).

L. Katz, Laurentian University, is undertaking an MSc thesis on the Côté gold deposit. It will encompass a deposit-scale study of the geological setting and an integrated alteration-lithogeochemical study.

Wytiahlowsky, University of Waterloo, is doing a BSc on the petrography of the breccias in the mineralized zone at the Côté gold deposit to distinguish between magmatic versus hydrothermal types.

## Discover Abitibi

A summary of recent projects funded through the Discover Abitibi initiative is listed in Table 35.

**Table 35.** Discover Abitibi Projects underway in 2012.

| Project | Request for Proposal Release Date | Principle Investigator | Status |
|---|---|---|---|
| Study of gold-bearing semi-massive sulphide mineralization in the Montclerg prospect | November 10, 2010 | T. Barrett | In press |
| Gold and iron oxide-copper-gold (IOCG) occurrences – Matachewan and Shining Tree area | November 10, 2010 | J. Ayer | In press |
| Lithogeochemical investigation, Kidd–Munro MEGATEM® survey area, Timmins–Kirkland Lake | October 1, 2010 | M. Hannington | Completed |

# REGIONAL LAND USE GEOLOGIST ACTIVITIES

## Land Use Planning Activities

The northeast Regional Land Use Geologist, based in Timmins, co-ordinates input into land use planning activities in the Sault Ste. Marie, Timmins and Kirkland Lake Resident Geologist districts and the part of the Sudbury District that is north of the French River. This report includes information about activities in all of these districts.

During January and February 2012, the position of northeast Regional Land Use Geologist was vacant, and essential job duties were shared between Hugh Lockwood, *P.Geo*., northwest Regional Land Use Geologist, Debbie Laidlaw, *P.Geo*., southern Regional Land Use Geologist, and Ruth Debicki, *P.Geo*., Land Use Policy and Planning Co-ordinator, with support from other staff members in the Timmins Regional Office. From March through June, the position was held by Catherine Daniels, *P.Geo*., and from July through December, the position was held in an Acting capacity by Gary Grabowski, *P.Geo*., while Ms. Daniels was on leave.

The objectives of the position are to

- effectively represent mineral-related values in the context of competing interests for land use;
- optimize the land base available for mineral exploration and development;
- raise awareness within the mineral sector of the implications of legislation and regulations other than the *Mining Act* on their activities; and
- promote awareness of how geoscience serves the public good, including by
  - establishing base-line environmental values;
  - identifying sources of minerals and energy to support sustainable economic activity; and
  - highlighting areas where natural geological hazards and mining-related hazards pose a threat to people and property.

The competing interests for land use vary from place to place across the province, but most have the potential to restrict the availability of land, access to it, and /or the activities on it. In 2012, the northeast Regional Land Use Geologist dealt with a variety of land use planning issues throughout the Northeast Region.

### CROWN LANDS

The Ministry of Northern Development and Mines (MNDM) engages with the Ministry of Natural Resources (MNR) when Crown land use planning initiatives may affect Provincial mineral interests. Such activities include Forest Management Planning, Far North Land Use Planning, and other work related to managing Crown land.

## Forest Management Planning

The forest management planning process involves consideration of a wide range of values including mineral values in the context of forestry activities, and the relevance of legislation other than the *Crown Forest Sustainability Act*, including the *Mining Act*. The northeast Regional Land Use Geologist provides input into the development of forest management plans, including

- the distribution of areas of high mineral potential, so that forestry planners are aware of areas where there may be pressures from the mineral sector for access for exploration;
- the locations of existing mining claims and leases, so that exploration workings such as grid lines are not inadvertently damaged or destroyed by forestry activities;
- information regarding current exploration and development activities in the area;
- the location of mining-related hazards, so that forestry workers are not put at risk; and
- the socio-economic impact of mineral exploration and mining in the forest management unit, so that its importance can be considered in the context of other sectors such as tourism that may be active within the forest management unit.

In 2012, there were no forest management units in the northeast region requiring this type of input because of the implementation of changes to the forest management planning process. In the past, forest management plans have been for five-year periods, with planning for each five-year term beginning 2 years before its implementation. Plan terms have recently been increased from 5 to 10 years, with 2 five-year phases, beginning with plans implemented in 2007.

Approved Forest Management Plans, with detailed information about annual operations including plans for creating new access routes or decommissioning existing routes, and maps showing forest access roads are posted on the MNR website at www.appefmp.mnr.gov.on.ca/eFMP/home.do?language=en.

## Disentanglement

When the Ontario's Living Legacy land use strategy was announced in 1999, it included many areas where sites designated as parks and conservation reserves overlapped areas of pre-existing mining lands. Such areas of overlap were designated as "forest reserves". The land use designation provided for ongoing mineral exploration and development and access to support such work, but prohibited all other resource development. The intention was that the sites would be added to the protected areas if and when the mining lands lapsed through normal processes.

The land use strategy was modified in 2002, and the Ontario Prospectors Association and Partnership for Public Lands were invited to work together to recommend options for "disentangling" the remaining mining lands in forest reserves from the Ontario's Living Legacy sites.

The 2 groups made joint recommendations in July 2003 for disentangling approximately half of the 66 sites, and asked the government to recommend solutions for 20 sites where they could not reach agreement. They did not comment on the 8 stand-alone forest reserves, or 3 other sites added after their discussions began.

The government announced the proposed solutions for disentangling remaining mining lands from the proposed protected areas in May 2005. Changes to 41 of the 66 sites were proposed, and a commitment was made to do further public consultation before the changes were implemented.

The MNR has the lead for implementing the recommended "disentanglement" options. The Land Use Policy and Planning Co-ordinator and the northeast Regional Land Use Geologist worked with MNR staff in 2012 to implement changes to some of the sites, following further public consultation. A decision was made to proceed with the proposed disentanglement of C1564, Woman River Conservation Reserve, by dropping the Conservation Reserve designation from the area originally selected, and regulating "replacement lands" elsewhere. A second decision was made, after extensive and contentious public consultation, to not proceed with the recommended "disentanglement' option for F175, Wolf Lake Old Growth Forest, and instead maintain the *status quo*. Finally, the

disentanglement solutions for 3 Forest Reserves, F179, Capreol/Hanmer Delta; F208, Vermillion River Delta; and F212, Shakespeare Forest, which were to remove the Forest Reserve designation and not seek replacement lands, were implemented.

## Wawa Crown Land Use Atlas Harmonization Project

The MNR has engaged members of the public to help it update the policies for Crown land in the Wawa District. This initiative is called the Crown Land Use Atlas Harmonization Project. It was begun in 2006, but revisited in 2011 after public opposition to policy proposals posted on the Environmental Registry as outcomes of the earlier work.

Many of the changes in land use policy initially proposed for the Wawa MNR District have the potential to restrict access to lands with significant mineral potential, and to make exploration and development of new mineral deposits more difficult.

In 2011, the northeast Regional Land Use Geologist attended meetings with the group and with MNR staff to provide input with regard to MNDM interests, and to highlight the potential effects that the proposed land use policies might have on mineral sector interests and activities in the area. The northeast Regional Land Use Geologist also worked to ensure that MNR had contact information for all holders of mining claims and leases in the area so that the claimholders and leaseholders could be included in the public consultation process on preliminary management options. Public consultations ended in September 2011.

Since then, MNR has not issued a recommended draft plan. The northeast Regional Land Use Geologist continues to monitor this project, and will review and comment on the recommended plan when it is produced.

## Temagami Land Use Plan

In early 2012, MNR released a draft of an amended Temagami Land Use plan. The amendments included many proposed changes to existing land use designations, including re-designation of a number of General Use Areas to Enhanced Management Areas. Prior to its release, the northeast Regional Land Use Geologist and MNDM management reviewed and commented on approximately 50 draft Policy Reports for individual land use areas, which resulted in numerous changes to the amendments that were released for public review and comment.

The reason for proposing the amendments was to harmonize the Temagami Land Use Plan with the language of the Crown Land Use Planning Atlas, and to ensure that the intent of Special Management Areas in the Temagami Land Use Plan is reflected accurately by re-designating the Special Management Areas as Enhanced Management Areas in the Crown Land Use Planning Atlas.

## Withdrawal Orders

In 2012, the northeast Regional Land Use Geologist reviewed a number of requests for withdrawal from staking under Section 35 of the *Mining Act*. Withdrawal requests can be for surface rights only, mining rights only, or for both surface and mining rights. These requests are made for a wide range of reasons, including

- developing waste disposal sites and sewage lagoons;
- selling Crown land for cottage lots;
- enabling land exchanges;
- supporting First Nation land claims and treaty entitlement negotiations;
- allowing hydroelectric and other infrastructure developments;
- facilitating Ministry of Transportation review of aggregate potential in support of highway maintenance; and
- assessing applications under Section 35.1 of the *Mining Act* for the withdrawal of Crown-owned mining rights in Northern Ontario, where the surface rights are privately held.

Four requests were reviewed in 2012; all were recommended for approval.

## MUNICIPAL AND PRIVATE LANDS

The Provincial Policy Statement (PPS), which guides planning in municipalities and on private land outside of municipalities in Ontario, is issued under the provisions of the *Planning Act*. The PPS was last modified in 2005. A compulsory five-year review of the PPS was initiated in 2010 to ensure that it is up to date and meets current environmental standards, ensures human health and safety, and protects Ontario's cultural and natural heritage. Together with colleagues in the northwest and southern districts and the Land Use Policy and Planning Co-ordinator, the northeast Regional Land Use Geologist provided detailed input into this review in 2011. An updated draft PPS was posted for public review in September 2012.

The MNDM supports municipal and private land use planning directly through the One-Window Planning Service led by the Ministry of Municipal Affairs and Housing (MMAH). When requested, the northeast Regional Land Use Geologist provides input into, and reviews, draft Official Plans, Official Plan Amendments, draft plans of subdivision and consent (severance) applications to ensure that Provincial mineral interests are appropriately considered in the planning process. MNDM input includes

- providing data with regard to mineral potential, mining claims and leases, exploration and mining activity and mining-related hazards to planning authorities, planning consultants and MMAH in support of new municipal Official Plans, Official Plan Amendments, Zoning By-laws, and Consents (lot severances);
- reviewing land use policies proposed in municipal planning documents and providing comments on those policies to MMAH "One-Window" planners for consolidation with feedback from other ministries; and
- supporting the development of municipal policies and guidelines, and working to enhance the availability of data to support wise planning decisions.

In 2012, the northeast Regional Land Use Geologist provided support for municipal planning by supplying background information in support of new Official Plan initiatives for the communities of James, Plummer, Plummer Additional, Coleman, Smooth Rock Falls, Charlton and Dack, Central Temiskaming, North Shore, Temiskaming Shores, Blind River, and Spanish. Site-specific information was also provided with regard to mineral potential, mineral occurrences and mining-related hazards in a number of municipalities. The Regional Land Use Geologist also reviewed and commented on the policies in 12 draft Official Plans, 4 Official Plan amendments and 8 Zoning Bylaw amendments. Four Consents (Severances) were also reviewed and commented upon during the year. Note that Consents are typically only reviewed for unorganized territory where the province has not delegated its approval authority to a municipality.

### Exemptions from Mining Tax

Section 189 (1) of the *Mining Act* now allows for owners of patented mining rights to apply for exemption from paying mining tax on the land. Key factors that are considered when applications are reviewed are whether or not the lands are being used for mining-related purposes, and whether or not there would be third party interest in using the lands for mining-related purposes (e.g., the surrounding lands are staked and being explored or the sites in question have provincially significant mineral potential). During 2012, 62 such applications were reviewed for the northeast. Comments were provided to MNDM's Mining Lands Section to be consolidated with other information for the Minister's consideration and decision.

## FIRST NATIONS

The northeast Regional Land Use Geologist provides information in support of First Nation interests in land use planning. In 2012, reviews of 2 applications for withdrawal and transfer of lands to First Nations were reviewed and recommended for approval. It is also anticipated that a broad range of geoscience input will be provided in 2013 and beyond with regard to Far North land use planning initiatives throughout northeastern Ontario.

## Other Activities

The northeast Regional Land Use Geologist also participated in other initiatives in 2012, as outlined below.

### CLASS ENVIRONMENTAL ASSESSMENTS

Class Environmental Assessments (Class EAs) are documents that set out streamlined environmental assessment processes. They apply to routine projects that have predictable and manageable environmental effects. There are currently 11 Class EAs in effect in Ontario with regard to initiatives including the development of new infrastructure such as dams, transmission lines, pipelines, highway corridors, commuter rail stations and bus terminals, and sewer and water facilities; the establishment of new parks and conservation reserves; forest management plans; and Crown land dispositions.

The northeast Regional Land Use Geologist provided input with regard to mineral potential, known mineral occurrences, mining land tenure, and mining-related hazards for 5 Class EA initiatives in northeastern Ontario in 2012. The Class EA initiatives reviewed include 2 proposed hydroelectric developments, a transmission line development, a blueberry farm, and an industrial park.

## FIRST NATIONS MINERALS INFORMATION OFFICER—NORTHEASTERN ONTARIO

The role of the First Nations Minerals Information Officer is to promote understanding and a co-operative working relationship between government, Aboriginal communities and mineral sector stakeholders in Ontario through the provision of outreach, information and training programs.

Information and training programs include technical information regarding the mining sequence, claim staking, basic prospecting, mineral exploration practices and techniques, and are delivered through information sessions, field trips and presentations at career and trades shows.

S.E. Halet joined the Ontario Geological Survey Resident Geologist Program in mid-April 2012 as First Nations Minerals Information Officer for Northeastern Ontario, based in Sudbury. S.E. Halet's activities in 2012, as First Nations Minerals Information Officer, are shown in Table 36.

**Table 36.** First Nations Minerals Information Officer activities in 2012.

| Community | Date | Activity |
|---|---|---|
| Attawapiskat First Nation | September 25–26 | Community and School Visit |
| Aundeck Omni Kanning First Nation | October 25–26 | Introduction to Prospecting Course |
| Constance Lake First Nation | October 3 | Short Introduction to MNDM Applications |
| Constance Lake First Nation | October 2–3 | Mining Awareness Session |
| Multiple Northeastern Ontario Communities | August 2 | Teaching Circle at Coniarum Reclamation Site in Timmins |
| M'Chigeeng First Nation | October 24 | Opportunities in Geosciences |
| Matachewan First Nation | August 21–13 | Career Fair Presentation |
| Mississauga First Nation | August 27–31 | Introduction to Prospecting Course |
| Nipissing First Nation | October 10–11, 17–18 | Introduction to Prospecting Course |
| Nipissing First Nation | September 10–11 | Mining Awareness Session |
| Sabaskong First Nation | November 6 | Mining Awareness Session |
| Temagami First Nation | November 13 | Mining Awareness Session |
| Union of Ontario Indians | October 16 | Aboriginal Service Canada Managers Mining Jobs Presentation in Sault Ste. Marie |

| Community | Date | Activity |
|---|---|---|
| Weenusk First Nation (Peawanuck) | September 19–20 | Community and School Visit |
| Whitefish Falls First Nation | September 12–13 | Mining Awareness Session |
| Wikwemikong First Nation | August 13 | Career Fair Presentation |

| Conference | Date | Location |
|---|---|---|
| Canadian Ecology Centre Mining Tour with Ontario Mining Association (CEC) | August 6-10 | Mattawa |
| Canadian Aboriginal Minerals Association Annual Conference (CAMA) | November 18–20 | Toronto |
| Mining Industry Human Resources Aboriginal Mining Education Forum (MIHR) | November 20–21 | Toronto |

# MINERAL DEPOSIT COMPILATION GEOLOGIST—NORTHEASTERN ONTARIO

The Mineral Deposit Compilation Geologists (MDCG) investigate and document mineral deposits and occurrences across the province. Through field visits, comprehensive literature research and personal research, they work with regional and district Resident Geologist Program staff to ensure that the Mineral Deposit Inventory (MDI) database is regularly updated. Regular updates are required to ensure that the Ministry of Northern Development and Mines is using the most up-to-date information in making land-use planning and policy decisions. A.C. Wilson is the northeastern Ontario MDCG.

In mid-2012, the Natural Resources and Values Information System or NRVIS platform that was used to enter new mineral deposit data was replaced with Land Information Ontario (LIO) Editor 4.0 as a centralized, ArcGIS®-based application. Although updates and additions were made to the mineral deposit database in 2012, no new MDI database could be released in 2012. A new data distribution tool is expected to be made available early in 2013. A list of records updated and created in 2012 for the entire province is available by contacting A.C.Wilson.

The most recent MDI database was released in December 2011. In addition to being made available through the MNDM website, the entire digital data set is available via the Ontario Geological Survey's publication services as "Mineral Deposit Inventory–2011". MDI data are searchable through the Ministry's GeologyOntario website and through OGS Earth.

Throughout the year, emphasis was placed on updating/correcting the reserve and resource figures for developed prospects with reserves and past producing mines with reserves, as well as prospects. Commodities of particular focus this year included graphite and rare earth elements. Geographic areas of focus included Temagami, Elliot Lake and the southern part of the Swayze greenstone belt. Mineral deposit records were also updated for 2 OGS mapping projects in the Timmins area and 1 OGS mapping project in southeastern Ontario.

Total contributions to the MDI database for northeastern and southern Ontario in 2012 included 508 updated records, 103 records deleted and 105 new records. A breakdown of the provincial records revised by office appears in Table 37.

**Table 37.** Mineral Deposit Inventory records revision in 2012.

| Resident or District Office | Updates | Deletions | New |
|---|---|---|---|
| Kirkland Lake | 109 | 21 | 25 |
| Sault Ste. Marie | 54 | 4 | 7 |
| Southeastern Ontario | 74 | 40 | 1 |
| Sudbury | 79 | 23 | 22 |
| Timmins | 192 | 15 | 50 |
| **Total** | 508 | 103 | 105 |

The MDI database is a dynamic compilation of over 19 000 records describing most of the known mineral occurrences in Ontario. It is an important reference tool for explorationists interested in exploring and acquiring mining properties in Ontario. When used in conjunction with other spatial databases generated by the Ontario Geological Survey, it provides additional tools for making mineral discoveries in Ontario.

## ACKNOWLEDGMENTS

Information on past activities reported in the text is from assessment files and other files of the Timmins Resident Geologist Office, unless otherwise noted. Information on current mining and exploration activities was provided by individual prospectors and exploration and mining company personnel, compiled from assessment files and obtained from public information sources, company web sites and SEDAR (System for Electronic Document Analysis and Retrieval).

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# Appendix

**Table 38.** Mineral deposits not being mined in the Timmins District in 2012.

**Abbreviations**

AF ..... Assessment File
CMH..... Canadian Mines Handbook
MDC..... Mineral Deposit Circular
OFR..... Open File Report
PEA ..... Preliminary Economic Assessment

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Alexo property Dundonald and Clergue Tp. MDI42A10NW00002 | Ni, Cu, Co | Open pit indicated: 18,000 t @1.36% Ni, 0.16%Cu, 0.06% Co, 0.41 g/t Pd Underground indicated: 6000 t @0.75% Ni, 0.10% Cu, 0.04% Co, 0.22 g/t Pd | Canadian Arrow Mines Limited | NI 43-101 Rpt 10/08/2012 | Past producer |
| Aquarius project Macklem Tp. MDI42A10SW00009 | Au | Indicated resource: 23,112,000 t @ 1.49 g/t Au Inferred resource: 502,000 t @ 0.83 g/t Au | St Andrew Goldfields Ltd. | Press release 20/11/2006 | Past producer 1984, 1988-89. |
| Augdome property Tisdale Tp. MDI42A06NE00086 | Au | Historical resource: 160 000 tons @ 0.10 oz/t Au | Augdome Corp. | CMH 1986-87 p.50 | Last active 1985 |
| Block A property West of Sunday Lake MDI32L04SW00012 | Au | Indicated resource estimate: 70,800,000 t grading 0.85 g/t Au (1,924,000 ounces); inferred resource estimate: 27,300,000 t @ 0.87 g/t Au (762,000 ounces) | Detour Gold Corporation | Trade Winds Ventures Inc. press release 30/12/2010 | Diamond drilling 2012 |
| Borden gold project Cochrane Tp. MDI000000000908 | Au | Indicated resource: 81,942,000 tonnes @ 1.0 oz/t Au (2,735,000 contained ounces); Inferred resource: 22,947,000 tonnes @ 0.93 oz/t Au (683,000 contained ounces) | Probe Mines Limited | NI 43-101 Rpt 16/05/2012 | Diamond drilling 2012. |
| Broulan Reef Mine (past producer) Whitney Tp. MDI42A11SE00021 | Au | Historical resource: 100 000 tons @ 0.22 oz/t Au | Temex Resources Corp. and Goldcorp Canada Inc. | CMH 1965 p.50 | Diamond drilling 2010-2012. Past producer 1915-1965. |
| Buffalo ankerite property (past producer) Deloro Tp. MDI42A06NW00011 MDI42A06NW00015 | Au, Ag | Indicated resource: 4,927,280 tons @ 0.108 oz/t Au (531,671 ounces); Inferred resource 3,864,641 tons @ 0.108 oz/t Au (417,032 ounces) | Lexam VG Gold Corp. | NI 43-101 Rpt 20/10/2012 | Past producer 1939-53. Diamond drilling 2012. |
| Carshaw property Shaw Tp. MDI42A06NE00016 | Au | 145,250 t @ 5.17 g/t Au (proven and probable) | Marshall Minerals Corp. | CMH 2001 | Inactive |

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Clay-Howells iron-REE project<br>Clay and Howells Tp.<br>MDI42G16SE00006 | Fe, REE | Inferred resource 8,477,000 tonnes @ 0.661% LREO, 0.071% HREO, 0.732% TREO, 44.15% $Fe_2O_3$, 0.13% $Nb_2O_5$%, 2.20 MnO% and 0.07% $ThO_2$% | Rare Earth Metals Inc. | NI 43-101 Rpt 26/09/2011 | Diamond drilling 2011 |
| Clavos project (past producer)<br>Stock and GermanTp.<br>MDI42A10SW00046 | Au | Indicated resource: 1,258,400 tonnes @4.81 g/t (194,600 ounces); Inferred resource 796,000 tonnes @ 4.7 g/t gold (120,000 ounces) | Sage Gold Inc. | NI 43-101 Rpt 12/10/2012 | Diamond drilling 2010-2012 |
| Côté Lake deposit<br>Chester Tp.<br>MDI41P12SW00036 | Au | Indicated resource: 269,000,000 tonnes @ 0.88 g/t gold (7,600,000 contained ounces); Inferred resource 44,000,000 tonnes @ 0.74 g/t gold (1,040,000 contained ounces) | IAMGOLD Corporation | IAMGOLD Corporation press release 22/01/2013 | Diamond drilling 2012 |
| Davidson-Tisdale (past producer)<br>Tisdale Tp.<br>MDI42A11SE00011 | Au | Mining resource estimate 374,110 t @ 6.84 g/t gold (82,282 ounces) | Lexam VG Gold Corp. | NI 43-101 Rpt October 2007 | Diamond drilling 2003-04 |
| De Santis Mine (past producer)<br>Ogden Tp.<br>MDI42A06NW00025 | Au | Albitite Zone: 72,212 tons @ 0.229 oz/t gold (probable non-NI 43-101 compliant); Hydrothermal Zone: 334,308 tons @ 0.19 oz/t gold (estimated non-NI 43-101 compliant) | Excellon Resources Inc. | Lateegra press release 08/02/2010 | Diamond drilling 2011-12 (11 037 m). |
| Detour Gold Gowest property<br>West of Sunday Lake area<br>MDI32L04SW00016 | Au | Indicated resource: 2,340,000 tonnes @1.16 g/t Au (87,400 ounces) Inferred resource: 4,040,000 tonnes @ 1.16 g/t Au (150,600 ounces) | Detour Gold Corporation | Trade Winds Ventures Inc. NI 43-101 Rpt 28/04/2009 | Inactive |
| Dundonald South deposit<br>Dundonald Tp.<br>MDI42A10NW00039 | Ni | Inferred Resource 116,000 tonnes @ 3.16% Ni (3658 tonnes Ni) | First Nickel Inc. | NI 43-101 Rpt 30/01/2009 | Inactive |
| Extender Minerals (past producer)<br>Penhorwood Tp.<br>MDI42B01SE00004 | Ba | Historic resource: 100,000 t @ 95% Ba | Extender Minerals of Canada Ltd. | AF | Inactive |
| Frankfield gold project<br>Tully Tp.<br>MDI42A11NE00007 | Au | Indicated resource: 6,016,544 tonnes @ 4.88 g/t Au (945,342 ounces) Inferred resource: 3,692,871 tonnes @ 4.22 g/t Au (536,773 ounces) | Gowest Gold Ltd. | NI 43-101 Rpt 15/11/2012 | Diamond drilling 2010 |

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Fuller deposit<br>Tisdale Tp.<br>MDI42A06NW00030 | Au | Indicated resource 1,475,389 tons @ 0.16 oz/t gold (236,245 ounces) | Lexam VG Gold Corp. | NI 43-101 Rpt 31/08/2007 | Diamond drilling 2012 |
| Gold River East property<br>Thorneloe Tp.<br>MDI42A05NE00121 | Au | Indicated resource: 597,000 tonnes @ 5.42 g/t Au (104,100 ounces)<br>Inferred resource: 4,317,000 tonnes @ 6.39 g/t Au ( 887,300 ounces) | Lake Shore Gold Corp. | NI 43-101 Rpt 05/04/2012 | Diamond drilling 2012 |
| Gold River West property<br>Thorneloe Tp.<br>MDI42A05SE00065 | Au | Indicated resource: 93,000 tonnes @ 4.44 g/t Au (13,300 ounces)<br>Inferred resource: 955,000 tonnes @ 4.57 g/t Au (140,500 ounces) | Lake Shore Gold Corp. | NI 43-101 Rpt 05/04/2012 | Diamond drilling 2012 |
| Goose Lake iron prospect<br>Shaw Tp.<br>MDI42A06NE00038 | Fe | 100,000,000 tonnes @ 68.8% Fe | N. A. | AF | Inactive. |
| Hart prospect<br>Eldorado Tp.<br>MDI42A06SE00065 | Ni, Cu | Total Indicated resource: 1,546,000 t @1.40% Ni, 0.10% Cu (47,779,000 lb Ni); Total inferred resource: 322,000 t @ 1.27% Ni, 0.08% Cu (899,000 lb Ni) | Liberty Mines Inc. | Liberty Mines Inc. PEA 02/10/2012 | Diamond drilling 2012 |
| Hawke Zone<br>Collins Tp.<br>MDI42B03SE00005 | $Nb_2O_5$ | 8,925,000 tons to 500 ft. @ 0.52% $Nb_2O_5$ | Sarissa Resources Inc. | AF | Diamond drilling 2009-10 |
| James Bay niobium project (Argor Carbonatite)<br>Centre Pt of South Bluff Creek<br>MDI42I15SE00004 | $Nb_2O_5$ | 63 MT @ 0.52% $Nb_2O_5$ | NA | OGS Study 41 | Last active 1969 |
| Kabinakagami Lake OccurrenceLizar Township<br>MDI42C16NW00004 | Fe | 10,100,000 tonnes @ 66.5% Fe | Crown Land | MDC011 | Staked 2012 |
| Jerome Mine (past producer )<br>Osway Tp<br>MDI41O09SE00005 | Au | Inferred Resource: 18,737,000 tonnes @1.7 g/t gold (1,030,000 ounces); | IAMGOLD Corporation | Augen Gold Corp. NI 43-101 Rpt 18/07/2011 | Diamond drilling 2010 |

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Kelex property<br>Clergue Tp.<br>MDI42A10NW00044 | Ni, Cu, Co | Open pit indicated: 131,000 t @1.1% Ni, 0.04%Cu, 0.04% Co, 0.06 g/t Pd<br>Underground indicated: 90,000 t @1.00% Ni, 0.04% Cu, 0.04% Co, 0.07 g/t Pd<br>Underground inferred: 54,000 t @ 0.84% Ni, 0.04% Cu, 0.03% Co, 0.03 g/t Pd | Canadian Arrow Mines Limited | NI 43-101 Rpt 10/08/2012 | Past producer. Dewatering, stripping 2012 |
| Kenilworth (Naybob) Mine<br>Ogden Tp.<br>MDI42A06NW00022 | Au | North Zone unclassified: 138,900 tons in 13 areas grades up to 0.25 oz/t Au; South Zone unclassified: 600,000 tons @ 0.23 oz/t Au | Goldcorp Canada Inc. and Metals Creek Resources JV | AF | Diamond drilling 2011 |
| Kenty Mine<br>Swayze Tp.<br>MDI41O15SE00029 | Au | Historic resource: #9 vein has possible resource of 43,3000 tonnes @ 4.7 g/t Au | NA | AF | Inactive |
| Kidd #3 Zone<br>Chester Tp.<br>MDI41P12SW00122 | Au | Historic resource: 408,000 tonnes @ 9.9 g/t Au | IAMGOLD Corporation | OFR5912 | Inactive |
| Kipling Kaolin<br>Kipling Tp.<br>MDI42J01NE00005 | kaolin, silica sand, ball clay | Historic resource: 30,000,000 tonnes | NA | OFR5918 | Sampling 2009 |
| Langmuir No. 1 deposit<br>Langmuir Tp.<br>MDI42A06SE00095 | Ni, Cu | Indicated resource 1,733,000 t @ 0.51% Ni | Inspiration Mining Corporation | NI 43-101 Rpt 06/01/2010 | Past producer |
| Langmuir #2 North deposit<br>Langmuir Tp.<br>MDI42A06SE00006 | Ni, Cu | Indicated resource: 8,324,000 t @0.40% Ni | Inspiration Mining Corporation | NI 43-101 Rpt 06/01/2010 | Past producer |
| Langmuir W4 project<br>Langmuir Tp.<br>MDI42A06SE00099 | Ni, Cu | Indicated resource 677,000t @ 1.00% Ni, 0.06% Cu<br>Inferred resource 171,000t @ 0.89% Ni, 0.06% Cu (combined open pit and underground) | Rogue Iron Ore Corp. | NI 43-101 Rpt 29/06/2010 | Diamond drilling 2007-08 |
| Loveland property<br>Loveland Tp.<br>MDI42A12NE00028 | Cu, Ni, PGE | Cominco Zone: 130,000 tons @0.68% Ni, 0.73% Cu (historic resource)<br>Hollinger Zone: 422,000 tons @ 0.71% Ni, 0.42% Cu (historic resource) | Amador Gold Corp. | Amador Gold Corp. website 19/01/2011 | Diamond drilling 2010 |
| Lucas prospect<br>Lucas Tp.<br>MDI42A14SE00005 | Au | 136,077 tonnes @ 3.4 g/t (drill indicated) | Noble Mineral Exploration Inc. | AF | Diamond drilling 2012 |

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Marlhill Mine<br>Hoyle Tp.<br>MDI42A11SE00007 | Au | M1 Vein Indicated resource 395,000 tonnes @ 4.52 g/t Au (57,400 contained ounces) | Lake Shore Gold Corp. | NI 43-101 Rpt 01/03/2011 | Diamond drilling 2010 |
| Martison Lake deposit<br>South of Ridge Lake<br>MDI42J06SW00004 | phosphate, REE | Measured and indicated resources (Anomaly A) 62,300,000 t @ 23.55% $P_2O_5$, 0.34% $Nb_2O_5$ Inferred resource: 55,700,000 t @ 21.87% $P_2O_5$, 0.34% $Nb_2O_5$ | PhosCan Chemical Corp. | NI 43-101 Rpt 16/05/2008 | Reverse circulation drilling 2012 |
| Multi Minerals zones 3 and 4<br>McNaught Tp.<br>MDI41O14SE00024 | phosphate, niobium | Historic resource: 37,000,000 @ 0.17% $Nb_2O_5$ and 21.3% apatite | 6378366 Canada Inc., 6070205 Canada Inc. | OGS Study 32 | Sampling 2010 |
| Multi Minerals Zone 6<br>McNaught Tp.<br>MDI41O14SE00011 | iron, phosphate, niobium | Historic resource: 4,557,000 tonnes @ 69.9% magnetite, 21.88% apatite, 0.12% Nb | 6378366 Canada Inc., 6070205 Canada Inc. | OGS Study 32 | Sampling 2010 |
| Murgold-Chesbar property<br>(Chester 1 property)<br>Chester Tp.<br>MDI41P12SW00073 | Au | Historic measured resource: 144,500 tonnes grading 14.7 g/t Au | IAMGOLD Corporation | Northville Gold Corporation Report 089/06/2002 | Bulk sampling 2010 |
| Nighthawk Mine<br>Cody Tp.<br>MDI42A10SW00059 | Au | Historic resource: 91729 tonnes @ 6.06 og/t Au | Goldcorp Canada Inc. | OFR6006 | Past producer. Inactive. |
| North Rundle property<br>Newton Tp.<br>MDI41O16NW00002 | Au | Historic possible resource: 16,830 tonnes @ 7.1 g/t Au | Claude Rundle Gold Mines Inc. | NI 43-101 Rpt 01/03/2011 | Inactive |
| Onakawana lignite<br>Dyer Tp.<br>MDI42I11SW00002 | lignite | 21 MT @ 5246 BTU | Onakawana Development Ltd. | OFR5111 | Inactive |
| Orofino Mine<br>Silk and Horwood Tp.<br>MDI41O16NW00020 | Au | Measured and indicated: 322,000 t @7.02 g/t Au; Inferred: 423,000 t @ 5.46 g/t Au | Claude Rundle Gold Mines Inc. | NI 43-101 Rpt 01/03/2011 | Inactive |
| Owl Creek East<br>Hoyle Tp.<br>MDI42A11SE00006 | Au | Historic assay resource: 3,019,685 t @ 7.17 g/t Au | Goldcorp Canada Ltd. | OFR5985 | Inactive |
| Owl Creek (West)<br>Hoyle Tp.<br>MDI42A11SE00006 | Au | Historic assay resource: 5,709,954 t @ 2.31 g/t Au (above 200m); 821,000 t @ 9.79 g/t Au (below 200m) | Goldcorp Canada Ltd. | OFR5985 | Inactive |
| Paymaster property<br>Tisdale Tp.<br>MDI42A06NW00002 | Au | Indicated resource: 3,231,553.7 t @1.82 g/t Au; Inferred resource: 2,786,498.7 @1.72 g/t Au | Lexam VG Gold Corp. | NI 43-101 Rpt. 10/01/2011 | Diamond drilling 2010 |

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Porcupine West property Bristol and Ogden Tp. MDI42A06NW00200 | Au | Indicated resource: 770,465 tonnes @ 5.13 g/t gold (126,977 ounces) Inferred resource 5,522,684 tonnes @ 3.97 g/t gold (704,198 ounces) | Explor Resources Inc. | NI 43-101 Rpt 12/01/2012 | Diamond drilling 2012 |
| Radio Hill iron property Penhorwood Tp. MDI42B01NE00026 | Fe | Historic reserve: 90,245,000 long tons @ 27.30% Mag Fe | Rogue Iron Ore Corp. | NI 43-101 Rpt. 30/04/2010 | Diamond drilling and metallurgical testing 2012 |
| Rundle Mine Newton Tp. MDI41O16SW00003 | Au | Measured and indicated: 349,000 tonnes @ 7.88 g/t Au; Inferred resource: 267,000 tonnes @ 6.68 g/t Au | Claude Rundle Gold Mines Inc. | NI 43-101 Rpt. 01/03/2011 | Inactive |
| Sangold property Keith Tp. MDI42B01NE00012 | Au | 125,000 tons @ 0.25 oz/t Au (historic resource) | Goldcorp Canada Ltd. | CMH 2001 | Diamond drilling 2005 |
| Shawmere Anorthosite Warren Tp. MDI42B02NW00001 | anorthosite | 858,504 tonnes @ 30.92 st% Al (drill indicated) | Avalon Rare Metals Inc. | AF | Permitted 2012 |
| Shunsby property Cunningham Tp. MDI41O10NE00056 | Cu, Pb, Zn | Total mineral inventory 4,000,000 tons @ 0.59% Cu and 2.56% Zn | Hage Corporate Services Inc. | AF | Inactive |
| Sothman property Sothman Tp. MDI41P14SE00005 | Ni | 317,515 tonnes @ 0.89% Ni (0.5% cutoff) | Xstrata Canada Corporation | Liberty press release 22/05/2008 | Inactive |
| Sugar Zone Hambleton and Odlum Townships MDI42C14SE00005 | Au | Indicated resource: 1,117,000 tonnes @ 8.41 g/t Au Inferred resource: 417,000 tonnes @7.13 g/t Au | Harte Gold Corp | NI 43-101 Rpt. 12/07/2012 | Diamond drilling 2012 |
| Texmont deposit Bartlett Tp. MDI42A03NE00002 | Ni | Historic resource: 3,800,000 tons @ 1% Ni to a depth of 488m | Fletcher Nickel Inc. | OGS Study 20 | Inactive |
| Timmins talc-magnesite deposit Adams, Deloro Tp. MDI42A06SW00024 | magnesite, talc | A Zone Core: Indicated resource 12,728,000 t @52.1% magnesite, 35.04% talc; Inferred resource 18,778,000 t @ 53.1% magnesite, 31.7% talc; A Zone Fringe: Indicated resource 5,003,000 tonnes @ 34.2% magnesite, 33.4% talc | Globex Mining Enterprises Inc. | NI 43-101 Rpt 16/04/2012 | Diamond drilling 2013 |
| Thunderwood JV Hoyle Tp. MDI42A11SE00113 | Au | 327,230 tonnes @ 7.14 g/t (assay) | Goldcorp Canada Inc. | OFR5985 | |

| Deposit Name/ Township | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Tully Gold property<br>Tully Tp.<br>MDI42A11NE00034 | Au | Indicated resource to 350m 362,090 t @8.0 g/t gold (93,140 ounces)<br>Total inferred resource 592,070 t @ 7.3 g/t gold (139,880 ounces) | San Gold Corporation and SGX Resources Inc. | NI 43-101 Rpt 19/10/2010 | Diamond drilling 2010 |
| Upper Hallnor deposit<br>Whitney Tp.<br>MDI42A11SE00019 | Au | Indicated resource: 8,758,000 tonnes @ 1.97g/t Au (555,900 ounces);<br>Inferred resource: 4,115,000 tonnes @ 1.82 g/t Au (241,000 ounces);<br>Measured resource: 2,982,000 tonnes @ 2.44 g/t Au (234,300 ounces) | Temex Resources Corp. and Goldcorp Canada Inc. | NI 43-101 Rpt. 05/09/2012 | Diamond drilling 2005-2012 |
| Vogel-Schumacher property<br>Hoyle Tp.<br>MDI42A11SE00124 | Au | Indicated resource: 2,219,000 tonnes @ 1.75 g/t Au (125,000 contained ounces); Inferred resource: 1,459,000 tonnes @ 3.6 g/t Au (168,800 contained ounces) | Lake Shore Gold Corp. | NI 43-101 Rpt. 14/06/2011 | Diamond drilling 2010 |
| Whitney talc-magnesite deposit<br>Whitney Tp.<br>MDI000000000349<br>MDI42A06NE00020 | magnesite, talc | 36.8 MT (est.) North and South Zones | General Magnesium Corp. | OGS Study 28 | Diamond drilling 2009 |
| Young-Shannon property (Chester 2)<br>Chester Tp.<br>MDI41P12SW00058 | Au | Historic indicated resource 220,000 tons @ 0.354 oz/t Au; historic inferred resource 725,000 tons @0.16 oz/t Au | IAMGOLD Corporation | NorthvilleGold Corporation Qualifying report 08/06/2002 | Diamond drilling in 2010 |

Ontario

# Ontario Geological Survey
# Regional Resident Geologist Program

## Timmins Regional Resident Geologist
## (Sault Ste. Marie District)—2012

**by**

**A. Pace and R. McMillan**

**2013**

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# Timmins Regional Resident Geologist (Sault Ste. Marie District)—2012

**A. Pace[1] and R. McMillan[2]**

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## INTRODUCTION

Mineral production from the Sault Ste. Marie District during 2012 consisted of gold production from 3 producing gold mines and bedrock aggregate extraction from several established quarries. A total of 39 individuals and companies are known to have performed mineral exploration and prospecting in the district during the year. Gold, base metals, uranium and rare earth metals were the major metal commodities targeted by exploration. Details on exploration activity can be found in the following text and by reference to Table 6. A district boundary change took effect in May 2012, which transferred the Wawa district area from the Timmins District to the Sault Ste. Marie District. All activities for the Wawa area district are now reported to the Sault Ste. Marie District Geologist District (Figure 1).

## MINING ACTIVITY

Mine production in the Sault Ste. Marie District came from 3 gold mines in 2012. Production statistics and brief descriptions of the individual mining operations are presented below and historical gold production for Wawa is presented in Table 4. Mineral deposits not being mined in the Sault Ste. Marie District are presented in Tables 20 and 21.

### Wesdome Gold Mines Ltd. – Eagle River Mine

The Eagle River Mine is located approximately 7 km north of the north shore of Lake Superior and 50 km west of the town of Wawa, in the Mishibishu Lake greenstone belt, and has been in production since 1995.

Gold production for the year ending 2012 amounted to 31 600 ounces of gold from 155 000 tonnes milled, at an average recovered grade of 6.35 g/t gold (press release, Wesdome Gold Mines Inc., January 1, 2013). Ore reserves at Eagle River Mine are shown in Table 1. Current and past production from the Eagle River Mine are shown in Table 3.

At Eagle River, development grades in the 811 Zone are improving at depth. Chip samples from the deepest level to date (705 m) averaged 15.82 g/t gold and muck samples averaged 11.23 g/t gold. The company expects to develop down to 741 m. Preliminary drilling results from 4 holes have encountered strong mineralization extending 200 m below current reserves limits. The high grade 811 Zone has now been traced from surface to a depth of 1000 m (press release, Wesdome Gold Mines Inc., August 7, 2012).

**Table 1.** Eagle River Mine ore reserves, 2012.

| Category | Tonnes | Grade (g/t Au) | Contained Ounces |
|---|---|---|---|
| Proven | 108 000 | 10.00 | 35 000 |
| Probable | 327 000 | 10.00 | 105 000 |
| Total | 435 000 | 10.00 | 140 000 |

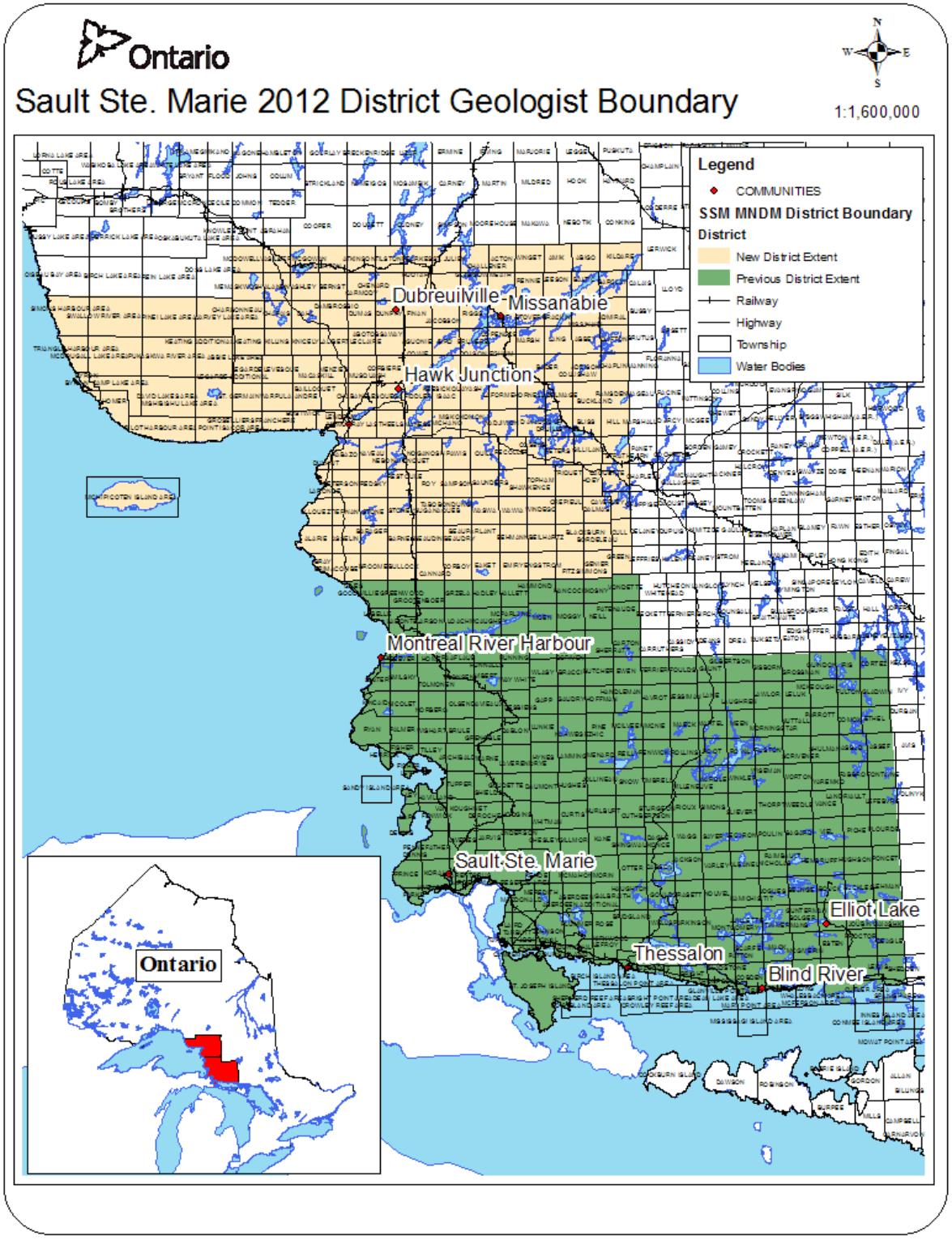


**Figure 1.** Sault Ste. Marie District Geologist District, showing previous extent (green) of the District, and the newly added Wawa district area (yellow).

## Wesdome Gold Mines Ltd. – Mishi Pit

The Mishi Mine began commercial production on January 1, 2012, and is situated 2 km from the Eagle River Mill. Ore reserves are shown in Table 2. It has measured and indicated resources of 5.7 million tonnes at 2.4 g/t gold or 438 000 oz. The Mishi's first mill run returned an average recovered grade of 2.3 g/t gold and recoveries averaging 93%. Gold production for the year ending 2012 amounted to 5300 ounces of gold from 67 200 tonnes at an average recovered grade of 2.47 g/t gold (*see* Table 3). The current reserve is 58 000 ounces with a 5 year mine plan and expansion potential (press release, Wesdome Gold Mines Inc., January 1, 2013).

**Table 2.** Mishi Mine ore reserves, 2012.

| Category | Tonnes | Grade (g/t Au) | Contained Ounces |
|---|---|---|---|
| Proven | 150 000 | 1.9 | 9 000 |
| Probable | 950 000 | 2.3 | 70 000 |
| Total | 1 1 00 000 | 2.2 | 79 000 |

**Table 3.** Combined historical and current gold production from the Wesdome Gold Mines Ltd. – Wawa operations.

| Mine | Year | Tonnes Milled | Recovered Grade (g/t gold) | Ounces |
|---|---|---|---|---|
| **Eagle River** | | | | |
| | 1990 | 60 857 | 4.93 | 9946 |
| | 1995 | 28 571 | 10.56 | 9700 |
| | 1996 | 162 075 | 12.38 | 64 523 |
| | 1997 | 156 294 | 8.97 | 45 070 |
| | 1998 | 199 464 | 11.79 | 75 629 |
| | 1999 | 163 156 | 9.1 | 47 749 |
| | 2000 | 229 262 | 7.03 | 51 843 |
| | 2001 | 246 012 | 8.6 | 68 074 |
| | 2002 | 281 603 | 8.17 | 73 938 |
| | 2003 | 241 926 | 9.1 | 70 781 |
| | 2004 | 246 012 | 8.34 | 65 977 |
| | 2005 | 198 217 | 8.33 | 53 062 |
| | 2006 | 135 100 | 10.05 | 43 669 |
| | 2007 | 76 676 | 13.07 | 32 299 |
| | 2008 | 118 961 | 12.98 | 49 660 |
| | 2009 | 132 004 | 14.32 | 60 753 |
| | 2010 | 155 554 | 7.34 | 36712 |
| | 2011 | 178 786 | 5.27 | 28 200 |
| | 2012 | 155 000 | 6.35 | 31 600 |
| | Total | 3 168 530 | 9.3 | 918 345 |
| **Edwards** | | | | |
| | 1997–2002 | 389 550 | 11.15 | 139 692 |
| **Mishi** | | | | |
| | 2002 | 20 000 | 4.41 | 2838 |
| | 2003 | 28 090 | 3.61 | 3256 |
| | 2004 | 43 947 | 3.6 | 5086 |
| | 2007 | 43 458 | 3.14 | 4382 |
| | 2012 | 67 200 | 2.47 | 5300 |
| | Total | 202 695 | 3.44 | 20 862 |
| | Combined Total | 3 423 624 | 8.0 | 1 051 239 |

**Table 4.** Gold production in the Wawa area to the end of 2012.

| Mine | Township | Years of Production | Tons Milled | Production (oz. gold) | Grade (oz./ton) |
|---|---|---|---|---|---|
| Alden–Goudreau | Cowie | 1937, 1940, 1943, 1945 | 13 479 | 3220 | 0.24 |
| Centennial | Naveau | 1939–1940 | 8612 | 610 | 0.07 |
| Cline | Jacobson | 1938–1940, 1947–1948 | 331 842 | 63 328 | 0.19 |
| Darwin/Grace | McMurray | 1902–1903, 1907–1908, 1910, 1923, 1925, 1930, 1935, 1937, 1940, 1943–1944 | 45 528 | 15 191 | 0.33 |
| Deep Lake | McMurray | 1936–1938, 1943 | 2790 | 1633 | 0.59 |
| Eagle River | Point Isacor | 1995–2012 | 3 061 367 | 876 201 | 0.286 |
| Edwards | Jacobson | 1938<br>1997–2002 | 1537<br>389 550 | 485<br>139 692 | 0.32<br>0.327 |
| Holdsworth prospect | Corbiere | 1933 | 60 | 10 | 0.17 |
| Island Gold | Finan | 2006–2012 | 1 088 403 | 209 544 | 0.192 |
| Kremzar | Finan | 1988–1990 | 392 858 | 37 678 | 0.10 |
| Magino/Algoma Summit | Finan | 1930–1940, 1988–1992 | >768 679 | 113 228 | 0.15 |
| Magnacon | Mishibishu Lake | 1989–1990 | 165 000 | 15 356 | 0.09 |
| Minto (includes Jubilee and Cooper) | McMurray | 1929–1942 | 184 600 | 37 678 | 0.20 |
| Mishi | Mishibishu Lake | 2002–2007, 2012 | 140 056 | 15 169 | 0.108 |
| Murphy/Algold/Amherst | Abotossaway | 1926–1932, 1936–1938, 1940 | 23 211 | 2450 | 0.10 |
| Norwalk/Manxman | Naveau | 1904, 1910 | 820 | 60 | 0.07 |
| Parkhill | McMurray | 1902, 1929, 1930–1938, 1940–1944 | 125 778 | 54 301 | 0.43 |
| Ranson | Rabazo | 1939 | 774 | 156 | 0.20 |
| Renabie | Leeson | 1947–1970, 1981–1991 | 5 583 895 | 1 100 000 | 0.20 |
| Smith/Van Sickle | McMurray | 1935–1936 | 9228 | 536 | 0.06 |
| Stanley | McMurray | 1936 | 1963 | 84 | 0.04 |
| Surluga | McMurray | 1968–1969, 1988–1989 | 87 460 | 8898 | 0.10 |
| | | **Total** | **12 427 490** | **2 695 508** | **0.217** |

## Richmont Mines Ltd. – Island Gold Mine

The Island Gold Mine property is located in Finan Township, 80 km northeast of Wawa and 10 km southeast of Dubreuilville. Ore reserves at Island Gold Mine are shown in Table 5. Ore from the Island Gold Mine is processed at Richmont's on-site Kremzar Mill, an 850-tonne-per-day-rated mill. Since Island Gold began commercial production in October 2007. Richmont has produced more than 225 000 ounces of gold from this mine. Underground operations are accessed via a ramp, and the mine's infrastructure currently reaches a vertical depth of approximately 400 m. As of June 30, 2012, the Island Gold Mine had a total of 181 employees.

Gold production for the year ending 2012 was 41 686 ounces of gold from 246 743 tonnes milled at an average recovered grade of 5.45 g/t gold (Richmont Gold Mines Ltd., press release, February 23, 2013).

The company reported lower tonnage levels during its first quarter of 2012. This was a result of a 1 week shut down caused by mechanical issues with the primary ball mill as well as development of newly identified reserve blocks that resulted in lower availability of mining areas. They have focused on accessing these new reserve blocks using a longitudinal retreat method.

**Table 5.** Island Gold Mine ore reserves, 2012.

| Category | Tonnes | Grade (g/t Au) |
|---|---|---|
| Proven and Probable | 785 221 | 5.50 |
| Measured and Indicated | 502 910 | 6.26 |
| Inferred Resources | 279 569 | 6.20 |

The company has conducted a series of surface and underground diamond-drilling programs totalling approximately 35 000 m at the Island Gold Mine. A total of 23 030 m of deep exploration drilling has been completed in 2012. Four zones (G, C, D and E1E zones) have been identified below the current mine infrastructure. The C Zone has been identified as the most continuous of the 4 zones and it appears to be a continuation at depth of the zone currently being mined at Island Gold (Richmont Gold Mines Ltd., press release, September 10, 2012).

# QUARRYING ACTIVITY

Stone and aggregate production continued from a number of quarries within the Sault Ste. Marie District. The production of aggregate material consists primarily of sand and gravel for use in concrete and asphalt. The products derived from these aggregate resources are used for the construction industry. Trap rock and decorative stone were also extracted. Production and a brief description from the 2 main quarrying operations in the Sault Ste. Marie District are presented below.

## Ontario Trap Rock

Ontario Trap Rock (a division of R.W. Tomlinson Ltd.) continued quarrying crushed bedrock aggregate from Nipissing gabbro at their operation located 3 km east of the town of Bruce Mines in Plummer Additional Township.

The company produces approximately 800 000 to 1 000 000 tonnes of high-quality aggregate from this facility yearly. The main product produced from the trap rock operation is high quality aggregate used for rail ballast, asphalt and road construction in Canada and the United States.

The operating season begins in March and normally ends in November, with 27 to 30 people employed fulltime, with many of the employees hired from the Lake Huron area. About 90% of the aggregate product is transported by ship from Ontario Trap Rock's deep-water port on Lake Huron, with the remaining product transported by rail and truck.

There are 7 sizes of product that are crushed at the trap rock operation. These include, in inches, 5, 2.5, 1, 5/8, 3/8, ¼ and sand or silt.

Tandem trucks are loaded with product and driven to the deep water port located on Lake Huron. Product falls through a gate and into an underground cement container which is able to dispense product onto a conveyor that automatically loads the lake freighters when they arrive.

## Palmer Aggregates Quarry

Since 1965, Palmer Construction Group Inc. has been serving the construction industry in Sault Ste. Marie and the surrounding area, and is owned and operated by Terry Rainone. The company currently produces 250 000 tons/year in aggregate for concrete and asphalt manufacture for its own operations and to 3 local concrete operators.

Geologically the property is located along the south side of the Gros Cap batholith within the northern city limits. The sand and gravel deposits in this area are Quaternary sediments that resulted from the most recent Wisconsinan glaciation and were deposited on bedrock of Jacobsville Formation sandstone. Like Palmer Aggregates, many of the other aggregate operations situated along the northern limits of the city are located along the south face of the Gros Cap batholith, where the greatest sand and gravel potential exists.

# EXPLORATION ACTIVITY

A summary of exploration activity in the Sault Ste. Marie District is reported in Table 6. Locations for the activities are shown on Figures 2 and 3.

**Table 6.** Exploration activity in the Sault Ste. Marie District in 2012, keyed to Figures 2 and 3.

**Abbreviations**

AEM ..... Airborne electromagnetic survey
AMAG ..... Airborne magnetic survey
AirGeo ..... Airborne geophysical survey
ARAD ..... Airborne radiometric survey
DD ..... Diamond drilling
GC ..... Geochemical survey
GL ..... Geological survey
GGrav ..... Ground gravity survey
IP ..... Induced polarization survey
MAG ..... Ground magnetic survey
Met ..... Metallurgical testing
Pr ..... Prospecting
Rcalc ..... Resource calculation
RS ..... Radiometric survey
Samp ..... Sampling (other than bulk)
Tr ..... Trenching
UG ..... Underground exploration/development

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 1 | Anconia Resources Ltd. (North Searchmont project) | Gapp (Cu, Au) | Samp, Pr |
| 2 | Appia Energy Corp. | Bouck, Beange | DD |
| 3 | Argentium Resources Inc. (Sill Lake property) | Vankoughnet (Pb, Ag, Cu, Au) | Assaying, data compilation |
| 4 | Boxxer Gold Corp. | Nicolet (Cu, Ag, Au) | DD, AEM, AMAG |
| 5 | China Metallurgical Exploration Corp. | Palmer (Cu, Au) | IP, GC |
| 6 | China Metallurgical Exploration Corp. | Montgomery, Palmer (Cu, Au) | IP, GC, DD |
| 7 | Conquest Resources Ltd. (Smith Lake project) | Leeson (Au) | DD-15-1759 m, IP |
| 8 | Cyr, Daniel (DAC property) | Jacobson (Au) | Pr, Samp |
| 9 | Darien Resources Inc. | Long (trap rock) | Tr, DD |
| 10 | Five Nines Ventures Ltd. | Gaiashk (U, REE) | DD, Rcalc |
| 11 | Gagne, Yvon | Montgomery, Nouvel (Cu) | Tr |
| 12 | Giyani Gold Corp. (Abbie Lake – Keating property) | Abbie Lake area, Keating, Keating Additional Townships (Au) | AMAG, AEM, DD-12, IP, GL, MAG, Pr, Tr |
| 13 | Gold Insight Resources | Galbraith (trap rock) | DD |
| 14 | GoldTrain Resources Inc. (Orphan claim) | Leeson, Brackin (Au) | Assays, Pr, Samp |
| 15 | GoldTrain Resources Inc. (Missinabie project) | Leeson, Brackin (Au) | Assays, DD-10-1907 m, |
| 16 | Hudson River Minerals Ltd. (Forge Lake property) | Cowie (Au) | Assays, DD-12-1200 m |
| 17 | International Montoro Resources Inc. (Serpent River property) | Joubin (U, REE) | AEM, Mag |
| 18 | Lakeland Resources Inc. (Ballard Lake property) | Bruyere (Au) | Pr, Samp |
| 19 | Lakeland Resources Inc. (Kam property) | Kamichisitit (Cu) | DD, Samp |
| 20 | Lakeland Resources Inc. (Midas Gold property) | Bruyere (Au) | Assays, Pr, Samp |

| No. | Company/Individual (Occurrence Name or Property) | Township/Area (Commodity) | Exploration Activity* |
|---|---|---|---|
| 21 | O'Connor, Thomas | Ryan, Kincaid (Daisystone, Cu, Au) | Samp, Tr |
| 22 | Pele Mountain Resources (Eco Ridge project) | Joubin, Gunterman (Au, U, REE) | Pr, DD, Rcalc, Met |
| 23 | Pelky, Robert | Lewis (Cu) | Pr |
| 24 | Argonaut Gold Inc. (Magino property) | Finan (Au) | Assays, DD-37, 224 m, Rcalc |
| 25 | Ralph, Jim (JR Lamprophyres) | Jessiman (diamonds) | Pr |
| 26 | Ralph, Jim (JR Uranium) | Maeck (U, REE) | Pr |
| 27 | Rastel, James | Rebazo (diamonds) | Pr, Samp |
| 28 | Reliant Gold Corp. (Esten property) | Esten (Cu) | Samp, GC |
| 29 | Richmont Mines Inc. Island Gold Mine | Jacobson (Au) | Assays, DD-35 000 m (surface and UG) |
| 30 | Richmont Mining Inc. (Ego property) | Abotossaway (Au) | Assays, DD-1-420 m |
| 31 | Robert, Leo | McMurray, Lastheels (REE) | Pr, RS |
| 32 | Skead Holdings Ltd. | Hughes (U, Th) | Samp |
| 33 | Strike Minerals Inc. (Clement property) | Jacobson (Au) | Assays, GL, Pr, Samp |
| 34 | Strike Minerals Inc. (Edwards Mine project) | Jacobson (Au) | DD-7, UG development, Samp |
| 35 | Superior Copper Corp. (Batchawana Copper property) | Kincaid, Ryan (Cu, Ag, Au) | DD, GGrav, AMAG, IP, Samp |
| 36 | Superior Copper Corp. (Glenrock property) | Palmer (Au, Cu) | Samp |
| 37 | Upper Canada Explorations Ltd (Rockstar property) | Riggs (Au) | GL, Str |
| 38 | Wesdome Gold Mines Ltd. (Mishi Pit) | Mishibishu Lake area (Au) | DD, Mine Development |
| 39 | Wesdome Gold Mines Ltd., (Eagle River Mine, 811 Zone) | Mishibishu Lake area (Au) | UG DD |

**DD-8-2196 m = 8 diamond-drill holes totalling 2196 m.*

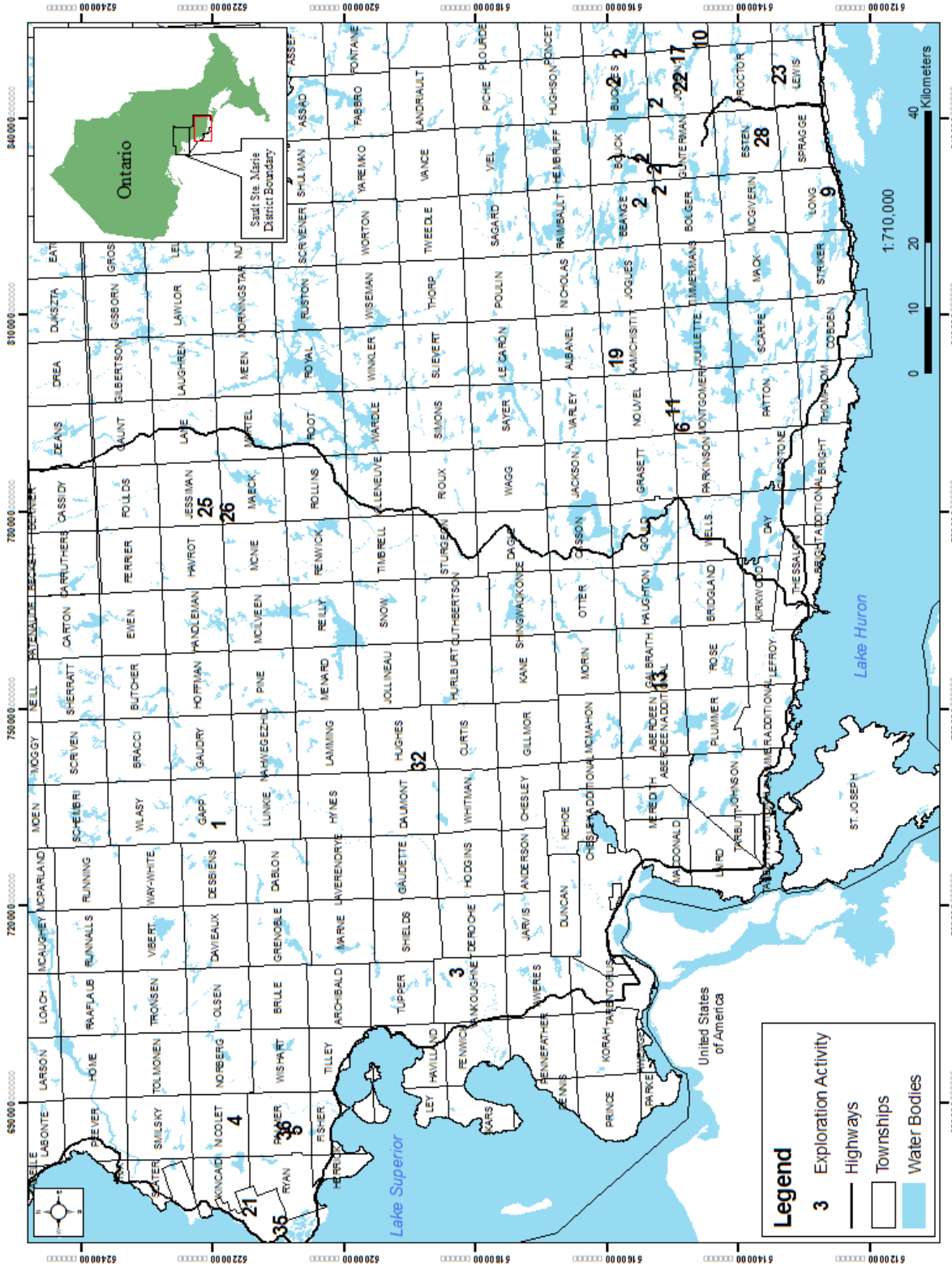


**Figure 2.** Exploration activity in the southern part of the Sault Ste. Marie District, 2012 (numbers keyed to Table 6).

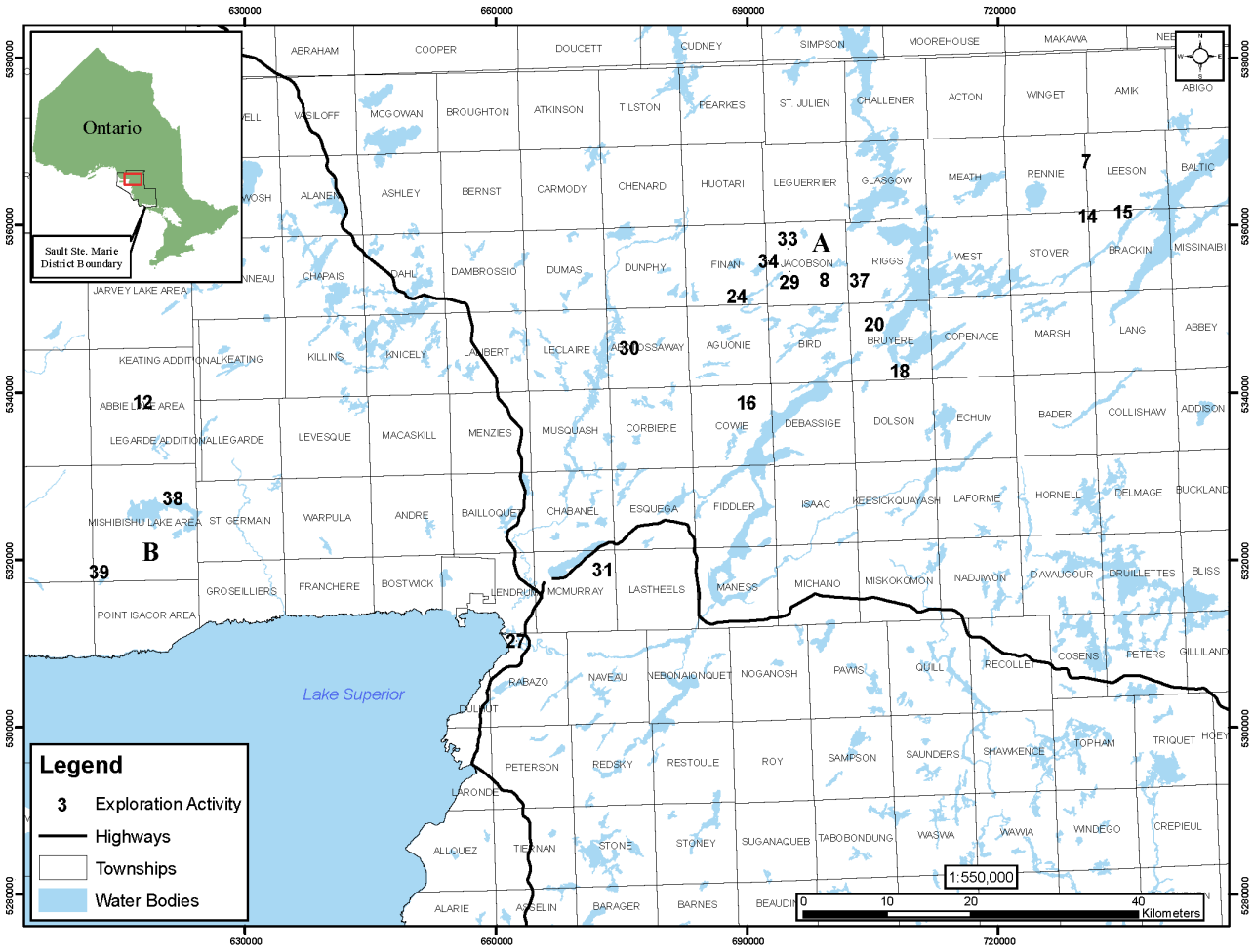


**Figure 3.** Exploration activity in the northern part of the Sault Ste. Marie District, 2012 (numbers keyed to Table 6). Letters indicate the location of current producing gold mines: A, Wesdome Gold Mines; and B, Richmont Gold Mines.

# ADVANCED EXPLORATION

## Strike Minerals Inc. – Edwards Gold Property

Strike Minerals Inc. has commenced an underground development plan to drill gold mineralized zones on both the 60 m and 90 m levels of the Edwards Mine. The development is planned to intersect a number of gold mineralized zones that include the Edwards #1, #2, #3, Rusty Weathered and Plowman #1 and allow for bulk sampling. The company anticipates drifting onto these zones where historical diamond-drill holes have indicated high-grade gold values between surface and the 100 m level (Strike Minerals Inc., press release, February 9, 2012). The underground exploration and development program on the 60m level has encountered gold values up to 69 g/t gold.

The geological interpretation indicates that this vein is the downward extension of a zone that was intercepted on the 30m level drifting from the old Edwards shaft (Strike Minerals Inc., press release, May 23, 2012). The underground development on both the 60 m and 90 m levels of the mine has included approximately 124 m of drifting on 3 new mineralized veins. The company has approximately 1000 tonnes with an average grade of 13.70 g/t gold stockpiled on surface (Strike Minerals Inc., press release, September 19, 2012).

Strike Minerals Inc. has completed a surface investigation on the Clement claims situated 1 mile northwest of the Edwards Mine property. The program was to conduct mapping and sampling of an identified quartz vein that

appeared to be an extension of a zone that was intersected in the Michael Syndicate shaft on adjacent mineral claims located 425 m northwest of the showing. Chip sampling was performed at 5 locations across the veining, with weighted assay averages, over a 0.9 m width, at each sample location, ranged from 0.40 to 5.34 g/t gold (Strike Minerals Inc., press release, May 10, 2012).

## Argonaut Gold Inc. – Magino Gold Project

In October 2012, Argonaut Gold Inc. acquired the Magino gold project. Prior to this acquisition, Prodigy Gold Incorporated intercepted significant gold mineralization during their resource expansion and step out drilling in multiple areas of the Magino mine gold project. All the results are from 3 distinct target areas. These areas include the central portion of the Magino gold deposit, the southwest extension of the Magino gold deposit, and the Lovell Lake area.

Prodigy completed 200 diamond-drill holes totalling 55 301 m in the above target areas between the months of January and June of 2012. This included 148 diamond-drill holes totalling 39 496 m in the central portion of the Magino deposit. There were18 diamond-drill holes totalling 5559 m in the southwest extension of the Magino gold deposit and 29 diamond-drill holes totalling 6357 m were drilled in the Lovell Lake area, located 200 m west of the main Magino gold deposit. The resource expansion drilling was concentrated within and below the main portion of the Magino gold mine deposit.

The company completed an updated NI 43-101 resource estimate and technical report for the Magino gold project. The drilling campaign included both in-fill and resource expansion drilling results in the resource update. Results are shown below in Table 7.

**Table 7.** Mineral resource estimate of the Magino project.

| Resource Category | Cutoff Grade (g/t gold) | Grade (g/t gold) | Tonnes | Gold (oz) |
|---|---|---|---|---|
| Indicated | 0.35 | 0.87 | 223 479 790 | 6 250 990 |
| Inferred | 0.35 | 0.80 | 13 809 410 | 355 190 |

*(Prodigy Gold Incorporated, press release, October 4, 2012)*

The company has also acquired crown leases, patented and unpatented mining claims and an interest in a license agreement of the Highland gold project owned by Pele Mountain Resources Inc.

## Boxxer Gold Corporation – East Breccia Copper-Molybdenum-Silver Exploration Program

The objective of the 2012 drilling program was to confirm 8 of the reported 55 historical drill holes from the East Breccia Zone that displayed mineralization (Boxxer Gold Corp., press release, May 7, 2012). Six of the proposed 8 diamond-drill holes have been completed. The 6 drill holes completed were located either at the collar or as close as possible to the historical drill hole. Highlights from the diamond-drilling program are listed in Table 8 below:

**Table 8.** Drilling results from the East Breccia Zone.

| Diamond-Drill Hole | Interval (m) | Copper (%) | Molybdenum (%) | Silver (g/t) | Rhenium (g/t) |
|---|---|---|---|---|---|
| EB-01-2012 | 247.92 | 0.14 | 0.011 | 2.44 | 0.32 |
| EB-02-2012 | 183.74 | 0.25 | 0.010 | 3.91 | 0.20 |
| | 67.81 | 0.49 | 0.011 | 6.86 | 0.17 |
| | 8.89 | 2.32 | 0.011 | 31.20 | 0.25 |
| EB-03-2012 | 142.32 | 0.15 | 0.010 | 2.09 | 0.22 |
| | 47.48 | 0.21 | 0.013 | 3.13 | 0.34 |

| Diamond-Drill Hole | Interval (m) | Copper (%) | Molybdenum (%) | Silver (g/t) | Rhenium (g/t) |
|---|---|---|---|---|---|
| EB-04-2012 | 226.64 | 0.08 | 0.013 | 1.24 | 0.30 |
| | 29.97 | 0.15 | 0.016 | 2.45 | 0.51 |
| | 19.97 | 0.11 | 0.014 | 1.61 | 0.32 |
| EB-05-2012 | 109.37 | 0.20 | 0.014 | 2.93 | 0.34 |
| | 50.96 | 0.07 | 0.017 | 0.68 | 0.29 |
| | 87.85 | 0.08 | 0.010 | 0.48 | trace |
| EB-06-2012 | 204.10 | 0.13 | 0.010 | 2.31 | 0.29 |
| | 23.44 | 0.16 | 0.020 | 5.20 | 0.78 |

*(Boxxer Gold Corp., press release, August 8 and September 8, 2012).*

In addition, the company has acquired 23 mineral claims that are contiguous to the East Breccia property. These properties include the Mountain Breccia and the Tribag property (Boxxer Gold Corp., press release, October 31, 2012). A high resolution geophysical survey has been contracted to be completed over the East Breccia as well as the newly acquired mineral claims.

The objective of the airborne survey is to identify new areas of mineralized breccia that may be covered with overburden and to fully understand the scope of the East Breccia project. The data from these surveys will be used along with the historical and current diamond-drilling information to plan the next phase of drilling on the East Breccia zone (Boxxer Gold Corp., press release, December 6, 2012).

## Conquest Resources Limited – Smith Lake Gold Property

Conquest Resources Limited has completed a diamond-drilling program consisting of 17 diamond-drill holes totalling 1759 m on the Smith Lake gold property located within the Missanabie–Goudreau area of the eastern portion of the Michipicoten greenstone belt. The planned drill holes have been designed to test near surface vein systems and other structural targets on the property. The first 4 holes of the program have been planned to follow up the company's high grade 63.3 g/t gold intersection from drill hole CSL-11-001 that was drilled during the fall drilling program (Conquest Resources Limited, press release, February 8, 2012).

To date the company has received assay results on the initial 6 holes, with 5 of the 6 holes returning gold values between 0.52 and 2.80 g/t gold over 0.25 to 1.5 m true thickness.

## Five Nine Ventures Ltd. – The Serpent River Property

The Serpent River property was acquired by Five Nine Ventures Ltd. in late 2010, with additional adjacent claims acquired in the fall of 2012 from International Montoro Resources Inc. The company commenced a grassroots exploration program consisting of preliminary geophysical work, global positioning system (GPS) surveying and induced polarization (IP) surveying. A NI 43-101 technical report was completed on the Serpent River property by the company in 2010. In 2012, a diamond-drilling program was completed consisting of 2 holes totalling 502 m. The drilling focused on testing known uranium and rare earth element (REE) mineralization along the original conductive trend (Five Nine Resources Ltd., press release, June 12, 2012).

Hole FN12-01 was drilled to a depth of 251 m and intersected gabbro/diabase to the end of the hole. The gabbro/diabase is a steeply dipping, northeast-trending intrusive crosscutting the Huronian Supergroup sediments. A zone of quartz-epidote-chalcopyrite-pyrite stringers with associated blebby and disseminated sulphides were intersected (Five Nines Ventures Ltd., press release, November 14, 2012).

In the adjacent claims, diamond-drill hole FN12-02 was drilled to a depth of 251 m. Drilling intersected the lower sedimentary units of the Huronian Supergroup. Significant assays from a 13 m section of the core include 0.037% $U_3O_8$, 198 ppm Th, 165 ppm Ce, and 88.2 ppm Y (Five Nines Ventures Ltd., press release, November 14, 2012).

## Giyani Gold Corporation – Abbie Lake–Keating Property

Giyani Gold Corp. has acquired a significant land package in the Mishibishu greenstone belt, east of their Abbie Lake–Keating property in Keating Township. This new acquisition consists of a total land size of 12 761 hectares situated in a highly prospective geological setting for gold and extends the company's land package eastward into Killin Township. These additional lands increase Giyani's property extent to 30 km in length (Giyani Gold Corp., press release, July 12, 2012).

An initial exploration program consisted of line cutting, geophysical surveys, prospecting, mapping and trenching. This work was followed up by a 12-hole, 1365.5 m, Phase 1 diamond-drilling program at shallow depths, with the objective of gaining a greater appreciation of the geology and geophysical anomalies. The drilling discovered a new gold-bearing structure. The discovery occurs in quartz sericite schists that are in contact with sediments. The drilling intercepted 2.0 m grading 2.70 g/t gold within a 13.6 m wide zone (Giyani Gold Corp., press release, October 5, 2012).

The structure also contains intense iron carbonate alteration, sericite, 2 styles of pyrite, green mica, potassic alteration, and tourmaline in the schist. In addition quartz eye porphyry and 2 altered iron formations are located within 50 to 150 m of the structure (Giyani Gold Corp., press release, October 5, 2012). This discovery is the result of Giyani Gold identifying geophysical anomalies over a 1.1 km strike length through persistent mapping, trenching, and geophysical surveys of the Keating East property followed by the Phase 1 drilling program (Giyani Gold Corp., press release, October 5, 2012).

## GoldTrain Resources Inc. – Missinabie Project and Orphan Claims

GoldTrain Resources Inc. has completed a total of 10 diamond-drill holes totalling 1907.9 m in the Nudulama area of the Missinabie project. Drill hole NU12-01 targeted the projected plunge of the East Zone and returned trace to weakly anomalous gold values. Drill holes NU12-02 through to NU12-10 were completed on the Nudulama claims in the area of the historical resource (GoldTrain Resources Inc., press release, April 26, 2012).

Significant assays from the drill program include 2.15 g/t gold over 18.8 m in hole NU-12-06 and 3.34 g/t gold over 3.5 m in hole NU-12-10 (GoldTrain Resources Inc., press release, April 26 and May 30, 2012).

GoldTrain Resources Inc. also completed a technical report on their Orphan claim property as part of their 2012 Phase 1 surface program that consisted of reconnaissance geological mapping and prospecting. A total of 4 grab samples were collected and submitted for gold analysis. The most significant sample returned 396 ppb gold from the Campbell vein. The Campbell vein is a narrow vein that strikes 350° and is 1 of 2 significant veins that crosscut the metavolcanic rocks of the Catfish assemblage. (GoldTrain Resources Inc., Technical Report, May 2012.)

## Hudson River Minerals Ltd. – Forge Lake Gold Property

Hudson River Minerals Ltd. has completed a 17-hole, 1669 m diamond-drilling program on the Forge Lake gold property. The drill program focused on 2 known gold zones that form part of the Forge Lake deformation zone. A total of 11 holes were drilled through the East Zone and 6 holes were drilled through the Main Zone. Significant assays from the East Zone include 16.45 g/t gold over 0.5 m in HR-FL-04; 4.03 g/t gold over 3.0 m in HR-FL-15, within a zone grading 1.93 g/t gold over 7.5 m; and 4.35 g/t gold over 3.9 m in HR-FL-16, within a zone grading 3.25 g/t gold over 12.7 m. Significant assays from the Main Zone include 4.7 g/t gold over 1.5 m in HR-FL-09; 4.10 g/t gold over 1.5 m in HR-FL-10, within a zone of 0.95 g/t gold over 13 m; and 4.56 g/t gold over 3.3 m in HR-FL-12, within a zone grading 1.00 g/t gold over 9.1 m (Hudson River Minerals Ltd., press release, January 25, 2012).

A second drilling program was completed by the company, which included an 11 hole, 1200 m diamond-drilling program on the Forge Lake property. The program was to determine the orientation and extent of a major deformation zone that was intersected previously in hole HR-FL-16. Significant assays from the second drilling program include 7.07 g/t gold over 5.5 m in HR-FL-20, 3.96 g/t gold over 2.0m in HR-FL-19, 8.46 g/t gold over 1.0 m in HR-FL-22 and 3.06 g/t gold over 1.8 m in HR-FL-24(Hudson River Minerals Ltd., press release, June 26, 2012).

# Lakeland Resources Inc. – Midas Property, Ballard Lake Property and Kam Property

## MIDAS PROPERTY

The Midas property lies within the eastern extension of the southern domain of the Goudreau Lake deformation zone. A newly exposed area was washed, mapped and 92 channel samples were taken and submitted for assay. Significant assays include up to 9.31 g/t gold over a 1 m cut channel sample along with additional assays from trenching that include 1.77 g/t gold over 0.97 m and 1.05 g/t gold over 0.85 m (Lakeland Resources Inc., press release, February 9, 2012).

## BALLARD LAKE PROPERTY

Lakeland Resources Inc. acquired the Ballard Lake property situated in Echum and Dolson townships covering the historic Ballard Lake shear zone. The company has completed an initial prospecting and mapping program to confirm the presence of gold and silver mineralization in the historic trenches. A total of 12 samples were collected, which returned assays ranging from 5.5 g/ t gold to 15 g/t silver (Lakeland Resources Inc., press release, September 25, 2012).

## KAM PROPERTY

Lakeland Resources Inc. has acquired the Kam property situated in Kamischisitit Township. The property consists of 1 claim encompassing approximately 128 hectares and is contiguous to the west of the former producing Copper Prince Mine. The company believes the Kam property includes the westerly extension of the historically mined Copper Prince vein which appears to have a strike length of 300 m exposed from historic trenches where it disappears under thicker overburden (Lakeland Resources Inc., press release, August 21, 2012).

The company has completed a Phase 1 diamond-drilling program that consisted of a minimum of 500 m of exploration drilling on the Kam property. The drilling program is being conducted to verify historical results from drilling carried out in the 1930s. Seven grab samples were taken from historical trenches along the strike of the Copper Prince vein, which resulted in values of 0.366 to 7.14% copper (Lakeland Resources Inc., press release, November 28, 2012).

# Pele Mountain Resources Inc. – Eco Ridge Mine Rare Earths and Uranium Project

The company has completed and released an updated NI 43-101 preliminary economic assessment (PEA) on the Eco Ridge Mine Rare Earths and Uranium project in Elliot Lake, Ontario. The PEA features an updated resource estimate and an all-new processing circuit designed to optimize the recovery of critical rare earth oxides (Pele Mountain Resources Inc., press release, April 16, 2012).

The updated PEA included an updated mineral resource as a result of rare earth oxides (REO) mineralization discovered outside of the Main Conglomerate Bed (MCB) (Table 9). This involved a second phase, core re-sampling program designed to increase the sampling range from the base of the MCB into the Hanging Wall Zone (HWZ) to approximately 25 m. The 2011 PEA reported at Eco Ridge is based solely on the average 2.7 m thick MCB.

The NI 43-101 resource estimate as part of the updated preliminary economic assessment includes mineral resources that are estimated within the MCB and for the new HWZ zone immediately above the MCB.

**Table 9.** Mineral resource estimate within the Main Conglomerate Bed and for the new Hanging Wall Zone.

| Zone and Classification | Tonnes ('000s) | $U_3O_8$ (%) | $U_3O_8$ ('000 lbs) | LREO (ppm) | HREO (ppm) | TREO (ppm) | TREO ('000 lbs) |
|---|---|---|---|---|---|---|---|
| **Indicated** | | | | | | | |
| MCB | 20514 | 0.045 | 20447 | 1426 | 193 | 1618 | 73184 |
| HWZ | 28223 | 0.012 | 7214 | 733 | 88 | 821 | 51111 |
| Total | 48737 | 0.026 | 27661 | 1025 | 132 | 1157 | 124295 |
| | | | | | | | |
| **Inferred** | | | | | | | |
| MCB | 16906 | 0.043 | 15940 | 1279 | 183 | 1463 | 54515 |
| HWZ | 20956 | 0.013 | 5822 | 713 | 95 | 808 | 37329 |
| Total | 37863 | 0.026 | 21762 | 966 | 134 | 1100 | 91843 |

*(Pele Mountain Resources Inc., press release, April 16, 2012)*
*Abbreviations: LREO, light rare earth oxides; HREO, heavy rare earth oxides; TREO, total rare earth oxides.*

A 6500 m diamond-drilling program that includes step-out drilling to the northwest and west of the existing resource area has recently been completed. The objective of the drilling program is to add up to 20 million tonnes of Inferred Resources (Pele Mountain Resources Inc., October 16, 2012). The company has also completed its bench-scale metallurgical testing program, where it achieved a significant milestone with the production of a mixed rare earth carbonate concentrate along with uranium oxide (Pele Mountain Resources Inc., press release, October 24, 2012).

## Superior Copper Corporation – Batchawana Copper Project

Superior Copper Corporation's Batchawana Copper property is located on the eastern edge of the Mid-Continental Rift (MCR) which underlies what is now Lake Superior and was active during the mid-Proterozoic, Keweenawan period (1100-1200 Ma). The Keweenawan rocks of the MCR consist of a thick sequence of subaerial flood basalts intercalated with conglomerates and felsic volcanic units that unconformably overlie Archean rocks of the Batchawana greenstone belt. To the north, the Mamainse Point Formation is overlain by the Mica Bay Formation. To the south the Mamainse Point Formation is in fault contact with red sandstone of the Jacobsville Formation. Both the Jacobsville Formation and the Mica Bay Formation are considered to be late Keweenawan in age based on paleomagnetic age estimates (Halls and Pesonen 1982). The rocks have been intruded by felsic dikes, felsic porphyry and felsic breccias considered to be Keweenawan in age and related to the Keweenawan felsic volcanic and intrusive rocks occurring more extensively within the Mamainse Point Formation to the west.

Superior Copper Corporation completed a total of 4 diamond-drill holes totalling 500 m on the Kincaid Breccia as part of the Batchawana Copper project. The drilling was to follow up on anomalous copper mineralization in 2 breccia types identified by reconnaissance mapping and surface sampling. The Kincaid Breccia was a known surface breccia occurrence but there had been no previous drilling to test for copper mineralization. Superior Copper's best drilling intercept was 3.6 m of 1.57% copper and 2.4 m of 2.82% copper of vein breccia mineralization. Surface mapping of the Kincaid Breccia has traced a mineralized breccia zone over 400 m in a northwest direction (Superior Copper Corporation, press release, January 30, 2012). Assay results for the first 4 drill holes are summarized in the Table 10.

Results from the reconnaissance geological mapping and surface sampling program at the Kincaid Breccia are displayed in Table 11.

**Table 10.** Drill results from the Kincaid Breccia Zone.

| DDH ID# | From (m) | To (m) | Length (m) | Cu (%) | Ag (g/t) |
|---|---|---|---|---|---|
| KB-01-11 | 19.5 | 22.3 | 2.8 | 1.36 | 3.7 |
| KB-02-11 | 18.0 | 21.6 | 3.6 | 1.57 | 3.5 |
| KB-02-11 | 26.6 | 29.0 | 2.4 | 2.82 | 5.6 |
| KB-03-11 | 22.4 | 22.7 | 0.3 | 3.70 | 21.7 |
| KB-03-11 | 25.6 | 30.2 | 4.6 | 0.32 | - |
| KB-04-11 | No significant mineralization: 213 to 2780 ppm Cu | | | | |

*(Superior Copper Corporation, press release, January 30, 2012)*

**Table 11.** Assay results from grab samples of the mineralized portions of the Kincaid Breccia.

| Sample | Cu (%) | Ag (g/t) | Au (g/t) |
|---|---|---|---|
| 1 | 1.61 | 1 | 0.031 |
| 2 | 1.63 | 6.2 | 0.034 |
| 3 | 17.06 | 23.4 | 0.078 |
| 4 | 3.14 | 29.6 | 0.184 |

*(Superior Copper Corporation, press release, January 30, 2012)*

The company completed an extensive field program during the spring and summer months of 2012 that consisted of ground geophysics, soil geochemistry and geological mapping and sampling. The ground geophysical program included gravity, magnetic and induced polarization surveys. Initial results indicate several coincident magnetic and gravity anomalies, which the company will be analyzing for future drill targets. The preliminary soil sampling results showed a highly anomalous linear trend for copper in the southern portion of the grid. Reconnaissance mapping and prospecting investigated historical copper showings and located a number of areas with newly identified copper mineralization. Areas with significant copper mineralization were subsequently stripped, washed and sampled. At this time Superior Copper has priority drilling targets to expand the SB Zone where the company carried out a successful drilling program in late 2011 (Superior Copper Corporation, press release, August 16, 2012).

# SAULT STE. MARIE DISTRICT STAFF ACTIVITIES

The Sault Ste. Marie Resident Geologist office is staffed by A. Pace, District Geologist, and R. McMillan, District Geological Assistant. S. Butorac resigned her position as District Geological Assistant in May 2012, with H. Pinder and M. Foggia hired on short term contracts as Acting District Geological Assistants from June until October 2012. R. McMillan was the successful candidate for the position of District Geological Assistant, which commenced in November, 2012. A district boundary change took effect in April 2012 that transferred the Wawa district area from the Timmins District to the Sault Ste. Marie District. All activities for the Wawa area district are now reported in the Sault Ste. Marie District (*see* Figure 1 for new geographic extent of the Sault Ste. Marie District Geologist District).

Staff of the Sault Ste. Marie District Geologist office spent a significant amount of time indexing, filing and incorporating all assessment files and mine plans pertaining to the Wawa district area into the Sault Ste. Marie District Geologist office. The staff have familiarized themselves with the exploration activities pertaining to the Wawa area and a field trip examining the regional geology of the Wawa area was provided by A. Wilson to the Sault Ste. Marie staff in the month of July 2012.

The Sault Ste. Marie District Geologist office completed 40 property visits during the year and updated a total of 35 Mineral Deposits Inventory (MDI) records. Assessment files received in 2012 are listed in Table 12.

A. Pace provided assistance at the drill core library to Andrey Bekker from the University of Manitoba and Jay Kaufman from the University of Maryland. Drill core library assistance was also provided to a variety of exploration companies during the summer months of 2012.

A. Pace provided 3 field trips over the year. A field trip, led by Professor H. Ohmoto, was provided to a series of graduate students from Pennsylvania State University. The field trip provided a geological examination of the Huronian Supergroup in the Elliot Lake area. A second field trip was provided to the Missassaugi First Nation as part of prospector's course delivered by S.E. Halet (First Nations Minerals Information Officer, Northeastern Ontario). The field provided the group with an understanding of the geology and mineral deposits located within and surrounding their traditional territories. A third field trip was provided to undergraduate geology students from Lake Superior State University and examined the Proterozoic volcanic rocks of the Mamainse Point Formation. The field trip included a site visit to an active exploration project. This provided the students with an opportunity to examine outcrops of mineralized rocks and an understanding of what is involved in an exploration project.

In May of 2012, A. Pace provided a presentation on *Mining and Exploration Highlights in the Sault Ste. Marie District* to the Wawa Economic Development Corporation.

In November 2012, A. Pace attended the Ontario Prospectors Association, Ontario Exploration and Geoscience Symposium in Sudbury. A. Pace provided a presentation on *Northeastern Ontario Exploration Opportunities.*

**Table 12.** Assessment files received in the Sault Ste. Marie District in 2012.

**Abbreviations**

Bulk ..... Bulk sampling
DD ..... Diamond drilling
DDH ..... Diamond drill hole(s)
EM ..... Ground electromagnetic survey
GL ..... Geological survey
GM ..... Ground magnetic survey
GRA ..... Ground radiometric survey
IP ..... Induced polarization survey
Lc ..... Line cutting
Mag ..... Ground magnetic survey
Pr ..... Prospecting
PStrip ..... Overburden stripping
Rept ..... Report
Samp ..... Sampling (other than bulk)
Str ..... Stripping
TEM ..... Time domain electromagnetic survey
Tr ..... Trenching
VLFEM ..... Very low frequency electromagnetic survey
VTEM ..... Versatile time domain electromagnetic survey

| Township or Area | Company Name | Year | Type of Work | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| 41J /08 SW | Verbina Resources Inc. | 2008–2010 | DD | 2.45529 | SSMP Deagle-04 |
| 41N / 02 SE, 41K /15 NE | Cenit Corporation and First Minerals Exploration Limited | 2010–2011 | GL, Str, Tr, Samp and assaying. | 2.47257 | SSMP Ryan-37 |
| 41 N/01 NW, 41 N/01 SW | Amador Gold Corp. | 2009–2010 | Rept, DD on the East Breccia. | 2.44313 | SSMP Norberg-17 |
| 41J / 08NW, 41J /08SW | PreCambrian Ventures Ltd. | 2010 | Geophysical Rept on the Whitefish Lake property. | 2.46457 | SSMP Gaiashk-23 |
| 41J / 08NW, 41J / 08SW | PreCambrian Ventures Ltd. | 2010 | Pr, Samp of VTEM anomalies on the Whitefish Lake property | 2.46950 | SSMP Gaiashk-24 |
| 41 O/03SE, 41O/03 SW, 41J/ 14NW, 41J/14 NE | Jim Ralph | 2010 | Rept | 2.46235 | SSMP Maeck-04 |
| 41J/13SW, 41J/13SE | Skead Holdings | 2010–2011 | B Horizon soil sampling-compassed grid lines, 9 samples collected and sent for Au and metallics to lab. Assaying. | 2.48117 | SSMP Hughes-12 |
| 41N / 02 SE, 41K / 15 NE | Cenit Corporation Coppercorp property. | 2010 | NI-43-101 Tech. Rept | SEDAR Website | SSMP Ryan-38 |
| 41N/02SE, 41K/15NE | RRS Syndicate. Claim holders are Roy Rupert, D. Shelly and D. Tortosa | 2010 | DD - 4, Rept | 2.48230 | SSMP Ryan-39 |

| Township or Area | Company Name | Year | Type of Work | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| 41N/01SW, 41N/01SE, 41N/01NW, 41N/01NE | Black Panther Mining Corp. | 2010 | GL, Pr, Samp | 2.48523 | SSMP Olsen-44 |
| 41K/ 09NW, 41K/ 09 SW, 41 K / 09 NE, 41K /09 SE | TRS Syndicate | 2009–2011 | Review of past work and current prospecting to date. | 2.49142 | SSMP Aweres-21 |
| 41J / 08NW, 41 J/ 08SW | Geo Earth Ventures Ltd. | 2011 | Mag, IP, Rept | 2.49179 | SSMP Gaiashk-25 |
| 41N/1, 41/ N2 | China Metallurgical Exploration Inc. | 2010–2011 | A helicopter borne AeroTEM, EM and Mag, Pr | 2.48980 | SSMP Palmer-4 |
| 41K/16SE | Pro Minerals Inc. (optioned claims from Maverick Investment Corporation. | 2011 | Handheld gamma ray Spectrometer GR 135G survey. GRA, Rept. | 2.48738 | SSMP Shields-03 |
| 41K/16SE, 41K/16SW, 41K/09NE, 41K/09NW | Claim holders are J. Ralph, G. Lucuick and C. Hicks. | 2002 | Assaying | donated | SSMP VanKoughnet-19 |
| 41J/06NE, 41J/06 SE | China Metallurgical Exploration Corp | 2010–2011 | Pr and soil and gas hydrocarbon survey, Rept | 2.49139 | SSMP Montgomery-26 |
| 41J/ 06NW, 41J /11 SW | George Lucuick and James Ralph | 2011 | Pr, Samp | 2.49787 | SSMP Gould-14 |
| 41N/02NE, 41N/02SE | Cenit Corporation | 2012 | GL, Samp, Rept | 2.50337 | SSMP Kincaid-24 |
| 41J/07NE, 41J/07SE, 41J/08NW, 41J/08SW | International Montoro Resources Inc. | 2012 | V-TEM, Rept | 2.49389 | SSMP Joubin-28 |
| 41J/07SE | Reliant Gold Corp. | 2012 | Samp, Rept, Assays | 2.51133 | Esten-20 |
| 410/03SW | Jim Ralph | 2012 | Rept, Pr, Assays | 2.51417 | SSMP Jessiman-01 |
| 41J/13SW | Skead Holdings Ltd. | 2012 | GL, Samp, Rept | 2.51516 | SSMP Hughes-13 |
| 41O/03SW | Jim Ralph | 2012 | Samp, Assays, Rept | 2.51522 | SSMP Maeck-05 |
| 41N/02SE | Superior Copper Corp | 2012 | DD, Rept | 2.51649 | SSMP Kincaid-25 |
| 41-N/8 | Rio Tinto Exploration Ltd. | 2012 | Ground geophysics, GL | N/A | SSMP Vibert-07 |
| 41J/07NE, 41J/07SE, 41J/08NW, 41J/08SW | Pele Mountain Resources Inc. | 2012 | DD, Rept | 2.51252 | SSMP Joubin - 29 |
| 41J/01NW, 41J/02NE, 41J/07SE, 41J/08SW | Robert Pelky | 2012 | Pr and plugger work/PStrip, washing off showing bomadier used | 2.52389 | SSMP Lewis-11 |
| 41N/02SE, 41K/15NE | Superior Copper Corp | 2012 | Geophysical Rept | 2.52093 | SSMP Ryan-40 |
| 041J/05 | Gold Insight Resources | 2012 | DD | 2.52708 | SSMP Galbraith-07 |

| Township or Area | Company Name | Year | Type of Work | AFRO Number | Resident Geologist Office File Designation |
|---|---|---|---|---|---|
| 041J/02 | Darien Resources | 2012 | DD, Tr, blasting | 2.50047 | SSMP Long-08 |
| 041N/02 | Thomas O'Connor | 2012 | Power Str | 2.50069 | SSMP Ryan-41 |
| 041N/02 | First Minerals Exploration Limited, Cenit Corp. | 2012 | DD | 2.50100 | SSMP Ryan-42 |
| 041J/06 | Yvon Gogne | 2012 | Tr | 2.50589 | SSMP Montgomery-27 |
| 041O/04 | Anconia Resources Ltd. | 2012 | Pr, Samp, Rept | 2.51464 | SSMP Gapp-18 |
| 041N/02 | Hudson River Minerals Ltd. | 2012 | Helicopter-borne magnetic gradiometer, VLF-EM and GRA | 2.52443 | SSMP Palmer-42 |
| 42C/03NE, 42C/06SW | 2299895 Ontario Inc. | 2012 | VTEM and horizontal magnetic gradiometer geophysical survey | 2.50605 | WP Abbie Lake-39 |
| 41/N/14, 42/C/3 | Augustine Ventures Inc. | 2012 | Pr, GL, Samp | 2.51392 | WP McMurray-102 |
| 42C/03NW | Canada Claim Group 2299895 Ontario Inc. | 2012 | GM | 2.51959 | WP Abbie Lake-40 |
| 42C/03NW | Richard Thibodeau | 2012 | DD, assay | 2.52275 | WP Abbie Lake-41 |
| 42C/07SE | Richmont Mines | 2012 | DD-16 | 2.51809 | WP Finan-88 |
| 42C/08 | Upper Canada Exploration Inc. | 2012 | Power Str | 2.52744 | WP Riggs-78 |
| 042B/05 | GoldTrain Resources Inc. | 2012 | GL, Pr | 2.51987 | WP Leeson-57 |
| 042C/02 | Richmont Mining Limited | 2012 | DD, assay | 2.51986 | WP Abotossaway-51 |
| 042C/03 | 2299895 Ontario Inc. | 2012 | Lc, Tr, DD, assaying | 2.5063 | WP-Keating-42 |
| 042C/08 | Strike Minerals Inc. | 2012 | Str, GL, Samp | 2.51886 | WP-Jacobson-113 |
| 041N/15, 42C/02 | Leo James Robert | 2012 | Pr, Samp | 2.519 | WP McMurray-103 |
| 042C/03 | Giyani Gold Corp. | 2012 | IP | 2.51936 | WP-Abbie Lake-42 |

*Notes: DD - 16 = 16 diamond-drill holes.*
*The Resident Geologist Office File Designation incorporates the name of the township in which the assessment work was performed.*

# PROPERTY EXAMINATIONS

## The Kincaid Breccia Zone

### LOCATION

The Kincaid Breccia mineral occurrence (UTM Zone 16, 674761E 5214976N) is situated on a major logging road off Highway 17 in Kincaid Township. It is located approximately 2.5 km northeast of the historical Coppercorp Mine Road turnoff. The Kincaid Breccia area underlies the northeast part of the Batchawana Copper property currently being explored by Superior Copper Corp.

### PROPERTY GEOLOGY

Exploration efforts have focused in an area identified as the Kincaid Breccia mineral occurrence. The eastern portion of the property consists of Archean rocks that make up the Batchawana greenstone belt, dominated primarily by mafic to intermediate metavolcanic rocks with minor felsic metavolcanic units. These rocks have been intruded by felsic dikes and breccias that are Keweenawan in age and are related to the felsic volcanic and intrusive rocks of the

Mamainse Point Formation occurring on the western portion of the property. The Mamainse Point Formation consists of a thick sequence of flood basalts and intercalated conglomerates that are intruded by subvolcanic felsic rocks.

A drilling program that consisted of 11 diamond-drill holes was completed in the area of the Kincaid Breccia mineral occurrence by Superior Copper Corporation in 2012. The drill holes were designed to test the depth and strike extent of the copper-silver mineralization found in the Kincaid Breccia during the 2011 mapping and sampling program (Superior Copper Corp., Assessment File, 2012). The drilling has allowed the company to construct a series of cross sections that depict the geology, structure and mineralization related to the Kincaid Breccia (Superior Copper Corp., Assessment File, 2012).

The Kincaid Breccia is a breccia zone that varies from 6 to10 m in width, trends north-northwest and dips 40 to 45° to the northeast (Superior Copper Corp., Assessment File, 2012). The breccia zone is composed of felsite breccia and a vein breccia intruded by a fine-grained mafic dike. The felsite breccia is auto-brecciated and consists of angular fragments of red, hematized felsite hosted within a reddish colour matrix. Minor stockwork quartz veining was also identified in sections of the felsite breccia.

The vein breccia is characterized by calcite-rich, siliceous veining carrying angular fragments of basalt, mafic volcanic and felsite. The breccia zone is intruded by a fine-grained mafic dike with a similar dip (Figures 4B and 4C). The felsite breccia occurs predominantly on the footwall side of the breccia zone in contact with the Archean mafic metavolcanic rocks (Figure 4A), whereas the vein breccia commonly occurs in contact with the Keweenawan basalts (Figure 5).

The mineralization consists of finely disseminated pyrite, chalcocite, malachite, chalcopyrite, and native copper. In the mineralized sections of the vein breccia, chalcocite can be found as patches within the siliceous/calcite matrix and within the brecciated host rock fragments. It was also found within the basalt units proximal to the vein breccia and felsite breccia. Chalcopyrite was more common within quartz stringers hosted within the mafic metavolcanic rocks.

## SUMMARY AND CONCLUSION

Surface mapping completed by Superior Copper Corp. in the summer and fall of 2011 described the Kincaid Breccia area as a crescent-shaped zone up to 20 m wide (Superior Copper Corp., Assessment File, 2012). It was described as being situated in contact along a north-northwest-trending fault block of Keweenawan basalts sitting as an outlier within the Archean greenstone belt (Superior Copper Corp., Assessment File, 2012). The recent diamond drilling program completed by the company intersected a mineralized vein and felsite breccia, trending north-northwest, on the fault contact between the Keweenawan basalts and the Archean greenstone belt. The breccia was separated by mafic intrusive dikes that had utilized the same fault conduit as the pre-existing felsite dikes and hydrothermal fluids creating the vein and felsite breccias.

Significant assay results from Superior Copper's 2012 diamond-drilling program include

- Hole KB-01-11: 1.36% copper over 2.8 m (vein breccia)
- Hole KB-02-11: 1.57% copper over 3.6 m (vein breccia) and 2.82% copper over 2.5 m (felsite breccia)
- Hole KB-08-11: 1.44% copper over 4.8 m (basalt-vein breccia – Archean contact)

Results of the diamond drilling indicated that the structure and mineralization demonstrated continuity on-strike and to depth. The variable copper grades encountered in the drilling were interpreted to be due to a plunging mineralized zone that was not entirely defined on the basis of the limited drill-hole data (Superior Copper Corporation, Assessment File, 2012). The geometry of the Kincaid Breccia is illustrated in Figure 5.

Two representative grab samples were collected from the mineralized zone by staff of the Sault Ste. Marie District Geologist Office. One sample was felsite breccia (sample KB-2012-1) and the second was vein breccia (sample KB-2012-2). The samples assayed 0.15 and 0.64% copper, respectively. Additional geochemical results are listed in Table 13.

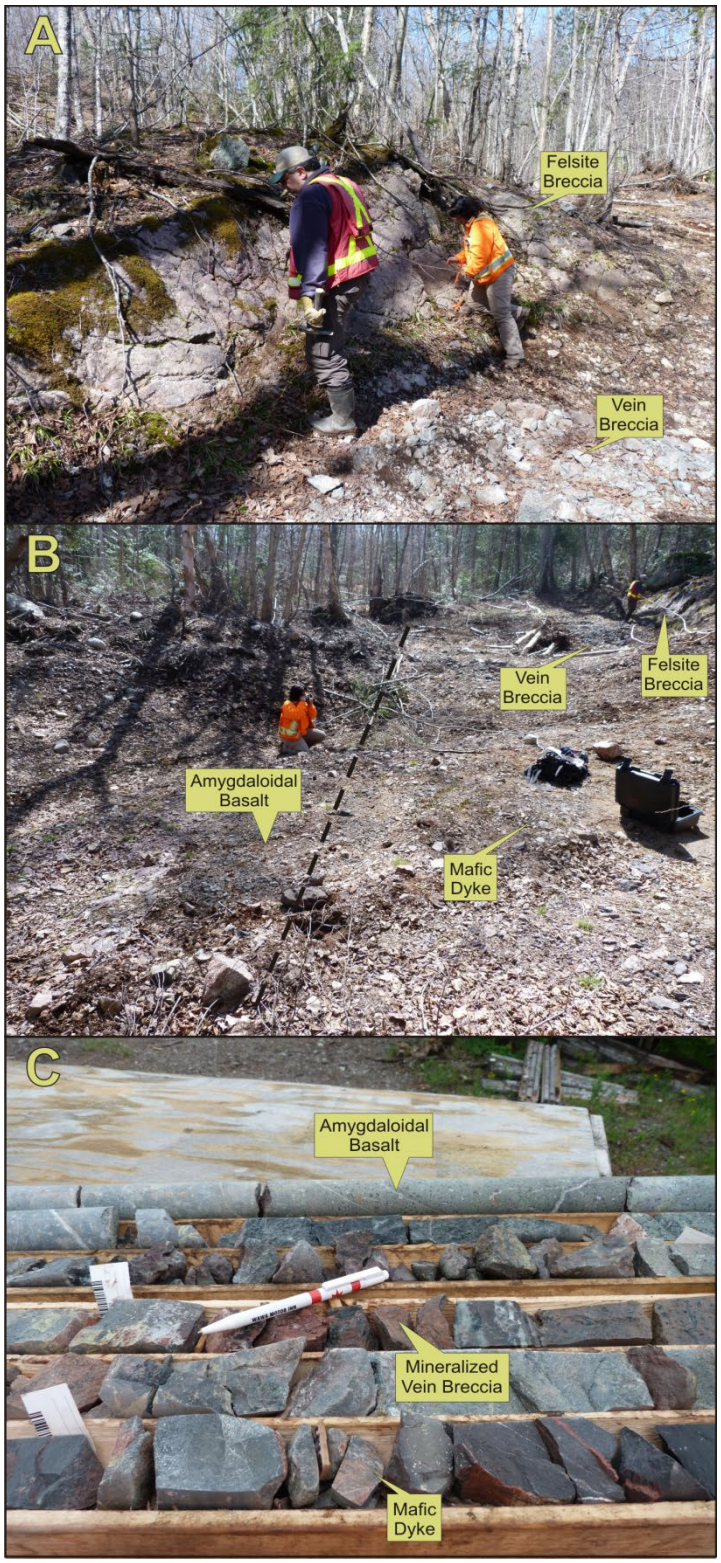


**Figure 4.** A) Examining surface outcrop exposures along the contact between the felsite breccia and the vein breccia. The felsite breccia is located on the footwall side of the breccia zone. B) Surface exposure of the Kincaid Breccia Zone in contact with amygdaloidal basalt. C) Recent drill core completed on the Kincaid Breccia Zone by Superior Copper Corporation in 2012 displaying the different geological contacts described on the property.

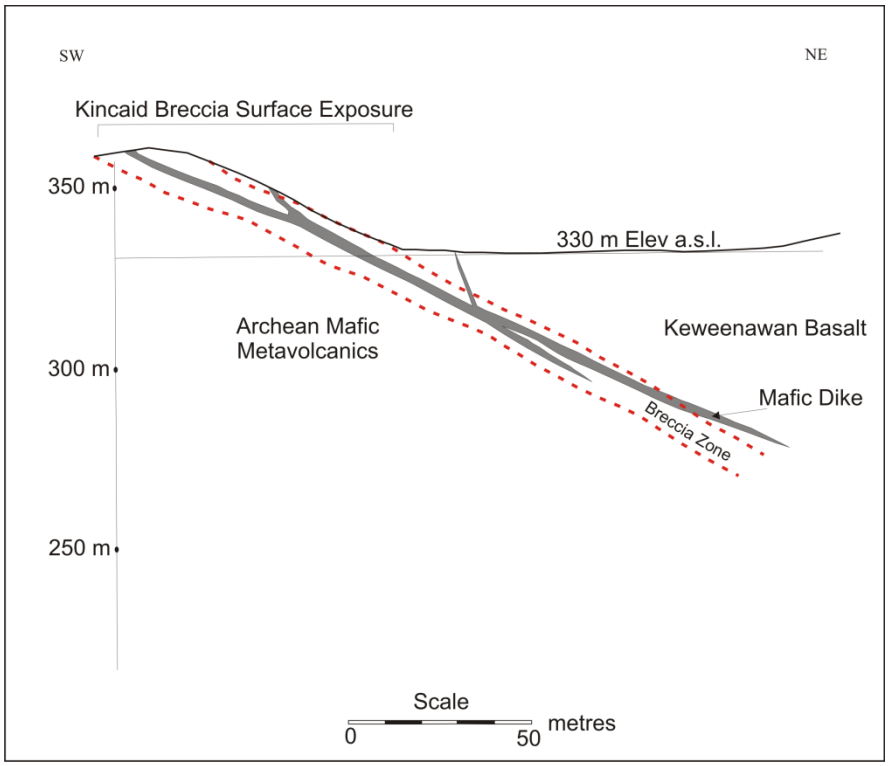


**Figure 5.** Idealized cross section, looking northwest, of the structural model for the Kincaid Breccia (Superior Copper Corp., Assessment File, 2012).

**Table 13.** Geochemical data for samples taken during a property visit to the Kincaid property. All analyses were performed at the OGS Geoscience Laboratories, Sudbury. UTM coordinates are in NAD83, Zone 16. Note: Major oxides are in weight percent. All trace elements and Total REE are in ppm.

| **Sample** | **KB 2012-1** | **KB 2012-2** |
|---|---|---|
| **Easting** | 674761 | 674761 |
| **Northing** | 5214976 | 5214976 |
| $Al_20_3$ | 5.41 | 3.43 |
| CaO | 0.126 | 0.095 |
| $Fe_20_3$ | 6.93 | 3.45 |
| $K_2O$ | 0.25 | 0.38 |
| MgO | 3.43 | 1.32 |
| MnO | 0.121 | 0.040 |
| $Na_2O$ | 0.06 | 0.07 |
| $P_2O_5$ | 0.043 | 0.032 |
| $SiO_2$ | 80.09 | 89.28 |
| $TiO_2$ | 0.51 | 0.31 |
| Cr | 518 | 764 |
| Cu | 1465 | 6356 |
| Ni | 241 | 0 |
| Al | 26079 | 16869 |
| Ca | 837 | 686 |
| Fe | 45287 | 23484 |
| K | 1877 | 2952 |

| Sample | KB 2012-1 | KB 2012-2 |
|---|---|---|
| Mg | 18951 | 7349 |
| Mn | 924 | 278 |
| Ba | 48.9 | 59.4 |
| Be | 0.92 | 0.72 |
| Bi | 0.65 | 1.32 |
| Cd | 0.069 | 0.147 |
| Co | 34.04 | 18.59 |
| Cr | 839 | 1130 |
| Cs | 0.937 | 0.608 |
| Total REE | 11.2749 | 7.0366 |

# The Esten Property

## LOCATION

The Esten property (Zone 17, 375048E 5128645N) is located in Esten Township. The property is accessed from the Highway 108 exit at Serpent River on Highway 17, then 11 km to an unnamed dirt road on the west side of Highway 108, then 5 km to an area of old trenches on the north side of the road.

## EXPLORATION HISTORY

The property was trenched and drilled in 1956 by Federal Kirkland Mining Co. where the company completed a total of 28 diamond-drill holes totalling 9594 feet. Esten Exploration Inc. completed 6 diamond-drill holes totalling 1922 feet. In total, 28 diamond-drill holes were directed at the known zone of mineralization or its potential strike extensions (*see* Figure 7). These companies have also completed very low frequency electromagnetic (VLF-EM) and magnetometer survey maps. In 2003, Gitennes Exploration Inc. sampled many of the existing trenches and a brief program of mapping was completed. In 2004, the company carried out a series of exploration activities that included a property-wide airborne magnetic and electromagnetic survey, along with geological mapping, geochemical sampling and IP surveying. In 2010, Reliant Gold Corp. carried out exploration consisting of surface sampling of historical trenches as well as conducting property-wide geological traverses focusing on the ground follow-up of the Gitennes Exploration anomalies (Table 14).

**Table 14.** History of exploration activity conducted on the Esten property from 1957 to 2010.

| Company | Work Done | Date | Results |
|---|---|---|---|
| Federal Kirkland Mining Company Ltd. | Diamond drilling, 28 diamond-drill holes totalling 9594 feet | 1957 | 1.78% Cu over 18.9 feet<br>1.72% Cu over 16.6 feet<br>0.84% Cu over 102.6 feet |
| Esten Explorations Inc. | Diamond drilling, 6 diamond-drill holes totalling 1922 feet | 1974 | 2.64% Cu over 2.5 feet<br>2.79% Cu over 3.8 feet<br>1.06% Cu over 5.9 feet<br>1.12% Cu over 5.9 feet<br>1.42% Cu over 7.0 feet<br>1.78% Cu over 3.4 feet |
| Gitennes Exploration Inc. | 21 chip samples from 6 old trenches | 2003 | Copper values ranged from 0.02% to 1% Cu |
| Gitennes Exploration Inc. | MMI geochemical analytical technique | 2004 | MMI for Cu indicates a strong anomaly associated with the Southern Siliceous Zone |
| Reliant Gold Corp. | Sampling existing trenches | 2010 | Average value of 1.52% Cu from a 0.5 m chip sample from each of the 5 historical trenches. Highest grade assay was 2.4% Cu. |

*MMI = Mobile Metal Ion™ soil sampling survey*

## PROPERTY GEOLOGY

The geology of the Esten property consists of Archean, felsic to intermediate intrusive rocks cut by aplite and diabase dikes. Texturally, the intrusive rocks range from massive to gneissic and are overprinted by 2 subparallel, fine-grained siliceous zones with gradational contacts (Figure 6A). Quartz-filled microfractures and sulphide mineralization occur in strongly sheared areas of the siliceous zones (Figure 6B). The siliceous zones are referred to as the "Southern" Siliceous Zone and the "Northern" Siliceous Zone. The morphology and areal extent of the zones are illustrated on Figure 7.

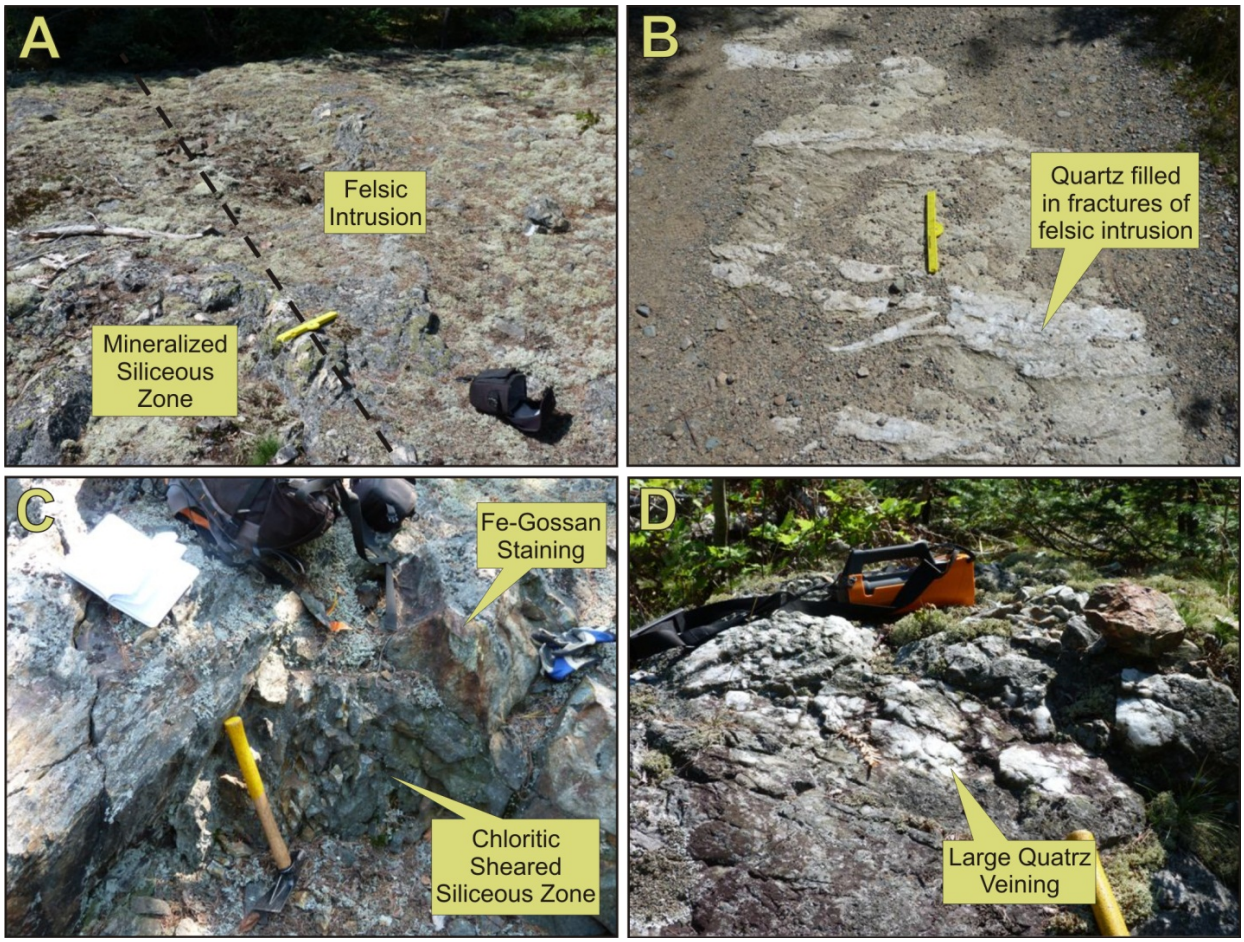


**Figure 6**. A) Contact between the mineralized siliceous zone and felsic intrusive rocks. B) The felsic intrusive rocks are heavily sheared displaying a series of microfractures filled with quartz. C) A chlorite-sheared siliceous zone identified in one of a series of historical trenches located on the Southern Siliceous Zone with iron-gossan staining and sulphide mineralization. D) Sheared section of the Northern Siliceous Zone displaying larger quartz veining than observed in the Southern Zone.

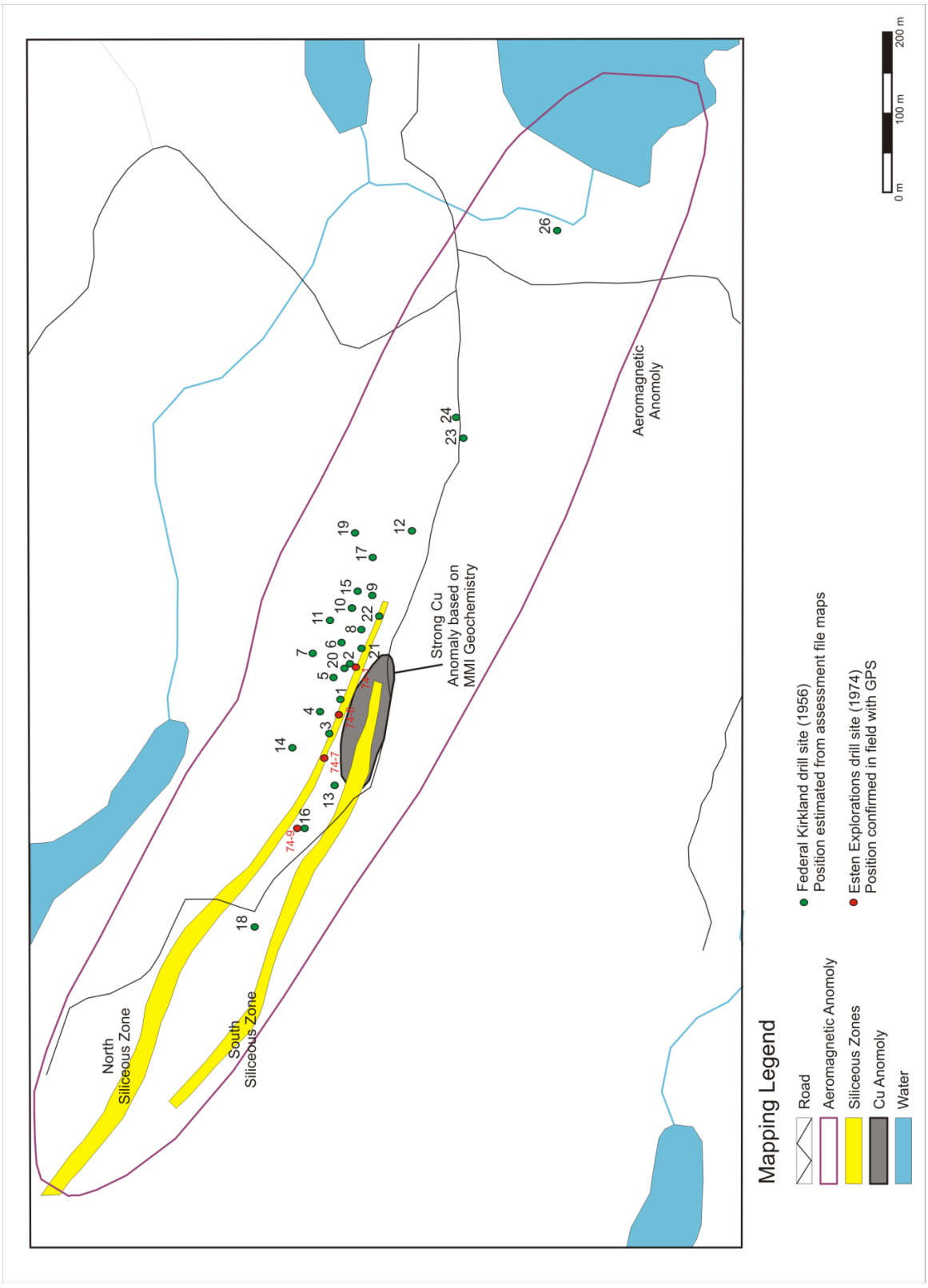


**Figure 7.** Map of the Esten property displaying the north and south siliceous zones, including the locations of past diamond drilling (red and green dots; numbers keyed to information in the assessment file), geophysical and geochemical analyzes (*modified after* Gitennes Exploration Inc. 2005).

The Esten property was first identified in a 1954 aeromagnetic survey by the Ontario Department of Mines. The survey outlined a 7 km long west-northwest-trending magnetic anomaly over the Esten property. The high level of magnetic intensity and contrast of the anomaly with the surrounding country rock presented a favourable exploration target. In 2005, Gitennes Exploration Inc. completed a ground magnetic survey and geological mapping on the property. The mapping and geophysical work identified a series of highly magnetic diabase dikes within the trend of the airborne magnetic feature. Magnetic responses were not detected over the siliceous zones that hosted the mineralization, indicating that the siliceous zones are not causing the airborne magnetic anomaly. This led the company to believe that a magnetic diabase or a zone of multiple magnetic dikes was the dominant cause of the airborne magnetic anomaly (Gitennes Exploration Inc., Assessment File, 2005).

The Southern Siliceous Zone is about 5 m wide, 500 m long, and strikes 270/85N (Gitennes Explorations Inc., Assessment File, 2005). A series of chloritic shears and quartz stringers cut the zone at very low angles. These sheared sections contain irregular patches of chalcopyrite and disseminated pyrite with iron-gossan staining being quite pervasive in the fractured sections. The mineralization and alteration are localized and associated with the shears and in the siliceous zone, but do not appear to extend into the felsic intrusive rocks. A series of historical trenches were located on the property where the mineralization and alteration of the Southern Siliceous Zone could be observed (Figure 6C).

The Northern Siliceous Zone is similar to the Southern Zone but there is little to no evidence of chlorite and significant sulphide mineralization, with only the staining of iron-gossan visible in fractures. The zone strikes N290°W dipping steeply to the north (Figure 6D). The presence of significantly larger quartz veining in the Northern Siliceous Zone in comparison to the South Siliceous Zone is attributed to the increased shearing intensity in the Northern Zone.

Copper mineralization has been identified only within the siliceous zones, with no evidence of mineralization located elsewhere in the felsic intrusive rocks. Samples were taken from 4 trenches located within the Southern Siliceous Zone during a property visit by staff of the Sault Ste. Marie District Geologist office. There were no samples taken from the Northern Siliceous Zone because of little outcrop exposure. Results from the analyses are shown in Table 15 below. A grab sample assay from Trench 2 returned 0.67% copper.

**Table 15.** Geochemical data for samples taken during a property visit to the Esten property. All analyses were performed at the OGS Geoscience Laboratories, Sudbury. UTM coordinates are NAD 83, Zone 17. Note: $CO_2$, S, FeO, $H_2O^+$ and $H_2O^-$ are in weight percent. All trace elements and Total REE are in ppm.

| Sample | Trench 1 | Trench 2 | Trench 3 | Trench 4 |
|---|---|---|---|---|
| **Easting** | 375145 | 375104 | 375104 | 375100 |
| **Northing** | 5128575 | 5128591 | 5128632 | 5128596 |
| Al | 22624 | 12622 | 46492 | 27084 |
| Ba | 5 | 9 | 44 | 342 |
| Be | 1 | 1 | 1 | 1 |
| Ca | 508 | 91 | 3306 | 153 |
| Co | 41 | 30 | 5 | 2 |
| Cr | 36 | 63 | 67 | 49 |
| Cu | 91 | 6698 | 26 | 6 |
| Fe | 25819 | 34080 | 59265 | 9200 |
| K | 338 | 355 | 2497 | 8878 |
| Li | 4 | 1 | 11 | 6 |
| Mg | 12110 | 7668 | 24534 | 4438 |
| Mn | 92 | 62 | 343 | 55 |
| Na | 6870 | 500 | 13404 | 4194 |
| Ni | 13 | 6 | 26 | 3 |
| P | 199 | 15 | 353 | 57 |
| Pb | 15 | 15 | 15 | 15 |

| Sample | Trench 1 | Trench 2 | Trench 3 | Trench 4 |
|---|---|---|---|---|
| S | 3719 | 8847 | 1683 | 1151 |
| Sc | 5 | 4 | 22 | 2 |
| Sr | 12 | 5 | 25 | 9 |
| Ti | 958 | 832 | 4573 | 341 |
| V | 50 | 39 | 214 | 49 |
| Y | 6 | 6 | 13 | 2 |
| Zn | 9 | 15 | 34 | 7 |
| Total REE | 24.392 | 75.3989 | 28.0784 | 4.2892 |
| | | | | |
| $CO_2$ | 0.06 | 0.03 | 0.13 | 0.08 |
| S | 0.42 | 0.95 | 0.20 | 0.14 |
| FeO | 2.45 | 2.24 | 5.35 | 0.76 |
| $H_2O^+$ | 1.52 | 1.30 | 3.46 | 0.88 |
| $H_2O^-$ | 0.27 | 0.40 | 0.58 | 0.25 |

# Caputo–Just Property

## PROPERTY ACCESS

The Caputo–Just property (UTM NAD83, Zone 16, 700842E 5209588N) is located in Wishart Township, 2 km northeast of Lower Tilley Lake. Access is by travelling along a 15 km gravel road off the Trans-Canada Highway just north of the Chippewa Falls Bridge.

## EXPLORATION HISTORY

Prior to 1966 when Karl Just recorded his first assessment work, which consisted of test pitting and trenching, little or no work was performed on the mineral occurrence. In the years from 1966 to 1968 Ontex Mining Limited discovered 3 mineralized veins on the property from work that consisted of test pitting, trenching, stripping and 2 diamond-drill holes from surface totalling 339 feet. In 1968, an adit was driven into 2 of the veins, with a lateral development of 40 and 50 feet. This development work was followed up by bulk sampling 500 tons of material, which was transported to the Coppercorp Mill for metallurgical testing. In 1971, Ontex Mining Limited followed up with an EM and magnetometer survey and a 6-hole diamond-drilling program totalling 2096 feet.

## PROPERTY GEOLOGY

The general geology of the area is underlain by Precambrian granitic rocks of the Algoma Plutonic Domain. The contact with volcanic rocks of the Batchawana greenstone belt lies to the immediate north of the property. A northwest-trending diabase has been identified on the property intruding the granitic rocks. The diabase is fine to medium grained, sheared and hosts mineralized quartz-carbonate veining. Diamond drilling from historical exploration work identified 3 mineralized veins in the diabase. All 3 veins are oriented to the northwest and are subparallel. Because of limited outcrop exposures, the surface projections of the veins were determined by the historical diamond drilling, as illustrated in Figure 8. Hole “S-1” drilled in 1968, reached a depth of 257 feet intersecting all 3 veins (Ontex Mining Ltd., Assessment File, 1970).

Assay results from Hole “S-1” of the 1968 diamond-drilling program are as follows:

Vein #1: 5.8 feet averaged 0.59% copper

Vein #2: 17.7 feet averaged 0.57% copper

Vein #3: 11 feet averaged 1.51% copper and 2.4 feet assaying 2.60% copper

Exploration on the property in 1968 included the development of 2 adits drifted into both Vein #1 and Vein #2. Adit 1 was drifted 40 feet into Vein #1 and a sample was taken for analysis that averaged 1.53% copper. Adit 2 is located 27 feet below Adit 1 and was drifted 50 feet into Vein #2. A sample taken at the end of the adit returned an assay of 1.50% copper (Ontex Mining Ltd., Assessment File, 1970). The average grade of the 500 ton bulk sample collected in 1968 was 1.18% copper (Ontex Mining Ltd., Assessment File, 1970).

In 2012, a visit was made by the staff of the Sault Ste. Marie District Geologist office to examine the mineralized veins. Because of limited outcrop exposures, only the No. 1 vein and a small section of the No. 2 vein were thoroughly examined. Historical trenching activities were located along the No. 1 vein. The trenching is approximately 150 feet long, 4 feet wide and averaging 3 feet deep. The No. 1 vein strikes 300/85S and dips steeply to the south (Figure 9A). The vein is composed of quartz, carbonate, chalcocite, bornite, chalcopyrite, pyrite, pyrrhotite, and malachite mineralization hosted within a sheared diabase (Figure 9B). The shearing and fracturing in the diabase is evident in the areas where veining is most intense. Many of the fractures have been filled with both epidote and hematite alteration (Figures 9C and 9D). The mineralization is concentrated on the margins of the quartz-carbonate veining and as massive patches at the wall rock contact. A grab sample collected for assay during the 2012 field visit from the No. 1 vein returned an assay of 0.29% copper and 1.3 oz/ton silver.

An outcrop of quartz-carbonate veining was discovered in contact with diabase 115 m from the main trenched area (Figure 9E). The veining consists of chalcopyrite, pyrrhotite and pyrite mineralization. It follows the same northwest strike direction as the 3 previously identified veins, but whether it is a new vein or part of the original 3 veins could not be confirmed because of overburden cover.

In 1971, the drilling of 2 shallow drill holes was designed to test the northwest extension of the veins returned poor results. Nevertheless, the fact that the outcrop is exposed in the same strike orientation and displays similar mineralization may indicate that the vein system extends to the northwest. A sample taken by the staff of the Sault Ste. Marie District Geologist office along this northwest-striking vein returned 0.29% copper. Further analytical results from the 2 samples taken by the staff of the Sault Ste. Marie District Geologist office are listed in Table 16.

**Figure 8.** Map illustrating historical exploration work on the Caputo–Just property as interpreted by Ontex Mining Ltd. in 1970, identifying the locations of all 3 veins. *Modified from* Ontex Mining Ltd. (1970).

**Figure 9.** A) Trenching along the No. 1 vein, the lines on the photo illustrate the NW striking orientation of the vein. B) Mineralization associated with the vein system hosted within a sheared diabase. C) and D) Shearing and fractures that display hematite and epidote alteration associated with the diabase. E) Examining outcrop of quartz-carbonate veining discovered on the northwest strike direction from the main trenched area.

**Table 16.** Geochemical data for samples taken during a property visit to the Caputo–Just property. All analyses were performed at the OGS Geoscience Laboratories, Sudbury. UTM coordinates are NAD83, Zone 16. Note: $CO_2$, S, FeO, $H_2O^+$ and $H_2O^-$ are in weight percent. All trace elements and Total REE are in ppm.

| Sample | Main Trench | West Trench |
|---|---|---|
| **Easting** | 700807 | 700706 |
| **Northing** | 5209594 | 5209649 |
| Ba | 336.2 | 5.8 |
| Be | 0.25 | 0.15 |
| Cd | 0.226 | 0.023 |
| Co | 57.75 | 58.56 |
| Cr | 60 | 127 |
| Cs | 0.150 | 0.045 |
| Cu | >2900 | >2900 |
| Ga | 11.54 | 11.46 |
| Hf | 0.67 | 1.25 |
| In | 0.0571 | 0.0432 |
| La | 4.33 | 2.61 |
| Li | 14.9 | 7.5 |
| Mo | 1.73 | 2.38 |
| Nb | 0.769 | 2.251 |
| Ni | 67.2 | 37.1 |
| Pb | 2.6 | 1.2 |
| Rb | 0.72 | 0.32 |
| Sb | 0.05 | <0.04 |
| Sc | 12.3 | 17.6 |
| Sn | 0.79 | 0.43 |
| Sr | 11.3 | 26.8 |
| Ta | 0.048 | 0.142 |
| Th | 0.480 | 0.732 |
| Ti | 1440 | 3045 |
| Tl | 0.016 | 0.005 |
| U | 4.076 | 0.893 |
| V | 135.7 | 144.6 |
| W | 0.34 | 0.23 |
| Y | 5.61 | 9.17 |
| Zn | 66 | 60 |
| Zr | 25 | 46 |
| Total REE | 18.2074 | 18.3057 |
| | | |
| $CO_2$ | 1.81 | 0.28 |
| S | 0.28 | 1.210 |
| FeO | 9.51 | 8.36 |
| $H_2O^+$ | 3.99 | 3.20 |
| $H_2O^-$ | 0.44 | 0.32 |

# McKee Property

## LOCATION

The McKee property (Zone 17, 311119E 5160034N) property is located in the eastern half of Otter Township and the western half of Casson Township. Burden Lake is situated to the north and Saunders Lake lies to the west of the property. The property is accessible by travelling east along Highway 638 and 670 from the City of Sault Ste. Marie, and then by all-terrain vehicle along a rugged bush road.

## HISTORICAL WORK ON THE PROPERTY

The McKee property consists of an east-trending quartz-carbonate vein that was originally staked by R. McKee in 1967. A series of pits and trenches were opened up by McKee in 1968 and the property was optioned to Riocanex who conducted geological mapping, magnetometer and vertical loop EM. In 1976, W.F. Chandler reported that 4 diamond-drill holes were drilled on the property but no records of the drill logs are available. In 1996, a ground geophysical survey was completed by Houston Lake Mining Inc. to detect conductive sulphide mineralization in the bedrock. Historical work was centred on this quartz-carbonate vein where it was exposed in several bedrock trenches and in an old adit observed on the property that aligns with the strike of the vein, but no record of that historical development work is available.

## PROPERTY GEOLOGY

The McKee mineral occurrence (MDI41J11SW00058) was visited by the staff of the Sault Ste. Marie District Geologist office. The mineral showing has been recently staked by prospector Mr. A. Fleury. The purpose of the visit was to locate the occurrence and examine the mineral potential.

The regional geology is made up of Archean massive granitic rocks which are overlain by younger Gowganda sediments of Huronian age. Mafic intrusive rocks of the Nipissing diabase have been identified to the north, with smaller more localized mafic dikes crosscutting both the granitic and Gowganda rocks.

Exploration has focused on an east-striking, north-dipping “Main” quartz-carbonate vein that ranges from 1 to 2 m in width and which is exposed over a distance of approximately 15 m (Figure 10A). This vein is hosted within massive granitic rock, with mineralization consisting of chalcopyrite, pyrrhotite, bornite, and minor specular hematite (Figure 10B). Hematite is the dominant alteration mineral with sulphide minerals, particularly the chalcopyrite and bornite crystals that are concentrated along the margins and within the quartz-carbonate vein. Veining is more prevalent and irregularly oriented into the granitic rock (Figure 10C), with mineralization only present in the form of specular hematite.

The eastern extension of this vein consists of a 1 to 2 m thick massive black mineral (Figure 10D). The eastern extension is located approximately 10 m east of the main vein. The elevated geochemical analysis of Fe, Mn and FeO levels (*see* Table 17) indicates that it is an iron oxide, possibly specular hematite. The widespread evidence of hematite alteration observed on the property may have attributed to the discovery of the quartz-carbonate vein.

An additional mineral showing was located approximately 400 m west of the “Main” quartz-carbonate vein. This showing has the same strike orientation as the main McKee vein but is hosted in Gowganda conglomerates. The Gowganda conglomerates display rounded granitic clasts in a fine-grained argillite matrix. The mineralization, consisting of specular hematite, minor chalcopyrite and malachite, is not as pervasive as it was in the main vein.

Significant assay results from 3 grab samples taken on the McKee property by the staff of the Sault Ste. Marie District Geologist office include 1.4% copper from the Main Vein, 1.4% copper from the Eastern extension and 0.23% copper from the Western Extension.

The discovery of a new mineral occurrence on the western extension of the Main Vein suggests that the vein is continuous along strike and therefore further exploration work along the strike of this vein would be required.

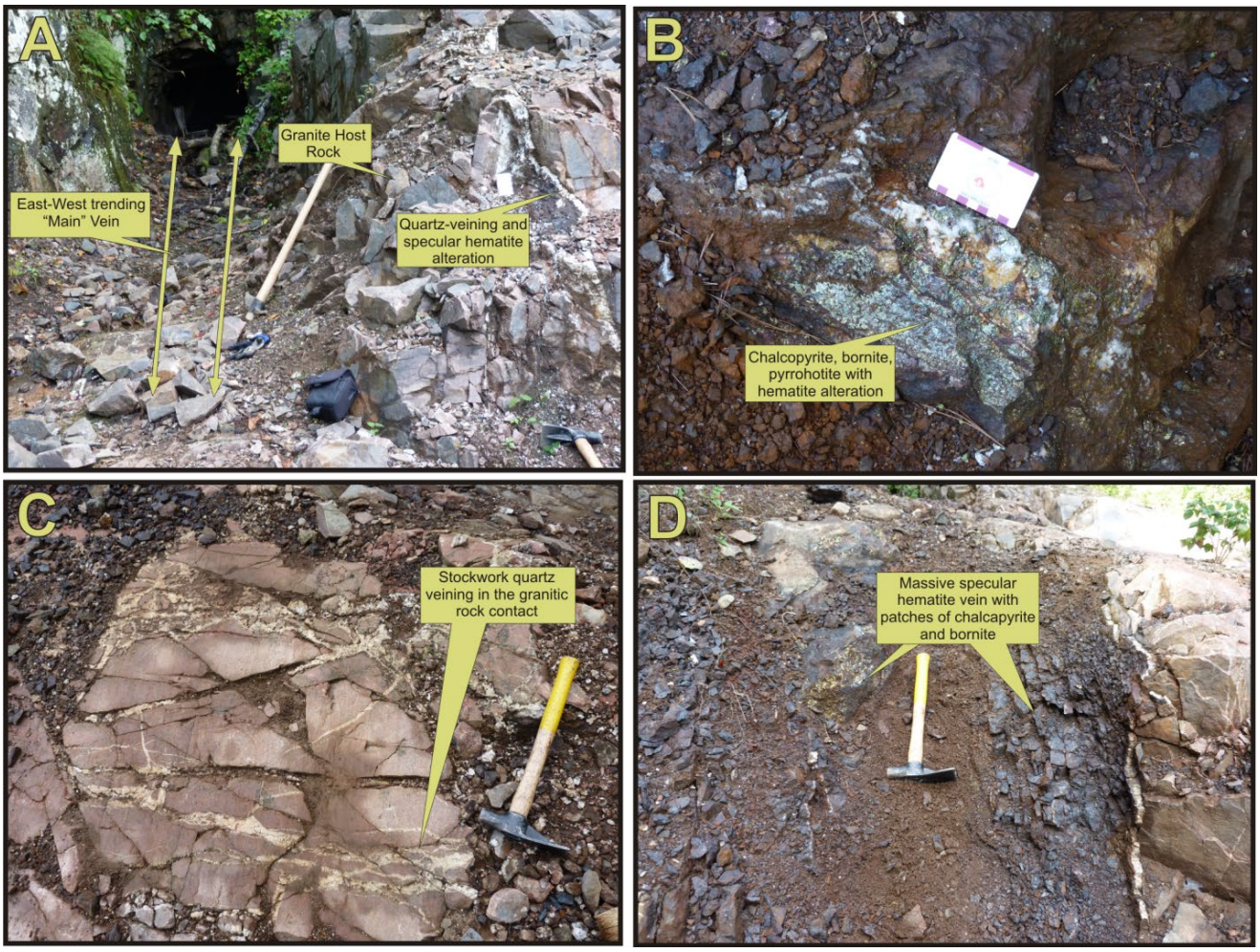


**Figure 10.** A) The east-trending Main vein in contact with the granitic host. The adit was developed along strike of the main vein. B) The sulphide mineralization that was observed on the McKee property. C) Irregularly oriented quartz veining in the host granitic rock. D) A massive section of specular hematite located along the eastern extension of the vein.

**Table 17.** Geochemical data for samples taken by staff of the Sault Ste. Marie District Geologist office during a visit to the McKee property. All analyses were performed at the OGS Geoscience Laboratories, Sudbury. UTM coordinates are NAD83, Zone 17. Note: $CO_2$, S, FeO, $H_2O+$ and $H_2O-$ are in weight percent. All trace elements and Total REE are in ppm.

| **Sample** | | **Mineralized Vein (Eastern Extension)** | **Mineralized Vein (Main)** | **Mineralized Vein (Western Extension)** |
|---|---|---|---|---|
| | **Easting** | 311132 | 311119 | 310958 |
| | **Northing** | 5160034 | 5160034 | 5160012 |
| Al | | 728 | 452 | 6207 |
| Ba | | 30 | 10 | 9 |
| Be | | 1 | 1 | 1 |
| Ca | | 312 | 46796 | 58677 |
| Co | | 13 | 10 | 9 |
| Cr | | 2 | 2 | 48 |
| Cu | | 14400 | 14400 | 2257 |
| Fe | | 95000 | 95000 | 95000 |
| K | | 83 | 70 | 98 |
| Li | | 1 | 3 | 2 |
| Mg | | 593 | 18601 | 13577 |
| Mn | | 7500 | 7500 | 7500 |
| Na | | 500 | 500 | 500 |
| Ni | | 4 | 10 | 3 |
| P | | 15 | 15 | 15 |
| Pb | | 53 | 44 | 38 |
| S | | 16000 | 16000 | 5666 |
| Sc | | 4 | 4 | 3 |
| Sr | | 17 | 18 | 69 |
| Ti | | 13 | 5 | 5 |
| V | | 18 | 17 | 27 |
| Y | | 11 | 20 | 10 |
| Zn | | 245 | 101 | 24 |
| Total REE | | 27.06 | 33.3 | 33.88 |
| | | | | |
| $CO_2$ | | 1.32 | 25.60 | 13.70 |
| S | | 13.60 | 8.22 | 0.60 |
| FeO | | 7.80 | 28.71 | 6.24 |
| $H_2O^+$ | | 5.52 | 0.26 | 0.41 |
| $H_2O^-$ | | 1.45 | 0.20 | 0.22 |

# RECOMMENDATIONS FOR EXPLORATION

## Rare Earth Element and Uranium Potential in the Newly Reclassified Matinenda Formation

In 2012, the Earth Resources and Geoscience Mapping Section of Ontario Geological Survey initiated a 2 year mapping project to map the geology of Albanel and Varley townships, located northwest of Elliot Lake, Ontario. The townships are situated at the contact between the Ramsey–Algoma granitoid complexes of the Archean Superior Province to the north and the unconformably overlying Paleoproterozoic Huronian Supergroup of the Southern Province to the south. The Archean rocks in Albanel Township consist dominantly of felsic intrusive rocks and lesser mafic volcanic rocks, both of which are cut by mafic dikes of the Paleoproterozoic Matachewan dike swarm.

Previous mapping by Siemiatkowska (1977) identified a basal sandstone unit at the eastern end of Albanel Township as being part of the Mississagi Formation. Recent mapping by Lewis (2012) reclassified this unit as the Matinenda Formation on the basis of its textural characteristics and its elevated uranium content (Figure 11A).

The basal sandstone unit identified during the mapping project is a yellow to light green arkose containing plagioclase and quartz. Intercalated within the sandstone unit are quartz pebble conglomerates that range up to 2 cm in diameter; clasts are subrounded and moderately well sorted (Figure 11C). The sandstone is anomalously high in uranium with typical portable gamma-ray spectrometer values of 300 cpm (counts per minute). On fracture surfaces and especially in the quartz-pebble conglomerate layers, maximum gamma-ray spectrometer readings of up to 5000 cpm total (200 ppm U) were measured (Lewis 2012) (Figure 11B).

The quartz-pebble conglomerate of the Matinenda Formation is host to the low-grade placer uranium deposits that were mined at Elliot Lake. In addition to the uranium potential of the Matinenda Formation, recent exploration activities have discovered that rare earth elements are also associated with the quartz-pebble conglomerate. The reclassification of the basal quartz-pebble conglomerate as Matinenda Formation is important because it extends those productive rocks at Elliot Lake into Albanel Township (Table 18). Besides uranium, further investigations are warranted to test the basal quartz-pebble conglomerate for its rare earth element potential.

**Table 18.** Assay-mode gamma-ray spectrometric readings from quartz-pebble conglomerate within the Matinenda Formation.

| | Easting (m) | Northing (m) | K (wt %) | U (ppm) | Th (ppm) |
|---|---|---|---|---|---|
| 1. | 348555 | 5160635 | 7.6 | 199.6 | 355.9 |
| 2. | 348555 | 5160635 | 9.1 | 192.1 | 511.3 |
| 3. | 350064 | 5160688 | 4.5 | 122.6 | 463.5 |

*Abbreviation: ppm = parts per million, wt % = weight percent.*

*Notes:*

*1. UTM co-ordinates are in Zone 17, NAD83*

*2. Multiply U by 1.1793 for $U_3O_8$. All K, U and Th data for samples 1 and 2 were recorded using an Exploranium GR-135G MiniSpec gamma-ray spectrometer and sample 3 was recorded using a RS-125 Spectrometer. The instrument was stabilized daily and data were recorded using the assay mode with a dead-time adjusted 5 minute count time.*

*3. Samples 1 and 2 were assayed by Lewis (2012) and sample 3 was assayed by Pace (2012).*

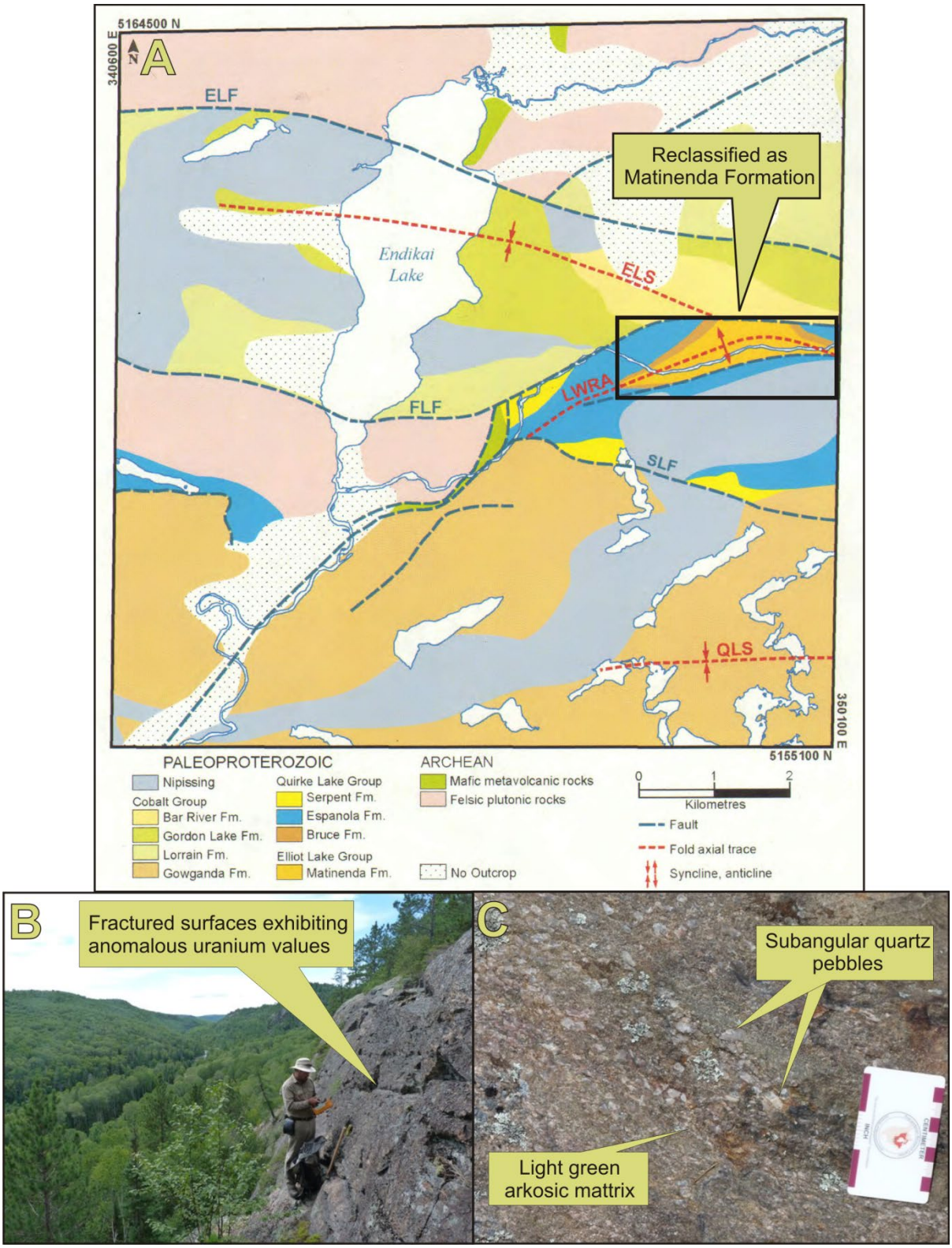


**Figure 11.** A) Simplified geological map of Albanel Township (Lewis (2012), *modified from* Siemiatkowska 1977). The square box illustrates the newly reclassified Matinenda Formation that was previously mapped as Mississagi Formation. B) Assaying a fractured surface of the newly reclassified section of the Matinenda Formation. C) Quartz-pebble conglomerate in a light green arkosic matrix characteristic of the basal section of the Matinenda Formation.

Recommendations for exploration made in the past years by Resident Geologist Program staff in Sault Ste. Marie are shown in Table 19.

**Table 19.** Compilation of Recommendations for Exploration made in the past years by Resident Geologist Program staff in Sault Ste. Marie.

| Author(s) | Report of Activities (publication year/page) | Recommendations/Township |
|---|---|---|
| R.J. Rupert | 1973, p.88 | Northwest Viel Tp. Cu prospect associated with NW-trending Nipissing diabase. |
| R.J. Rupert | 1973, p.89 | Gaudette Tp. Radioactive structure is favourable for copper, molybdenum and nickel. |
| G. Bennett and E.J. Leahy | 1980, p.99 | VanKoughnet Tp. The argentiferous galena occurrences in the area have a high potential value which increases with silver prices. |
| G. Bennett | 1982, p.133 and 137 | Hughes Tp. There seems to be a close spatial association between base metal-silver occurrences and dike rocks of Keweenawan age, especially felsite and lamprophyre. This association may be simply structural in that the deposits, namely argentiferous galena, lead, copper and zinc, occupy linear trends of N10ºW. |
| G. Bennett | 1983, p.149 and 150 | Aweres Tp. Radioactive quartz-pebble conglomerate found near or at the base of the Thessalon Formation between Sault Ste. Marie and the NE part of the Quirke Lake syncline contain numerous anomalous gold values of up to 600 ppb. Also in Day Tp, |
| G. Bennett, E.J. Leahy and K.D. Booth | 1985, p.218 | Davieux Tp. Evidence suggests there is a direct relationship with gold occurrence and primary magnetite presence in lean iron formation. |
| G. Bennett, E.J. Leahy and K.D. Booth | 1985, p.227 | From Goulais Bay to Elliott Lake, within the Huronian Supergroup, selected outcrops have a variety of colour, textures and exhibit distinct structures. These make an attractive ornamental stone and the integrity and dimension of these outcrops remain to be measured. |
| G. Bennett, E.J. Leahy, J.P. Donald, E. Frey, J.J. Kral, and D.J.J. Tortosa | 1986, p.253 | VanKoughnet Tp. While examining the area for industrial mineral potential the authors noted Black Granite outcrop with the dimension of 10 by 1 by 66 km. |
| G. Bennett, E.J. Leahy, J.P. Donald, E. Frey, J.J. Kral, and D.J.J. Tortosa | 1987, p.237 | Olsen and southern Tronsen Tps. Geochemical anomaly surveys, prospecting, mapping and drilling over pyritic iron formation. A structure traced for 5 miles in an east-trending direction has potential for gold. |
| G. Bennett, E.J. Leahy, J.P. Donald, E. Frey, J.J. Kral and D.J.J. Tortosa | 1987, p.244 | Prince Tp. Building dimension stone – red granite-monzonite. Large deposit over 4 $km^2$. The deposit is homogenous, no deleterious minerals or staining and is good for building or monumental stone.<br><br>Wells Tp. Nipissing diabase – black granite is another large deposit which is homogenous and dimensions need to be measured. |
| G. Bennett, E.J. Leahy, J. Walmsley | 1992, p.223 | Hughes Tp. Mineralized breccia zone within the granite gneiss. Shear zone crosscutting consists of diabase fragments, quartz stringers and carbonate. 10–15% mineralization includes sphalerite, pyrite, galena, chalcopyrite and pyrrhotite and Cu values range from 0.05–4%, Zn from 1–13%, Pb from 1–7%, Ag from 1–2000 ppm. |
| G. Bennett, E.J. Leahy and J. Walmsley | 1992, p.225 | Fenwick Tp. Barite in dolostone associated with stratabound copper occurring at the base of the Gordon Lake Formation. Mineralization includes very fine-grained pyrite and specular hematite. The depositional environment is suitable for base metal concentration. |
| G. Bennett, E.J. Leahy, J. Walmsley and M. Hailstone | 1993, p.225 | Montreal Mining Location: Domeykite occurrence within felsite intrusion on Hwy 17, 50 km north of Sault Ste. Marie. The copper arsenide occurs within fractures. |
| G. Bennett, E.J. Leahy, J. Walmsley and M. Hailstone | 1993, p.230 | Batchewana greenstone belt remains a prime area for mineral exploration as well as greenstone belts in Deroche, Shields and Gaudette tps. |

| Author(s) | Report of Activities (publication year/page) | Recommendations/Township |
|---|---|---|
| G. Bennett, M. Hailstone and B. Fremlin | 1995, p.250 and 251 | Northeast corner of Ryan Tp. Gold associated with Archean-hosted iron formation within the northern margins of the Batchewana greenstone belt. There are similarities to the Geraldton greenstone belt. |
| G. Bennett, M. Hailstone and B. Fremlin | 1995, p.251 | Flack Lake fault 45 km north of Blind River: The Flack Lake fault has potential for copper mineralization. |
| M. Hailstone and P. Morra | 1998, p.11 | Day Tp. Gold associated with basal pyritic units of the Livingston Creek Formation. |

**Table 20.** Mineral deposits not being mined in the Sault Ste. Marie District (former extent) in 2012.

**Abbreviations**

AF .....Assessment Files
AR .....Annual Report
CAMH..... *Canadian and American Mines Handbook*
CMH.....*Canadian Mines Handbook*
MRC…….Mineral Resource Circular
OBM……..…..Ontario Bureau of Mines
GR .....Geological Report
MDC .....Mineral Deposit Circular [No.15–]
[*formerly* Mineral Resources Circular, No.1-14]
MDIR.....Mineral Deposit Inventory record
OFR ..... Open File Report
OGS……..…….Ontario Geological Survey

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Reserve References | Status | Amis Site # |
|---|---|---|---|---|---|
| Pater Mine<br>Spragge Tp.<br>41J/02NE | Cu, Au, Ag | Total production was 70 460 264 lbs Cu.<br>Est. 2 000 621 ton @ 1.8% Cu. | MRC 12, pg.65<br>GR 76, pg.90 – 94. | Past Producer<br>1960– 1968 | 07955 |
| Bar-Fin Mine<br>Thompson Tp.<br>41J/03NE | Cu | Production of 120 000 lbs of Cu from 1500 tons of ore. 1.82% over 3 feet and 9.27% over 1.9 feet. | MRC 12, pg.67<br>GR 17, pg.62-63 | Past Producer<br>1906 | 07968 |
| Bald Dome prospect<br>Plummer Add. Tp.<br>41J/05SW | Cu | 80 – 100 feet true width averaging 0.25% Cu, diamond drill core. | MRC 12, pg.52<br>AF 0014 | showing | 07885 |
| Bruce Mines<br>Plummer Add. Tp.<br>41J/05SW | Cu, Ag | 40 000 ton @ 1.8% Cu above 155-foot level Bruce Mines Taylor site. | MDC 12 | Past Producer<br>1915–1921 | 07888 -<br>07891 |
| Campbell–Dukes prospect<br>Plummer Add. Tp.<br>41J/05SW | Cu | 33 000 ton @ 1.2% Cu<br>in 230 by 8 by 220 foot block | MRC 12, pg.54<br>AF 0014 | Past Producer<br>1956 | 07883 |
| Rock Lake Mine<br>Aberdeen Tp.<br>41J/05NE | Cu, Ag | 1 524 000 lbs Cu from 43 300 tons of ore. | MDC 12, pg.14 | Past Producer<br>1899 – 1903 | 07781 |
| Havilah Mine – Ophir Mine<br>Galbraith Tp.<br>41J/05NE | Au, Ag, Cu | 1 main vein, 2 – 150 foot shafts,<br>1 to 183 foot adit.<br>In 1911, 1030 oz Au and 214 oz Ag from 6589 tons ore milled. | MRC 13, pg.18<br>OBM 1893,<br>AR v.3, pg.37-45 | Past Producer<br>1892 -1894, 1900, 1910 and 1911 | 07851 |
| Steinberg Mine<br>Plummer Add. Tp.<br>41J/05SW | Cu | 124 000 T @ 1.1% Cu (drill indicated) for a length of 200 feet to a depth of 200 feet. | OGS 1969,<br>MRC. 12, pg.56-57<br>AF Plummer - 0014-0017. | Past Producer<br>1919 | 07884 |
| Stobie Mine – Rainbow Mine<br>Johnson Tp.<br>41J/05SW | Cu, Ni, Au | 9 tons of ore shipped from 100 foot level, 280 feet of lateral work. Shaft is 160 feet depth. | MRC 12, pg.34-35<br>MRC 2, pg.74<br>AF Index plan | Past Producer<br>1899–1901 | 08013 |
| Bilton Option<br>Patton Tp.<br>41J/06SE | Cu | 95 160 tons @ 1.72% Cu over a width of 7.3 feet to a depth of 200 feet. | ODM 1953, GR 17, pg.55-58, AF | Past Producer<br>Pre 1956 | 08093 |

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Reserve References | Status | Amis Site # |
|---|---|---|---|---|---|
| Boyea Lake Adit and East Zones<br>Montgomery Tp.<br>41J/06NE | Cu | 50 000 tons @ 2.5-3% Cu<br>135 150 tons @2.32% Cu across 7 feet over 1068 feet.<br>75 000 tons @ 1.0% Cu across 20 feet over a length of 300 feet. | Sudbury Contact Mines AR 1971<br>MRC. 12, P.43-44, AF | Past Producer<br>Pre-1942 | 08060 |
| Crownbridge (Cannon) prospect<br>Kamichisitit Tp.<br>41J/06NE | Cu | 415 000 tons @ 1.8% Cu over a width of 6.5 feet. | MRC.12, P.94<br>AF | Past Producer<br>1966–1967 | 08018 |
| Glagoma Mine<br>Gladstone Tp.<br>41J/06SE | Cu | 1917 2 shafts sunk to 250 feet | MRC 12, P.25-26<br>OGS 1963, GR.17 P.52-55 | Past Producer<br>1917 and 1962 | 07865 |
| Goulding Mine<br>Cobden Tp.<br>41J/06SE | Cu | 1962 to 263.3 dry tons shipped @ 1.45% and 222.5 dry tons shipped @ 1.34%. | MRC 12, P.19<br>OGS 1964, GR.20, P.62-65 | Past Producer<br>1962 | 07823 |
| North Montgomery-Grand Portage Mine<br>Gould Tp.<br>41J/06NW | Cu | No production or reserve data found. | OGS 1969, MRC 12, P.27-28. OGS 1899, AR v.8, pt.1, P.37-38<br>SMDR 00463 or MDIR A0229 | Past Producer<br>1899 | 07871 |
| Milgate (Abbican) prospect<br>Nouvel Tp.<br>41J/06NE | Cu | 105 750 tons @ 1.08% Cu (drill indicated)<br>A Zone L-600 by W-10 by D-235 feet | OGS 1969, MRC.12, P.97.<br>ODM 1957, MRC.2, P.71. | 1936–1955, 56<br>Development work. | 08076 |
| Principle Strategic Minerals prospect<br>Gladstone Tp.<br>41 J/06SE | Cu | 112 300 tons containing 3 128 196 lbs. Cu | MRC 12, P.26, GR 17, P.50-51.<br>AF | Pre 1957 | 07864 |
| Sheba prospect<br>Nouvel Tp.<br>41J/06NE | Cu | L-1000 feet by W-3 feet on surface<br>@ 0.59% Cu, weighted DD assays. | MRC 12, P.98 | 1956-57<br>Development work. | 08077 |
| Twin Lakes prospect<br>Esten Tp.<br>41J/07SE | Cu | Probable - 76 900 tons@ 1.73% Cu over 8 foot width, drill indicated. | MRC 12, P.23<br>AF Esten 0010-D1 | 1957<br>Trenching and DD | 07841 |
| Bi-Ore Mine<br>Sagard Tp.<br>41J/10NW | Cu | 2726 tons of concentrate containing 1 647 079 lbs. of Cu. | ODM 1951, AR. v.60, pt.2, P.2.<br>MRC 12, P.70-71 | Past Producer<br>1947–1949 | 07931 |
| Cheney Mine<br>Gould Tp.<br>41J/11SW | Cu | 39 405 tons @ 3.97% Cu (drill indicated)<br>3500 tons mined in 1967. | MRC 12, P.26-27<br>ODM, 1929, v.38, pt.7. P.10-15 | Past Producer<br>1966–1967 | 07874 |
| Copper Prince Mine<br>Kamichisitit Tp.<br>41J/11SE | Cu, Au | 4 shoots<br>310 by 6.3 feet averages 3% Cu<br>60 by 9.7 feet averages 1.9% Cu<br>45 by 6.6 feet averages 2.3% Cu<br>110 by 9.6 feet averages 0.9% Cu<br>Weighted average of 4 DD holes, 2.7% Cu over 7 feet and 0.03 oz/ton Au. | MRC 12, P93-94<br>GR 178, P.66-67<br>SMDR File 00823<br>MP 57, P.87 | 1928-29<br>DD, trenching and grabs sampling.<br>1973 mining operations suspended after shipping small quantity of Cu concentrate. | 08019 |
| Jardun Mine<br>Jarvis Tp.<br>41K/09NE | Pb, Zn, Ag, Cu, Au | No. 1 and 4 zone reserves are 20000 tons averaging 7.25% Pb, Zn and 1.52 oz/ton Ag.<br>No. 3 zone reserve estimate is 19367 tons averaging 9.56% Pb and Zn with 1.10 oz/ton Ag. | MRC 12, P.32-33<br>AR v.67, pt.2. P.108-109. | Past producer<br>1954–1957 | 08007 |
| Kerr Scott (Algoma Galena)<br>Deroche Tp.<br>41K/09NE | Pb, Zn, Ag, Au | 1859 tons of hand-cobbed ore recovered.<br>Deposit reserves have not been calculated. | MRC 12, P.21-22<br>AR v. 49, pt.1, P.223<br>ODM 1928 v.37, pt.3, P.72-73 | Past Producer<br>1939 | 07833 |

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Reserve References | Status | Amis Site # |
|---|---|---|---|---|---|
| Goulais River, Doughty, Eagle Mine, Tribag, Edwards. VanKoughnet Tp. 41K/16SW | Cu, Ag | 250 000 ton @ 2.35% Cu, 0.26 oz/ton Ag in 3 zones (drill-indicated). | GDIF #75, OBM 1905, v.14, pt.1 AR 1970, MP 46, P.92-93 AR 1973, MP 57, P.86. | Past Producer 1900 | 07974 |
| Kristina Mine (Supercrest) (Superior) LaVerendrye Tp. 41K/16NE | Cu | 369 350 tons @ 1.95% Cu in No 4 and No. 6 shaft zones. No. 6 Shaft Zone, 10 000 tons @ 4% Cu and 200 000 tons @ 2.53 % Cu. | MRC 12, P.75 MRC 1, P.43 OBM, v.11, 1902, P.274 OBM, v.17, 1908, P.79 | Past producer 1903–1907 1952-1957: 22,000 feet of DD | 08040 |
| Prace–Sill Lake Mine VanKoughnet Tp. 41K/16SW | Pb, Zn, Ag | 20 000-60 000 tons @ 12 oz/ton Ag, and 20 000 tons @ 41.65 oz/ton Ag and 33.7% Pb over 1.13 ft width. | AF SSMP Vankoughnet 16, 17. | Past Producer 1975, 1979, 1981, 1983–84 and 1985–1987 | 07976 |
| Caputo–Just (Caputo-Thompson, Ontex) Wishart Tp. 41N/01SW | Cu | 475 tons @ 1.18 % Cu recovered from 3 zones | MRC 12, P.78 MP 25, P.5 | Past Producer 1968 | 07985 |
| Coppercorp Mine Ryan Tp. 41N/02SW | Cu, Ag, Au | 1.02 million tons @ 1.16% Cu production. | MRC 12, P.45-46 ODM 1953, AR 62, pt.4, P.18-24 AF –Montreal Mining Co. SSMP-0012 AF SSMP Ryan 15, P.30 AF SSMP Ryan – 37 (cd). 2.47257, pg.3. | Past Producer 1965–72 | 07937, 07938, 07939, 8061 |
| Glenrock (Rockdale) Palmer Tp. 41N/02SE | Co, Au, Cu | Several zones – main zone L-250 by W-3.5 feet (drill indicated) 1953, 11 DD holes, failed to show continuity with depth, best assay 16% Co. | MRC 12, P103 MRC 10 P20 | Glenrock 1952 Rockdale 1958 | 08081 |
| Jogran prospect Ryan Tp. 41N/02SE | Cu, Mo | Reserve est. 18 M tons @0.19% Cu and 0.05% $MoS_2$ | MRC 12, P.60-61 MRC 7, P.11 AF RYAN SSMP - 15, P.30 | 1965–66: DD | 07924 |
| Mamainse Mine Ryan Tp. (A.McDonell Location, west of Ryan Tp.) 41N/02SW | Cu | Vein L-1500 by W-13 feet 3 shafts sunk to depth 60, 280, 320 feet No production recorded. | MRC 12, P.57 AR. v.62, pt.4, P.23 MRC 2, P.79 | Past Producer 1882–1884 | 08050 |
| Maricona prospect (Rankin Location-Point Aux Mines) Slater Tp. 41N/02NE | Cu | 295 405 tons @ 1.17% Cu (1098 by 345 by 8.1 feet) | MRC 12, P.58 AF Rankin Mnrl 1964, 0013-A1 AF Rankin Mnrl 1956, 0012 AF Rankin Mnrl 1949, 0017A | Past Producer 1865–66 and 1949, 1955–56 | 07902 Same as 07899 |
| Pancake Lake (Richards) Kincaid Tp. 41N/02SE | Cu | 310 by 21.5 by 310 feet @ 0.76% Cu Developed prospect. | MRC 12, P.38 | 1952 intermittent until 1964 | 08026 |

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Reserve References | Status | Amis Site # |
|---|---|---|---|---|---|
| Tribag Mine<br>Nicolet Tp.<br>41N/02SE | Cu, W, Ag, Au | 4 Zones (Breton, West, East and South)<br>Reserve est. 2004 : Breton, 40 M tons @ 0.2% Cu above 300 m.<br>East Breccia, 125 M tons @ 0.13% Cu and 0.04% $MoS_2$<br>West Breccia, 0.1 M tons @ 0.6 to 1.0% Cu | MRC 12 , P.80AF<br>SSMP Ryan-15, P.30 | Past Producer 1967–1973<br>Production from Breton and West Breccia Zones | 08068 |
| Goulais River<br>Nahwegezhic Tp.<br>41O/04SW | Fe | Algoma Ore Division Iron Range: 25-40% total iron. Estimated reserves 30 480 000 tons of iron pellets in Cowie Lake Section.<br><br>McPhail deposit (southern extension): 31% total iron, est. Reserves 5 080 000 tons of iron pellets. | MRC 11, P.41-42<br>OGS Report 192, P.49-56 | 1910-1944 Development work<br>1963-1966 DD, trenching, metallurgical studies. | 08065 |

**N.B. This table contains tonnage and grade estimates, referred to as "reserves" (indicated, possible, probable), which were determined at various times by methods largely unreported. Unless specifically indicated, it must be assumed that these estimates are not in compliance with the reporting standards required by National Instrument 43-101. Abbreviation: AMIS = Abandoned Mine Information System.*

**Table 21.** Mineral deposits not being mined in the Wawa Area in 2012.

**Abbreviations**

CAMH..... *Canadian and American Mines Handbook*
GR..... Geological Report
NM ..... *The Northern Miner*
OFR..... Open File Report
RGF..... Resident Geologist Files

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Alden-Goudreau (past producer)<br>Cowie Township | Au | 170,000 tons @ 0.50 oz/t Au | Michipicoten Forest Resources and Cedar Falls Forest Resources | CMH 1937-43 | Diamond drilling 2011 |
| Betty Lake Iron Range<br>Knicely Township | Fe | 1,570,140 tonnes @ 39.5% Fe | Essar Steel Algoma Inc. | RGF | Inactive. Bulk sampled 1999 |
| Big Lake Iron Range<br>Corbiere Township | Fe | 302,150 tons per 100 feet @36.6% Fe | Michipicoten Forest Resources and Cedar Falls Forest Resources | GR 153 | Last active exploration 1955 |
| Braminco prospect<br>Brackin Township | Au | 100,000 tons @ 0.15 oz/t (#21 Vein); 23,000 tons @ 0.31 oz/t (#7 Vein); 5000 tons @ 0.26 oz/t (B Vein) | Conquest Resources Limited | RGF | Last explored 2004 |
| Cline Gold Mine (past producer)<br>Jacobson Township | Au | 204,000 tons @ 0.221 oz/t Au (88-60 Zone) | Cline Mining Corporation | NI 43-101 Rpt. 30/11/2009 | Diamond drilling 2008 |
| Edwards Mine (past producer)<br>Jacobson Township | Au | 96,000 tonnes @ 11.3 g/t Au (at the end of 2000) | Strike Minerals Ltd. | RGF | Dewatering and diamond drilling 2011 |
| Ego Mines Claims<br>Abotossaway Township | Au, Cu | 7 mineralized zones; W-8 zone hosts 442,080 tonnes @ 2.6 g/t Au, 1.91% Cu | Richmont Mines Inc. | OFR 5587 | Inactive |
| Goudreau Zone<br>Finan Township | Au | Indicated Resource: 220,667 t @ 12.0 g/t Au (85,262 ounces);<br>Inferred Resource: 169,027 t @ 10.3 g/t Au (55,730 oz) | Richmont Mines Inc. | RGF | Diamond drilling 2010 |

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| G.W. Macleod Mine (past producer) McMurray Township | Fe | 18,700,000 tonnes (blocked out) @ 31% Fe | Essar Steel Algoma Inc. | OFR 5990 | Mine closed in 1998. |
| Josephine–Bartlett Iron Range Corbiere Township | Fe | 7,555,788 tonnes @ 58.36% Fe | Essar Steel Algoma Inc. | OFR 5578 | Diamond drilled 1946. |
| Josephine Mine (past producer) Corbiere Township | Fe | 3,965,00 tons @ 51.65% Fe, 14.92% Si, 1.88% S | Canada Iron Inc. | RGF | Mine cave-in in 1946. Inactive. |
| Jubilee–Surluga Property (past producer) McMurray Township | Au | Inferred Resource: 32,200,000 tonnes @1.14 g/t Au | Augustine Ventures Inc. | NI 43-101 Rpt 21/11/2011 | Past producers (8) 1902–1991. Diamond drilling 2011. |
| Kremzar Mine (past producer) Finan Township | Au | 229,777 tonnes @ 7.65 g/t Au | Richmont Mines Inc. | RGF | Active exploration 2000 |
| Lakemount property, Esquega Township | Ni, Cu | Inferred Resource 3,048,000 tonnes @ 0.35% Ni, 0.20% Cu, 0.13 g/t Pt, 0.09 g/t Pd | First Development Holdings Corporation | NI 43-101 Rpt. Platinum Group Metals 21/01/2005 | Diamond drilling 2003–04 |
| Lochalsh Zone (past producer) Finan Township | Au | Probable Reserves: 185,450 t @ 5.6 g/t Au (33,161 ounces); Indicated Resource: 252,755 t @ 5.3 g/t Au (42,875 ounces); Inferred Resource: 210,160 t @ 6.4 g/t Au (43,083 ounces) | Richmont Mines Inc. | RGF | Diamond drilling 2010 |
| Lucy Iron Range (past-producer) Chabanel Township | Fe | 13,780,000 tonnes @ 33.2% Fe | Essar Steel Algoma Inc. | RGF | Mine closed 1970 |
| Magino Mine (past producer) Finan Township | Au | Indicated Resource: 67,555,000 t @ 1.00 g/t Au (2,176,300 ounces @ 0.35 g/t cut-off) Inferred Resource: 54,242,000 t @ 0.99 g/t Au | Prodigy Gold Incorporated | NI 43-101 Rpt. 2/11/2011 | Diamond drilling 2011 |
| Magnacon Mine (past producer) Mishibishu Lake Area | Au | 1.47 million tons aver. 0.19 oz/t Au (drill indicated). Past producer 1990, 19,397 oz from 163,366 tons | Wesdome Gold Mines Ltd. | CMH, 1997-98, p. 204 | Underground exploration 2004. Drifting westward toward Mishi Mine. |
| Magpie Iron Range (past producer) Leclaire Township | Fe | 332,400 tonnes @ 36% Fe | Essar Steel Algoma Inc. | RGF | Mine closed 1921. Underground mine. |
| Markes occurrence Jacobson Township | Au | 65,000 tonnes @ 5.75 g/t Au | Pele Mountain Resources Inc. | RGF | Diamond drilling 2010 |

| Deposit Name/ NTS | Commodity | Tonnage-Grade Estimates and/or Dimensions | Ownership References | Reserve References | Status |
|---|---|---|---|---|---|
| Mishi deposit Mishibishu Lake area | Au | Open pit Measured+Indicated resource: 5,169,200 t @2.14 g/t Au; Inferred Resource 764,100 t @ 2.42 g/t Au Underground Measured+Indicated resource: 567,100 t @ 4.52 g/t Au; Inferred Resource 437,600 t @ 5.78 g/t Au | Wesdome Gold Mines Ltd. | NI 43-101 Rpt 12/01/2011 | Diamond drilling, dewatering 2011. Commercial production January 2012 |
| Murphy–Algold–Amherst gold mine (past-producer) Abotossaway Township | Au | 248,800 tons @ 0.305 oz/t Au | Lake Shore Gold Corp. | RGF | Diamond drilling 2003. |
| Nudulama prospect Leeson Township | Au | 579,325 T @ 0.194 opT Au | GoldTrain Resources Inc. | RGF | Inactive |
| No. 8 Zone Finan Township | Au | 90,700 tonnes @ 6.9 g/t Au | Richmont Mines Inc. | RGF | Exploration 1997 |
| Pine Zone Finan Township | Au | 70,000 tonnes @ 6.4 g/t Au | Richmont Mines Inc. | RGF | Inactive |
| Ranson Mine Rabazo Township | Au | 30,3000 tonnes @ 12.4 g/t Au | N.A. | RGF | Diamond drilling 2001 |
| Renabie Mine (past producer) Leeson Township | Au | 1 million tonnes @ 0.2 g/t Au. Past producer 1100000 oz Au | N/A | RGF | Rehabilitated |
| Ruth Iron Range (past producer) Chabanel Township | Fe | 34,608,000 tonnes @ 30.9% Fe | Essar Steel Algoma Inc. | RGF | Diamond drilling 1967 by Algoma Ore Company Ltd. |
| Shenango Gold Mine Hawkins Township | Au | 37,440 tonnes @ 4.3 g/t Au | Canadian Orebodies Inc. | RGF | Inactive |
| Shihan VMS property Meath and Rennie Townships | Zn, Pb, Cu | Indicated: 199,699 tonnes @ 3.81% Zn, 0.21% Pb, 0.09% Cu, 91.82 g/t Ag, 0.30 g/t, 0.30 g/t Au Inferred: 44,362 tonnes @ 4.30% Zn, 0.20% Pb, 0.09% Cu, 72.82 g/t Ag, 0.21 g/t, 0.30 g/t Au | Goldpath Resources Corp. | NI 43-101 Rpt 14/11/2011 | Inactive |
| Sir James Dunn Mine (past producer) Chabanel Township | Fe | 65,454,545 tonnes @ 34% Fe, 7% $SiO_2$ | Essar Steel Algoma Inc. | RGF | Inactive. |
| Surluga Mine (past producer) McMurray Township | Au | 385,000 tons @ 0.21 opT Au | Augustine Ventures Inc. | NI 43-101 Rpt 21/11/2011 | Diamond drilling 2011 |

## REGIONAL LAND USE GEOLOGIST ACTIVITIES

For the report of the northeast Regional Land Use Geologist, *see* Timmins District report.

## FIRST NATIONS MINERALS INFORMATION OFFICER—NORTHEASTERN ONTARIO

For the report of the First Nations Minerals Information Officer, Northeastern Ontario, *see* Timmins District report.

## MINERAL DEPOSIT COMPILATION GEOLOGIST—NORTHEASTERN ONTARIO

For the report of the Mineral Deposit Compilation Geologist, Northeastern Ontario, *see* Timmins District report.

## ACKNOWLEDGMENTS

Information on past activities reported in the text is from assessment files and other files of the Sault Ste. Marie District Geologist office unless otherwise noted. Information on current mining and exploration activities was provided by individual prospectors and exploration and mining company personnel, compiled from assessment files and obtained from public information sources.

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# Metric Conversion Table

| Conversion from SI to Imperial | | | Conversion from Imperial to SI | | |
|---|---|---|---|---|---|
| *SI Unit* | *Multiplied by* | *Gives* | *Imperial Unit* | *Multiplied by* | *Gives* |
| | | LENGTH | | | |
| 1 mm | 0.039 37 | inches | 1 inch | **25.4** | mm |
| 1 cm | 0.393 70 | inches | 1 inch | **2.54** | cm |
| 1 m | 3.280 84 | feet | 1 foot | **0.304 8** | m |
| 1 m | 0.049 709 | chains | 1 chain | 20.116 8 | m |
| 1 km | 0.621 371 | miles (statute) | 1 mile (statute) | **1.609 344** | km |
| | | AREA | | | |
| 1 $cm^2$ | 0.155 0 | square inches | 1 square inch | **6.451 6** | $cm^2$ |
| 1 $m^2$ | 10.763 9 | square feet | 1 square foot | **0.092 903 04** | $m^2$ |
| 1 $km^2$ | 0.386 10 | square miles | 1 square mile | 2.589 988 | $km^2$ |
| 1 ha | 2.471 054 | acres | 1 acre | 0.404 685 6 | ha |
| | | VOLUME | | | |
| 1 $cm^3$ | 0.061 023 | cubic inches | 1 cubic inch | **16.387 064** | $cm^3$ |
| 1 $m^3$ | 35.314 7 | cubic feet | 1 cubic foot | 0.028 316 85 | $m^3$ |
| 1 $m^3$ | 1.307 951 | cubic yards | 1 cubic yard | 0.764 554 86 | $m^3$ |
| | | CAPACITY | | | |
| 1 L | 1.759 755 | pints | 1 pint | 0.568 261 | L |
| 1 L | 0.879 877 | quarts | 1 quart | 1.136 522 | L |
| 1 L | 0.219 969 | gallons | 1 gallon | **4.546 090** | L |
| | | MASS | | | |
| 1 g | 0.035 273 962 | ounces (avdp) | 1 ounce (avdp) | 28.349 523 | g |
| 1 g | 0.032 150 747 | ounces (troy) | 1 ounce (troy) | **31.103 476 8** | g |
| 1 kg | 2.204 622 6 | pounds (avdp) | 1 pound (avdp) | **0.453 592 37** | kg |
| 1 kg | 0.001 102 3 | tons (short) | 1 ton(short) | **907.184 74** | kg |
| 1 t | 1.102 311 3 | tons (short) | 1 ton (short) | **0.907 184 74** | t |
| 1 kg | 0.000 984 21 | tons (long) | 1 ton (long) | **1016.046 908 8** | kg |
| 1 t | 0.984 206 5 | tons (long) | 1 ton (long) | **1.016 046 9** | t |
| | | CONCENTRATION | | | |
| 1 g/t | 0.029 166 6 | ounce (troy) / ton (short) | 1 ounce (troy) / ton (short) | 34.285 714 2 | g/t |
| 1 g/t | 0.583 333 33 | pennyweights / ton (short) | 1 pennyweight / ton (short) | 1.714 285 7 | g/t |

OTHER USEFUL CONVERSION FACTORS

| | *Multiplied by* | |
|---|---|---|
| 1 ounce (troy) per ton (short) | 31.103 477 | grams per ton (short) |
| 1 gram per ton (short) | 0.032 151 | ounces (troy) per ton (short) |
| 1 ounce (troy) per ton (short) | 20.0 | pennyweights per ton (short) |
| 1 pennyweight per ton (short) | 0.05 | ounces (troy) per ton (short) |

*Note: Conversion factors in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the* Metric Practice Guide for the Canadian Mining and Metallurgical Industries*, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.*

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