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Northern Ontario pushes to expand mining investment

The mining industry in northern Ontario is known mostly for its huge nickel deposits. Inco's and Falconbridge's nickel mines in the Sudbury Basin are the best known. And with nickel prices being what they are, interest in the region continues.

And how. Inco and Falconbridge want to merge. Teck Cominco wants Inco, but without Falconbridge. Xstrata made a hostile bid for Falconbridge, which Falconbridge rejected. And, in June, Phelps Dodge trumped them all when it made an approximately US\$40-billion friendly offer for Inco and Falconbridge in a two-part deal.

While those five companies are sorting out who gets who, other smaller mining and exploration companies in the Sudbury Basin continue with business. In addition to nickel, these companies are exploring for and producing copper, gold, platinum-group-metals and zinc.

The value of Ontario's metals production during 2005 was C\$7.9 billion, according to the Ontario Geological Survey. And Ontario accounted for 36 percent of Canada's metals production during that year. An offshoot of mining's impact on northern Ontario's economy is the growing number of support industries in the cities of Sudbury and North Bay. Among them are equipment manufacturers, contract mining companies and consulting firms.

The province is making a significant effort to encourage investment of all types of industries in northern Ontario. And the mining industry is near the top of the list. In May, Ontario's Ministry of Economic Development and Trade hosted a handful of mining editors for a tour of the Sudbury mining district along with some manufacturers and mining support companies located in Sudbury and North Bay. Many of them began as suppliers and contractors to the local mining industry but have since grown their businesses to include the global market.

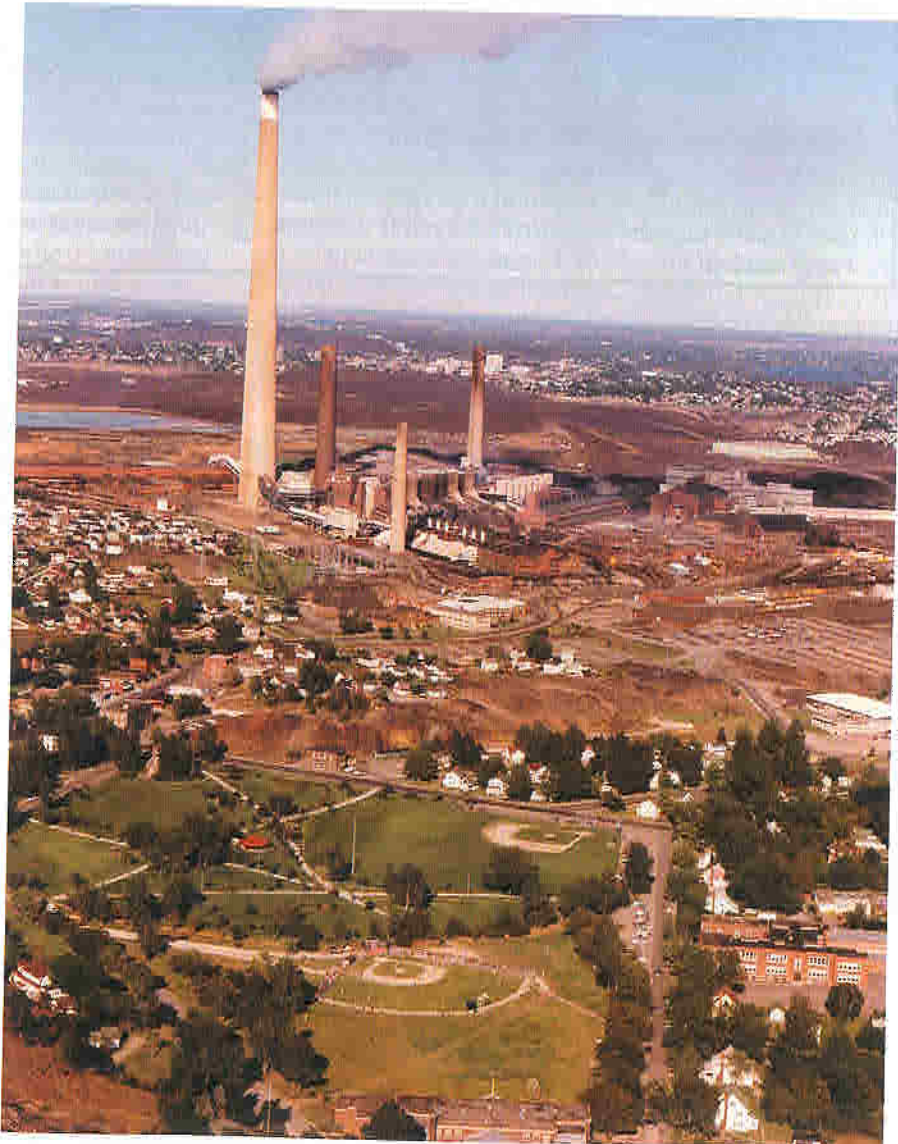
Northern Ontario

Northern Ontario covers about 800,000 km² (309,000 sq miles), or about 89 percent of the provincial land mass, said Marc Leroux, with the

Ontario Geological Survey's Information and Marketing Services. The region's population is about 839,500 people, or 7 percent of the province's total. That equates to one person/km² versus 104 people/km² in the south, he said.

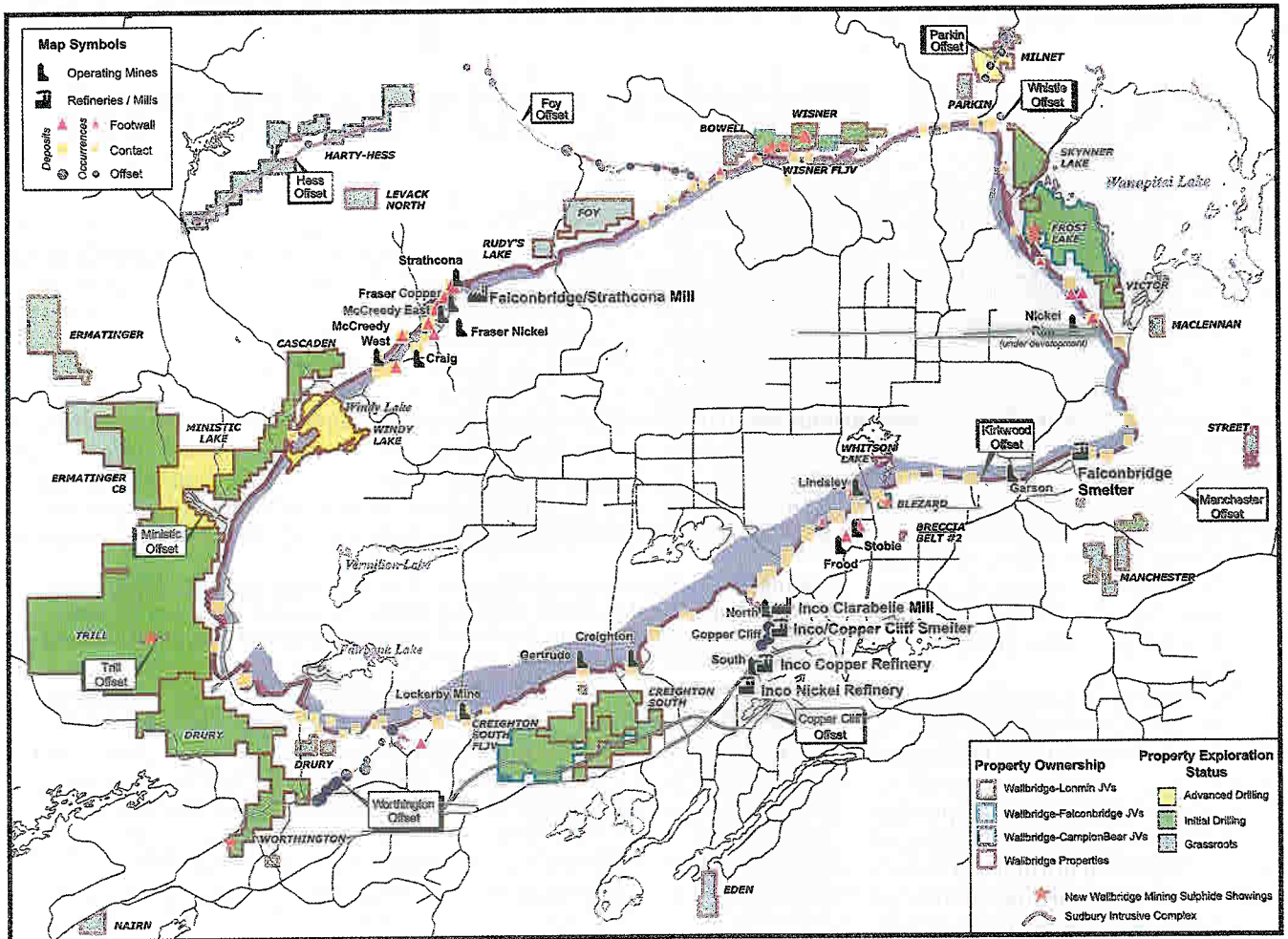
The value of the province's metal production throughout the years has totaled about C\$343 billion, Leroux said. The major metals included nickel, gold, copper, zinc and silver. In 2005, the value of Ontario's mining industry was C\$7.9 billion, including metals and nonmetals production, development and exploration. The mining industry in the region employs about 22,500 people at an average salary of C\$59,500, he said. Indirect jobs amounted to 75,000. In addition, there are more than 400 junior mining companies

Falconbridge's Superstack in Sudbury Ontario. Falconbridge and Inco are the two major players in the Sudbury Basin. However, there are 10 other nickel-copper operations in the basin and several junior companies exploring for copper, nickel and precious metals.



Steve Kral, Senior Editor

Location map of the major mines, plants and exploration projects in the Sudbury Basin. (Map courtesy of Wallbridge Mining.)



with properties in Ontario. Combined, those companies have a market capitalization of about C\$2.7 billion, Leroux said. And the Toronto Stock Exchange has 60 percent of the world's listed mining companies.

There are 14 operating base metals mines in Ontario this year, Leroux said. Twelve gold mines are also operating, along with one platinum-group-metals mine, and one other mine that produces magnesium, calcium and strontium, he said. Fourteen major industrial minerals mines are also operating in the province. And DeBeers Canada announced earlier this year that it will go ahead with construction of Ontario's first diamond mine.

Mining

The Sudbury district hosts 12 nickel-copper mining operations, according to the Ontario Ministry of Northern Development and Mines. The two largest companies are Falconbridge and Inco. But there are several smaller operations as well.

Falconbridge's operations in northern Ontario include three underground mines, the Strathcona Mill in Onaping, and a smelter and sulfuric acid plant in the town of Falconbridge. At the beginning of 2005, Falconbridge's reserves in the Sudbury area were 11.86 Mt (13 million st) at an average grade of 1.2 percent nickel and 1.3 percent copper.

Ore from Falconbridge's Sudbury operations is shipped from the Strathcona mill. Copper concentrate

is sent to the company's Kidd Metallurgical Division in Timmins, Ontario. Nickel-copper concentrate is smelted and refined at the company's smelter in Sudbury.

Inco has six underground mines and one openpit operation in the Sudbury Basin. The company also operates the Clarabelle Mill, a smelter, nickel, copper and silver refineries, a sulfuric acid plant and a liquid sulfur dioxide plant. In addition, Inco operates a nickel, cobalt and precious metals refinery in Port Colborne, Ontario.

Inco's Sudbury mines produced 98 kt (216 million lbs) of nickel during 2005. About 16.3 kt (36 million lbs) of that came from external sources. The company also produced 130 kt (287 million lbs) of copper from its Sudbury operation, about 4.5 kt (10 million lbs) of which were from external sources. And Inco produced about 1.67 kt (3.7 million lbs) of cobalt. Precious metals production during 2005 — including platinum, palladium, gold, silver and others — amounted to 13 t (419,000 oz).

FNX and Dynatec in the second quarter of 2005 began commercial production of the PM deposit at their jointly held McCreeedy West underground mine. The deposit contains copper, nickel, platinum and gold mineralization from the McCreeedy West Mine's 275-m (900-ft) level to the 670-m (2,200-ft) level. In October, FNX purchased Dynatec's interest in the joint venture and now controls all of Dynatec's Sudbury's assets.

The McCreeedy West Mine produced about 3.6 kt (8 million lbs) of nickel during 2005. It also produced

about 2.8 kt (6.2 million lbs) of copper and 44.6 t (98,410 lbs) of cobalt. And the mine produced 312 kg (10,040 oz) of combined platinum, palladium and gold.

Exploration

During 2005, about \$5 billion was spent on exploration activities throughout the world. Of that, nearly \$1.5 billion was spent in Canada, Leroux said, and about \$321 million was spent in Ontario. Canada ranked second in exploration expenditures during 2005, behind Latin America and ahead of Africa and Australia, according to figures from Metals Economics Group.

Exploration around the Sudbury region is mostly for nickel, copper and precious metals mineralization. However, some exploration has been taking place for gold, copper-zinc-silver and diamonds, in addition to a range of industrial minerals, according to Ontario Ministry of Northern Development and Mines.

Falconbridge has two nickel projects in advanced stages of exploration. In 2004, the company began a five-year, C\$368-million underground definition drilling program at its Nickel Rim South deposit. Inferred resources are currently 13.2 Mt (14.5 million st) averaging 1.7 percent nickel, 3.5 percent copper, 0.04 percent cobalt, 8 g/t (0.2 oz/st) platinum and 2.2 g/t (0.06 oz/st) palladium.

Surface and underground exploration activities at the company's Fraser Morgan deposit have revealed four mineralized zones along a 2.5-km- (1.5-mile-) long strike zone. A prefeasibility study of the deposit is under way.

Wallbridge Mining is the third largest landholder in the Sudbury Basin, behind Falconbridge and Inco, according to Bruce Jago, vice president of exploration. His company provided the editors with a helicopter tour of the Sudbury Basin.

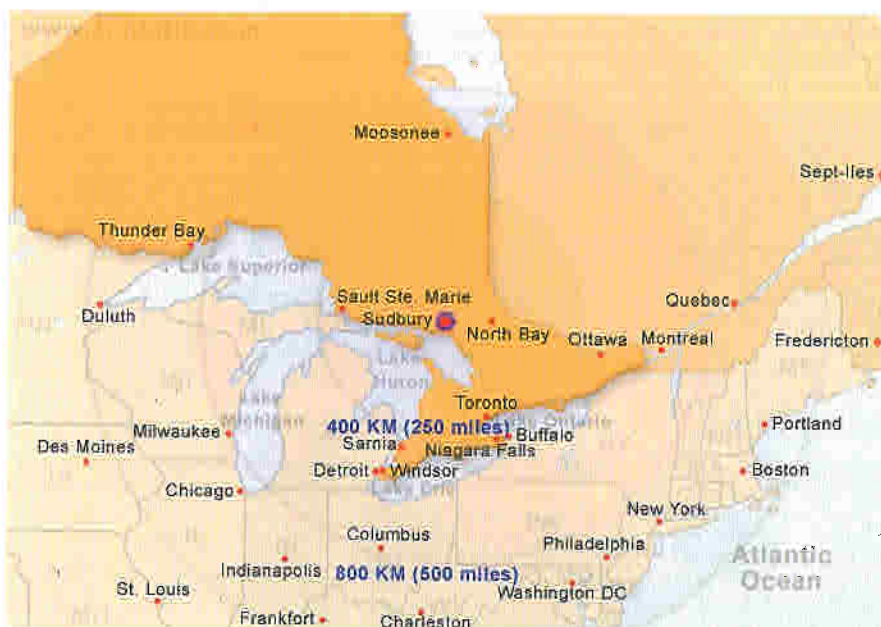
Wallbridge Mining's portfolio of 23 properties in the region cover more than 300 km² (115 sq miles), Jago said. Eighteen of those properties involve joint venture agreements with Lonmin. The other five are included in one of three separate joint ventures with Falconbridge.

The company's most advanced property is the Wisner. In 2005, Wallbridge Mining geologists outlined an inferred resource the newly discovered Broken Hammer zone of 251 kt (276,600 st). Precious metals grades are 1.56 g/t (0.045 oz/st) palladium, 1.62 g/t (0.047 oz/st) platinum and 0.61 g/t (0.017 oz/st) gold. Copper grades are 1 percent, while nickel is 0.1 percent.

The Wisner property is part of two joint ventures, both involving Wallbridge Mining. The first is the Sudbury Camp Joint Venture with Lonmin, while the second involves Falconbridge. Together, the Wisner property covers more than 9 km (5.6 miles) of strike length in the footwall of the Wisner Embayment.

FNX is working on a C\$40-million advanced stage exploration program at its Podolsky property near Norman, Ontario. So far, a planned 790-m (2,600-ft) vertical shaft has been sunk to 610 m (2,000 ft). This shaft will provide access to the 2000 deposit. The company is also

Location map of Sudbury and North Bay in relation to other major cities.



exploring properties in the area that it picked up when it acquired Aurora Platinum. Included is a joint venture with Falconbridge for a diamond drill program at the Foy property and another joint venture program with Inco on the Nickel Lake property.

First Nickel is evaluating three nickel-copper-cobalt properties in the North Range region of the Sudbury Basin with the goal of earning an interest in each of them. The Howell property is a potential openpit prospect, the company said. It has a measured resource of 601.8 kt (663,300 st) at an average grade of 1.18 percent nickel, 0.7 percent copper and 0.04 percent cobalt. Indicated resources are 400 kt (440,000 st) grading 1.1 percent nickel, 0.2 percent copper and 0.04 percent cobalt. The other two properties being evaluated by First Nickel are the Foy Mouth and Morgan-Lumsden properties.

Research and development facilities

In addition to the number of mining operations and exploration projects in the Sudbury area, there are also about 340 mining industry equipment and service suppliers in the region. Sudbury is also home to Laurentian University, one of the largest Canadian universities in its mining-related programs. And the region has several community colleges, is the home of the Ontario Federated School of Mines and the Ontario Geological Survey is headquartered there.

Recognizing the importance of the mining industry to Canada in general and Ontario in particular, the Ontario Mineral Industry Cluster Council (OMICC) was formed in 2003. This group consisted of just about every group touched by the mining industry. In addition to the federal and provincial governments, the OMICC included multinational mining companies, junior exploration companies, research institutions, mining municipalities, environmental nongovernmental organizations, local and multinational equipment suppliers, aboriginal organizations, industry associations and economic development agencies.

One of the OMICC's goals was to capitalize on Ontario's mining industry by becoming a leader in mining

The mining industry of northern Ontario has spawned a significant support industry in the cities of Sudbury and North Bay. Most of them began by serving the region's underground mining industry but have since expanded to serve the global mining industry.



industry research. So in 2004-2005, the group conceived the idea of the Center for Excellence in Mining Innovation (CEMI), to be located at Laurentian University. CEMI's vision is "for Sudbury to become an international center for world class, industry-driven research, advancing state-of-the-art concepts, processes and methodologies in support of the regional, national and international exploration and mining industries, and providers of mining services and supplies."

John Gammon is director, mining initiatives with CEMI. He said some of the research themes identified for CEMI include exploration, deep mining, automation/telerobotics, environment/reclamation and mine process engineering. CEMI will establish separate research centers for each of those, he said. So far, CEMI has collected about C\$25 million in cash and in-kind contributions for CEMI-linked projects, Gammon said.

Laurentian University was chosen because it has in place six research chairs, nine mining research centers and seven mining-related graduate programs. And the university has endorsed CEMI and will provide some funding to develop the concept, Gammon said. An advisory board has been instituted. It consists of representatives from industry, supply houses, government, academia, labor, municipalities, and aboriginal and environmental interests.

Deep Mining Research Consortium. The Deep Mining Research Consortium (DMRC) was initiated in 2003. Its goal is to fund research for new technologies for mining at depth. Membership in the DMRC includes seven mining companies, the city of Sudbury, and the federal and pro-

vincial governments. The idea of the consortium allows the companies to share in the rewards and the risks with their funding, said Charles Graham, the director of the DMRC. And the DMRC can leverage contributions from the membership, making the funding go farther.

One pilot project currently under way is the study of diesel engine performance at depth, Graham said. CANMET was contracted to conduct field experiments that focus on the effects of increased barometric pressure and intake air density on diesel engine emissions in a deep production mine.

The goal of a second project was to solidify backfill material that can be placed quickly, yet be stable enough for use in deep mining zones. A cost-benefit analysis will compare gelfill with hydraulic and pastefill systems for various deep mining scenarios, Graham said.

Falconbridge Technology Center. In 1997, the C\$18-million Falconbridge Technology Center was commissioned. It is comprised of several engineering and natural science disciplines. These include extractive metallurgy, process control, electroplating and materials technology.

The center houses Falconbridge's 60-member Metallurgical Technology Group. Included in the group are technical, graduate, postgraduate and administrative staff. Eight engineers-in-training are typically on staff, undergoing two years of training in operations and technology.

The technology center developed a new laterite nickel smelting technology that Falconbridge plans to use at its new Koniombo nickel project in New Caledonia. This technology has achieved a higher process intensity, improved energy use and an improved environmental hygiene performance with respect to dust capture.

The process mineralogy group at the technology center mixes geology, mineral science, applied statistics and mineral processing to design and implement more efficient mineral processing flowsheets. The results have been producing more profitable concentrations of the mined ore into a treatable or salable concentrate of paymetals. To date, this technique has been applied to improving existing concentrator operations and designing and verifying flowsheets for new orebodies from drill core.

North Bay

There are no mining operations in the North Bay area. But a substantial mining support industry thrives in this city of about 56,000 people. Some of those companies include large, familiar names like Atlas Copco, Sandvik-Tamrock and Boart Longyear. But there are also several other smaller, less familiar companies that serve the regional mining industry. In all, North Bay has about 65 manufacturing, consulting and other support firms that service the mining industry of Canada and the world.

During the tour, the editors visited several of the plants and talked with local officials. Each ticked off the reasons why North Bay is a good place to do business.

The city began as a transportation hub for northern Ontario. And it remains so today. It is centrally located, about an hour-and-a-half east of Sudbury and about three hours from Toronto and Ottawa. And the city is a reasonable distance from six borders crossings into the United States. An east-west railroad that crosses Canada passes through North Bay, making it easy and less expensive to ship product. And the city has an international airport.

North Bay officials have also put in place a number of incentives aimed at economic growth. The city has lowered the corporate tax rate by about 65 percent in recent years, further encouraging investment. And the city's industrial land prices are among the lowest in Canada.

The following are a handful of the companies in North Bay and Sudbury visited by the editors.

Atlas Copco. Two of Atlas Copco Canada's plants are located in northern Ontario. Atlas Copco Construction and Mining Canada is located in Lively, a suburb of Sudbury. Atlas Copco Exploration Products is located in North Bay. Atlas Copco Construction and Mining Canada has about 200 people throughout Canada. The Lively plant has about 150 employees. The 6,967-m² (75,000-sq ft) facility is the company's main distribution and warehouse center for its Canadian operations. The facility also has a remanufacturing area for Atlas Copco equipment with about 50 mechanics.

Mike Mayhew, marketing and communications manager, said Atlas Copco Construction and Mining moved its headquarters to Sudbury from Montreal in 1999. Most of the 16 mines in operation at the time were Atlas Copco customers, he said, so the move made logistical sense. It also put the company's service technicians within 12 hours of its other customers throughout Canada.

Atlas Copco Exploration Products makes drill rigs, diamond drill bits and drill rods for shipment throughout the world. The plant is currently operating at capacity, the company said, due to the current mining boom. The plant now has about 100 to 120 people, up from about 30 in 2000. Management said it would like to increase production but several factors have impeded that plan. Because of the boom in materials, steel is difficult to get. So Atlas Copco's suppliers may have problems supplying the plant. And engines for the company's drill rigs are also difficult to obtain.

Mining Technologies International. Mining Technologies International manufactures surface and underground mining equipment. The company's Sudbury operations makes in-the-hole and blasthole drills, hydraulic crushers for underground operations, jumbos, load haul dumpers and haul trucks. The plant employs between 300 and 400 people.

Jannatec Radio Technologies. This Sudbury-based company uses two-way radios, computer-aided dispatch and a monitoring system to keep track of employees working alone underground. A worker registers a personal identification code with the monitoring station. A timer at the station is started for a preset limit. If the person has not talked with the monitoring system or someone else before the timer has expired, an alarm goes off. If

In addition to the large number of mining industry support companies in northern Ontario, the region is also positioning itself to become a leader in global mining research. Laurentian University in Sudbury has six research chairs, nine mining research centers and seven mining-related programs.



the worker responds, the timer is reset. If he does not, the appropriate people are dispatched to find the worker.

Miller Technology. This company, based in North Bay, supplies mining utility and personnel carriers, mostly for underground work. The founder began making his three-wheeled Mine Kart in his garage 25 years ago. That vehicle has since become the Miller Truck. This 4x4 personnel or equipment transport vehicle can be customized to customer specifications. In fact, the company said only about a dozen of the vehicles sold are the same. The company has also expanded into becoming a distributor for other mine and construction vehicles. And it has become global, with several of its Miller Trucks in operation at underground mines Tanzania, Chile and Peru.

Cementation Canada. This company is one of Canada's largest engineering, contracting and underground mine builders. Based in North Bay, the company's expertise includes shaft sinking, underground mine contracting, mine development, Alimak raising and raise boring, and underground mine infrastructure installations. The company currently operates two of the largest raise borers in North America.

J.S. Redpath. This company was incorporated in 1962 and serves the global underground mining industry. Work includes shaft sinking and collaring, hoist and headframes, tunneling, raiseboring, Alimak boring and contract mining. Headquartered in North Bay, J.S. Redpath has done work in North and South America, Indonesia, Greenland, Africa and the Canadian arctic. The company is currently building the Oyu Tolgoi Mine in Mongolia's South Gobi Desert. ■