

Ontario's mining industry

Exploring new frontiers at home while expanding the limits of possibility on a global level.

TABLE OF CONTENTS

Ontario: an Overview.....	p54
Golden opportunities.....	p56
The Ring of Fire's slow burn.....	p60
The best of the rest.....	p62
Global reach.....	p64
Toronto's unique financing role.....	p67
How to build and operate mines in Ontario.....	p69
Conclusion: forging a new path.....	p76

This report was researched and prepared by Global Business Reports (www.gbreports.com) for Engineering & Mining Journal.

Editorial researched and written by Gabrielle Morin, Angela Harmantas and Irina Negoita.

For more details, please contact info@gbreports.com.

Cover photo: Red Lake mine, courtesy of Goldcorp.



Ontario: an overview

The preeminent mining region bridges industry expertise with world-class assets.



Cementation raise boring team at Totten mine with underground set-up. Photo courtesy of Cementation.

There is no other mining jurisdiction in the world that is home to the level of mining expertise found in Ontario. That might seem like a grandiose statement, but there are numbers to support it: the province's mineral production is valued at \$9.2 billion, with more than \$4 billion annually invested in R&D, exploration, construction and equipment. The Toronto Stock Exchange is the preeminent center for global mining finance, accounting for the majority of the world's mine financing. Hundreds of juniors exploring the globe for metals and minerals call Toronto home. Ontario alone is home to more than 1,000 mining supply and services companies.

"It is important to understand the significance of the mining industry to Ontario's economy," said Hon. Michael Gravelle, Minister of Northern Development and Mines of Ontario. "There are 42 operating mines right now, and more people employed in the mining sector than there were 10 years ago. The mining supply and service sector employs 50,000 people. Nearly 25% of all exploration in Canada is done in Ontario."



Hon. Michael Gravelle, Minister of Northern Development and Mines of Ontario.

Nevertheless, since 2012, exploration in the province has suffered. Ontario's two largest mineral exports – gold and nickel – endured some of the most volatile commodity prices in recent memory. The mineral-rich Ring of Fire was also dealt a substantial blow as major companies shelved projects because of a frustrating lack of infrastructure commitments from industry or government. On the other hand, with a number of new mines set to open in the next two years, not including Vale's fully automated Totten nickel mine that opened in February 2014, help to bolster faith in Ontario's mining potential.

Changes to the regulatory climate

The security that mining companies thought they enjoyed with Ontario's regulatory framework was seriously questioned in 2012, when the Ministry of Northern Development and Mines introduced a number of changes to Ontario's Mining Act. The new scheme requires companies to file a plan with the government of Ontario prior to undertaking exploration work, as well as to consult with any potentially affected aboriginal communities in the area. While the changes sought to provide clarity with regards to a company's duty to consult, they have had the unintended effect of slowing the permitting process at a time when exploration expenditure in the province has dropped significantly.

According to Denis Frawley, a partner at Toronto-based law firm Ormston List Frawley LLP, some of his clients were frustrated with the lack of clarity with regards to the consultation process. "There was noticeable concern that the government did not have processes and staff in place to swiftly deal

with consultation-related filings. But companies are adjusting to the new system, and First Nations are becoming more proactive," he said.

Others are less fortunate. Northern Superior Resources Inc., a Sudbury-based company, filed a \$110 million lawsuit against the Ontario government after its talks with the Sachigo Lake First Nations communities broke down. Northern Superior claims that the Ontario government failed to meet its own duty to consult by not intervening in their discussions.

The longer-term effect of the modernized Mining Act will take time to manifest. "We do think that the changes related to consultations with First Nations are beneficial because they encourage and require those active in mineral resource exploration and extraction to initiate dialogue with communities that are directly affected by mining and mineral resource exploration from the onset of a project," said Frawley. "Hopefully, it will lead to more cooperation," he added.



Denis Frawley, partner, Ormston List Frawley LLP.



Improving your bottom-line performance

We partner with our clients to solve their toughest challenges. Ask us how we can drive asset productivity and reduce operational costs. We're here to help. Learn more at www.hatch.ca



Contact us





Golden opportunities

Exciting new gold districts offer huge potential in Ontario.

An aerial view of Rubicon Minerals' Phoenix gold project in Red Lake, Ontario. Photo courtesy of Rubicon Minerals.

Ontario has been producing gold for over a century, since the first discovery in the Kirkland Lake area in 1903 led to subsequent high-grade deposits found in Timmins and Red Lake. Over the past few years, new areas of gold mineralization have been identified in previously overlooked areas, creating excitement that there is yet more of the precious metal to be found in the province.

The behemoth of Ontario's gold producers is Goldcorp's Red Lake mine in northwestern Ontario, one of the most profitable gold mines in the world. In 2013, the mine produced 493,000 oz of over 20 g/mt gold, yielding revenues north of \$684 million. Yet

industry-wide cost pressures forced Goldcorp to consider new ways to optimize production at the historic site.

George Burns, executive vice president and COO of Goldcorp Inc., described the "cell mining" concept that divides the underground mine into different areas, with one team per cell who are responsible for equipment, planning, scheduling and execution. "Last year we increased our development vertically by 50% simply by empowering our workforce to deliver better results," he said.

At current reserve levels, Red Lake is expected to be operating for another 12 years. Goldcorp's future success in Ontario lies in its Cochenour project, which is scheduled to begin production in 2015. Located just 5 km west of Red Lake, Cochenour is forecast to produce between 225,000-250,000 oz/y of gold.

"We will be touching the ore body later in 2014. The shaft is nearly complete and we are currently working on connecting the shaft to the ore body," said Burns.

Just a few kilometers north of the Red Lake mine is the Phoenix Gold project, which junior company Rubicon Minerals Corp. is planning to put into production in 2015. The project was initially discovered in 2008.

"The deposit was formed by the same series of geological events responsible for the deposition of gold at Goldcorp's Red Lake mine. There are two major folding structures in the Red Lake district; one where the Goldcorp's Red Lake mines are located, and another one 7 km to the northwest, along the axis of which the Phoenix Gold project is located," said Michael Lalonde, a former director of underground operations at Goldcorp who is now president and CEO of Rubicon Minerals.

The Phoenix Gold project has a resource estimate of more than 3 million oz using a 4 g/mt cut-off, and is expected to produce more than 165,000 oz/y for 13 years. Rubicon has constructed an all-weather road, brought line power to the site, built a tailings management facility, a 200-person camp, a new headframe, and a modern hoisting plant. In addition, the company recently completed shaft sinking at 730 m below surface, and is now fully equipped and commissioned.

M&A hones in on Ontario

Gold companies on the hunt for developing assets are looking at projects in stable jurisdictions with known areas of mineralization to increase their reserve base.

HARTE
GOLD CORP

HARTE GOLD ON PATH TO DISCOVERY AND PRODUCTION

High Grade epithermal gold deposit & Hemlo Style
gold mineralization

IP Survey identifies extensions to mineralized
zones, new parallel zones

Summer 2014 Drill program has significant
discovery potential

70,000 tonne bulk sample fully permitted

TSX: HRT
Tel: 1-416-368-0999
www.hartegold.com



Michael Lalonde, president and CEO, Rubicon Minerals Corp.



George Burns, executive vice president and COO, Goldcorp.




Robert Gallagher, president and CEO, New Gold.

Since 2012, there have been a number of major acquisitions in the gold sector in Ontario: IAMGOLD acquired Trelawney Mining and Exploration Inc., Osisko Mining Corp. acquired Queenston Mining Inc., Primero Mining Corp. acquired Brigus Gold Corp., and New Gold Inc. acquired Rainy River Resources.

New Gold's president, CEO and director, Robert Gallagher, explained why Rainy River represented a good platform for the company's first foray into Ontario. "Two years before we made the acquisition, the company was valued at over three times the final purchase price. The fall in the gold price made it very difficult for Rainy River to finance the construction of the project, which they had estimated to cost around \$800 million. When Rainy River's market capitalization got to a price where our acquisition of it with a reasonable premium to the market was very positive on a per-share basis, we did the transaction," said Gallagher.

Yet there has been a seismic shift in the merger market since 2013, when New Gold acquired Rainy River Resources, according to Cameron Mingay, partner at Toronto-based law firm Cassels Brock and Blackwell LLP that acted for New Gold on the deal. "The fall in gold prices led to a decrease in the valuations of projects, and companies who are in the position to make acquisitions can offer lower premiums if they can manage to do so," he said.

This point was driven home with the first major deal of 2014, when Goldcorp offered a 15% premium to purchase rival company Osisko. Comparatively, New Gold offered a 42% premium to acquire Rainy River just over six months prior. While Goldcorp eventually lost out on the Osisko deal to a creatively structured joint bid by Agnico Eagle and Yamana Gold Inc., who will jointly operate the company's projects in Quebec and Ontario, these actions prove that the acquisitions market is heating up after a lengthy period of inactivity.







RUBICON MINERALS

CANADA'S NEXT POTENTIAL HIGH-GRADE GOLD PRODUCING COMPANY

Rubicon Minerals Corporation is an advanced-stage gold development company. The Company is focused on responsible and environmentally sustainable development of its Phoenix Gold Project in Red Lake, Ontario. Initial potential gold production is expected to be achieved in mid-2015, based on current knowledge and planning by management of the Company. The Phoenix Gold Project is well-funded and fully permitted for initial production at 1,250 tonnes per day. In addition, Rubicon controls over 100 square miles of prime exploration ground in the prolific Red Lake gold district which hosts Goldcorp's high-grade, world-class Red Lake Mine. Rubicon's shares are listed on the NYSE MKT (RBY) and the Toronto Stock Exchange (RMX).

Contact: Allan Candelario, Director of Investor Relations
(416) 766-2804 ir@rubiconminerals.com
www.rubiconminerals.com



New gold districts in Ontario

It is significant that the Rainy River, Tre-lawney and Queenston projects, the objects of these bids, are all outside of the traditional gold mining camps in Ontario. New gold districts in the province are emerging and Ontario companies with projects in underexplored areas are demonstrating how much more gold there is yet to be found. The difficulty in these areas lies in the geology: while the Timmins and Kirkland Lake gold deposits were largely discovered near surface, it is likely that many other deposits are going to be discovered under glacial cover and are therefore much harder to find. "The Rainy River deposit was discovered through integrating surficial geology and detailed till sampling and drilling," explained James Sid-dorn, vice president at SRK Consulting, part of a team that investigated the geological controls on gold mineralization at Rainy River. "This sub-surface discovery proves that, although deposits are undoubtedly harder to find these days, many more await discovery in Ontario. To locate them, we must also apply our geological knowledge combined with the use of geophysical data sets to understand the distribution of structures and their control on the distribution of mineralization.

One such company with a known asset outside of traditional mining camps is Tre-



Conducting geological studies of the Rainy River deposit. Photo courtesy of SRK Consulting.

asury Metals, whose Goliath Gold project in northwestern Ontario is in close proximity to the Rainy River and Cote Lake projects. The project, which has a resource of 1.7 million oz and average grade of 2.87 g/mt, also hosts a significant upside potential. "The C Zone is a new shoot that Treasury identified in early 2013, and has great potential to contain another company-maker hole," said Martin Walter, president and CEO of Treasury Metals.

Also exploring in the area is Tamaka Gold, a private exploration company whose Gold-lund property is situated on the same greenstone belt as the Rainy River project. "The property was an operating mine between



Stephen Roman, chairman, president and CEO, Harte Gold.

1982-1985, producing around 18,000 oz/y. Tamaka controls an 18 km mineralization strike between the towns of Sioux Lookout and Dryden," said Tamaka's president and CEO, Howard Katz. The project contains grades of around 1.3 g/mt, which is higher than most of the recently acquired projects in the region.

Exploring in the shadow of a headframe

While new gold districts are always exciting, exploration in these areas can bring more risks than even Canadian investors are willing to handle in current market conditions. Exploration companies with assets near known producing mines are at an advantage.

Harte Gold is an exploration company with an asset located 60 km west of Barrick's Hemlo mine, which produced more than 204,000 oz in 2013. The company is using its knowledge of the area to find a similar deposit at its Sugar Zone property. "The Sugar Zone deposit is a sheer zone hosted quartz vein with gold mineralization coming right to surface. At Hemlo, a similar environment existed," said Stephen Roman, chairman, president and CEO of Harte Gold. "On our property, regional prospecting uncovered what we call the "Peacock showing", named after our prospector, Mr. Terry Peacock, which assayed 87 g/mt, in a similar sericitic schist as Hemlo, where more than 20 million oz were found. We are currently focusing our work on starting the advanced exploration program and bulk sample on the Sugar Zone property."

Timmins: the historic producer

The Timmins gold camp in northern Ontario is one of the most productive gold mining camps in the world. With mines in operation since 1910, the area has produced more than 70 million oz of gold, yet companies continue to find new deposits in the Abitibi greenstone belt.

ORMSTON LIST FRAWLEY LLP
Expert legal advice and pragmatic approaches for the resource exploration and mining industries

Ormston List Frawley LLP is a law firm that provides corporate, securities and litigation advice to companies and individuals involved in mineral exploration and mining. We use our expertise and experience to provide pragmatic advice and work as effective partners in helping our clients achieve their exploration, project development and financing goals.

40 University Ave, Suite 720
Toronto, ON M5J 1T1
tel: +1.416.594.0791
fax: +1.416.594.9690
www.olfaw.com

Denis S. Frawley (x113, dfrawley@olfaw.com)
Michael T.R. List (x112, mlist@olfaw.com)
John P. Ormston (x111, jormston@olfaw.com)
Barbara Hendrickson (x146, bhendrickson@olfaw.com)
Heather R. Weir (x116, hweir@olfaw.com)
James J. Brink (x118, jbrink@olfaw.com)
Daniel Ilas (x123, dilas@olfaw.com)



Duncan Middlemiss, president and CEO, St. Andrew Goldfields.



Rob McEwen, chairman and CEO, McEwen Mining.



Eric Sprott, CEO and CIO, Sprott Asset Management.

St. Andrew Goldfields currently produces nearly 100,000 oz/y of gold from its Holt, Holloway and Hislop mines just outside of Timmins. While their Holt mine, a former Barrick operation, has a good five years of reserves left, the company is also exploring its 120 km land base in one of the two major fault zones in the area; the Porcupine-Destor fault zone.

"If you look at SAS's land package from Matheson east to the Quebec border, it is very underexplored due to the topography of the area: huge glacial deposits of overburden with sand and alluvial sitting on top. No one has ever really viewed the bedrock. Now we have science to find the location of the fault and the technology to drill through it," said the company's president and CEO, Duncan Middlemiss.

The other major fault zone in the area, Pipestone, runs parallel to the north of Porcupine-Destor. Compared to Porcupine-Destor, Pipestone is even less explored. Greg Romain, CEO of Gowest Gold, believes that the Porcupine zone represents a major area for potential discovery in the Timmins mining camp: "Our North Timmins Gold project covers a 109 km² land package and, beyond Gowest's flagship project, Bradshaw, we have intersected gold on a number of other parts of the project and identified numerous targets that deserve further exploration."

With new gold mines set to open and new areas of exploration proving fruitful for Ontario mining companies, the sector has done everything it can to weather the gold storm in 2013. Gold companies may have experienced the biggest drop in the price of the precious metal in recent memory, but there are signs that the market is beginning a bull run.

Both Rob McEwen and Eric Sprott have staked their careers in the gold sector. Rob McEwen, the founder of Goldcorp and now

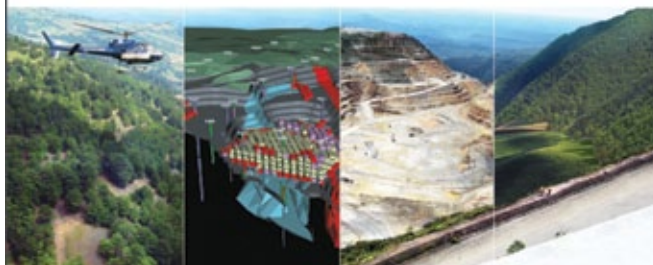


Sulphide enriched gold mineralization at the Wolf Zone. Photo courtesy of Harte Gold.

chairman and CEO of McEwen Mining, believes that gold prices could hit \$5,000/oz over the next few years. "All of the reasons that gold was running before have not changed: debt levels are accumulating, and the cost of servicing that debt will become onerous," he explained. "Also, a number of major gold projects expected to come on-stream over the next few years have been delayed, potentially constraining supply."

Eric Sprott, CEO and CIO of Sprott Asset Management and a self-confessed gold bug, is slightly more conservative in his estimate. "If we look at the gold price trends since 2000, we can expect to see a \$2,100 /oz gold price by the end of 2014," he said. "There is huge demand for gold in China and India, central banks are buying gold again and mint sales are skyrocketing – yet there has been no increase in production." The funds Sprott runs that are invested in gold stocks were up 40% in the first seven weeks of 2014.

Cradle to cradle



Exploration, feasibility, due diligence, engineering and operations through to mine closure.

Our global experience gives you expert, integrated solutions on every phase of your mining project.

Same team — start to finish.

 **srk consulting** 

>1,500 professionals • >50 offices • >20 countries • 6 continents

Canadian Offices:

Saskatoon, Sudbury, Toronto, Vancouver, Yellowknife

The Ring of Fire's slow burn

Making progress in the mineral-rich region despite setbacks



Hatch recently prepared the most comprehensive feasibility study yet for a mine in the Ring of Fire. The remote wetlands presents many technical, environmental, social and business challenges which must be addressed with a successful project implementation plan. Photo courtesy of Hatch.

Development of the Ring of Fire has experienced its share of setbacks recently. In November 2013, Cliffs Natural Resources decided to halt its Big Daddy chromite project, citing risks associated with developing infrastructure in the frontier area of northern Ontario. Companies in the mineral-rich area are dependent upon getting federal and provincial support to fund badly needed infrastructure to the region.

“Obviously, having an industry participant leave the region is never a positive development but we are hoping that there is a silver lining and this event will underline the need for more timely-

decision making regarding key issues such as environmental permitting and infrastructure,” said Alan Coutts, president and CEO of Noront Resources Ltd., whose Eagle’s Nest project is the most advanced in the Ring of Fire.

A number of developments in early 2014 may be the starting point to solving the dilemmas that caused Cliffs to suspend its operations. First, the province of Ontario announced the formation of the Ring of Fire Development Corp. to assess various possibilities to fund infrastructure development and engage with First Nations communities affected by development in the region. The Liberal government went even further, announcing a C\$1 billion investment to fund a transportation solution.

Furthermore, the Matawa First Nations signed a framework deal in March 2014 with the provincial government that allows the two sides to move forward in a community-based approach to resource development in the region.

These steps are critical to moving projects forward in the Ring of Fire, which potentially represents \$25 billion in new economic activity for the province. For stakeholders who are invested in the region, these announcements could not come soon enough.

Neil Novak, a former executive at Noront Resources, spent years exploring in the Ring of Fire before it was known as such. His former company, Spider Resources, was sold to Cliffs in 2010 after he uncovered mineralization that looked to be chromite. “Even though there is a lot of chromite found around the world, we need geographical diversification of chromite mines,” said Michael White, president and CEO of IBK Capital, that has raised more than \$140 million for companies active in the Ring of Fire. “At the moment, chromite production is concentrated in a few global clusters, and some are not doing so well in terms of guarantee of supply: South Africa, one of the largest global producers, has power issues that can affect deliverability. The industry would very much like to see chromite produced in Ontario, a stable jurisdiction where we have discovered a 100-year plus supply.”

Richard Nemis was the CEO of Noront at the time of the company’s discovery and gave the region its name as a tribute to his favorite singer, Johnny Cash. His new company, Bold Ventures Inc., is exploring at a number of sites in the Ring of Fire, most notably the Black Horse chromite deposit in conjunction with KWG Resources Inc. Although he was a key player in the initial Noront discovery, Bold Ventures is more interested in what else there is to






XPS is an internationally recognized metallurgical testing and consulting business that provides specialist services to the mining and metallurgical industry.

We offer industry expertise in the following key areas:

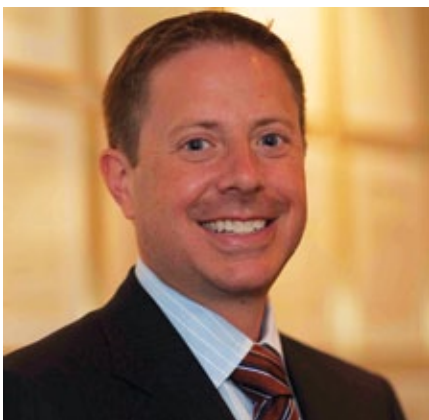
- Quantitative Mineralogy (QEMSCAN and Microprobe)
- Mineral Processing / Metallurgical Flowsheet Optimization
- Operational Support, Start-up and Commissioning
- Process Monitoring and Control Solutions (Mining and Processing)
- Installed Asset Integrity Management through Materials Assessment, Selection and Testing

for most commodities including: gold, nickel, copper, zinc, PGEs, rare earth and industrial minerals.

XPS Consulting & Testwork Services

6 Edison Road, Falconbridge, Ontario, Canada P0M 1S0
+1 705 699 3400
Dominic.fragomeni@xps.ca
www.xps.ca





Michael White, president and CEO, IBK Capital.



Alan Coutts, president and CEO, Noront Resources.



Dominic Fragomeni, director, XPS Consulting & Testwork Services.

find in the Ring of Fire. “We are more interested in base or precious metals; our focus is on extending the Ring westward between the sub-provinces,” he explained.

MacDonald Mines Exploration Ltd. is using down-hole geophysics to explore their properties, which include the Butler VMS project. According to Richard Schler, CEO of MacDonald Mines, the Butler project has a similar mineralization to Glencore Xstrata’s world-class Kidd Creek base metals mine in Timmins. “We got Dr. Jim Franklin, a respected geoscientist, to take a look at it and he feels like the geology lends itself to a Kidd Creek-type of deposit. We have gotten some good copper grades in the feeder zone, and we hope the grade will improve. The size of the heat engine to produce this alteration zone is big, so the potential in this could be anywhere from 50-100 million mt.”

How to solve the infrastructure puzzle

The debate surrounding infrastructure development in the region is currently centered upon transportation solutions to access the area. However, there is the additional challenge of building once you get there: the Ring of Fire is essentially marshland, which means that traditional methods of building mines on solid ground would not work.

Global engineering firm Hatch sees the Ring of Fire as one of the most exciting areas of opportunity for the company in Ontario. “There are many challenges presented by the geography, lack of infrastructure and social licensing which require new ways of thinking, and that makes it so exciting,” explained Jan Kwak, Hatch’s managing director of mining and minerals processing. “For instance, a construction strategy would probably require starting in the winter when the ground is frozen and it is easier to transport materials to the site. During the winter, we would need to create an island of solid ground where we can set up camp, store material and equipment and use as a base to expand from when the ground thaws in summer.”

Complicating matters, many people in Ontario and across Canada wonder if the value of the chromite in the ground is enough to justify the level of infrastructure spending in the region. According to James Siddorn, vice president at SRK Consulting, logistics and location are decisive factors for any project in Canada’s North. “When producing chromite and nickel, bulk tonnage movement is needed. Therefore, Ring of Fire’s geographical location, as well as the quality of the deposit are critical issues,” he said.

Sudbury-based XPS Consulting and Testwork Services, a Glencore company, worked with KWG Resources on their Black Horse deposit to convert the chromite into a metalized chrome and iron alloy. “Processing facilities have used the conventional route, which

is an electric-furnace approach where the raw ore is smelted at 1,700 °C with a high energy input of 60 to 80 MW of power,” said Dominic Fragomeni, director at XPS Consulting & Testwork Services. “In our work with KWG we were asked to think outside the box and consider alternatives to a conventional ferrochrome smelter, which is what drove us to look at direct reduction technologies. This technology is not new, however we have added a twist to take advantage of the lower cost natural gas available in Ontario. We are currently developing technologies to increase the rate of reaction and reduce the temperature of the direct reduction process, as well as considering downstream processing options.”

Whether or not it is a road that runs east to west, as favored by Noront, or a railway, which KWG Resources advocates, infrastructure development in the Ring of Fire is critical to the success of these projects and the province of Ontario as a whole.

MacDonald Mines Exploration Ltd.

TSX-V:BMK
BUTLER PROPERTY
ONTARIO'S RING OF FIRE

“There is good potential at Butler for a world-class VMS deposit”

- James M. Franklin, PhD, FRSC, P. Geo

Contact details:
info@macdonaldmines.com
www.macdonaldmines.com

The best of the rest

Unlocking value in Ontario's diverse commodities



Kearney mine's ore stacking conveyor and processing plant. Photo courtesy of Ontario Graphite.

With the eyes of the world fixated on Ontario's gold sector and the potential in the Ring of Fire, it is the overlooked commodities in the province that hold the promise of high returns for investors.

The Sudbury Basin hosts some of the most prolific nickel deposits in the world. Vale's Creighton mine has been in operation since 1901; while Glencore Xstrata's Nickel Rim South mine is currently Sudbury's largest mining operation.

In February of 2014, Vale opened the long-awaited Totten mine, the company's first new mine in the Sudbury Basin in more than 40 years. Totten was a former producing mine that laid dormant for

decades until Vale spent \$760 million to make Totten a fully state-of-the-art, automated mine. As the mine ramps up to full production in 2016, it will add eventually 2,200 mt/d of ore containing copper, nickel and precious metals to Vale's production profile for 20 years.

Although Vale and Glencore Xstrata dominate nickel production in Ontario, there is room for smaller players. Toronto-based First Nickel Inc. owns and operates the Lockerby nickel mine in Sudbury. Like Totten, Lockerby was a 30-year-old mine when First Nickel acquired the project in 2005. "It is one of the deeper mines in Sudbury at a mile underground and has some of the higher-grade material in the region, which makes it feasible to mine it at such depths," said Thomas Boehlert, president and CEO of First Nickel.

In 2014, First Nickel plans to increase output by roughly 10% to 15%. This production increase comes at a good time for nickel prices in the global market. A number of interesting geopolitical developments have caused nickel prices to rise in 2014, such as Russia's political action in Ukraine and Indonesia's ban on unprocessed ore. Last year's worst performer on the London Metal Exchange might be poised to enter a bull market in 2014.

It is an exciting time for Ontario's nickel industry, with KGHM International also advancing work on their Victoria nickel project near Sudbury, and Noront Resources is just beginning to uncover new areas of nickel mineralization in the Ring of Fire. There could be a potentially new nickel belt opening up in Ontario in the future.

The great graphite race

Graphite is experiencing resurgence in the global marketplace as demand is expected to increase: Tesla, the high-end electric vehicle manufacturer, announced plans to build a factory in North America that could require up to 126,000 mt/y of flake graphite. In Ontario, three companies are swiftly advancing graphite projects in order to meet rising global demand.

The most advanced project is Ontario Graphite Ltd.'s Kearney mine, a former graphite producer currently on track to restart production in early 2015. "At its peak the Kearney mine was producing around 10,000 mt/y, but shut down when the price of graphite dropped significantly," said Tom Burkett, CEO and member of the board of directors of Ontario Graphite. The company has invested about \$50 million to bring the mine to the point of production. Kearney has a very high quality of coarse flake graphite, whereas the other Ontario graphite plays are of a finer quality. "We also have



The Kearney Mine:
One of the largest confirmed mineral resource graphite projects in North America

www.ontariographite.com
705.636.5344



Thomas Boelert, president and CEO, First Nickel Inc.



Tom Burkett, CEO and member of the board of directors, Ontario Graphite.



Neil Novak, president and CEO, Black Widow.

the advantage of understanding the previous challenges faced by our predecessors. For example, we are developing an aggregate market to deal with non-graphite bearing rock we have at the mine with a view towards environmental sustainability and efficiency," said Jerry Janik, vice president of operations and general manager mining of Ontario Graphite.

Junior company Zenyatta Ventures was the top-performing mining company on the TSX Venture Exchange in 2012 and 2013 after discovering the Albany deposit in northern Ontario. The Albany project is a unique hydrothermal style deposit, currently one of the only vein-type graphite deposits in the world – one of the most valuable forms of graphite. "We have an extremely high-purity and high crystalline volcanic graphite deposit with low contaminants as opposed to sedimentary flake type graphite deposits," explained Aubrey Eveleigh, CEO, president and secretary of Zenyatta Ventures.

The ability to value-add is critical to the price of graphite in the marketplace. Northern Graphite Corp., whose large-flake Bissett Creek project in Ontario contains an overall resource of more than 93 million mt of graphite, is working on a purification technology that yields over 99.9% purity levels. "Our research was designed using a low-temperature thermal approach, where we performed scaling testing in conjunction with a metallurgical company to prove that it is scalable," said Gregory Bowes, CEO of Northern Graphite."

According to Ellerton Castor, CFO of Ontario Graphite, there is a degree of opacity surrounding how graphite is priced and the value-added nature of the mineral is critical to understanding the commodity. "There is a learning curve associated with graphite, but given the declaration by both the United States and the European Union that graphite is a strategic mineral, we have seen a significant number of investors taking time to get to know the graphite space," he said.

More to find in Ontario

In 2008, De Beers Canada Inc. opened the province's first diamond mine, the Victor mine in the James Bay Lowlands, which highlighted the diversity of commodities to be found in Ontario. The province also holds significant copper deposits outside of Timmins, Ontario, where Glencore Xstrata operates the Kidd Creek copper zinc mine. The company recently announced that it would extend operations at Kidd Creek into 2021. In addition to diamonds and copper, there is ongoing exploration around the Red Lake mining district of northwestern Ontario for iron ore, where past-producing mines hold promise for junior companies. The province also produces industrial minerals such as salt, gypsum, talc and calcium carbonate.

Black Widow Resources Inc. recently hit zinc mineralization in its exploration campaign on the Shunsby project in the Porcupine mining district of Ontario. The property was historically considered an

iron or copper play, but exploration work uncovered interesting zinc mineralization. "Black Widow compiled all of the historical data on the property and soon realized it was more of a zinc play, in that most of the 214 historical drill holes reported impressive zinc mineralization," said Neil Novak, president and CEO of Black Widow.

There is also a large potential to find new sources of platinum group metals (PGM) in Ontario. Current PGM production is limited to KGHM's McCreedy West mine in Sudbury, but that is set to change in 2014. Wallbridge Mining Co. Ltd. is constructing its Broken Hammer open pit project in Sudbury that contains a significant amount of highly valuable PGM resources. Transition Metals Corp., a junior project generator in Sudbury, recently discovered an exciting new area of PGMs through its partnership with Impala Platinum. Located 25 km from Thunder Bay in north-western Ontario, Sunday Lake represents an emerging new PGM district in the province.

BLACK WIDOW
RESOURCES INC.

**SUCCESSFUL, INNOVATIVE
DEVELOPERS AND EXPLORERS**

Proven management and exploration expertise in Canada and worldwide; pioneered numerous discoveries in Ontario.

Neil Novak, P.Geo., President / CEO
Suite 1000 – 36 Toronto St., Toronto, ON, M5C 2C5
Tel: 416 203 8636 Email: info@blackwidowresources.com

www.blackwidowresources.com

Global reach

Ontario miners export their expertise around the world



Aerial view of Orvana's Don Mario exploration project. Photo courtesy of Orvana Minerals.

South America is the traditional backyard for Toronto-based mining companies with operations overseas, but many juniors are pushing new mining frontiers in less-known destinations of Eastern Europe and Asia. Of the nearly 9,000 projects held by TSX- and TSX-V-listed companies, nearly 50% are outside of Canada.

Canadian mining companies have a long history of operations in South America. Barrick Gold, Yamana Gold, Goldcorp, Teck Resources and Kinross Gold Corp. are just a selection of major companies that operate mines in the region, accruing revenues of nearly US\$20 billion.

**ORVANA
MINERALS CORP.**

**EUROPEAN FOCUSED GOLD PRODUCER
WITH ORGANIC GROWTH OPPORTUNITIES**

- Multi project/commodity producer
 - El Valle-Boinás Carlés – Spain; Gold, copper, silver
 - Don Mario, Upper Mineralized Zone – Bolivia; Copper, gold, silver
- Development ready project
 - Copperwood copper project, Michigan USA
 - Entered into agreement to sell Copperwood for up to \$25 million.
- Strengthening Balance Sheet
 - Optimizing operations
 - Improving cash flow
 - Continued debt reduction
- Strong management team
 - Operationally focused

Contact: ask_us@orvana.com
www.orvana.com

Unsurprisingly, a number of Toronto-based juniors are hoping to replicate the success of these major companies in proven mining camps. Mexico has always been a preferred mining jurisdiction, with world-class deposits of precious metals and strong community support for the industry. Recently, however, the Mexican government instituted a 7.5% mining tax as part of a series of reforms to the country's fiscal regime.

Excellon Resources has been active in Mexico since 1996. Its project, the La Platosa mine in Durango, is Mexico's highest-grade silver mine, producing more than 1.4 million oz/y at a grade of 718 g/mt in 2013. The company's focus is to increase high-grade production in 2014. "We increased production from 5,000 mt in July 2013 to 7,000 mt in September and October 2013; although we may only produce 200 mt/day, each of our tons carries up to 30 oz of silver – our average ton is worth \$500 to \$600 at current silver prices," said Brendan Cahill, president, CEO and director of Excellon Resources.

Aura Minerals Inc. operates the Aranzazu mine in Mexico that produced 13.6 million lb/y of copper in 2013. The company is looking to increase its production capacity at Aranzazu by over 70% by 2016. "In the current economic environment, this would more than double our profits," said Jim Bannantine, president CEO of Aura Minerals. "Once we reach the 30-35 million lb/y milestone in 2016, simple economies of scale mean that the cash cost will come down to approximately \$1.35/lb."

More potential in Latin America

The majority of Canadian mining investments into Latin America are dedicated to Mexico, Peru, Chile, Argentina and Brazil. However, Toronto juniors are steadily advancing projects outside of the "big 5."

In Guyana, Sandspring Resources Ltd. is looking to bring its 4.1 million oz Toroparu gold project into production in 2017. The project received a major boost earlier this year when Sandspring signed a \$150 million streaming deal with Silver Wheaton Corp. The international mining community is watching this first large project in Guyana according to Rich Munson, Sandspring's CEO. "Guyana Goldfield's Aurora project will help to de-risk the perception of the country. If the International Financial Corp., one of the main financing companies for Guyana Goldfields, is comfortable with the situation, it will also give the green light to the industry."

Latin American Minerals is hoping to advance its camp-scale Paso Yorbaí gold project in Paraguay.

The advantage for juniors located in a historic mining jurisdiction such as Ontario is being able to export mining expertise to developing countries that are less familiar with mining. GoldQuest Mining Corp.'s president, CEO and director, Julio Espailat, organized a delegation from the San Juan province in Dominican Republic to visit the underground mines in northern Ontario in order for policymakers to understand the impact of underground mining operations. "They are of course encouraged to form their own opinions about underground mining, but this way they will become more familiar with the process and its impact on the environment," said Espailat.

Toronto mining companies broaden their horizons

With so much success in South America, a number of Toronto-based companies are hoping to apply their expertise to less traditional mining jurisdictions. Dundee Precious Metals Inc. owns and operates the Chelopech gold mine in Bulgaria and the Kapan gold project in Armenia, and is developing the Krumvograd gold mine, also in Bulgaria. Since acquiring the Chelopech mine in 2004, Dundee Precious Metals has quadrupled its overall production to 130,000 oz/y of gold and 45 million lb/y of copper.



Rick Howes, president and CEO, Dundee Precious Metals.

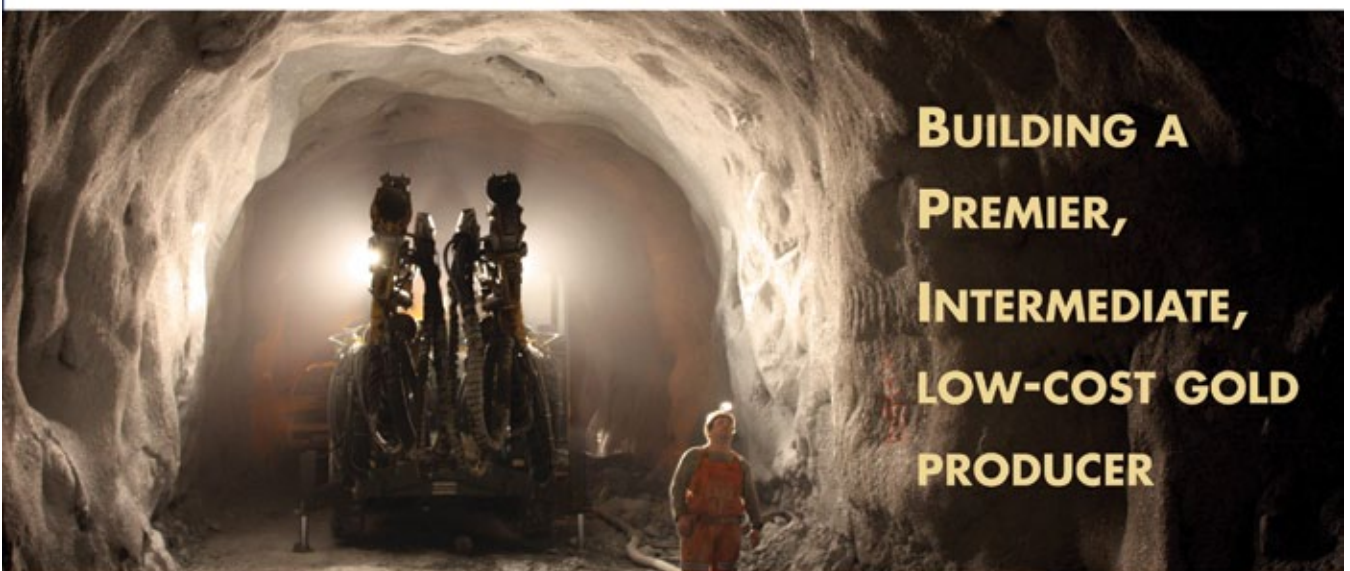
"Eastern Europe has a long history of mining," explained Rick Howes, the company's president and CEO. "Our model of building these businesses is to avoid over-staffing with ex-patriots and employ local nationals. After the introduction and training of new methods and technology over an eight-year period at our producing Chelopech mine, a local management team is in full control." The company's other producing asset is the Kapan gold mine in Armenia. "Kapan was a relatively small underground-mine that Dundee acquired in 2008. Five years' drilling culminated in a new resource estimate of a large deposit, to



Jim Bannantine, CEO of Aura Minerals.

be expanded underground rather than open-pit. The mine is producing 30,000 oz/y gold, and is a polymetallic deposit of gold, copper, silver and zinc; 50% of the value is in the gold and based on the inferred and indicated resource there is the potential to double current production," said Howes.

Eastern Europe's Communist history meant that for a number of years, mining operations were taking place unbeknownst to the global industry. Once the Iron Curtain fell, the mineral potential of former Soviet Bloc countries created excitement. Black Iron, a Toronto-based exploration company with 100% ownership of the Shymanivske



TSX:DPM

www.dundeeprecious.com



A Rare Opportunity: We are ready to start!

Kutessay II is the only past producing Heavy Rare Earth Elements (HREE) mine in the world outside of China. Stans Energy owns a 20 year mining license acquired through auction in December 2009. With this purchase, Stans Energy Corp. effectively becomes the only company outside China with proven industrial scale hydrometallurgy for all 15 Rare Earth metals and oxides.

Stans Energy Corp. and our local subsidiaries are working towards rebuilding the mine and refurbishing the processing facilities in order to bring Kyrgyzstan back to the global forefront of Rare Earth Element production.

TSX-V: HRE OTCQX: HREEF

STANS ENERGY CORP.
8 King St. East, Suite 205, Toronto, ON, M5C 1B5
Tel: 647 426 1865 Fax: 647 426 1869
info@stansenergy.com

www.stansenergy.com

iron project, thinks there is huge potential in Ukraine. "Historically, Ukraine has produced about 140 million mt/y of iron ore, now production is down to 90 million mt/y. It is slightly more than Canada, but minuscule compared to Australia's production," said Black Iron's president and CEO, Matthew Simpson. The current political situation involving Ukraine and Russia is however weighing heavily on the minds of the mining industry.

Silver Bear Resources Inc. is developing a high-grade silver project in the eastern region of Russia. The Mangazeisky project has a measured and indicated resource of 17.9 million oz of silver at 518 g/mt and inferred resources of 43.9 million oz of silver at 282 g/mt. Despite these grades, Silver Bear is one of very few foreign companies developing a silver project in Russia. "Silver is considered a non-strategic metal within Russia, meaning it did not receive a lot of resources for development from Soviet authorities," said Mark Trevisiol, Silver Bear's president and CEO. "A lot of the former Soviet Union's silver production come as a byproduct of mining base metals (lead and zinc) hence exploiting silver-based deposits was not warranted."

Stans Energy Corp. is working to advance their Kutessay II rare earths project in Kyrgyzstan. "Kutessay II was the only hard rock, heavy rare earth deposit that was ever in production outside China and supplied 80% of the Soviet Union's rare earths for 30 years until ceasing operations in the early nineties," said David Vinokurov, vice president of corporate development at Stans Energy. "The demand for rare earths has only surged since, and they are now used in virtually every type of electronic application."

While there are larger deposits worldwide, the challenge is finding a project with the right mix of the critical rare earth elements, with a low amount of capital expenditure required. With Kutessay II, Stans believes, they have found that essential mix. "What makes Kutessay II stand out is that it contains nearly 50% heavy rare earths, and with a projected output of 1,500 mt/y of oxides, the projected capex is in the right range," said Vinokurov.

Outside of the former Soviet bloc of countries, Europe holds significant potential for Canadian juniors. Orvana Minerals Corp. owns and operates the El Valle-Boinas/Carled (EVBC) underground gold copper mine in Spain and the Don Mario mine in Bolivia. The company exceeded its production estimates from EVBC in 2013 and has increased the capacity of its milling facility to 2,200 mt/d. "In comparison with some of the large gold deposits in Ontario, the grade

at EVBC is lower. However, the advantage we have is that there is copper and silver as by-products," said Michael Winship, president and CEO of Orvana Minerals.

Developing projects closer to home: the United States

Sometimes, the best areas to explore are south of the border, where rule of law is secure and the regulatory regime is similar to that of Canada. Duluth Metals Ltd. owns the massive Twin Metals deposit in Minnesota, which houses 27 billion lb copper, 8.9 billion lb nickel and 35.6 million oz of palladium-platinum-gold. "Compared to similar deposits of this type, from a contained metal point of view, this is probably the second-largest contained metal reserves next to Norilsk," said Christopher Dundas, chairman, CEO and director of Duluth Metals.

Romarco Minerals Inc is working on developing the Haile gold project, a former producer that houses a measured and indicated gold resource of 71.2 million mt at 1.77 g/mt for 4.0 million oz. "The Slate Belt of the East Coast was where gold production in the United States started, long before the California Gold Rush. Today gold prices are materially different and the technology has changed significantly," said Romarco's president and CEO, Diane Garrett.

The population density of the United States has an impact on the permitting process, which is the main challenge to mining operations in the country. As Steve Donohue, director of mining sector services at Foth Infrastructure and Environment, explained: "While there is significant local support from the mining world, permits are more challenging to obtain due to non-governmental organizations and other environmental groups, leading to a longer review process to obtain permits. In Canada, because many of the mining projects are located in remote areas away from communities, the permitting process is less intense."



Steve Donohue, director of mining sector services, Foth Infrastructure and Environment.

Toronto's unique financing role

Accessing creative forms of financing in a cash- constrained environment



Bay Adelaide West in Toronto's financial district. Photo by Alessio Bragadini.

Toronto may be the global epicenter of mining finance, but even Canadian investors – long lauded for their knowledge of the risks associated with the mining industry – have grown wary of investing in the sector. Mining companies have been amongst the worst performers on the Toronto Stock Exchange and the Toronto Venture Exchange. For the first time in many years, the first quarter of 2013 did not feature a single mining IPO.

With fewer listings and less capital raises, the TMX Group, owner of the TSX and TSX-V, decided to utilize its global reach to access investors outside of Toronto. The Group recently signed an agreement with the Santiago Stock Exchange to create a new venture exchange in Chile that allows TSX-V listed companies to list on its Latin American counterpart and tap into the investor base in South America. “Our unique two-tier exchange system is at the core of our value proposition and differentiates us from other markets. In Santiago's case, both the government and the exchange really liked the two-tier model. Many of our Canadian issuers are doing business in Latin America and it seemed like a natural extension of our capabilities for us to be involved,” explained Kevan Cowan, president, TSX Markets and group head of equities.

Closer to home, the TSX eased its rules to allow companies to raise capital at less than \$0.05 a share, while the federal government extended mineral exploration tax credit for another year. However, according to Denis Frawley, partner at Ormston List Frawley LLP, these measures are not enough to tackle the funding issue. “The industry expected the tax credit to be extended due to the current financial situations, and the pricing policy has not led to a strong influx of capital on the TSX,” he said.

The lack of traditional forms of capital has led mining companies to look at other forms of financing for their projects. Royalty deals have become more attractive to near-production companies looking to raise money to fund construction. Sandspring Resources and Rubicon Minerals Corp. both landed multi-million dollar deals with streaming companies Silver Wheaton and Royal Gold Inc., respectively.

Rubicon Minerals evaluated several options, including equity and debt financing, for their Phoenix Gold project. When they were unable to find a suitable offer, the company turned to a \$75 million royalty deal with Royal Gold. “Having the backing of a major royalty company like Royal Gold gives us additional security. The

streaming deal was well received by the markets, and the share price appreciated once more investors became interested in the company,” said Rubicon's CEO, Michael Lalonde.

The streaming deal subsequently led to a \$100 million bought deal financing.

While royalty companies are in a good position to capitalize on the lack of traditional forms of available capital, even Franco-Nevada Corp.'s president and CEO David Harquail acknowledges that mining companies would prefer to raise money in the traditional manner. “We represent the area of growth now for the

**Celebrating 25 years of
Exploration & Mining
Investment Banking**

We share your love of discovery and wholehearted belief that perseverance pays. It is why we formed 25 years ago and continue to serve the exploration and mining industry today.

Thank you for 25 years of great business and support. We look forward to many more years of service.

**25
Years**
IBK Capital Corp.

Exploration & Mining | Investment Banking
Debt & Equity Financing
Going Public (RTO)
Merger, Acquisition & Divestiture Advisory
Business Valuations & Fairness Opinions
Takeover Defense Planning

416.360.4505 | www.ibkcapital.com
Toronto, Canada

gold industry – there is no question about that,” he said. “Companies such as Franco-Nevada are the go-to space right now for gold miners; most probably, mining companies would prefer to raise money in the traditional way, through equity-bought deals, but it is a tough financing environment for them out there at the moment.”

Shares of metal streaming and royalty companies are up well above those of producers, who have sold their profit margins. However, there are strong feelings in Toronto’s mining community against selling a royalty at the bottom end of a market. “Streaming and royalties are permanent and an enormously expensive way of financing,” said Rob McEwen, CEO of McEwen Mining.

Eric Sprott is even firmer in his take on royalty deals. “The most opportunistic deal a company can do at the low end of the gold market is a royalty deal. Sprott (the company) offered a line of credit to a gold-producing company who instead signed a royalty deal, so there are indeed other forms of financing available besides royalties.”

Private equity in a Canadian mining context

A combination of undervalued assets and the promise of high returns means that private equity firms are taking a closer look at

the mining industry. In 2013, the estimated amount of private capital raised was over \$10 billion to be directed at the mining sector, yet few deals of significance occurred.

While private equity firms are slowly learning about the risks and rewards of the mining industry, mining companies often perceive private equity funds as debt providers, according to David Thomas, managing director of mining-focused private equity firm Resource Capital Funds (RCF). Another misconception is that private equity funds are vulture funds. “In reality, we are looking for good assets managed by talented teams that have the ability to shepherd projects through the various stages of development,” said Thomas.

RCF has made investments in Noront Resources and First Nickel in Ontario, and David Thomas sits on Noront’s board of directors. This type of hands-on involvement on a management level is characteristic of private equity investments. Waterton Global Resource Management, a Toronto-based private equity firm, dedicates a significant amount of time and capital to developing a mining asset.

The company recently raised \$1 billion for a fund designed to invest in precious metals. “When we set out in June 2013 to establish the fund, our target was \$750



David Thomas, managing director, Resource Capital Funds (RCF).


million; however we quickly saw that high quality investors from around the world were coming to us as the mining space continued to worsen, making the opportunity set larger,” said Isser Elishis, managing partner and CIO of Waterton.

With a \$1 billion fund in hand, the industry may expect to see a number of investments, but Isser Elishis countered the idea that there are currently a lot of quality assets available at distressed prices. “When it comes to booms and busts for commodity prices, many companies end up cutting back on development and high grading their assets,” said Elishis. “When we look at what has happened over the last two years in the market, the valuation of a company relative to where it sits today is not distressed.”

Private equity may eventually become an important element in financing mining projects in Ontario, but there are some improvements that need to take place in the regulatory framework and on the infrastructure side to unlock the true value of some of the deposits, according to Ben Gibbons, vice president, corporate finance at accounting firm Collins Barrow Toronto LLP. “While there are a number of significant assets, what is lacking are the infrastructure solutions that enable companies to leverage them economically. Once these problems are solved, private equity participants will gain interest in the market.”


Michael White, president of Toronto-based financial house IBK Capital, believes the province has allowed its collective passion for producing metals to wane over the last hundred years, especially in Ontario. “The province was a frontier for metals and mine development – we wrote the book on many different mining techniques and have built up service industries around that, all the way up to our capital markets, which were founded on mining,” he said. “Many Ontarians do not understand the significance of this.”

C. J. STAFFORD & ASSOCIATES
RECRUITING CONSULTANTS • INTERNATIONAL SEARCH AND SELECTION



30 YEARS
Est. 1981

MINING • MINERALS • METALS



Knowledge, Integrity and Credibility...

- ✓ Founded on 30 plus years of executive search and recruitment for all aspects of the Canadian and global mining industry
- ✓ Building teams, project staffing, interim management for clients in over 30 different countries
- ✓ Working with major mining companies, juniors, mine development companies, engineering consultants, banks, manufacturers and other service providers to recruit the best talent
- ✓ We offer clients access to a global pool of talent and a successful track record of how to attract and retain the very best!

Contact us today at +1 416.484.1960 • www.cjstafford.com • info@cjstafford.com

Santiago • Johannesburg • London • Toronto • Denver • Perth • Lima

How to build and operate mines in Ontario

Sudbury takes the lead in developing technologies of the future.



The Minecat UT150-eMV is the first electric utility vehicle approved for 20% ramp travel. Photo courtesy of Industrial Fabrication.

If Toronto is considered the mining finance capital of the world, the small northern Ontario town of Sudbury is its service and supply counterpart. Sudbury and its surrounds are home to more than 1,000 mining supply and service companies worth an estimated \$5.6 billion to Ontario's economy. The sector employs more than 25,000 people.

These numbers may be surprising given Sudbury's relative insulation from the global stage. The service and supply sector has long benefitted from the presence of major nickel and base metal mines in the region, and most of their business is done with Vale and Glencore Xstrata. Yet the volatility in nickel prices over the past few years has demonstrated the need for these companies to export their services and expertise to the global marketplace.

Efficient material haulage

Sudbury-based Rematech Industries designs and maintains conveyor belts for underground mines. The company worked on the Nickel Rim conveyor system, where

they helped to design a 1,700-foot flex belt that lasted the life of mine and was since adopted by Vale and Glencore Xstrata. "On a cost per ton basis, there is nothing that beats a conveyor belt," said Rematech's vice president, Ivo Beljo. "It can move more than any other equipment and it is a one time capital cost. Our customers are starting to look at new types of conveyors, for instance more vertical ones, so we are

noticing evolution in the equipment and increased demand."

While conveyor belts are the standard form of material haulage, Sudbury's Rail-Veyor Technologies Global Inc. believes it has developed a superior system that runs 24/7 based on rail technology. The Rail-Veyor system only uses power when the train is inside or in the vicinity of a drive station along the route. "We believe Rail-



Ivo Beljo, vice president, Rematech.



MacLean Engineering

CELEBRATING 40 YEARS OF INNOVATION!



BOLTERS - GROUND SUPPORT
Series 900, Small Section Bolter, Utility Bolter

UTILITY VEHICLES
Scissor Lifts, ANFO Chargers, Fuel-Lube, and More

SHOTCRETE - GROUND SUPPORT
Sprayers, Transmixers, Agitators

ORE FLOW FACILITATION
Blockholers, Water Cannon

www.macleaneengineering.com

Veyor is more than 50% more efficient than a heavy haul truck system in terms of energy usage and maintenance and 20% more efficient than a conveyor system," said Ronald Russ, Rail-Veyor's president, CEO, CFO and treasurer.

While propulsion systems are present in most underground and open pit operations, trucks are still needed to move people and materials. Underground mining operations are closed environments with dark, wet and abrasive conditions that can impact the life span of a tire. "Over the years bias ply tires have dominated the market, because of their characteristics that withstand the abrasive conditions underground," explained Gary Foley, director, corporate sales at Fountain Tire. "The downside with bias ply tires is heat generation, which is an enemy to any tire whether it is open pit or underground."

Accessing places where humans can't go

Penguin Automated Systems Inc. was founded by Dr. Greg Baiden, who was formerly responsible for corporate mining research at Inco, now Vale. His work at Penguin ASI involves developing remote-controlled technology to access areas that are unsafe for humans. Penguin recently received a CAD\$1 million grant from the federal government to



4,500 ft video inspection system. Photo courtesy of Minewise.

develop a new robotic system that will be able to enter confined spaces to load explosives for remote detonation.

Minewise Technology Ltd. has developed a progressive scanning technique that allows for detailed surveys of vertical raises or shafts up to 1,250 m. The device captures 360° radial scans every 8 cm and utilizes an integrated fiber optic gyro to preserve the azimuth of the scanner at all times. The data can be directly imported into the mine's 3D coordinates. "This 'scanning during decent' approach eliminates the shadowing of data typical of stationary scanning technologies," said Everett Henderson, Minewise Technol-

ogy's technical manager. Using a pan-tilt-zoom high-resolution color camera, companies can inspect bore holes, raises, ore passes or cage compartments that are inaccessible for personnel.

Making underground mines safer for workers

A number of companies in northern Ontario are looking at ways to improve air quality in underground mines through systems that monitor dust loading, airflow temperature and relative humidity for worker heat stress. Maestro Mine Ventilation developed a system called Vigilante AQS™ (or Air Quality System) that measures different parameters such as dust loading on haulage ramps and gas detection technology. Mine managers are then able to access that data in real time.

"There has been a lot of attention recently on diesel particulate matter (DPM), which has been deemed as a carcinogenic by the World Health Organization, and silicosis that is prevalent in coal mining and many drill and blast mines," said Michael Gribbons, vice president, sales and marketing at Maestro Mine Ventilation.

The tightening of ventilation regulations is encouraging companies to look at what they can do to make their underground systems more efficient. Schauenburg Industries Ltd. is a North Bay-based manufacturer of ventilation ducting systems. Its managing director, Don Croteau, has noticed a trend over the past few years of mining companies taking an increased interest in their ventilation costs. "They have started to realize that it is not just blowing the air, but the power around the fan, the cost of the fans, and the cost of the ducting, especially with the prices of energy increasing," said Croteau.

In an underground setting, the ability to communicate between mine workers both below and above ground is essential to ensuring the health and safety of employees. Becker Varis is a company that provides

minewise
Technology Ltd.

New progressive cavity scanning of depth to 1250m provides Hi-Rez CMS data without shadows. Combined with 1080p HD video, raise/shaft scanning is taken to a whole new level. With a full suite of inspection equipment, Minewise can address all of your surveying requirements.

Minewise Technology Ltd.
727 Lorne St. Sudbury ON, P3C 4R5
ph. (705) 674-3332

www.minewise.com

voice, video and data communication systems to underground mines using a mine's leaky feeder system. "A leaky feeder system acts as a communication medium; we can put Ethernet points anywhere along the mine," said Albert Bower, managing director at Becker Varis. "Leaky feeder systems became the primary media of communication when mining at large saw a boom and required reliable and cost effective communication underground."

Sudbury's equipment manufacturers are also innovating in the types of materials used in an underground setting. Replast Manufacturing Ltd., a manufacturer of safety showers and toilets for underground mines, uses fire resistant resin instead of plastic, which can be extremely flammable.

Next step: exporting outside of Ontario

A significant portion of Sudbury service and supply companies still relies on Vale and Glencore Xstrata for their revenue. A company in Sudbury only dealing with Sudbury clients is dependent on the price of nickel, as Jon Baird, managing director of the Canadian Association of Mining Equipment and Services for Export stated. "Even those companies that work with gold companies in Timmins make a huge difference to their



Jon Baird, managing director of the Canadian Association of Mining Equipment and Services for Export.

revenue base – diversification is the key to success," he said.

The lack of customer diversification is a significant barrier to the industry's growth. Organizations like the Sudbury Area Mining Supply and Service Association are making it a priority to help its members increase their global presence. "SAMSSA's role is to stick to its mandate of helping business become intelligent: our job is to tell people that there are new opportunities available," said Dick DeStefano, SAMSSA's executive director.

According to a recent report by Export Development Canada, Ontario's export sec-

tor is expected to grow thanks to a weaker Canadian dollar and rising demand from the United States. The industrial machinery market is also expected to see strong growth of 7% this year and 13% next year.

Regionally, South America is the largest export market for Canadian mining equipment, followed by the USA. "There is also a lot of potential in Africa, and Australia has been a historical market for Canadian suppliers," said Baird. "More difficult but noteworthy markets are China and Russia, which have stronger domestic services but rely on Canadian expertise."

Rematech's vice president Ivo Beljo agrees that the sector needs to start looking at exporting its products to diversify its revenue base. "Many companies here were family run businesses and felt no need to talk about their work or expand outside of the local spectrum. Times are changing now, though, and many of us are able to spread our wings beyond Sudbury's borders," he said.

Manufacturing and distributing heavy equipment

Ontario manufacturers and distributors of heavy equipment are facing major challenges in the mining sector, not the least of which is increased competition for cus-

REMATECH





PROVIDING SOLUTIONS
TO THE MINING INDUSTRY SINCE 1964




50 YEARS IN BUSINESS. REMATECH WON THE BELL
BUSINESS EXCELLENCE AWARDS SUDBURY CHAMBER
OF COMMERCE BUSINESS OF THE YEAR IN 2014.

tel. 705-674-0742, fax 705-671-0941
email sales@rematech-sudbury.com
www.rematechindustries.com



ENERGY DISTRIBUTION


AUTOMATION

COMMUNICATION

TRANSPORTATION

becker varis... we speak your language.

- SMARTCOM Leaky Feeder System
- Voice, Data and Video
- WLAN High Speed Data Solutions
- RFID Tagging and Tracking System
- Collision Avoidance System
- SMARTBLAST Remote Central Blasting System



becker
VARIS

SMART LEAKY FEEDER COMMUNICATION

705-674-8111 | www.varismine.com

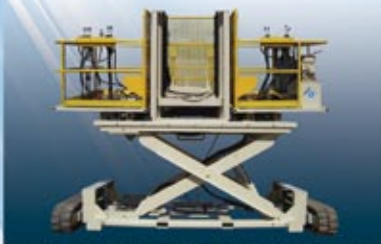


B&D SUPER JACK



B&D MULTI HANDLER

Improve safety, reduce downtime, increase efficiencies and maximize production with the world's best tooling package for heavy shovels and haul trucks.



B&D SWING SHAFT CHANGER



B&D TIRE HANDLER STATION

B&D MANUFACTURING
 +1 705 855 2363
 sales@bdfmfg.com
 bdfmfg.com



Series 900 Scissor Bolter. Photo courtesy of MacLean Engineering.

tomers. Manufacturing of any sort in Ontario comes with high costs for labor and energy, putting pressure on internal profit margins. For companies to prosper, they must figure out a way to design equipment to suit the evolving trends of the mining industry.

Safety is the most integral component in the design process of heavy mining equipment. In Ontario, where underground mines run over 2 km deep, this is even more prevalent. MacLean Engineering's Series 900 Scissor Bolter was designed with this in mind.

"Due to the fact that the ore bodies in the Canadian Shield are some of the deepest in the world and are mined with bigger openings headings at depth, safety was our primary concern when designing the unit," said Don MacLean, founder and chairman of MacLean Engineering. In 2011, the company delivered its 300th unit to Goldcorp's Musselwhite mine in Ontario.

MacLean sees equipment becoming bigger and more powerful as underground mines must become more productive. "Whereas 15-ton trucks used to be the norm, now we are seeing 60 tonners as the norm," he said. "At the same time, speed is of the essence as the distances from the shaft or surface to the workplace are getting longer. We adjust our product development based on the needs of our customers, who are now telling us that they want to increase the amount of mt moved per shift and in doing so will need our utility vehicles to service larger openings."

B&D Manufacturing Inc. out of Sudbury focuses on truck and shovel maintenance. "B&D Manufacturing was founded in 1980 by two young entrepreneurs who invented a portable align boring machine," said Andre Ruest, general manager of B&D Manufacturing. "Before then, underground

mining equipment had to be disassembled, brought to surface and transported to an outside machine shop for repairs. With our flagship Portable Align Boring Machine, technicians do maintenance work right on-site, reducing downtime and associated costs, and eliminating safety concerns."

Another trend that is appearing in equipment manufacturing is energy efficiency, specifically as a result of higher fuel costs and the need to reduce emissions at site.

An Ontario-based manufacturer, Industrial Fabrication Inc., just released its Minecat UT150-eMV, the industry's first purpose-built electric vehicle for hard rock mining. "The Minecat EDS (Electric Drive System) consists of a PMAC brushless traction motor for superior efficiency," said Daryl Rautiainen, Industrial Fabrication's vice president. The battery pack uses environmentally friendly Lithium Ion Phosphate cells that are 100% recyclable.

For Strongco Corp., a Toronto-based distributor of surface mining equipment, telematics, or the ability to track the equipment in real time, is the biggest trend right now in the heavy equipment sector. The company is the largest Volvo equipment dealer in North America. "Every Volvo machine we buy now comes with a CareTrack system that can feed maintenance and product information to us," said Bob Dryburgh, Strongco's president and CEO. "Strongco can utilize this information to be able to inform our customers how the machine is running and when it might need maintenance."

"Even though Ontario has high-quality manufacturing, the industry needs to work on promoting our products to compete internationally," said Ricky Lemieux, president of Sudbury-based Rock-Tech Ltd., a manufacturer of equipment for underground mining applications.

Drilling for dimes

Few would disagree that the companies worst hit by the commodity price downturn are drilling contractors. With exploration having declined considerably in Ontario since 2012, very few rigs are turning and the competition for new contracts is fierce. If and when drilling activity picks up, drilling contractors have had to slash their prices so low that it will be a long time before profits return to healthy levels.

Drillers have to remain focused on what they can control. For Orbit Garant Drilling Inc., this means investing in new computerized drilling technology that could save junior companies hundreds of thousands of dollars once exploration activity rebounds.

The technology has achieved more than 30% greater productivity compared to conventional drilling and has reduced the duration of some customers' drilling programs by up to 50%, according to Alain Laplante, CFO of Orbit Garant. "In turn, this increased efficiency means that far fewer consumables are being used and rig components are lasting longer. Another benefit is that our customers can monitor our progress, view core samples, and access detailed performance reports on demand, all via the internet."

Shaft sinking in Ontario

Shaft sinking is the most technically challenging aspects of underground mine development, and Ontario is home to two of the deepest mines in the world: Glencore Xstrata's Kidd Creek and Vale's Creighton. Building a shaft at such depths which guarantees the safety of workers requires a creative approach. DMC Mining Services, a contractor based in Toronto, has been tasked with sinking the shaft at KGHM's Victoria nickel mine in Sudbury. At its deepest point, the Victoria project ore body is located nearly 2,600 m underground. The depth and nature of the rock stressing presents a significant challenge. "DMC will sink one exploration shaft to 1,000 m to better understand the grades and concentration of minerals," said Bill Shaver, president and CEO of DMC. "From there, the mine will be developed at 1,200 mt/day. The long-term expectation is that the second shaft will be sunk relatively adjacent and it will go down to 2,200 m."

Unsurprisingly, Ontario contractors have developed a number of innovative technologies that have been exported to other parts of the world. "DMC is the first contractor to use our patented Long Round Jumbo technology in shaft sinking where we were blasting rounds up to 5 m long; it was employed at Falconbridge's Craig mine in the 1990s,"

said DMC's Shaver. "Today, we are sinking two shafts in Saskatchewan for BHP Billiton using shaft boring roadheader (SBR) for the first time anywhere in the world." DMC is hoping that this SBR technology will be able to go nearly twice as fast as actual technology. "Shafts are usually sunk at the rate of 3 m/day. This would be a tremendous leap in shaft sinking, because the speed of sinking has not changed significantly in the past thirty years," said Shaver.

Challenges in Ontario are not always related to the depth of the ore body. In reviving the former Totten Nickel mine, Cementation Canada Inc. was faced with the task of dewatering the historical shaft. The company was contracted to determine whether to build a new access point or use the existing one. "Vale chose to upgrade the existing access, which required less capital but was more risky," said Roy Slack, president of Cementation Canada. "The original approach was to look at dewatering pumps within the shaft, but we were able to use a vent raise to dewater it that allowed us to do work in the shaft itself."

Ultimately, safety is the key concern for shaft sinkers. "The safety has improved dramatically over the years, and we are now sinking shafts with barely any accidents and zero fatalities," said DMC's Shaver.

For 34 years, we have served the mining and civil industry in a safe and environmentally responsible manner.



DMC Mining can be your source for:

- Contract mining
- Shaft sinking
- Raise boring and raise excavation
- Mine construction and infrastructure
- Mine development and rehabilitation.
- Head frames and hoisting plants
- Ground freezing and grouting programs
- Engineering design and feasibility studies
- Property development through equity investment, partnerships or joint ventures

DMC
MINING SERVICES

DMC Mining Services - Canada
1-800-892-8293
191 Creditview Road, Suite 400, Vaughan,
Ontario, Canada L4L 9T1

Peter Van Alphen
Vice President/General Manager
pvanalphen@dmcmining.com
tel: 647-925-0909

DMC Mining Services - USA
1-800-748-2375
488 East, 6400 South Suite 250
Salt Lake City, UT 84107

Phil Buck
Vice President/General Manager
pbuck@dmcmining.com
tel: 801-975-1979

www.dmcmining.com

The evolving relationship between EPCMs and clients

A hot topic at 2014's Prospectors and Developers Association of Canada conference in Toronto was how difficult it had become to build a mine on time and on budget. Mining analyst Christopher Haubrich presented research showing that capital cost overruns in the sector have averaged between 20% and 60% since 1965. What is surprising, however, is that in his analysis of 50 mines built between 2005-2013, only two of the commonly cited reasons for capital cost overruns – commodity market “heat” and project quality – were statistically significant. Most of the reasons cited by mining companies for cost overruns had nothing to do with whether a mine would be built on time and on budget.

This leaves a grey area between EPCM companies and their clients as to who is responsible for project delays and budget blowouts. “When major projects are going over budget it affects the entire industry,” said Andrew Boushy, vice president and general manager, minerals and metals at Ausenco Engineering Canada Inc.

According to Jan Kwak, managing director, mining and mineral processing at Hatch Ltd., mining companies are looking for more predictability in outcomes, and large divergences from the original plan for cost and schedule are not acceptable. “We believe the best way to have more surety and predictability in a project is by doing a better job in scoping the project. In the rush to get projects built during the boom years, many companies skipped these steps, which resulted in cost overruns. Our approach is to place more effort into project planning and scoping to make sure we understand precisely what we want to build and how we will build it; it may be basic but it is profound,” he said.

Making mines more efficient: a productivity analysis

Globally, mining companies are bringing new mines into production that are low-grade and high-tonnage, putting increased strain on profitability. Ontario's producers are also dealing with high energy costs in comparison to the rest of Canada. There is a need for technologies that can assist with energy reduction across the entire mining value chain.

Emerson, a diversified global manufacturing and technology company, is devoting its resources to help Ontario's miners tackle the challenge of energy efficiency. Through its product umbrella of over 70 brands, the company offers products that control energy usage and monitor equipment. “In the shaft of the mine, industrial LED lighting emits less heat than a conventional incandescent lighting system and is much more energy-efficient. On a SAG mill, companies use Emerson Process Management's CSI Technology – ‘machinery health monitoring systems’ – as a predictive diagnostic tool for machinery management,” said Thomas Cleland, manager, business development at Emerson Canada. In Canada, Emerson's turnover is close to \$1 billion annually. Emerson also provides products for conveyor belts such as rollway bearings and sealmaster bearings. “Our Control Techniques variable speed drives can be used in a re-generative configuration, such as a dynamic brake for an inclined rock conveyor. The braking drive can generate as much as 50% of the energy required to run another same-sized drive connected on the same DC buss circuit,” he said. The company is also working on wireless control products.

Implementing IT in the quest for profitability

In the midst of a commodities downturn, mining companies are looking to big data to help them increase profitability. While a recent Accenture survey of mining executives



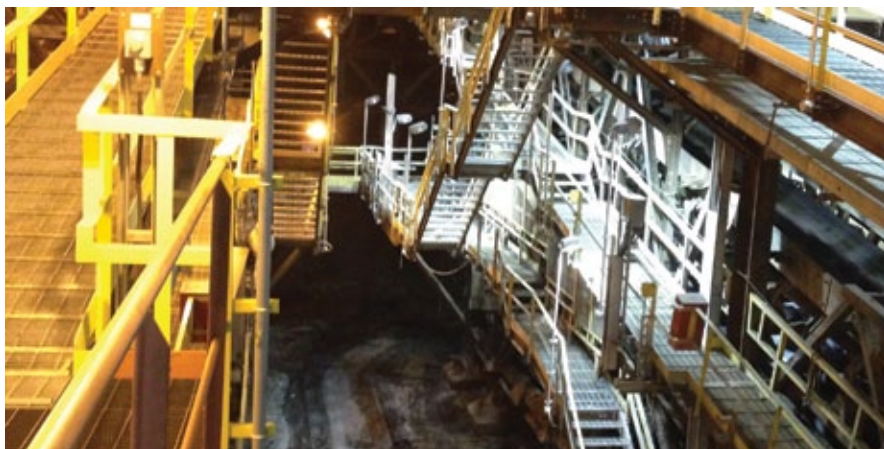
Chris Novak, CEO, Centric Mining Systems.

showed that 25% of them had at least doubled their overall digital investment, there is still a degree of uncertainty about what these software tools can do.

Centric Mining Systems is a Sudbury-based company that developed software designed to collect metrics related to the extraction, conveyance and processing of ore. These metrics are then transformed into Key Performance Indicators (KPI's) and delivered to decision makers. “We see that there are three kinds of KPIs: one you cannot see because you are unable to compile the data efficiently and effectively, one that is incorrect but accepted because we have nothing better, and one that you do trust and accept despite a lack of accountability in the data,” said Chris Novak, Centric's CEO. “This would be unacceptable in any other business. Our approach brings opportunity with accountability, and brings forth KPI's that as an industry; we could not produce in a timely enough manner to be useful.”

Part of the problem, according to Novak, is that each part of the mining enterprise sees itself as unique and isolated, and so they develop information management solutions independently. “For us the goal is tearing down the silo walls, so that knowledge is shared and delivers the maximum ROI,” he said.

Another company bringing Enterprise Resource Planning solutions to the mining industry is Illumiti, an SAP systems integration and management consulting company based in Toronto. The company has worked with Strongco and St Andrew Goldfields to implement SAP into their operations. “Their exposure to what is happening internally will keep improving as they gain a better understanding of reporting and information analysis,” said Rory Friedman, vice-president operations. Software giant IBM is also investing in mining with a number of enterprise resource planning products designed for the industry.



High intensity hazardous location LED lighting systems. Photo courtesy of Emerson - Appleton Electric.

Extract More

With your Equipment, People, and Process

Emerson will help increase uptime through new technologies, multiple world class brands, and 80 years of industry expertise.

To find out how to **extract more** in mining contact us at:
Tel: 905 948 3400 or Email: Mining.Canada@Emerson.com

The Emerson logo is a trademark and service mark of Emerson Electric Co. © 2015

EMERSON

EMERSON. CONSIDER IT SOLVED.®

Conclusion: forging a new path

Ontario's model for sustainable development



Glenn Nolan, vice-president of aboriginal affairs, discussing Eagle's Nest project in the Ring of Fire with local First Nations at Neskantaga First Nation Open House. Photo courtesy of Noront Resources.

Developing mining jurisdictions around the world look to Canada as a model of sustainable development, but even a province with as rich a mining history as Ontario has its fair share of environmental and social challenges when it comes to mining. The Ring of Fire is a classic example of how development in a mineral-rich region can be hampered when it comes to obtaining the social license to operate.

The two biggest challenges to developing mines in northern Ontario are its remoteness and engaging with Aboriginal groups. "Remoteness brings challenges in how you move forward and design the project as well as access; for example, more helicopter work, which requires different procedures and planning," said David Brown, principal and environmental geochemist at environmental consulting company Golder Associ-

ates. "The remoteness and the number of communities in the Ring of Fire have made engagement more complicated."

Companies that are able to engage with First Nations groups early on are the ones that have a high probability of success. The Morris Group of Companies, a Sudbury-based diversified services company, set up the Niska Career Academy in 2010, which was the first major aboriginal training college in Cochrane, Ontario. The college has achieved an 80% job placement rate. "We are doing our best to get the First Nations involved in projects and to have them trained so that they are qualified for higher skilled jobs in the mining industry. Partnerships with First Nations include setting up joint ventures where they have decision making power, where they can deploy their members and exercise revenue sharing structures," said David Morris, the company's founder.

In Ontario, Aboriginal employment accounted for 9.7% of total mining jobs in 2011. Mining is also the largest private sector employer of Aboriginal peoples in Canada.

Getting Ontario's youth involved in the mining industry: recruitment

The mining industry is facing a major skills shortage worldwide. In Canada, however, there is talk of a lost generation of miners as young people turn to what they consider higher-skilled employment. This is a huge problem for Canada's mining industry: according to the Mining Industry Human Resources Council, nearly 146,000 workers will be needed over the next decade to replace retiring mining workers.

OPERATIONAL REPORTING

RECONCILIATION

STOCKPILE MANAGEMENT

ORE TRACKING

EQUIPMENT UTILIZATION MONITORING

GRADE CONTROL

A CLEAR VIEW OF YOUR DATA
FIND OUT HOW AT CENTRICMININGSYSTEMS.COM

centric
mining systems

The most in-demand role in the mining industry is that of a mine engineer. Chris Stafford, president of Toronto-based mining recruitment firm CJ Stafford & Associates, believes that young mining engineers have suffered from the current market downturn. "Roughly five years ago, the mining industry was so busy that engineering consulting companies were overwhelmed with the demand for their services. To overcome this, they hired graduates fresh out of university with little, or no, field experience. This went against all the norms that had governed the industry for decades as traditionally it was expected that a 'consultant role' would require 15-20 years of on-the-ground experience. Sadly, as mining activity continued to decline, these newly-hired, young consultants were the first to be laid off at a time when prospects of new jobs were slim at best. Certainly, in this current job market, a graduate would be well advised to look for employment in the north, as generally speaking opportunities are more likely the farther north you go, where often the pay is better and responsibilities greater."

With the impending retirement of the boomers and anticipated shortage of upcoming talent, those companies who better understand the needs of millennials will lead the industry in the war for the best



Chris Stafford, president, CJ Stafford & Associates.

talent, according to Stafford. However, it is not up to the mining industry itself to recruit new talent. Another challenge to recruiting young workers to the mining industry is overcoming their prejudices. "Most students, even in engineering, do not realize the potential of a mining career; it is not like it was in the nineteenth century," said Mary Murray, principal at Mine Staffing International. "A lot of this stems from the fact that mainstream media does not like to cover mining stories unless it is negative coverage. We are not reading stories in traditional media about the successes of mining and all of the progress that has occurred."

A new era for Ontario's miners

By mid-2014, the mining industry in Ontario seems to have collectively weathered the storm. Those who survived 2013 relatively intact seem determined to learn from the mistakes of their industry's past. Growth above all is no longer the operating mantra, replaced instead by a promise to make efficient use of shareholder funds.

"There was certainly a rush into the junior sector when the commodity boom happened, as the returns were high and the sector was very vibrant," said Lee Hodgkinson, natural industry leader mining at KPMG.

"One could argue that too many companies were created without enough quality assets. There now needs to be some significant consolidation and reallocation of capital. There has been a paradigm shift at the top of the market. The overarching message now is value over volume and disciplined capital allocation. The companies have learned their lessons, but the way the market itself reacts is what will drive executive decisions," he said.

Ontario is forging its own path in the mining industry. Having grown through many different cycles, its industry stakeholders understand that the key to survival is to innovate and think differently.

CH2MHILL®

Environmental and Engineering Services for the Mining Industry



CH2M HILL serves our clients in the mining industry with a broad set of services available throughout the life cycle of a mine. These services range from permitting and compliance for new and expanded mines, to mineral processing and metallurgical engineering, water and waste management and treatment, through reclamation and restoration services needed during mine closure.

Whether the project is large or small, CH2M HILL specializes in identifying strategic solutions to mining challenges that save time and money. With 17 offices in Canada and 247 offices worldwide, we have the local knowledge and global reach to solve your most pressing technical and regulatory issues.

ch2mhill.com | twitter.com/ch2mhill | facebook.com/ch2mhill