

# GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS



## MINING IN ONTARIO AND TORONTO'S GLOBAL REACH 2020



Finance - Production - Exploration - International Projects - ESG  
Engineering & Consulting - Battery Metals - Innovation

TORONTO STOCK EXCHANGE AND TSX VENTURE EXCHANGE

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Dear Reader,

Global Business Reports (GBR) is delighted to be back in Ontario to provide our annual guide to the current mining landscape in Canada's largest mineral producing province. In this edition of our Industry Explorations series, GBR pays special attention to Toronto's influence across the full value chain, from its financial institutions on Bay Street, the mining producers and juniors headquartered in the city with operations across the globe, to its innovation-led service sector. GBR's research team was stationed in Toronto for three months, conducting face-to-face interviews with key decision makers throughout the industry to provide a holistic view of the companies and themes shaping the industry.

When researching the previous edition of this report, a wave of M&A activity had just begun, sparked by the all-share merger between Barrick and Randgold. One year later, and a glance at the map of Ontario mines shows a remarkable transfer of assets, with operations controlled by Goldcorp, Tahoe Resources, North American Palladium and Detour Gold now in the hands of Newmont, Evolution Mining, Pan American Silver, Impala Canada and Kirkland Lake Gold.

While producers have been making hay while the sun is shining, spurred on by gold at a 7-year high, the junior exploration community has languished with a dearth of financing available despite the cannabis and crypto booms subsiding. The likes of Great Bear Resources and Wallbridge Mining, however, have shown that the best projects can still attract substantial investment and trade at eye-catching multiples. The need to replace reserves is becoming more pressing and the global demand for metals has yet to diminish, so, for the mining-savvy investor, this is an opportune time to capitalize on high-upside, undervalued assets.

As environmental, social and governance (ESG) criteria move to the forefront of strategy for mining companies, investors, and governments alike, Ontario's mature service sector has adapted to offer solutions that create a more sustainable, responsible, mining practice. An emphasis on innovation is no longer an afterthought; mining companies are looking to optimize production and efficiency. For a cyclical industry, the risk of standing still and not evolving should not be an option.

We would like to thank all our interviewees that have taken the time to provide their insights into the market. To all our readers, we encourage your feedback, and welcome interest in being interviewed for future reports.

When it comes to mining, what happens in Ontario, invariably does not stay in Ontario. In fact, it has the potential to influence the global sector. The following pages are an illustration of the sentiment of one of the world's preeminent mining jurisdictions.



**Alice Pascoletti**  
General Manager  
Global Business Reports  
GBR

Data as at December 31, 2019. Source: TSX/TSXV Market Intelligence Group and S&P Global Market Intelligence.

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GBR journalists provide unique and first hand analysis and insights into all aspects of the Ontario mining industry after months on the ground

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0 75 150 Kilometers  
0 75 150 Miles

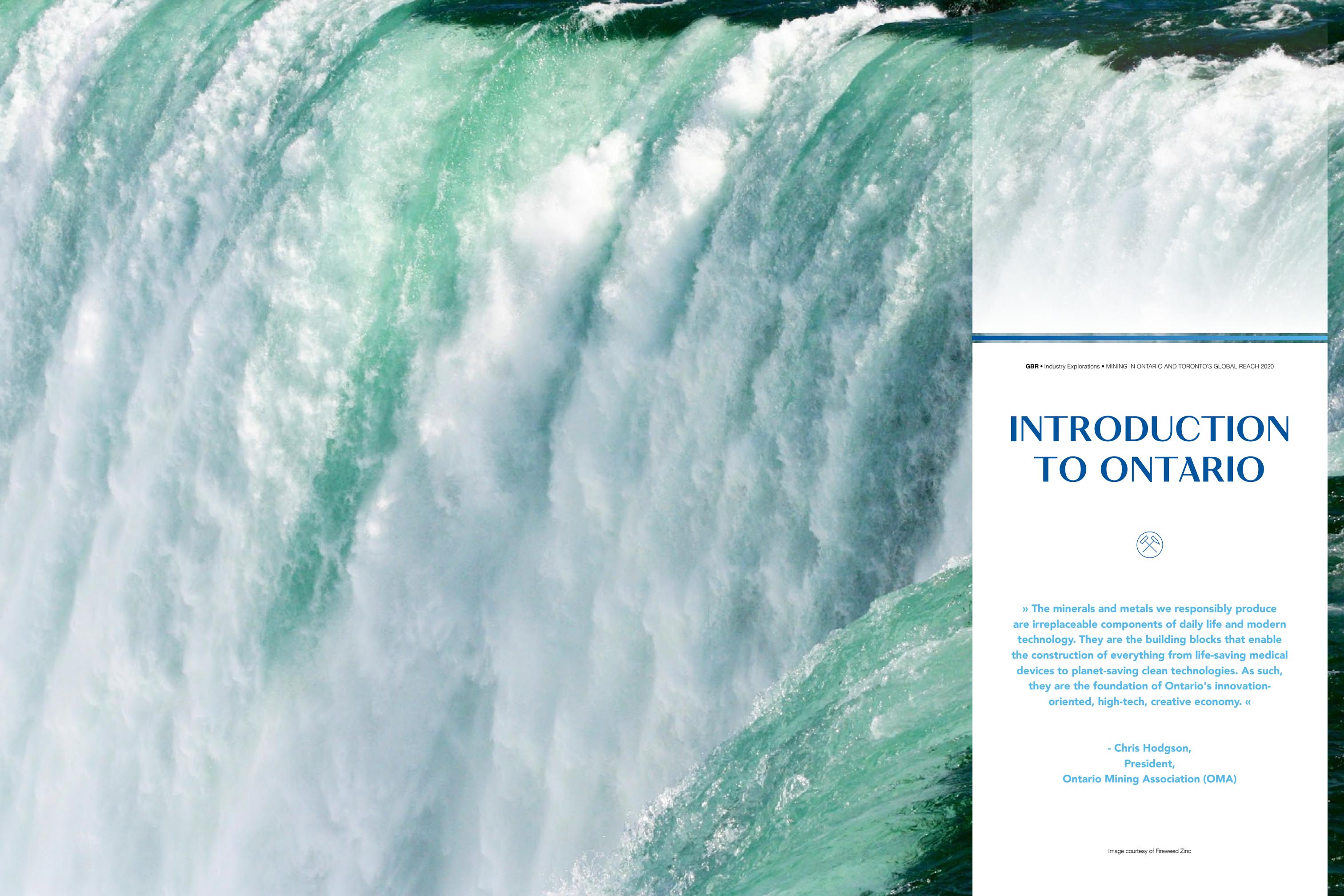


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Industry Explorations  
Global Business Reports

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# INTRODUCTION TO ONTARIO



» The minerals and metals we responsibly produce are irreplaceable components of daily life and modern technology. They are the building blocks that enable the construction of everything from life-saving medical devices to planet-saving clean technologies. As such, they are the foundation of Ontario's innovation-oriented, high-tech, creative economy. «

- Chris Hodgson,  
President,  
Ontario Mining Association (OMA)

Image courtesy of Fireweed Zinc

## INTRODUCTION TO ONTARIO

# A global mining powerhouse facing competition

→ Ontario's position as one of the world's pre-eminent mining jurisdictions is clear from a number of metrics. As Canada's leading producer of minerals, valued at C\$10.1 billion in 2018, with the second largest number of mining companies headquartered in one city (Toronto is second to Vancouver) and as the traditional home of mining finance on Bay Street where the TSX is found, Ontario's influence reaches far beyond the borders of the province. However, remaining competitive in a global market place cannot be maintained through reputation alone, and despite impressive production figures and a world-class mining ecosystem, there are signs that Ontario's traditional position of dominance has started to wane. The Fraser Institute's Mining Investment Attractiveness Index ranked Ontario number 20 in 2018, behind British Columbia (18), Nunavut (15), Manitoba (12), Newfoundland & Labrador (11), Northwest Territories (10), Yukon (9) and Québec (4). Of course, the majority of these jurisdictions do not come close to matching Ontario's global

influence, but even from a mining finance standpoint, the days of spending an afternoon on Bay Street to raise project finance are no longer.

High energy and labor costs and lengthy permitting processes are two of the main issues facing Ontario. Fortunately, the provincial government – led by Doug Ford's Progressive Conservative Party, elected on June 28, 2018 – and a network of mining associations are cognizant of these challenges and have been proactive to establish a more favorable climate for mining investment.

In his interview with Global Business Reports, Greg Rickford, Minister of Energy, Northern Development, Mines and Indigenous Affairs from the Government of Ontario, emphasized a focus on key areas in order to position Ontario as the leading mining jurisdiction in Canada, including expediting regulatory processes for mine production, strengthening spaces for industry-wide dialogue and creating focused task groups to resolve a backlog of project-specific issues immediately. When

asked what steps the Ontario government is taking to reduce red tape and streamline the mining process, Minister Rickford pointed to the four mining-related clauses in the "Better for People, Smarter for Business" project.

Firstly, creating certainty for proponents submitting a closure plan by creating a 45-day timeline for the ministry to make a decision; secondly, to streamline processes and lessen confusion by amending the regulatory framework; thirdly, amending the mining rehabilitation code to ensure that it refers to the most recent version of dam safety; and lastly, improvements to the land mass administration system to make it easier for stakeholders to merge individual claims. "The timeline to open a mine is not at the speed of business or commodity markets, and we are working to correct this," acknowledged Minister Rickford.

"Ontario is blessed with commodities that are currently in demand, and the market has been doing well, but in order to keep our industry thriving, we have to be competitive in the global arena," stated Chris Hodgson, president of the Ontario Mining Association (OMA).

To this end, tangible progress has been made, as dialogue between the OMA, the government and Ontario's Workplace Safety and Insurance Board (WSIB) caused WSIB to end its unfunded liability charge, reducing the employer's average premium rate to 17%. "These kinds of successes are always the result of collaboration," reflected Hodgson.

"With high priced labor your competitiveness is in productivity," noted Roy Slack, president of the Canadian institute of Mining, Metallurgy and Petroleum (CIM), highlighting Canada's role as a leader in implementing battery-operated and autonomous equipment, alternative energy sources and environmental responsibility. "These advances help to offset the costs of deeper mines and higher labor and are critical to obtaining the social license we need to operate in a sustainable manner," he added.

### Record M&A activity sweeps the industry

2019 ended much the way it started, with a wave of high-profile M&A deals in the

gold and PGM space as Impala Platinum acquired North American Palladium for C\$1 billion in October, Kirkland Lake Gold stunned the market with its acquisition of Detour Gold for C\$4.3 billion in November and China's Zijin Mining Group bought Continental Gold for US\$1.3 billion in December. By mid-December 2019, 348 deals worth more than US\$30.5 billion had been agreed, according to Refinitiv Eikon data. This figure is up from US\$10.8 billion in 2018 and even surpasses the previous high of US\$25.7 billion from 2010. One of the most noticeable differences between the boom-time M&A surge in 2010 and the 2019 activity has been the lack of premiums linked to the transactions, most notably Barrick's no-premium acquisition of Randgold, and the modest 18% premium paid by Newmont for Goldcorp. "The financial strategy we are seeing from companies is still very conservative," commented Daniel Ricca, partner of KP-MG's energy and natural resources division, explaining that, despite the robust gold price, a seven-year downturn and previous misuse of capital are still fresh in

the minds of investors: "The effects are still visible, and we see management and investors are still trading carefully."

At the Denver Gold Forum in September 2019, the month gold traded at a six-year high breaking the US\$1,500 barrier, the main themes were the growing importance of ESG (Environmental, Social and Governance) to investors, and companies emphasizing their commitment to remain disciplined with capital allocation despite the rapid generation of free cash flow that flourishing precious metals prices were generating. This prudent approach from senior management is a legacy, you would like to think, of the numerous failed excesses of the previous upcycle. Shareholders want management to show accountability and discipline throughout the entire commodity cycle, according to Ian Roberston, executive vice president of communication strategy at strategic shareholder advisory firm Kingsdale Advisors: "When times are good, mining companies may paint an overly optimistic picture of where the company is and where the company is heading. In these cases, man-

agement takes all the credit, but when the share price drops, they argue it is not management's fault but the commodity price's fault," said Robertson, pointing to the post-2013 write-downs that caused shareholders to demand new leadership and direction.

### Growing disparity: producers thrive as juniors languish

The OMA represents the mining producers active in the province who, by all accounts, had a stellar year in 2019. Three of the eight mining companies in the inaugural TSX30 in 2019 – a list that recognizes the top 30 performing stocks on the Toronto Stock Exchange over a three-year period – are Ontario mining producers headquartered in Toronto. The success of Kirkland Lake Gold (number four on the TSX30 and the best performing mining stock), North American Palladium (16) and Wesdome Gold Mines (19), shows that mining in Ontario can thrive despite high labor and energy costs.



**We want to maintain Ontario as one of the most competitive places for exploration and reduce the regulatory burdens for extraction. Our goal is to provide the conditions so that mines can actually open, supporting all stages of the business.**

**- Hon. Greg Rickford,  
Minister of Energy,  
Northern Development,  
Mines and Indigenous Affairs – Government of Ontario**



## Increasing Exploration Success



Our goal is to advance the fundamental science that will discover the next generation of orebodies while training highly qualified personnel for careers in the minerals industry.

We work with industry on collaborative research projects across the world to support the development of new exploration methods and technologies.

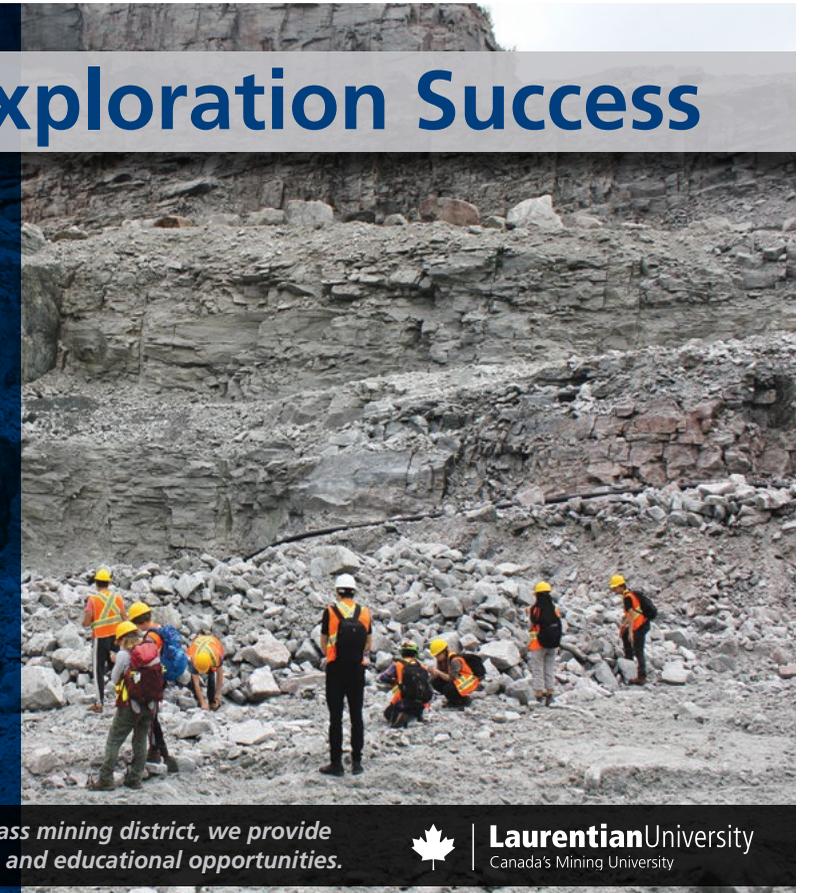
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Located in Sudbury, Ontario, a world class mining district, we provide unrivaled exploration-focused research and educational opportunities.



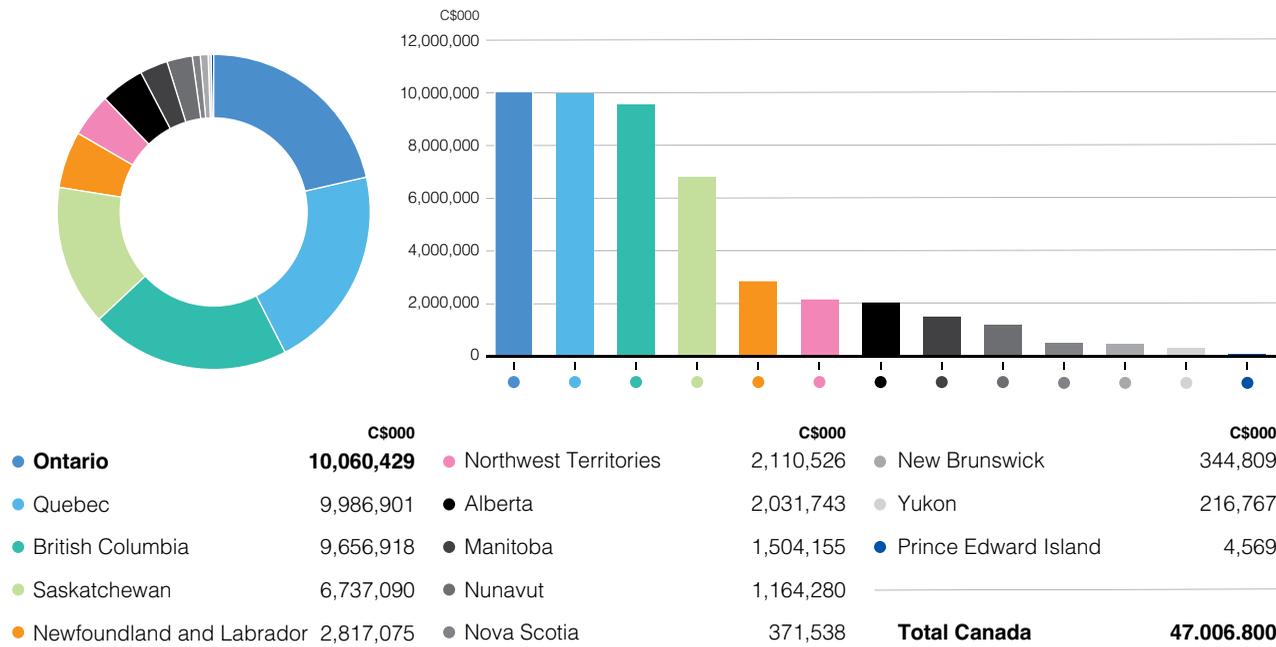
**Laurentian University**  
Canada's Mining University





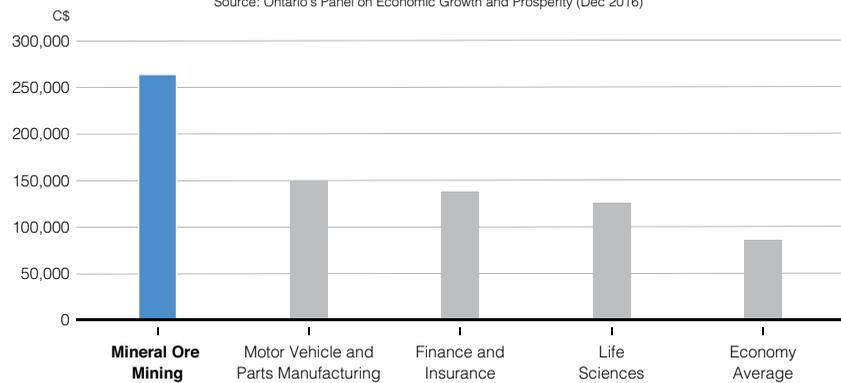
MINING PRODUCTION 2018 BY PROVINCE

Source: Natural Resources Canada



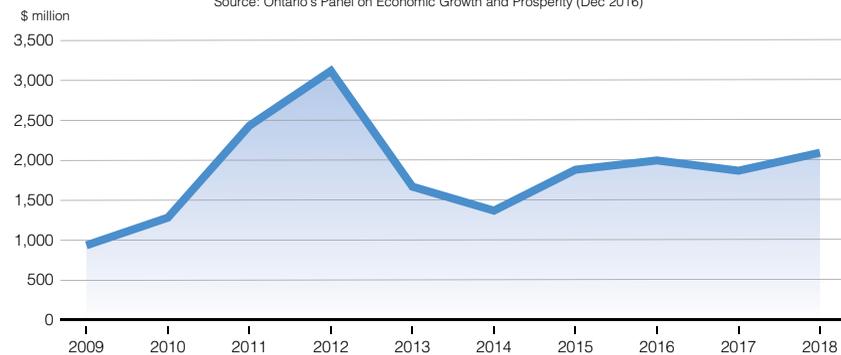
ONTARIO ANNUAL GDP PER WORKER (2015)

Source: Ontario's Panel on Economic Growth and Prosperity (Dec 2016)



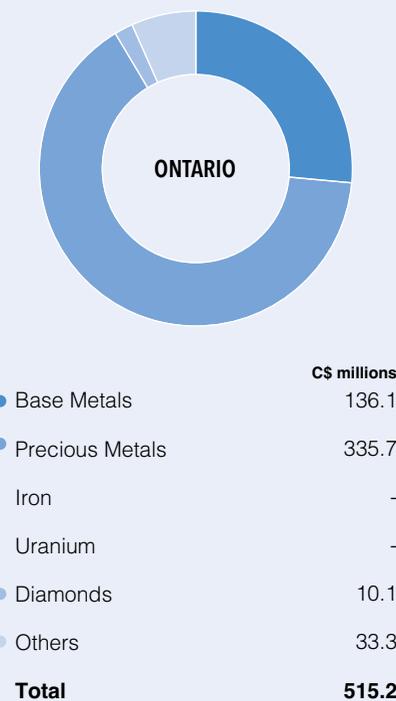
ONTARIO CAPITAL INVESTMENT IN MINING

Source: Ontario's Panel on Economic Growth and Prosperity (Dec 2016)



EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES BY MINERAL COMMODITY SOUGHT, 2019

Source: Natural Resources Canada



Greg Rickford

Minister of Energy, Northern Development, Mines and Indigenous Affairs  
**GOVERNMENT OF ONTARIO**



**“Better for People, Smarter for Business” is our project to make regulations more efficient... The timeline to open a mine is not at the speed of business or commodity markets and we are working to correct this.**



**Where is your attention focused to improve the mining sector in Ontario?**

We are working on expediting regulatory processes for mine production, strengthening spaces for industry-wide dialogue, and creating focused task groups to immediately resolve a backlog of project-specific issues.

One of our priorities is to help enterprises with their residual regulatory matters so that they can move to their next stage of development. Our strategy has been to form teams of senior elite talent and ministry officials that work intensively to solve project specific issues. We want to provide immediate and individualized solutions for operations at an impasse. The teams deal with challenges at all stages of the mining cycle from exploration to closure plans. This is part of our broader strategy to assist with issues that stem from an excess of red tape.

We are working to establish forums that bring together the entire complexion of senior stakeholders in the sector. The aim is to strengthen the dialogue at an industry level and tackle a mining agenda collaboratively. The Premier left a mandate for this initiative and is continuously updated on its findings.

**What is the Ministry doing to reduce the red tape and streamline the mining process?**

“Better for People, Smarter for Business” is our project to make regulations more efficient. It aggregates policies across all ministries and there are four clauses specific to mining. One – creating certainty for proponents submitting a closure plan by creating a 45-day timeline for the ministry to make a decision. Two – to streamline processes and lessen confusion by amending the regulatory framework. Three – an amendment to the mining rehabilitation code to ensure that it refers to the most recent version of dam safety. Four – improvements to the land mass administration system to make it easier for stakeholders to merge individual claims. The timeline to open a mine is not at the speed of business or commodity markets and we are working to correct this.

**How can the authorities help balance mine development with the considerations of Indigenous communities?**

Canada's value proposition is its set of

principles and values. We can never build a mine that is proximal but not accessible to communities; the positive effects of an operation must reach everyone. Mines have the potential to be the life source of a town, bringing job prospects and kick starting other businesses. In terms of Indigenous consultations, we are developing a standardized approach to memorandums of understanding and impact-benefit agreements. We want to establish bilateral agreements that are standardized, have realistic expectations, and allow for clear timeframes.

**Can you comment on the infrastructure plans at the Ring of Fire?**

The corridor will link communities and extend access to health and social services as well as technology. The reasons to develop go beyond mining. We know that the mineral profile is world-class and that there is immense potential to create wealth. Because of its resource and size, it can be transformative asset for the province.

**How should the industry address the human resource issue of a growing skills deficit?**

Our role as government is to create the conditions that stimulate the workforce for the industry. With that being said, I believe there is tremendous opportunity to mobilize an Indigenous workforce. 12 % of the mining workforce is Indigenous and I believe this percentage can grow.

**How can Toronto retain its position as a global mining leader?**

We want to maintain Ontario as one of the most competitive places for exploration and reduce the regulatory burdens for extraction. Our goal is to provide the conditions so that mines can actually open, supporting all stages of the business. Many companies are based here but do not necessarily operate here: I intend to correct this. Incentives and regulatory frameworks play an important role and we are working to address both aspects. Through policy corrections we can energize the sector. I am a firm believer that the conditions exist to fuel a bull market. If we provide the right conditions to encourage the industry at a provincial level, the effects will reach Toronto and this will help boost its role as a capital lender worldwide. ■



## Chris Hodgson

President  
ONTARIO MINING ASSOCIATION  
(OMA)



As 2020 marks our association's centennial, we also want more people in the province to discover and embrace all that our industry has become over the past 100 years, and all it has to offer. This is why we launched #ThisIsMining, a campaign that aims to surprise and inspire, motivating people to form opinions about our industry based on curiosity, discovery and engagement.



### What have been some of the key milestones achieved by the OMA in the last two years?

First and foremost, we're continuing to make strides on our safety performance. Over the past 30 years, we've improved lost time injury frequency by 96%. In 2016 and 2018, our industry met its zero-fatality objective - a significant achievement on our way to achieving zero harm. These kinds of successes are always the result of collaboration. We're proud of the work we do with the government and other partners to build a world-class safety culture, and we are committed collaborating on a number of other files that have a big impact. For instance, we've had a constructive dialogue with the Workplace Safety and Insurance Board that resulted in the WSIB ending its Unfunded Liability charge, leading to a reduction in premium rates - a big boost for competitiveness. Energy is also a large component of our cost structure in Ontario, so we are working with the government to have industrial energy pricing that is more transparent, more predictable, and lower cost. We're also putting in programs and adopting new technologies to help reduce energy consumption.

### How does the OMA's "Meet the Miners" event bring together industry, government and communities to address pertinent issues?

We have a long history of working constructively with governments and communities of interest to build consensus on issues that matter to our industry and to the people of this province. For the past 41 years, OMA has hosted a Meet the Miners event at the Ontario Legislature. The day includes meetings, presentations by thought leaders, panels that tackle key challenges and opportunities facing the industry, and a large reception. It is an opportunity for industry leaders to meet with policy-makers and ministry staff, hear what their priorities are, and to share our successes and concerns. Meet the Miners is about making the connections between our policy-makers' objectives and what mining can deliver, provided we have good policies and governance structures in place.

### How important is the mining industry to Ontario's economy?

Though the number fluctuates with various commodity price changes, mining in Ontario has revenues of around C\$10 billion per year. The industry creates 26,000 direct jobs and approximately 50,000 indirect jobs in mineral manufacturing and processing. It is important to note that the average weekly wage in Ontario mining is 77% higher than the average industrial wage in the province, so these are good, high-paying jobs. The impact of mining goes beyond mineral extraction and processing.

### Can you elaborate on the importance of strengthening relationships between mining companies and local communities?

We aim to trigger growth and diversification in the local economy. While important in any community, this approach is imperative in remote ones, where mining can have an outsized impact. Aligning interests and reconciling values with Indigenous communities is an important element in our relationship-building. Over the last few decades, Indigenous-industry partnerships have evolved tremendously through the conclusion of various types of agreements related to mine development. These have proven to be successful in securing benefits for many Indigenous communities. We are working with the government to ensure that an equitable model for Resource Revenue Sharing further aligns community and industry interests and development goals.

### Where would you like to see the Ontario Mining industry by the end of 2020?

We would like to see Ontario as the number one mining jurisdiction for capital, not only invested in operating mines, but also in juniors, as a robust mining cycle relies on vibrant mineral exploration that leads to discoveries, which can be turned into new mines. As 2020 marks our association's centennial, we also want more people in the province to discover and embrace all that our industry has become over the past 100 years, and all it can offer. This is why we launched #ThisIsMining, a campaign that aims to surprise and inspire, motivating people to form opinions about our industry based on curiosity, discovery and engagement. ■

## Roy Slack

President  
CANADIAN INSTITUTE OF  
MINING, METALLURGY AND  
PETROLEUM (CIM)



### How can Canada maintain its competitiveness in a global market despite high labor costs?

Canadian mining has been very innovative in many areas; its mineral processing technology is only one example. We are the leading country in implementing battery-operated and autonomous equipment, and a leader in alternative energy, as well as in safety and environmental responsibility. These advances help offset the costs of deeper mines and higher labor and are critical to obtaining the social license we need to operate in a sustainable manner.

People are realizing they have to implement innovative ideas. We are seeing a more open industry not only in discussing innovation but integrating it in practice. Canada must be a leader in this regard in order to be economically sustainable.

### Can you elaborate on the One CIM initiative?

The CIM has been around for a long time and the goals have not changed. They are strong goals that help our industry: to

create and deliver knowledge, to create a robust network, and to facilitate mineral literacy and public awareness.

### In what path would you like to see the industry moving beyond 2020?

One of CIM's three main aims is to improve public awareness and mining literacy. The public must realize that minerals and mining will be a big part of the solution to climate change, enabling electric, battery and alternative energy solutions. Electric equipment in underground mines also reduces ventilation requirements, which is typically the largest single power draw in underground mining. Not only does it change the power source, it reduces the power need. Additionally, I feel our industry has gone from a state of compliance to one of commitment. It is not only about adhering to the laws and regulations. We must go beyond that. For instance, the Canadian industry has become a leader in relations with First Nations peoples and the environment. This creates new standards and, while the industry has done well in this regard, it must continue to do so. ■

## Janice Zinck

Director – Green Mining Innovation,  
CanmetMINING  
NATURAL RESOURCES CANADA



### What does the Canadian Minerals and Metals Plan (CMMP) hope to achieve?

CMMP was initiated approximately three years ago, and is a pan-Canadian strategy for metals and minerals that has been co-developed by the federal, provincial and territorial governments. The CMMP was formally launched at PDAC 2019, and determines priorities and objectives for six areas: economic development and the competitiveness of the minerals and metals sector; advancing the participation of Indigenous peoples; communities; Canada's global leadership; environment; and science, technology and innovation. The first in a series of action plans will be launched at the PDAC in 2020.

### Why does China hold such dominance over the critical mineral space and how can countries such as Canada catch up?

China's dominance in the critical mineral space started 30 years ago and their long-term strategy allowed them to beat competitors. At that time, everybody was comfortable allowing China to supply products. Our resource strategies are not

nearly as long-term in the Western world as they are in China.

### Could you expand on NRCan's Mining Value for Waste program?

The tailings challenge in Canada is enormous. Approximately 200 million mt of tailings are produced annually in Canada. After decades of mining and processing, the metal value of historic tailings is significant, and there is an equivalent level of liability. Couple this with the public concern regarding mine waste, the opportunity to re-examine these wastes as resources is very compelling. In fact, the grade of some tailings far exceeds what is mined today. As well tailings often contain several of the critical minerals such as tungsten and rare earths. The Mining Value for Waste program is a pan-Canadian effort to develop tools, technologies, and policies to de-risk and accelerate demonstration and full-scale waste re-processing / repurposing projects. The goal is to reduce mine waste liability and environmental impact, while providing local and national value for Canada (jobs, resources, etc.). ■

# Heather Gamble

CEO & Founder  
WOMEN ON THE MOVE



➔ **Can you introduce Women on the Move (WOM) and outline the company's vision?**  
Women on the Move (WOM) is Canada's leading business accelerator for female business owners/entrepreneurs ready to scale. Our value proposition to the community is that we take female-owned businesses to their first US\$1 million in revenue. Currently, less than 1% of female founders achieve over a million dollars in annual revenue and we believe that these businesses just need some capacity building to achieve success. The company was established in 2014 and has since trained, coached and advised over 1,000 female founders. WOM's main goal is to equip female founders to establish successful and sustainable business ventures, with a mission to have 10,000 women achieve this success.

**How did you get the idea for WOM's mining and metals-focused Artemis project?**  
My first client was a mining engineer based in Santiago, Chile – a single consultant who wanted to start a business. We worked together to get her company to US\$1 million in revenue, which was achieved within a very short amount of time. Working with this client, I was introduced to the mining industry. A significant number of women in the mining industry heard about the momentum we were building and approached WOM for assistance. I realized that it was not possible to only be helping one business at a time and had to come up with a plan to build capacity in a collective. This is how the Artemis project was born. The program is designed to equip women entrepreneurs with senior level sales training, senior level sales coaching, senior level sales business introductions and senior level sales business connections.

**Do you think many women see the mining industry as a feasible career option?**  
Over 30% of Canadian university graduates that study STEM (science, technology, engineering, and mathematics) courses are women. However, a very small percentage of women see mining as a feasible career path. Looking at the sector, De Beers is the only mining company which has demonstrated that they are committed to attracting women into the industry. ■

# Felix Lee

President  
PDAC



➔ **How did PDAC 2019 compare to previous editions of the event?**  
What set PDAC 2019 apart from previous conventions is the fact that it was attended by Canada's head of state, and was the second time a sitting Canadian Prime Minister has visited and spoken at the event.

**In Q3 2019 there were raises in the precious metal prices, but equity has not returned to the junior market. What do you attribute this to?**  
The amount of equity raised dropped off significantly in 2018, to the extent that the amount of equity raised in 2018 was actually below the previous low in 2013, and it seems that even a lesser amount of equity is going to be raised in 2019. To that end PDAC is encouraging the government to keep in place certain fiscal incentives to drive investment into the exploration side of the business, such as the maintenance of the flow-through share (FTS) regime as well as the renewal of tax credits. Approximately 80% of all equity raises for exploration in Canada have been flow-through, which illustrates its importance.

**What do you think that Canada can learn from other jurisdictions to help foster a better mining climate?**  
Finland is a prime example of the value of infrastructure and how it can assist exploration and mining. Infrastructure plays a huge role in bringing down the overall cost of exploration, and that is why PDAC continues to advocate on a federal level for investment to develop the far North.

**What do you think Canada should do to maintain its role as a global mining leader?**  
Historically, Canada has enjoyed a dominance in the mining industry, but we should not rest on our past laurels and recognize the fact that Canada faces increasing competition. We should push for increased government geoscience programs in order to collect more geological data. Ultimately, explorers go where there is information and where there is sufficient infrastructure in place to make a project economically feasible. ■



2020

THE WORLD'S PREMIER  
MINERAL EXPLORATION  
& MINING CONVENTION

March 1 - 4

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# Dr. Ross Sherlock



Director of the Mineral Exploration Research Centre (MERC)  
**LAURENTIAN UNIVERSITY**



## What is the focus of the Mineral Exploration Research Centre (MERC)?

Our goal is to advance the fundamental science that will discover the next generation of orebodies. Our belief is that the discovery of orebodies has the biggest multiplier effect in the creation of new wealth for society.

MERC works with industry and governments on collaborative research projects across Canada and the globe. These projects support the development of new exploration methods and technologies while training highly qualified personnel for careers in the minerals industry, academia and government. MERC facilitates and manages research projects, typically field-based and exploration related. Our largest current project is "Metal Earth," a C\$104 million, seven-year, applied R&D effort supported in large part by the Canada First Research Excellence Fund (CFREF). MERC also offers short courses and modular courses targeted at industry professionals, which are run in partnership with industry events such as the PDAC and Roundup. MERC is a part of the Harquail School of Earth Sciences (HES) here at Laurentian University in Sudbury, Ontario. HES is a comprehensive geology department offering BSc, MSc and PhD programs including options for a thesis based MSc in geology or applied MSc in mineral exploration.

## How is innovation impacting geological exploration?

Innovation in exploration has introduced new and complex datasets, faster and more effectively, with an increased degree of resolution. However, geoscientists are often unable to interpret and

utilize the details of the data being generated and consequently industry has become data rich and knowledge poor. MERC and HES are combating this trend by fostering a deeper understanding of ore systems to produce geoscientists who are better equipped at interpreting complex multi-parameter datasets and can navigate within a data-rich work environment.

Industry over the last decade has shifted its focus to brownfield exploration because of unsatisfactory returns from its greenfield exploration efforts. However, with sustained exploration, brownfield environments will inevitably deliver declining results. MERC's Metal Earth project is focused on reducing the risk in greenfield exploration by helping to identify higher probability targets in under-explored areas.

## How will the Metal Earth project impact geological exploration?

Metal Earth is a large multidisciplinary research project, led by MERC, focused on understanding the Earth's early evolution and processes that led to differential metal endowment in Precambrian rocks. Metal deposits occur in clusters, with some areas of the earth's crust remarkably rich in metal deposits, and other areas of similar geology with relatively few deposits. By understanding the processes that result in these differences and making the process mapable and predictable, industry will possess a significantly more effective exploration tool to focus its greenfield exploration efforts. This tool will be exportable to other jurisdictions of similar geology such as the Birimian of West Africa and the Guiana shield of South America.

## How can the mining sector become a more attractive career option for a young talent pool?

Youth often perceives resource development as low-tech, manual and environmentally destructive. However, those with direct experience with the industry soon realize the opposite is true. Resource development is one of the most beneficial activities for society that can create a lasting positive legacy. Sudbury, is a great example of what mining has made possible and what opportunities await a new generation of geoscientists. We are working to help younger generations see this reality. We have partnered with entrepreneurial companies such as Orix Geoscience to show that a career in geoscience can include aspects of the outdoors, technology, creativity, environmental sustainability, and innovation. Seeing the modern image of geoscience has proven to be inspirational.

## What makes the Laurentian University outstanding for students interested in geology?

Laurentian is one of the few universities sitting in a world class mining hub with a full range of exploration, mining, smelting and refining activities. Besides MERC and the Harquail School of Earth Sciences, Laurentian also has the Goodman School of Mines, the Bharti School of Engineering and the Mirarco Mining Innovation Institute. The Ontario Geological Survey, Geoscience Laboratories and Ministry of Northern Development and Mines are also housed in the same building as MERC and HES. There are ample opportunities for students to gain valuable industry experience throughout their education. ■

# Denis S. Frawley



Partner  
**ORMSTON LIST FRAWLEY LLP**



## Which mining-related projects of interest has Ormston List Frawley LLP been involved in in the last 12 months?

An important client of Ormston List Frawley is Noble Minerals. We are assisting them on matters related to a large property they own of more than 50,000 hectares in Northern Ontario.

## Can you expand on how changes to the Canadian Securities Laws have impacted the regulatory framework in Ontario?

The regulator is moving to a model where data collection is prioritized. The reporting of extra information has made transactions longer and more complex. Additionally, Canada has the oddity of having many security jurisdictions. Each province has its own set of regulations. Often there are many similarities and regulations across provinces can be harmonized. However, increasingly we are seeing more exceptions, and this has complicated compliance. Nevertheless, the Regulation Commission has announced that they are looking for ways to reduce the regulatory burden.

## Despite favorable precious metals prices, the junior mining sector is still struggling to raise capital. Do you think the equity markets have changed or has the money yet to trickle down?

The consolidation of the brokerage industry has meant a reduction in retail investment. Whilst before investment in junior mining stocks was commonplace, that it is no longer the case. Investment specialized in mining attracts people within the industry and those with specialized knowledge, not the wider public. The

boutique brokerage firms that specialize in mining dominate the capital markets.

## To what extent do federal elections impact the country's mining climate?

Regardless of which political party wins in Canada, the transition is relatively smooth for mining and there is rarely a dramatic impact. I do not think the General Election is that interested in minerals, a more relevant issue for them is oil and

gas because of the pipelines. Mining is not viewed as being that closely related to climate change and therefore it does not have that dynamic, however, this may change in the future when the general public realizes how important strategic minerals are for technologies such as electric vehicles. Mining in Canada is more of provincial responsibility.

## What type of mining clients does Ormston List Frawley work with and what can the firm offer them?

Ormston List Frawley works with junior and exploration-stage mining companies. Our lawyers recognize that business and legal needs in the mining space are distinct from those of other industries, especially for small to mid-cap companies. We understand that they need legal counseling that is affordable, quick, relevant and convenient. In addition to this, we are also able to fulfill many of the back-office functions related to documentation and permitting that companies without their own legal departments cannot fulfill alone. ■

## ORMSTON LIST FRAWLEY LLP



## PRAGMATIC LEGAL SOLUTIONS DYNAMIC, ENTREPRENEURIAL SPIRIT

Drawing on our extensive experience with mineral resource companies and investors, we are able to guide our clients with efficient and effective legal advice in areas relating to corporate and securities laws, financings, business agreements and commercial litigation. Whether you are involved in early stage exploration or advanced project development, contemplating a strategic transaction or involved in a dispute, call on us to provide you with targeted, sophisticated advice that is built on our commitment to producing solutions.

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GBR • Industry Explorations • MINING IN ONTARIO AND TORONTO'S GLOBAL REACH 2020

# TORONTO'S FINANCIAL DISTRICT



» My theory is that there has been a renaissance in mining, whereby a lot more is demanded from companies as the sector in general has matured. The companies, the environment and investors have all changed, demanding greater ROI. «

- Dean McPherson,  
Head of Business Development –  
Global Mining, the TSX and TSX.V

Image courtesy of Zia Syed on Unsplash

## TORONTO: THE HOME OF MINING FINANCE

# The challenge of attracting investment

⇒ Toronto remains the global investment engine of the mining industry through its stock exchanges, mining-focused financial services, consultants, legal advisors and banks that have a long history of financing projects from early stage exploration through to production. With almost twice the number of mining companies listed on the TSX and TSX.V (approximately 1,200) compared to its nearest competitor, the ASX, even companies that have never had or will likely never have operations in Canada choose to be headquartered in Toronto for its access to capital.

In October 2019, the TSX30 program was launched to highlight the top 30 performers on the main exchange over the last three years based on dividend adjusted share price appreciation. Considering the challenging market conditions in that time period, it is a welcome surprise that eight of the companies on the list are in the mining sector, five of which are headquartered in Toronto, with Kirkland Lake Gold being the fourth best performer overall with over 600% return. "The program showcases that investors can still receive great returns in the mining market," commented Dean McPherson, head of business development – global mining at the TMX Group, noting the significant role that management and jurisdiction play in encouraging investor appetite. Although these success stories are encouraging, they do not paint the full picture. While the incredible performance of a small section of the industry is an encouraging sign moving forward and should attract some investor confidence, a lack of new listings and the continued struggles of the junior community to attract finance have created a chasm between those who produce, and those who explore. A clear illustration of the challenging financial climate facing the industry came from Triple Flag Precious Metals Corp, which decided to pull the plug on its planned C\$360 million IPO in December 2019, citing difficult market conditions and a lacklustre demand for new mining issues.

"In terms of new listings and financings, 2019 has been a bit volatile, not only for the mining sector but across the board," acknowledged McPherson, before noting that this is truly a global issue, as the number of new listings on TMX Group's equity exchanges in 2019 still outweighed those of its major competitors combined.

In such a context, companies need to cast their nets wide when sourcing capital, and a roadshow that includes the United States, Europe and Asia requires juniors to demonstrate more than just promising drill results. "My theory is that there has been a renaissance in mining, whereby a lot more is demanded from companies as the sector in general has matured. The companies, the environment and investors have all changed, demanding greater ROI," reflected McPherson. Despite the struggles of the junior market, the outlook for metal demand is robust, and the fact remains that mines need

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EQUITY CAPITAL RAISED BY MINING COMPANIES ON THE TSX AND TSXV



PERCENTAGE OF GLOBAL MINING FINANCINGS THAT TOOK PLACE ON THE TSX AND TSXV IN 2019



NUMBER OF MINING COMPANIES ON THE TSX AND TSXV



NUMBER OF NEW MINING COMPANIES LISTED ON THE TSX AND TSXV IN 2019



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Drilling will Focus on Extensions of Known Veins in the Bralorne-Pioneer-King Mine Corridor
- **Well Funded**  
Strong Institutional Shareholder Base, C\$13.1 Bought Deal Closed February 2020

[taliskerresources.com](http://taliskerresources.com)



# Dean McPherson

Head of Business Development – Global Mining  
**TORONTO STOCK EXCHANGE AND TSX VENTURE EXCHANGE**



**TMX Group offers the most seamless and largest access to global capital for the mining sector. No other exchange can offer a mining ecosystem of bankers, research analysts and traders, all of which can ensure success post listing.**



**In 2018, you mentioned that there was a return of investor confidence. Over the last year, how has this progressed?**

The last 12 months have been good for TMX Group and its equity markets, Toronto Stock Exchange (TSX) and TSX Venture Exchange (TSXV), which remain global leaders in the mining sector. 2018 was particularly encouraging; we had a notable presence in the number of large financings done globally as TSX issuers accounted for approximately 30% of global mega-financings.

One of the major trends we saw in 2018 was an increase in M&A activity, including the Barrick-Randgold merger and the Newmont-Goldcorp merger, both of which decided to list in Toronto. We have seen this trend continue in 2019 with the recent North American Palladium acquisition by Impala Platinum.

In terms of new listings and financings, 2019 has been a bit volatile, not only for the mining sector but across the board. We are seeing the market pick up and the number of new listings have started to increase in Q3 2019, a trend we expect to continue into 2020.

**In the first half of 2016, the gold price increased by approximately 20% and equity raises almost tripled. In Q3 2019, a similar rise in gold prices took place, but equity raises have not increased to the level we have seen before. What do you attribute this to?**

I believe that it has a lot to do with structural changes in the marketplace, as well as two new industries competing in the market – cannabis and Bitcoin. From a stock exchange perspective, this is healthy as you want more industries for investors to be able to diversify their portfolio. My theory is that there has been a renaissance in mining, where a lot more is demanded from companies as the sector in general has matured. The companies, the environment and investors have all changed, demanding greater ROI.

With the increase in commodity prices, we saw a notable surge in financing activities, especially below the US\$50 million financing levels. We have not seen a mega-raise yet, but we believe that it is just a matter of time before it will happen as investors are still waiting for the volatility in the market, due to the trade wars, to subside.

**Can you elaborate on the launch of the inaugural TSX30 program?**

In October 2019, we launched the TSX30 program which highlights the top 30 performers on the exchange over the last three years based on dividend adjusted share price appreciation. Eight of the companies were mining companies, with Kirkland Lake Gold being the fourth best performer overall with over 300% return. The program showcases that investors can still receive great returns in the mining market. We also noticed that management and jurisdiction plays a significant role in encouraging investor appetite. Mining companies have to demonstrate to the market that they have the structures and controls in place to show how investment money will be spent.

**What is TMX Group's strategy to expand its global reach?**

We are the only global stock exchange in Latin America with a full-time presence in the region. Approximately 45% of the projects that are represented in our market are outside of Canada, and Latin America contributes to 20%.

Africa is also a strong market, we have offices in China, and are developing business in Australia, Israel, and Kazakhstan. Once Australian companies get beyond a US\$100 million market cap, they tend to look at TMX as they see us as a gateway to larger pools of capital.

**As a final message to the global mining community, what does TMX Group have to offer in 2020?**

TMX Group offers the most seamless and largest access to global capital for the mining sector. No other exchange can offer a mining ecosystem of bankers, research analysts and traders, all of which can ensure success post listing. We offer a complete service that extends beyond the initial capital raise.

We maintain a competitive advantage through innovations such as the Capital Pool Company (CPC) program, which we developed for our Venture market. We have also brought on a team member whose sole focus is to investigate and evaluate ways in which we can remove barriers to the movement of capital across our markets on a global level. ■

"In October 2019, we launched the TSX30 program which highlights the top 30 performers on the exchange over the last three years based on dividend adjusted share price appreciation. Eight of the companies were mining companies, with Kirkland Lake Gold being the fourth best performer overall with over 300% return. The program showcases that investors can still receive great returns in the mining market. We also noticed that management and jurisdiction plays a significant role in encouraging investor appetite."

- Dean McPherson,  
 Head of Business Development – Global Mining,  
 Toronto Stock Exchange and TSX Venture Exchange

"The devil is in the details; we understand this and it is how we drive our business model. We focus on our business, knowing the fundamentals of our operations and make decisions to support people. We put a lot of effort and investment into exploration, and this has helped the company to significantly add to reserves and resources at both Macassa and Fosterville, while increasing production and reducing unit costs at both of these mines."

- Anthony (Tony) Makuch,  
 President and CEO,  
 Kirkland Lake Gold



Rank	Company	HQ Location	3-Yr Share Price
4th	Kirkland Lake Gold	Ontario	+605%
5th	Trilogy Metals	British Columbia	+503%
9th	Ivanhoe Mines	British Columbia	+312%
11th	Labrador Iron Ore Royalty Company	Ontario	+282%
15th	Anglo Pacific Group	United Kingdom	+185%
16th	North American Palladium	Ontario	+183%
17th	Gran Colombia Gold	Ontario	+178%
19th	Wesdome Gold Mines	Ontario	+172%

"We believe that the only way to show value to our shareholders is through continued exploration success and we still have a significant amount of exploration potential. Wesdome is currently focused on the Abitibi belt. Once we are well on our way to get Kiena restarted and reach 100,000 oz of production at Eagle River, the company will be in a position to look at acquiring more assets"

- Duncan Middlemiss,  
 President and CEO,  
 Wesdome Gold Mines

"The royalty model can present significant value from a cash-flow perspective and is more attractive in many cases than owning the underlying mine. While a number of traditional mining investors may want the leverage to the commodity price that comes with owning the equity of an operator, many other investors prefer to forego that leverage and the associated risk in exchange for a more secure stream of earnings."

- John F. Tuer,  
 President and CEO,  
 Labrador Iron Ore Royalty Company (LIORC)



## Michael F. White

President and CEO  
IBK CAPITAL CORP.



### How has the finance market for mining companies evolved since we last spoke in September 2018?

We have seen a rise in the price of precious metals, led by gold. We are seeing greater stability in pricing and this is a strong indicator that we continue to transition from a bear market to a bull market after years of consolidation in mining and metals. Gold and palladium have been strong performers and we expect silver to perform even better in the medium term. Nickel and cobalt are getting traction as well. These metals are ones to look out for because of the rise in the market for electric vehicles, and an interest in where the supply will be sourced over the long term.

There is definitely a swing in sentiment as we are seeing interest in minerals even by the generalists. You can see this in the attention being given to the best junior companies with high-grade reserves. Grade is of crucial importance to investors these days.

A comment that applies to any exploration discovery is that continuous exploration and expansion of a deposit are important for the company's market valuation. Always adding net new mineralization is necessary to fuel higher prices. If a company's sole focus turns to infill drilling, converting inferred resource to indicated, or measured, this might be an indication that the stock has reached its limits.

### Can you comment on the potential you see in MacDonald Mines' SPJ project near Sudbury?

SPJ ticks many of the boxes, including a good location and land package. There is a past producing mine which, in its time, produced high-grade material. There are solid fundamentals so that if you have exploration success, you have access to necessary infrastructure to develop a mine. In terms of discoveries, there are many drill holes with visible gold, which is a good start. Next, one wants a sense as to the thesis for the potential size. In this case, the project thesis is a reinterpretation of an old mine and deposit expanding beyond past limits. If they can show that their reinterpretation is correct with successful drilling and continued high-grade gold discovery then the project has a lot of promise.

To compare to Great Bear two years ago, we are in a different market, and potential new discoveries are getting attention earlier on. That is good to see.

### The investment boom in Cannabis seems to be subsiding. Do you think this will impact the climate for mining investment?

It is difficult to compare across markets because mining and cannabis are very different. Cannabis is a very new investment option and there is still a lot of money to be made in this space, especially globally. However, in the Canadian cannabis space, investors have begun to sober up and look at attractive opportunities elsewhere. Mining is receiving renewed attention because of a few recent high-profile success stories. Generalists are starting to reawaken to the possibility of making money in mining. The mining sector has a lot of value to regain and the appreciation in the prices of precious metals and battery metals is starting to attract attention.

### What advice would you give to junior companies looking to raise capital in today's markets?

What I like about an early bull market is that it separates the good from the bad. In the early days of a bull market, investors are very critical and cautious, which means they are careful about where they put their money. Management has to be very convincing in order to obtain capital. There must be a strong vision that is backed with historical data and reliable results, as well as a tested team that can be trusted to deliver results. Management must convince investors that, not only is there potential for profitable discoveries, but that their theories are well supported and make sense. Junior companies must have well-defined targets and avoid rushed decisions like drilling. Investors will be put off if due diligence and planning are not prioritized. There is a lot of competition for funding. Being thorough with a strategy and prepared for execution is far more attractive than rushing to get results. ■



**What I like about an early bull market is that it separates the good from the bad. In the early days of a bull market, investors are very critical and cautious, which means they are careful about where they put their money. Management has to be very convincing in order to obtain capital.**



## Ryan Matthiesen

Managing Director – Investment Banking  
HAYWOOD SECURITIES



### What financial services does Haywood Securities offer and how important is the mining sector for the business?

Haywood Securities was established in 1981 and is predominantly resources and mining focused. We are a full service investment bank and one of the largest independently (employee) owned private investment dealers in Canada. We offer a breadth of product offerings such as typical investment banking, equity research, institutional sales and trading, corporate finance, private placements, ECM, and M&A. We also have a large wealth management group with approximately C\$8 billion in assets under administration. Most of our services in each facet are geared towards small to medium capital players. Technical due diligence is the most paramount part of our business, coupled with people. We have several PhD geologists, Master's mining engineers and a very strong technical team on the research side who are dedicated to find the best assets and investors.

Mining is and will always be the number one sector within Haywood Securities. We want to ensure that we are properly positioned with the right people and skill sets for the inevitable mining bull market. Our focus is on the best management teams and high quality assets that can have scale and be attractive to a larger company down the road.

### What makes a mining company attractive to investors today?

Currently, people want to see free cash flow and high margins. In the junior space, projects that are advanced enough so that people can see a path to production and are backed by a good management team and good investors, will attract interest. Capital is migrating to more secure jurisdictions and investors are willing to pay a premium for stability, a factor that is more important than it was a few years ago.

### Can you give some examples of recent deals Haywood Securities has been involved in?

Haywood Securities recently acted as lead underwriter and sole bookrunner for a C\$18.5 million bought deal for RNC Minerals. We have worked closely with RNC Minerals for the last four years and acted as lead on each of their equity fi-



**There is now the opportunity for longer term investors to look at the undervalued juniors and take advantage of the current market. If you have the ability and patience to analyse and evaluate assets and teams, which is our company's sweet spot, you will find great opportunities.**

ncings and closely with the company on M&A activity, including the acquisition of the Beta Hunt mine in Australia, which has produced some of the largest gold specimens in Australian history.

Haywood Securities was also the sole bookrunner on Steppe Gold's C\$25 million long form prospectus IPO in 2018 – the only main board TSX mining IPO in 2018. This really speaks to the challenges in the mining space. With regard to M&A, we helped Minera Alamos acquire Corex Gold in Mexico, as well as La Fortuna from Argonaut Gold.

### In 2019, despite a strong gold price, equity raises have not returned to the market. Have there been structural changes in the way companies raise money or is it a matter of time before equity returns to the market?

When gold was in the US\$1,200 to US\$1,300 range over the last five years, the mining fund managers were trying to outperform their index. Now, gold prices have broken through the technical resistance and increased to the US\$1,400 to US\$1,500 range. A significant amount of generalist investors looked at their portfolios and saw that they were underweight in gold. There was a flow of funds into the gold space, but it is generalists coming in and they go first to the largest and most liquid names that are already in production. At the same time, we have seen a lot of consolidation on the fund management side of the business and a significant number of the larger mining funds and their parent entities have been merging. The funds are seeing generalist money coming into the large and mid-caps and, from their perspective, it is riskier to pick a micro-cap that could double when some of these intermediates have been doubling. This has created a large valuation gap as bigger companies have been trading at much better multiples.

Haywood Securities believes that this is not sustainable in the medium term. There is now the opportunity for longer term investors to look at the undervalued juniors and take advantage of the current market. If you have the ability and patience to analyse and evaluate assets and teams, which is our company's sweet spot, you will find great opportunities. ■

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to be discovered, financed and put into production – a process that does not happen overnight. A distressed market also presents opportunities, and the disparity between bullish precious metals prices and declining junior share prices is not sustainable. “There is now the opportunity for longer term investors to look at the undervalued juniors and take advantage of the current market,” observed Ryan Matthiesen, managing director of investment banking at Haywood Securities, adding: “If you have the ability and patience to analyze and evaluate assets and teams, you will find great opportunities.”

#### Raising finance in 2020: What are investors looking for?

With further M&A activity expected between the precious-metals mid-tiers and “cannabis 2.0” on the horizon as edibles, beverages and vaping products enter the Canadian market, the competition for investment dollars looks set to remain stiff in 2020. How, then, can the downtrodden junior community stand out from the crowd? “What I like about an early bull market is that it separates the good from the bad,” stated Michael White, president and CEO of IBK Capital, the private investment firm that has helped to raise finance for the likes of Great Bear Resources (GBR) – the standout junior stock of 2019. “Management has to be very convincing in order to obtain capital. There must be a strong vision that is backed with historical data and reliable results, as well as a tested team that can be trusted to deliver results,” explained White, noting that investors will be put off if due diligence and planning are not prioritized in the rush to drill. “There is a lot of competition for funding. Being thorough with a strategy and prepared for execution is far more attractive than rushing to get results,” he added. From the point of view of the investor, what should exploration companies focus on to impress the market, and are there indications that a stock may have reached its peak? “A comment that applies to any exploration discovery is that

continuous exploration and expansion of a deposit are important for the company’s market valuation,” said White, pointing to the success of GBR’s strategy to continually step-out and add new mineralization at its Dixie project. “If a company’s sole focus turns to infill drilling, converting inferred resource to indicated or measured, this might be an indication that the stock has reached its limits,” he concluded.

Keith Spence, president & CEO of Global Mining Capital, echoed the sentiment that preparation is key, suggesting that junior companies often go public too hastily: “If a company remains private, puts its house in order, gets rid of some of the risks and then goes public, it will have a better product to offer the market.”

Noting a significant structural change in mining industry financing, Spence explained that a strong retail base had made Toronto into a global financial center for mining, but the amount of institutional money grew and eventually the retail market disappeared: “Many investors have left the mining space after losing huge amounts of money due to major financial disasters and scandals during the last 20 years, such as the massive gold mining fraud by Bre-X Minerals.”

A reoccurring theme in Global Business Reports’ research and interviews was the growing importance of team and jurisdiction. Terry Harbort, president and CEO of Talisker Resources and VP exploration for Sable Resources, related how over the last 10 years, there have been approximately 200,000 drill holes drilled in the global mining industry, yet only 38,000 of these drill holes actually had a significant intercept. “The discovery rate in the industry is 0.6%, so investors want to invest in the 0.6% of the industry that has actually found something,” said Harbort, noting that Sable Resources’ team has been responsible for discovering approximately 40 million oz globally.

Ryan Matthiesen commented that advanced projects in the right location with a clear path to production, backed by a good management team and strong investor base, will attract

interest: “Capital is migrating to more secure jurisdictions, and investors are willing to pay a premium for stability, a factor that is more important than it was a few years ago.”

#### The rise of the royalty & streaming model

Gold and palladium producers were not the only mining players to enjoy a fruitful 2019. Another group, those in the royalty and streaming space, has been growing exponentially over the last decade, regardless of market conditions. Since 2008 when Franco-Nevada resumed trading, the core royalty and streaming group is up roughly 470%, in comparison to the S&P 500, which is up 96%, gold bullion up 87% and the S&P/TSX Global Gold Index down 25%.

Two of the inaugural TSX30 cohort are royalty and streaming companies – Anglo Pacific group (#15), the only royalty and streaming company listed on the London Stock Exchange, and Labrador Iron Ore Royalty Company (LIORC) (#12), which owns a 7% royalty on Iron Ore of Canada (IOC), a 15.1% equity interest in IOC, and a commission that pays 10 cents per tonne of all product produced at IOC.

John Tuer, president and CEO of LIORC, reflected that, while the TSX30 is a nice snapshot of a three-year period of both capital gains and dividends, it is the company’s longer term returns that he is most proud of: “Since our IPO in 1995, LIORC has returned over 14% per year to our shareholders. The return on the TSX over the same period of time was about 7%.”

From a macro perspective, mining companies typically use royalty and streaming when equity becomes more expensive and when their share prices are down. While the model was originally focused on producers’ non-core assets, it is now becoming increasingly popular among project developers that require financing, such as Minera Alamos, which announced a C\$14 million royalty/equity construction package with Osisko Gold Royalties in December 2019. “This partnership, coupled with targeted optimi-

zations, will greatly reduce the upfront funding requirements of what is already a low capital cost operation,” stated Jason Kosec, Minera Alamos’ vice president of business development. Alex Pernin, CEO of newly formed Star Royalties, spoke of the advantage royalty and streaming companies provide investors with commodity price leverage, expansion and optimization upside, reserve and resource growth, as well as exploration potential, without the associated mining costs, nor operations management. Emphasizing the vast difference in the operational management of a mining company compared to a royalty and streaming company, Pernin observed: “When I was at Barrick Gold, we had 14,000 employees and a US\$20 billion market capitalization; Franco-Nevada also had a US\$20 billion market capitalization but had 34 employees.”

#### Modern finance

If the definition of insanity is doing the same thing over and over again and expecting different results, there is a case to be made that a number of those limiting themselves to sourcing investment through traditional sources deserve to be sectioned. While that may seem a tad harsh, the fact that financing has declined whilst gold has reached record highs in Canadian dollars surely implies that change is necessary. Fortunately, a number of players in the mining finance space have broken from the traditional mould to offer the market something different.

Red Cloud Securities (formerly Red Cloud Klondike Strike) rebranded in 2019 to demonstrate its position as a modern-day, next-generation brokerage firm, according to its new CEO Bruce Tatters. Explaining how a 90% reduction in institutional commissions in the brokerage industry over the last two decades has severely hollowed out corporate access services in the small cap universe, Red Cloud decided not to have a trading operation like traditional legacy brokers have adopted since their inception. “Our institutional equity department focuses on institutional cor-

porate access marketing for companies,” said Tatters, mentioning the wide platform of services Red Cloud offers that goes well beyond the offerings of traditional brokerages including retail marketing, social media services, advisory, graphics support, video services and web development.

Unlike traditional brokers whose outreach is restricted to trading clients, Red Cloud’s institutional portfolio manager outreach is over 250 globally registered companies in the mining space and does not require a company to trade. “We communicate our research to companies via links to our website so they can register with us,” explained Tatters, concluding: “It is a truly unique monetization system focused for our corporate clients.”

One of the recent entrants to the mining finance market, and one of the most innovative, is Tradewind Markets, which has built a technology platform for digitizing the ownership and trading

of physical assets in the precious metals space. Michael Albanese, Tradewind’s CEO, expanded on how his company is making it easier, more cost effective and more secure to buy, sell and hold precious metals: “We make it very easy for retail individuals to purchase metals through a network of brokers that handle our product. The gold and silver is held physically at the Royal Canadian Mint – which is a sovereign and secure location – and we use blockchain technology to maintain and record ownership.”

Additionally, Tradewind’s Origins tool allows buyers to specify criteria to purchase metal from a certain mine, method of production and geography. “Tradewind’s ORIGINS solution makes ESG principles tangible and actionable,” said Albanese, continuing: “As a miner, you will also benefit because you will be able to showcase that you are producing according to responsible standards.” ■



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# Bruce Tatters

CEO  
RED CLOUD SECURITIES



➤ **What were the factors behind the recent rebranding of Red Cloud Securities?**  
Red Cloud Securities rebranded to demonstrate its position as a modern-day, next-generation brokerage firm. The company differs from other brokerage firms in the sense it does not have a trading operation like traditional legacy brokers have had since their inception. Our institutional equity department focuses on institutional corporate access marketing for companies. This corporate access service assists investment banking departments in revenue-generating capabilities. The current problem in the brokerage industry is that institutional commissions are down 90% over the last two decades. This phenomenon severely hollowed out corporate access services in the small cap universe.

Chad Williams, the founder of Red Cloud, started the firm on the premise of charging corporate clients directly for corporate access services, offering both service excellence and a platform of services well beyond the offerings of traditional brokerages. These 25 or 30 additional services are diversified retail marketing, social media services, advisory services, graphics support, video services and web development. Working with Red Cloud's forward-looking integrated model of both brokerage and non-brokerage-related services for market outreach serves clients exponentially better than traditional brokerages.

**Mining investment has been hard to come by in recent years, especially for juniors. How can Red Cloud help in this regard?**

Red Cloud provides a much broader marketing distribution outreach than typical brokerage firms. Although the institutional outreach might appear similar, our institutional salesforce is both focused on mining and on corporate access, not distracted by bothering institutions for trading business. Red Cloud's institutional portfolio manager outreach is over 250 globally registered in the mining space. We are not confined to the outreach of traditional brokers where their outreach is restricted to trading clients. Red Cloud does not require a company to trade. We communicate our research to companies via links to our website so they can register with us. ■

# Keith Spence

President & CEO  
GLOBAL MINING CAPITAL CORP



➤ **Can you introduce Global Mining Capital Corp and describe the profile of projects it invests in?**

Global Mining Capital is a private equity firm that invests in late-stage development projects globally. At that stage most of the project risks usually have been removed, except the financial risks. We invest in gold and base metals such as zinc and copper, as well as battery metals, such as nickel, cobalt and lithium. We try to find low-risk jurisdictions, such as Canada, Australia, certain jurisdictions in Africa and certain jurisdictions in South America, where political risk is manageable. Global Mining Capital has Chinese partners and go where our partners go. We have teams in Toronto, Vancouver and Hong Kong.

Most of Global Mining Capital's investments tend to be beyond US\$100 million, and we prefer deals in the US\$300 million to US\$500 million space.

**With a dearth of equity available for juniors, do you think there have been structural changes in the way mining companies finance projects?**

There has been a significant structural change. The retail investor has left the mining space for investments such as bitcoin and cannabis. The fact that the mining sector in Toronto had a strong retail base and people were willing to invest in a junior company stock made it a global financial center for mining. However, the amount of institutional money grew and the retail market has gradually disappeared. Many retail investors have left the mining space after losing huge amounts of money due to major financial disasters and scandals during the last 20 years, such as the massive gold mining fraud by Bre-X Minerals.

Currently, most financing comes from private equity firms, other institutional sources or larger mining companies acting as financiers. Without a solid retail investment class, the mining sector is not going reach high market prices. It is incumbent on firms to bring credibility back to the mining space. ■

## ADVICE FROM THE INVESTMENT COMMUNITY



"A comment that applies to any exploration discovery is that continuous exploration and expansion of a deposit are important for the company's market valuation. Always adding net new mineralization is necessary to fuel higher prices. If a company's sole focus turns to infill drilling, converting inferred resource to indicated or measured, this might be an indication that the stock has reached its limits."

- Michael F. White,  
President and CEO,  
IBK Capital



"One of the inherent problems in my opinion, is that it is easy for junior companies to go public on the Toronto stock exchanges. Too many companies go public before they should... If a company remains private, put its house in order, gets rid of some of the risks and then goes public, it will have a better product to offer the market."

- Keith Spence,  
President and CEO,  
Global Mining Capital



"In the junior space, projects that are advanced enough so that people can see a path to production and are backed by a good management team and good investors will attract interest. Capital is migrating to more secure jurisdictions and investors are willing to pay a premium for stability, a factor that is more important than it was a few years ago"

- Ryan Matthiesen,  
Managing Director – Investment Banking,  
Haywood Securities



"The number one thing a public company can do, especially if they are in a space that is subjected to large fluctuations in commodity prices, is to make sure they have a strong relationship with their shareholders and are building relationships on an ongoing basis"

- Ian Roberston,  
Executive Vice President – Communication Strategy,  
Kingsdale Advisors



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## MINING IN ONTARIO



» Through the use of electric vehicles, we will be able to reduce 7,000 mt of greenhouse gas emissions and associated maintenance costs, as well as save the consumption of 2 million liters of diesel and 1 million liters of propane. «

- Marc Lauzier,  
General Manager - Porcupine Gold Mines,  
Newmont

Image courtesy of Epiroc

## MINING PRODUCTION IN ONTARIO

# Majors streamline operations after mergers

⇒ In the wake of the two super mergers concluded in early 2019, there was uncertainty surrounding how the world's two largest gold miners, Newmont and Barrick Gold, would deal with their assets in Ontario. Would Newmont manage to sell its Red Lake mine? Would it begin operations at the new Borden mine in 2019? Would Barrick maintain its headquarters in Toronto despite its CEO being based abroad? Would Barrick's Hemlo mine survive the cut as the company decided to sell off non-core assets?

Crucially for the Ontario mining industry, the answer to all of the above was a resounding yes. The common theme in the

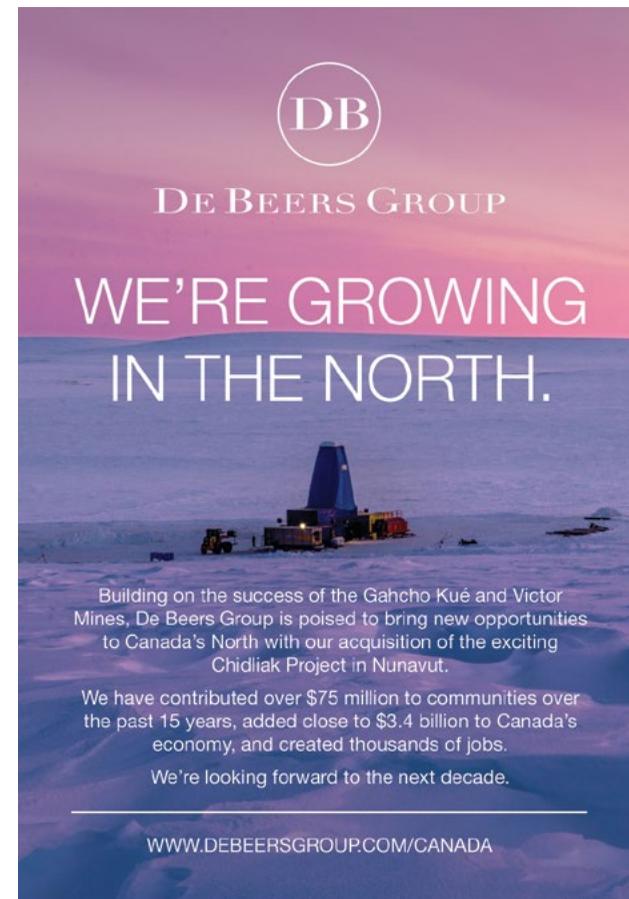
restructuring decisions taken by both companies has been to focus on top-tier assets, trimming the fat to reduce costs and optimize operations.

Mark Bristow, Barrick's president and CEO, spoke on the reasoning behind the merger with Randgold: "Through the merger, we obtained the possibility of having six or seven of the top 10 assets in the world. If you have an asset portfolio like this, you can create a standout business. If you want to be dominant in the gold mining industry, it is not about size, but about value and the quality of the assets," he stated.

Bristow commented that Barrick's success in 2019 was due to a focus on youth, praising his new management team for closing four big deals in 10 months – the Barrick-Randgold merger, the Nevada consolidation, the acquisition of Acacia Mining and the sale of KCGM. "One of the things we were focused on during the merger was to create a more agile, fit for purpose and modern corporate structure. You can have the best assets in the world, but without the right people, they are useless," elaborated Bristow, who likened the previous incarnation of Barrick to a "patient in intensive care" when discussing a possible merger with John Thornton in 2015, emphasizing how the new generation of young talent brought in has re-energized the company.

This philosophy has been applied to Barrick's Hemlo operation in Thunder Bay. The project has undergone a modernization process to reduce an average employee age, which sat at 57 before the restructuring. "During our due diligence on Hemlo, we did not have a consensus on whether it was a good or bad operation, but it was clearly old fashioned," reflected Bristow, noting that a voluntary separation package offered to many of the mine workers had been accepted by all. "The next steps at the mine will be to phase out the open pit operation and move to an underground contract mining model, with the objective to upgrade Hemlo to a Barrick Tier 2 asset and extend its Life of Mine well into the future," he explained, concluding that Hemlo today is a more lean, agile, modern and profitable mine.

A major milestone for the Ontario mining industry was celebrated on October 1, 2019, as Newmont's new Borden "mine of the future" entered into commercial production. Located near Chapleau, under 200 km from Timmins, the Borden mine sits under the umbrella of Newmont's Porcupine Gold Mines



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operations, which also include the Hoyle Pond underground mine and the Hollinger open pit mine. The three operations combined should deliver approximately 300,000 gold oz/y, according to Marc Lauzier, Porcupine Gold Mines' general manager, who commented that Borden is expected to produce approximately 1,800 mt/d at about 6 grams of gold per tonne. "Borden's digital mining technologies, low carbon-energy vehicles and modern health and safety controls position it as one of the world's most technologically advanced mining operations," stated Lauzier, who expects Borden to be fully electric by 2021.

The Canadian and Ontario governments each provided Newmont with C\$5 million for the electrification of the mine, which can be seen as a model of modern resource development from both environmental and cost standpoints: "Through the use of electric vehicles, we will be able to reduce 7,000 mt of greenhouse gas emissions and associated maintenance costs, as well as save the consumption of 2 million liters of diesel and 1 million liters of propane," explained Lauzier.

Further northwest, Newmont suspended operations at its historic Red Lake mine in July before selling the asset to Australian company Evolution Mining for US\$375 million in November. Evolution Mining will also pay an additional US\$100 million in contingent payments upon discovery of new resources. The Australian company says it plans to spend US\$50 million on exploration and invest US\$100 million in existing operations to revitalize the historic mining camp.

### A golden age for Ontario mid-tiers

The darling of the Canadian mining industry over the last four years has been, without a doubt, Kirkland Lake Gold (KL Gold), with a remarkable rise that saw its stock rise from under C\$3 in January 2016 to a high of almost C\$65 in Q3 2019 as its market cap broke the C\$12 billion threshold. KL Gold's serene progress was – at least temporarily – halted on November 25th, as the market reacted in shock to the company's all-share acquisition of Detour Gold Corp for C\$4.9 billion, a 24% premium to its valuation at the time.

When questioned about initial market skepticism to the Detour transaction, KL Gold president and CEO Tony Makuch spoke of the value he sees in adding a third high quality asset to the KL portfolio with a large reserve to support mining for over 20 years. "We have already taken two "under-loved" assets at Macassa and Fosterville, and turned them into industry leading mines through investments in exploration, infrastructure, equipment and development," he stated, continuing: "Detour is in our back yard in northeastern Ontario, we know the geology here well, and bring a lot of synergies."

Another low-cost, high-grade gold producer from Ontario that enjoyed a tremendous 2019 was Wesdome Gold Mines, having sustained exploration and production success at its Eagle River mine in Ontario and with a second high potential asset with its Kienna mine in Québec. Before becoming Wesdome

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# Marc Lauzier

General Manager - Porcupine Gold Mines  
**NEWMONT**



## Can you provide an overview of Newmont's Porcupine Gold Mines operations?

The company's Porcupine Gold Mines operations include the Hoyle Pond underground mine, the Hollinger open pit mine, and the recently inaugurated Borden underground mine. Located in and around the Timmins, the Porcupine district has produced more than 67 million oz gold since 1910. Hoyle Pond has been in operation in excess of 30 years and, currently, approximately 60% the gold produced at Porcupine comes from this operation. At Hoyle Pond, mechanized cut and fill and longhole mining methods are used to recover the ore, and the mine typically produces approximately 150,000 oz/y gold.

The remaining 40% of the ore comes from the Hollinger open pit mine which is as much a reclamation project as a mining project. Hollinger was mined until the late 1960s as an underground operation, after which some companies mined some 'glory holes' near the surface and left a bit of an environmental mess. When Newmont acquired the property, we put a plan together to mine near the surface while addressing the stoping issues to stabilize the ground. Our operations are funding the rehabilitation of the of the impacts from historic mining operations.

The Borden mine near Chapleau is Newmont's newest operation and has been in commercial production since 1 October 2019. As one of the most technologically advanced mines in the world, Borden is expected to produce approximately 1,800 mt/d at about 6 g/mt gold. The three operations combined should deliver approximately 300,000

oz/y gold. The Dome mine ceased operations in 2017, but ore from our three operations is sent to the Dome processing facility using a circuit that includes crushing, grinding, gravity concentration, cyanide leaching, carbon in pulp recovery, stripping, electrowinning and refining.

## The Borden mine has been heralded as Ontario's "mine of the future". What are some of the latest technologies being used in the mine?

Borden's digital mining technologies, low carbon-energy vehicles and modern health and safety controls position it as one of the world's most technologically advanced mining operations. We continue moving Borden towards an all-electric mine. Currently, all of the drilling operations, rock support systems, personnel carriers, and scoops that move the rock to the trucks are electric. We are working with a few suppliers to acquire battery operated trucks, which will replace our remaining diesel operated vehicles in the near future. We expect to be fully electric by 2021. We are implementing better tracking and ventilation-on-demand systems in the Borden mine, as well as new blasting technologies that improve accuracy and reduce the amount of explosives needed. We are also focused on managing our water use as efficiently as possible.

As a reward for our investment into safe and sustainable mining, the Canadian and Ontario governments each provided the company with C\$5 million for the electrification of the mine. Through the use of electric vehicles, we will be able to reduce 7,000 mt of greenhouse gas



emissions and associated maintenance costs, as well as save the consumption of two million liters of diesel and one million liters of propane.

## Can you elaborate on Newmont's relations with the indigenous communities in the Timmins and Chapleau region?

As our Porcupine mines are spread across the Timmins and Chapleau region, we have agreements with eight communities – four in the Timmins area and four in the Chapleau area. We provide benefits to these communities and proactively reach into those communities for talent. Porcupine Gold Mines' First Nations employment numbers are approximately 10% and we are continuously working to increase local, First Nations representation in our workforce.

## What are Porcupine Gold Mines' principal objectives and targets for 2020?

The Borden gold project replaced the Dome mine, which was shut down in 2017, meaning that production at Porcupine will only increase slightly in the short-term. However, at Borden there is great possibility for expansion through further exploration. Since the merger, the implementation of Newmont's Full Potential continuous improvement program will allow us to enhance safety, productivity and efficiency. Newmont aims to always operate in a safe, environmentally responsible and sustainable manner while achieving competitive productivity and cost targets. This will allow us to compete internally for capital to invest in future expansions that generate superior returns in a safe and responsible manner. ■



# Mark Bristow

President & CEO  
**BARRICK GOLD**



Through the merger, we obtained the possibility of having six or seven of the top 10 assets in the world. If you have an asset portfolio like this you can create a standout business.



## What was the vision behind the merger between Barrick and Randgold?

Barrick is a great company, but unfortunately fell on some hard times. When I started Randgold 24 years ago, I modeled the vision of the company on the early Barrick. The vision was focused on value, agility, quality assets, and being prepared to take risks, with great leadership at the top. Barrick developed some management issues that took the company to the edge so I started talking to John Thornton in 2015, discussing a possible merger. What attracted me to Barrick was the quality of its assets. There were three Tier 1 assets – Cortez Hills, Goldstrike, and Pueblo Viejo, and another three potential Tier 1 assets – Turquoise Ridge, which has since come to fruition, Veladero, and the Porgera JV. Through the merger, we obtained the possibility of having six or seven of the top 10 assets in the world. If you have an asset portfolio like this you can create a standout business.

## How has the structure of the company changed since the merger?

You can have the best assets in the world, but without the right people, they are useless. What had made Randgold such a success was its management structure. We did not have a head office but rather a corporate office, which is now the corporate office for Africa and the Middle East. To set up the right corporate structure, you need the right management systems and modern strategies together with younger people in your business. In the merger, we transported the Randgold model to a much bigger organization and have achieved success in only 10 months, thanks to a set of young, but top-end executives who represent a standout team in the mining industry. This team has already closed four big deals – the Barrick-Randgold merger, the Nevada consolidation, the acquisition of Acacia Mining, and more recently the sale of KCGM.

## Can you elaborate on Barrick's new strategy for the Hemlo mine in Ontario?

During our due diligence on Hemlo, we did not have a consensus on whether it was a good or bad operation, but it was clearly old fashioned, and had an aver-

age employee age of 57. We recently offered many of the employees a voluntary separation, which they have all taken. Hemlo today is a more lean, agile, modern and profitable mine. The next step will be to phase out the open pit operation and move to an underground contract mining model, with the objective to upgrade Hemlo to a Barrick Tier 2 asset and extend its Life of Mine well into the future.

## What is your philosophy for mining in foreign jurisdictions?

I believe that you mine a national asset. Whatever way you operate it, it belongs to the host country, and you have a duty to deliver value out of that asset otherwise you should leave it in the ground. The value of that asset should be divvied up into various segments, and most importantly back into the communities and the population of that country. We have to ask ourselves, why has mining got such a bad name? You cannot blame the markets. Poverty is a responsibility we all have to deal with. As a public company, you have an obligation to bring to account natural resource extraction across the globe regardless of where you operate.

## Where does Barrick see the most opportunity for growth moving forward?

East Africa is an exciting region for the company, and we have now expanded our footprint from North Eastern DRC into Tanzania, which basically falls in the same geological province. With the launch of Twiga Minerals in Tanzania we are breaking new ground and pioneering the way we share the economics of mining with host countries in a developing world.

Canada is a standout jurisdiction for finding big mines. Although there has been a bit of a drought in Canadian exploration for a while, the opening up of big gold/copper porphyries in British Columbia is developing a new frontier. Some of the older regions in Ontario and Quebec also hold great potential. Look at how Australia has been so successful in reinventing itself through creative and penetrating exploration. Archean rocks produce surprises and I believe in Canada there are still great opportunities that lie within the ground ■

# Anthony (Tony) Makuch

President and CEO  
KIRKLAND LAKE GOLD



**Kirkland Lake Gold (KL) was the number one mining stock on the inaugural TSX30. What are the main factors that have contributed to the company's remarkable performance?**

The devil is in the details; we understand this and it is how we drive our business model. We focus on our business, knowing the fundamentals of our operations and make decisions to support people. We put a lot of effort and investment into exploration, and this has helped the company to significantly add to reserves and resources at both Macassa and Fosterville, while increasing production and reducing unit costs at both of these mines. Both the nature of the high grade in these deposits and the prospective geology at these mines have been a big part of value creation. The company leads its peer group by investing more money on a per ounce of production basis into exploration. We have also delivered value to shareholders through capital investment.

**The Detour Gold acquisition was met by some skepticism by the market. What would you say to those who question the decision?**

We see Detour as a unique opportunity for the KL and Detour shareholders. For KL, it provides a third high quality asset in our portfolio. Detour is already a long life mine with a large reserve to support mining for over 20 years. We see significant exploration upside in the current pit area that can support growth in mine life, but also help to lower costs and increase production through improved productivity and higher throughput. We have already taken two "under-loved" assets at Macassa and Foster-

ville and turned them into industry leading mines through investments in exploration, infrastructure, equipment and development. Detour is in our backyard in northeastern Ontario, we know the geology here well, and bring a lot of synergies.

**How has Kirkland Lake Gold incorporated new technologies at its Macassa mine?**

The Macassa mine is leading the industry in the use of battery powered production equipment, including LHDs or scoop trams and underground haul trucks. The mine has worked closely with its suppliers and manufacturers to develop and trial the first underground mine trucks and scoops, but also in developing the battery systems and charging methods to be used. The mine originally started with 20 mt underground (u/g) trucks, and is now working on the third generation of u/g trucks with capabilities for 40 mt payloads. This equipment not only has supported the production growth at Macassa since 2015, but also improves working conditions in the mine through less heat and noise generation.

**Can you elaborate on the company's new projects for 2020: Robbin's Hill at Fosterville, the Amalgamated Break at Macassa, and exploration work in the Northern Territory?**

At Robbins Hill, the company has achieved significant exploration success with surface drilling following the same exploration thesis and findings from the Phoenix and Lower Phoenix systems the host the Eagle and Swan ore bodies at the current Fosterville



mine. The new program for Robbins Hill involves the development of twin 3 km exploration ramps from the existing underground mine workings at Fosterville to the newly discovered mineralization at Robbins Hill.

At Macassa, a near surface resource was previously discovered along the Amalgamated Break. Recent drilling at depth has identified mineralization along the Amalgamated Break at depth below 5,800 feet. It is important to note that the past mining in Kirkland Lake has been entirely on the "Main or 04" Breaks and South Mine Complex. The Amalgamated Break is emerging as a potential new mining front and we have announced the development of an exploration ramp from surface into the new mineralization to support advanced exploration including both underground diamond drilling and bulk sampling. This ramp can also provide for a new ore source for the Macassa Mill, and allow for further exploration both on strike and to depth along the Amalgamated Break. This is exciting as it can lead to the development of a whole new mine in Kirkland Lake after 100 years of mining.

For Northern Territory in Australia, the company has been aggressively exploring the Cosmos, Union Reef and Pine Creek properties over the last three years. The Lantern discovery has been a game changer for the Cosmos mine, and this supported our decision to restart the Union Reef mill in October 2019. We have spent the last two years exploring the Lantern discovery at the Cosmos mine, including underground development, diamond drilling, mapping and bulk sampling. ■



# Duncan Middlemiss

President and CEO  
WESDOME GOLD MINES



**We are confident that we will be able to keep growing the company organically. We believe that the only way to show value to our shareholders is through continued exploration success and we still have a significant amount of exploration potential.**



**What has been the basis of Wesdome Gold Mines' success over the last three years?**

Wesdome has a crystal clear strategy about building Canada's next mid-tier gold producer. For us, mid-tier has a floor of 200,000 oz/y. The way we are going to succeed in this strategy is through the company's two primary assets – the Eagle River mine in Ontario and the Kiena mine in Quebec. Eagle River has been in production for many years, and the exploration and production success we have had with this mine since 2016 has given us the confidence that we will be able to develop a platform of at least 100,000 oz/y with an expanding mine life and profitability.

**Can you provide details of Wesdome's flagship project, the Eagle River complex?**

Currently the reserves at the Eagle River complex stand at just over 400,000 oz at 12 g/mt. The guidance for 2019 was 72,000 to 80,000 oz, all coming from the Eagle River complex with the majority coming from the underground mine and a small portion from the open pit which is starting to deplete. Initially we thought that we were going to mine 16 g/mt, but we have been producing at 21 g/mt.

**What is the current status of the Kiena project and timeline for its development?**

The Kiena project is in advanced exploration stages. The advantage Wesdome has is that this project is a fully built, fully permitted mine, and the resources which we have been able to explore and define better are incredibly high grade – almost 18 g/mt in the indicated and 15 g/mt in an inferred resource. The timeframe and capital input to get the Kiena mine restarted is estimated to be fairly low. We have recently updated our resource estimate and combined measured and indicated resources are approximately 740,000 oz. in our high grade A Zone. The updated estimate includes drill data as of August 6, 2019 and includes an additional 140 drill holes, for a total of 36,050 m drilled since October 12, 2018.

This year we will have spent C\$27 million on the Kiena project, completely funded by the Eagle River project. Wesdome has invested heavily in exploration at Kiena over the last four years as we believe that we really have a superior geological asset which we have to prove out. We are in the process of completing a PEA of which some of the sections are conducted at a PFS level, with results expected to be released in April 2020, which will then define the company's next steps.

**Do you expect M&A activity to pick up as precious metals prices continue to rise?**

The M&A space has been quiet for some time as people who had made a foray into such activities had been punished by low commodity prices and market reaction. Mining was not showing great returns for investors, who then started to look at other industries. Industry-wide we are seeing a lack of exploration by majors, but I believe that we will start seeing more M&A activity moving forward. The recent acquisition of North American Palladium by Impala Platinum, for example, is good for the M&A front. Since the rules have changed and companies are now allowed a 105-day window, more companies are seeking partnerships and mergers.

**Where would you like to see Wesdome by the end of 2020, and what is the focus of the company moving forward?**

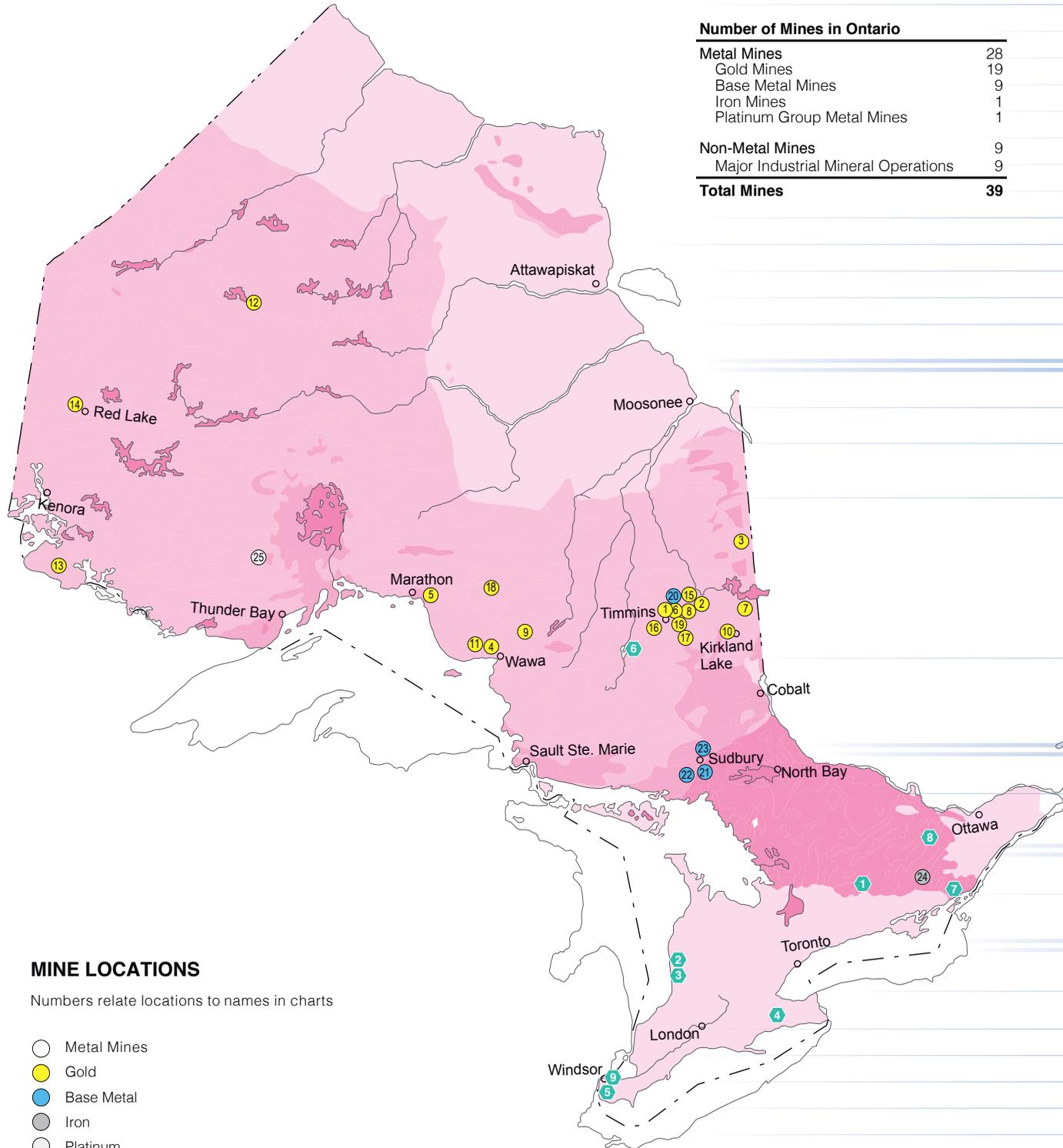
By 2020, I would like to see the Eagle River project ramping up towards a production of 100,000 oz/y. I would also like to have a restart plan in place for the Kiena mine and perhaps have some pre-production activities underground.

We are confident that we will be able to keep growing the company organically. We believe that the only way to show value to our shareholders is through continued exploration success and we still have a significant amount of exploration potential. Wesdome is currently focused on the Abitibi belt. Once we are well on our way to get Kiena restarted and reach 100,000 oz/y of production at Eagle River, the company will be in a position to look at acquiring more assets. ■



# MINING OPERATIONS MAP

Source: Ontario Mining Association



### Number of Mines in Ontario

<b>Metal Mines</b>	28
Gold Mines	19
Base Metal Mines	9
Iron Mines	1
Platinum Group Metal Mines	1
<b>Non-Metal Mines</b>	9
Major Industrial Mineral Operations	9
<b>Total Mines</b>	<b>39</b>

### MINE LOCATIONS

Numbers relate locations to names in charts

- Metal Mines
- Gold
- Base Metal
- Iron
- Platinum
- ◆ Industrial Mines/Quarries

### GOLD MINES

Name	Company
1 Bell Creek Mine	Pan American Silver
2 Black Fox Mine	McEwen Mining Inc.
3 Detour Lake Gold Mine	Kirkland Lake Gold
4 Eagle River Mine	Wesdome Gold Mines Ltd.
5 Hemlo Mine	Barrick Gold Corp.
6 Hollinger Mine	Newmont - Porcupine Gold Mines
7 Holloway – Holt Mine	Kirkland Lake Gold Ltd.
8 Hoyle Pond Mine	Newmont - Porcupine Gold Mines
9 Island Gold Mine	Alamos Gold Inc.
10 Macassa Mine	Kirkland Lake Gold Ltd.
11 Mishi Gold Mine	Wesdome Gold Mines Ltd.
12 Musselwhite Mine	Musslewhite - Newmont
13 Rainy River Mine	New Gold Inc.
14 Red Lake Gold Mines	Evolution Mining
15 Taylor Mine	Kirkland Lake Gold Ltd.
16 Timmins West Mine	Pan American Silver
17 Young – Davidson Mine	Alamos Gold Inc.
18 Sugar Zone	Harte Gold
19 Borden Mine	Newmont - Porcupine Gold Mines

### BASE METAL MINES

20 Kidd Creek Mine	Glencore PLC
21 Sudbury Operations: Morrison Mine	KGHM International Ltd.
22 Sudbury Operations: Coleman Mine Copper Cliff North Mine Creighton Mine Garson Mine Totten Mine	Vale S.A.
23 Sudbury Operations: Nickel Rim South Mine Fraser Mine	Glencore PLC

### IRON MINES

24 Tomclid Iron Mine	Ferromin Inc.
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### PLATINUM GROUP METAL MINES

25 Lac des Iles Mine	Impala Canada
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### MAJOR INDUSTRIAL MINERAL OPERATIONS

1 Blue Mountain Operations (nepheline syenite)	Unimin Canada Ltd.
2 Goderich Brine Field (salt)	Compass Minerals Canada Corp.
3 Goderich Mine (salt)	Compass Minerals Canada Corp.
4 Hagersville Mine (gypsum)	CGC Inc.
5 Ojibway Mine (salt)	K+S Windsor Salt Ltd.
6 Penhorwood Mine (talc)	Imerys Talc
7 St. Lawrence Mine (wollastonite)	Canadian Wollastonite
8 Tatlock Quarry (calcium carbonate)	OMYA Canada Inc.
9 Windsor Brine Field (salt)	K+S Windsor Salt Ltd.



Image courtesy of De Beers - Reclamation supervisor at Victor Mine, Ontario

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Gold Mines' president and CEO in 2016, Duncan Middlemiss was instrumental in the growth of St. Andrew Goldfields prior to its acquisition by Kirkland Lake Gold. Under his leadership, Wesdome's stock has risen from under C\$2 in July 2016 to over C\$10 dollars in December 2019, and shows no sign of slowing down. "Wesdome has a crystal clear strategy about building Canada's next mid-tier gold producer," stated Middlemiss, before going on to explain how Wesdome's exploration and production success at Eagle River – producing at 21 g/mt in 2019 – has allowed the company to accelerate the investment program into the complex: "This includes enhancing the tailings capacity, improving the mill by adding a Falcon gravity concentrator and developing the proper drilling platforms within the mine."

Success at the Eagle River mine has also funded the C\$27 million advanced exploration program at Wesdome's Kiena project in Québec, with a PEA expected to be released in April 2020. "The advantage Wesdome has is that this project is a fully built, fully permitted mine, and the resources that we have been able to explore and define better are incredibly high grade – almost 18 g/mt in the indicated and 15 g/mt in an inferred resource," said Middlemiss.

A Toronto-based gold miner to have successfully made the transition to mid-tier status in recent years is Alamos Gold, with mines in Ontario and Mexico and advanced stage development projects in Turkey. In 2014, Alamos Gold had one producing mine, Mulatos, producing approximately 145,000 oz/y of gold. By 2018, the company was producing 500,000 oz/y from four different operations, going from roughly 1.8 million oz of reserves, to approximately 9.8 million oz. John McCluskey, Alamos Gold's president and CEO, touched on the company's philosophy to operate in a counter cyclical fashion: "While other companies were making large market transactions, we were generating free cash flow. When the market came off dramatically and companies had to deal with the debt of their acquisitions, Alamos Gold had over US\$400 million in cash with no debt."

In Ontario, Alamos Gold has been building out the lower mine infrastructure at its Young-Davidson mine, which will essentially set the mine up to operate for the next 20 years, according to McCluskey: "The mine is currently built to operate at approximately 6,500 mt/d, but with the addition of the lower mine infrastructure, we will be able to handle 8,000 mt/d, which is the capacity of our mill. This matched capacity will give Alamos Gold an increased production profile, and as the economies of scale work in our favor, we will also be able to reduce costs."

Alamos Gold has also enjoyed success at its Island Gold mine. Acquired in late 2017, there was initial skepticism from the market surrounding the price for the asset, but in the two years since, the acquisition has proven to be a valuable acquisition, with increased throughput at the mine raising production from roughly 100,000 oz/y to approximately 145,000 oz/y in 2019. "We saw an excellent resource that had been ignored for a number of years and could be converted to reserves on a one to one basis," commented McCluskey, citing aggressive exploration budgets that have exceeded US\$20 million as having converted a substantial amount of reserves, which will lead to an updated resource estimate being released in early 2020.



**We consulted across stakeholders and wrote a set of principles that recognized and consolidated existing standards and instruments. By defining what constitutes responsible gold mining, we created a credible platform through which mining producers can provide confidence that their gold is being produced responsibly.**

**- Terry Heymann,  
CFO,  
World Gold Council**



**ESG at the forefront of strategy**

Speaking at the Northern Miner's Progressive Mine Forum in Toronto, October 2019, Claudia Mueller, associate director of the Global Mining Management program at the Schulich School of Business, proclaimed that the next generation of mining leaders will arrive with a "tsunami" of environmental, social and governance (ESG) concerns.

Furthermore, the number one consideration in EY's Top 10 business risks and opportunities in mining 2020 is license to operate (LTO), an issue that has evolved into something more than simply social license. "Looking at the list year-over-year, we have seen a big shift from the traditional corporate social responsibility approach towards adopting a holistic environmental, social and governance strategy," observed Theo Yamogo, co-leader of mining and metals Canada at EY.

From BlackRock CEO Larry Fink's open letter to the mining industry, to the appointment of the environmentally conscious Mike Henry as CEO of BHP Billiton in January 2020, the largest players in investment and mining production are prioritizing responsible mining, with ESG at the forefront of company strategy.

With this in mind, the World Gold Council, the market development organization for the gold industry backed by 26 of the world's leading gold mining companies, has established an overarching framework for responsible gold mining that ad-

dresses ESG issues. "Government, investors and communities are interested in understanding what responsible gold mining looks like," said Terry Heymann, CFO at the World Gold Council, continuing: "We consulted across stakeholders and wrote a set of principles that recognized and consolidated existing standards and instruments. By defining what constitutes responsible gold mining, we created a credible platform through which mining producers can provide confidence that their gold is being produced responsibly."

In December 2019, at the Energy & Mines World Congress in Toronto, Gold Fields' CEO Nick Holland spoke of the exponentially rising cost of energy combined with the increasing effects of climate change becoming a pertinent issue that the industry must address.

De Beers, the biggest player in the global diamond market, has the ultimate goal of becoming the first company in the world to have a carbon-neutral mine, according to Nompumelelo (Mpumi) Zikalala, managing director of De Beers Managed Operations, who spoke of the company's Project Minera research and development initiative to investigate the potential for carbon-neutral mining: "We are working in collaboration with scientists and academics from five universities across Canada and Australia... Together, we are examining different mineral carbonation technologies and testing them out in laboratories and on mine sites. We are very excited as this could usher in a whole new era of sustainable mining," she explained. ■



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## John McCluskey

President, CEO & Director  
**ALAMOS GOLD**



### How has Alamos Gold more than treble production in five years?

The company tends to operate in a very counter-cyclical fashion. While other companies were making large market transactions, we were generating free cash flow. When the market came off dramatically and companies had to deal with the debt of their acquisitions, Alamos Gold had over US\$400 million in cash with no debt. We only started to look at acquisition opportunities after the market correction occurred, and these transactions were at much more reasonable prices. In 2014, Alamos Gold had one producing mine, Mulatos, producing approximately 140,000 oz/y of gold. By 2018, the company was producing 500,000 oz/y of gold from four different operations, going from roughly 1.7 million oz of reserves, to 9.7 million oz. We have been reinvesting the cash flow generated back into our big expansion projects, and making big capital investments which we believe will increase the life of our mines significantly. We are now reaching a point where we will be able to harvest the benefits of this big capital investment.

### What have been the main milestones achieved at Alamos Gold's Ontario operations in the last year?

We are in the process of building out the lower mine infrastructure at the Young-Davidson mine in Ontario, which will essentially set the mine up to operate for the next 20 years. By spring 2019, we were able to show that we had completed most of the blasting and rock-related work in terms of preparing for the installation of both the machinery and infrastructure that we would need. We are now on schedule for the completion of the lower mine expansion in the first half of 2020. The mine is currently built to operate at approximately 6,500 mt/d, but with the addition of the lower mine infrastructure we will be able to handle 8,000 mt/d.

At the end of 2017, Alamos Gold acquired Island Gold. There was a lot of skepticism in the market on why we made this decision, especially at the price that we acquired the asset. We saw an excellent resource that had been ignored for a number of years and could be converted to reserves on a one to

one basis. Throughout 2018 and 2019, we have been drilling at the Island Gold project aggressively with exploration budgets of US\$20 million per year. We have significantly grown the resource base while converting a substantial amount of resources to reserves. An updated resource will be released in early 2020. Alamos Gold has also increased throughput at the mine, which has allowed us to increase production from roughly 100,000 oz/y to approximately 145,000 oz/y in 2019.

### What is the current status of the company's Mexican assets?

When Alamos Gold started production at Mulatos there was a seven-year mine life, and now, 15 years later, there is still a seven-year mine life. We did not acquire a discreet ore body, but rather an entire district of mineralization which ranks sixth in the world in terms of size. We have been exploring the area for many years and have managed to find a number of satellite deposits outside of the main Mulatos pit, where we continue to mine and expand high grade gold mineralization.

### At what stage of development is the Kirazli project in Turkey?

Alamos Gold's work in Turkey over the last years has been focused attaining all the permits we needed to develop the Kirazli project, the last of which was received in March 2019. Construction activities had been ramping up through the spring; however, in October 2019, we suspended all construction activities on the Kirazli project, pending the renewal of our Turkish mining concessions, which expired on October 13, 2019.

### Alamos Gold was awarded best CSR practice in 2019 by the Mexican Center for Philanthropy (Cemefi). Can you explain the factors behind this recognition?

This award acknowledges our successes with the voluntary relocation of residents from Mulatos to Matarachi. Alamos Gold worked closely with the communities, investing in several projects that will provide long-term benefits, including the construction of 21 new homes, a new school, church and medical clinic. ■

## Nompumelelo (Mpumi) Zikalala

Managing Director

**DE BEERS GROUP MANAGED OPERATIONS**



### How has De Beers Group restructured its management to consolidate its South African and Canadian assets?

The restructuring is subsequent to a strategic review which identified key success factors for our upstream business. The new business, De Beers Group Managed Operations, will streamline operational management and identify synergies to create a more sustainable business in the two countries.

### Where is the company currently focused in Canada?

We are excited about our operations in the Northwest Territories. The plant at the Gahcho Kué Mine, a joint venture between De Beers Group and Mountain Province Diamonds, was designed with a capacity of 3 million mt/y. The team has since been able to improve the efficiency of the plant which can now comfortably process an additional 10% above its capacity rate.

In Ontario and Manitoba we are conducting exploration in several projects resulting in numerous exciting drill targets. We are also working with Adia Resources to investigate the Lynx projects, which have returned abundant microdiamonds, and with Tri Origin Exploration on their projects in the Abitibi area.

In Nunavut, we continue to progress the Chidliak project with drilling, environmental baseline studies and geological and geotechnical assessments. De Beers Group continues to see the acquisition of Chidliak project as part of the purchase of Peregrine Diamonds as a profitable investment with high potential. Linked to the Chidliak diamond resource, we have initiated Project Arctic Fox, which is involved with identifying

technologies that we need to apply to reduce our mining footprint with minimal impact to the environment.

### Can you elaborate on De Beers Group's aim to build mines that leave no footprint?

De Beers Group has recognized that we need to find new and sustainable ways to recover diamonds. We have made significant studies that showed that approximately half of our emissions currently come from the use of fossil fuels, with the other half coming from the use of electricity. We are implementing the Project Terra initiative to address key energy and carbon impacts and we are setting targets for reducing our carbon emissions and greenhouse gas emissions.

Project Minera is De Beers Group's research and development initiative that is investigating the potential for carbon-sequestration. We are working in collaboration with scientists and academics from five universities across Canada and Australia. Together, we are examining different mineral carbonation technologies and testing them out in laboratories and on mine sites. We are very excited as this could usher in a whole new era of sustainable mining.

### How has the evolving consumer demographic for diamonds impacted the market?

There are many different consumers in the market with different preferences. The younger generations still have a strong desire for diamonds, but they exhibit different behaviors than previous generations. Millennials value authenticity, uniqueness and ethically-sourced

products. Over the years, the De Beers Group has made investments into having a responsible footprint and we recognize that millennials want to know that the diamonds they are buying serve a greater purpose and therefore we continue to create awareness of our socio-economic investment and sustainable initiatives.

Through our Building Forever strategy we are focused on implementing sustainable initiatives to ensure that we build a positive, lasting legacy that will endure long after the last De Beers Group diamond has been mined. We work in partnership at a local, national and global level, particularly in two areas in which we believe we're uniquely placed to make a significant impact: 'Standing with Women and Girls' and 'Protecting the Natural World'.

Regarding our commitment to standing with women and girls, in September 2017 we announced our three-year partnership with UN Women. Through this, De Beers Group became a HeForShe Thematic Champion and is committed to standing with women and girls throughout our company, within our communities and across our brands. We also have the ambition to leave a lasting and positive legacy across every part of our business, while also helping to strengthen the relationship between people and nature through our commitment to protecting the natural world. Be it through the 200,000 hectares we have set aside for conservation, the nature reserves we own and manage across southern Africa or our translocation of 200 elephants to a country that desperately needs them, we believe in the importance of forever. ■



**In 2014, Alamos Gold had one producing mine, Mulatos, producing approximately 140,000 oz/y of gold. By 2018, the company was producing 500,000 oz/y of gold from four different operations, going from roughly 1.7 million oz of reserves, to 9.7 million oz.**



# Modifying Factors and Optimized Cut-Off Grade Determination



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Cut-off grade (COG) is a standard, industry-accepted method used to determine which part of a mineral deposit to include in a Mineral Resource or a Mineral Reserve estimate, or potentially in an operation's Life of Mine Plan (LOM). It is the minimum grade (or value) at which mineralized material can be economically mined or processed. The selected COG is essentially a trade-off between the revenue (inclusive of losses) that the potentially-economic material contributes to the mine's cash flow vs. the cost to extract that same material. COG is an essential parameter for determining reserves, for generating production and business plans, and ascertaining the potential profitability of a stope or open-pit bench. Selecting the correct COG is essential. It affects the mine plan, cash flow, mine cost, sustainability and profitability of the operation. However, the work required to generate the optimum COG is often not given the requisite attention and diligence. The process of selecting a COG should begin with an understanding of what the over-arching corporate and mine objectives are for the deposit. Typi-

cally, it is value in the form of NPV and internal rate of return (IRR) but may also include a COG that produces high metal content or ounces at the risk of resulting in lower net present value (NPV). The widely-adopted method to calculate the COG is a break-even methodology. This approach accepts mining material which will generate revenue from the sale of the finished product that is equal to the cost of certain modifying factors, such as mining, processing, general administrative expenses (G&A), sustaining capital costs, treatment and refining of contained metal(s) and is often inclusive of applicable royalties. The pitfall here is that it does not guarantee that the orebody will cover those costs that are excluded from the calculation (such as initial capital cost). It also does not clarify what technical and economic modifying factors to include, which can have wide implications on the future and profitability of the mine. The decision of which modifying factors to include is often left to the personal judgement of mine professionals. In determining which common modify-

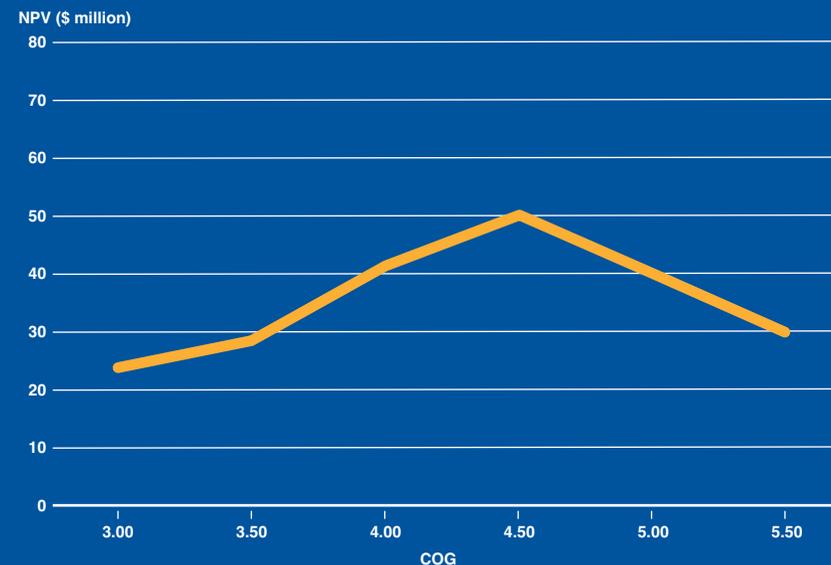
TABLE 1

REVENUE	
Metal Price (\$)	100%
Mill Recovery (%) (Fixed)	100%
Payable Metal (%)	85%
Treatment and Refinery (\$)	80%
Transportation (\$)	75%
Royalties (%)	75%
Mill Recovery (Variable)	20%
UPSTREAM (OPERATING) COSTS	
Mining Cost	100%
Milling Cost	100%
G&A	90%
Dilution	70%
Sustaining Capital	55%
Corporate G&A	25%
Profit Margin	10%
Project Capital	10%

FIGURE 1

## NPV FOR VARIOUS COG

Source: SRK, 2020



ing factors are used in the industry, a 2019 survey of approximately 100 global mines and projects were accessed. Table 1 summarizes our findings as to the modifying factors used along with the percent of those surveyed that applied them. A strategic optimization methodology can be used to select the preferred COG. It involves first running multiple scenarios at a range of different COGs inside a flexible evaluation model. A mine plan is first performed for each COG (balancing effort with value), thus producing a mine schedule. Costs are then included for each scenario and then fed into the economical model. This then produces an individual NPV and IRR for each COG scenario. The highest value scenario for the related COG may then be agreed as the preferred option. Figure 1 demonstrates an example of an underground gold mine that we accessed with this approach. In this example, a COG of 4.5 g/mt produced the greatest value overall. Additional scenarios, using lower COGs of 3.0 g/mt and 3.5 g/mt, led to higher production tonnages with low plant feed grades.

This resulted in the material not being able to cover all costs and therefore lower NPVs. Inversely higher COG scenarios of 5.0 and 5.5 g/mt generated high feed grade but the tonnes were too low to cover all the fixed operating costs and capital costs. This is summarized in Figure 1. Aside from NPV, other corporate objective criteria are also accessed, such as long life mine life, scenario with low upfront capital, or high ounces. These criteria are compiled and summarized in the form of a decision matrix tool. This approach is developed collaboratively with mine planners and stakeholders, where each objective is ranked for each COG scenario against the weighted objectives. Depending on the selected company criteria, mine site preferences and the ranking, the results will be a COG which combines all these criteria. Selecting a COG with prudence will set the course for your entire operation and environment. Determining the correct modifying factors will assist in getting the right answer and taking a strategic optimization approach will ensure that all objectives are reviewed, validated and considered. ■

### BIO

**Gary M Poxleitner** is involved in leadership within the mining consulting industry and provides technical advice, mine and project reviews, due diligence and audits, cut-off grade analysis, operating cost estimation, mine design and economic and productivity improvement studies, as well as training and mentoring in all aspects of mine orebody extraction in the underground environment. This involves high level concept projects, PEA, PFS, Feasibility, project execution and operational assistance. He assists clients in providing innovative albeit practical solutions to complex problems. Gary's technical experience covers a wide range of commodities, geographic and mining settings. Gary a professional engineer registered in Ontario and a professional project manager, he has previously held positions as Vice Chairman of Camiro, Membership Chair of the CIM Sudbury Branch, and is currently on the Canadian CIM Council and Chair of the CIM Underground Mining Society. Gary has a P.Eng in Mining Engineering and a graduate from Laurentian University, Canada (1991).



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# CANADIAN EXPLORATION



» I keep reading that people are never making discoveries, the rate of discoveries is going down. The funny thing, well, I guess I'm the sucker then because I keep buying guys who say they're making discoveries. «

- Eric Sprott

Image courtesy of Sable Resources

CANADIAN EXPLORATION

# A suffering junior market waits for the tide to turn

Despite robust metals prices and gold breaking the US\$1,600 threshold for the first time since 2013, funding has been harder than ever to come by for Canadian exploration companies. The cannabis hysteria and cryptocurrency boom have died down, but generalist investment has yet to return to the exploration sector, preferring to invest in low-cost producers showing free cash flow. “The funds are seeing generalist money coming into the large and mid-caps and from their perspective it is riskier to pick a micro-cap that could double when some of these intermediates have been doubling,” explained Ryan Matthiesen, managing director of investment banking at Haywood Securities. “This has created a large valuation gap as bigger companies have been trading at much better multiples,” he added.

However, the discrepancy between the producers and juniors is not sustainable, as depleting reserves and declining ore grades incrementally increase the necessity for new discoveries to be funded, developed and brought into production. In his interview with Global Business Reports, Barrick president and CEO Mark Bristow named Canada as a “standout jurisdiction for finding big mines,” pointing to the opening up of big gold/copper porphyries in British Columbia and the potential of the older regions in Ontario and Québec to be reinvented through creative and penetrative exploration. “Archean rocks produce surprises, and I believe in Canada there are still great opportunities that lie within the ground,” reflected Bristow. This sentiment was echoed by Shastri Ramnath, president, CEO and director of private project generator Exiro Minerals Corp: “Our philosophy is that there are many deposits out there waiting to be found,” said Ramnath, suggesting that the belief that all the easy discoveries have been found is misleading, and the reason discovery rates are down is in part due to the nature of the value chain. “Exploration has been pushed down to the juniors; juniors are publicly traded and therefore have short term pressures from stakeholders. This results in management decisions such as focusing on a small geological deposits for drilling that could simply be an anomaly,” she explained. Some of the standout Canadian exploration projects in 2019 belong to Vancouver-based companies active in Ontario, or Toronto-based companies exploring the provinces and territories away from their home base. With this in mind, instead of focusing solely on exploration projects in Ontario, we wanted to expand the coverage of Toronto’s junior community and highlight some of the best projects throughout Canada.

### Golden opportunities at Red Lake

Red Lake in Northwestern Ontario has been a hive of activity in 2019, as Newmont sold its Red Lake mine to Australian company Evolution Mining for US\$375 million in November, Pure Gold Mining began construction at its Madsen Gold mine in September and a host of juniors ramped up exploration at the historic mining camp. The best performing junior stock of Q4 2018 made further strides in 2019, as extensive exploration of Great Bear Resources’ (GBR) Dixie project at Red Lake produced spectacular result after spectacular result, seeing the Vancouver-based junior’s share price rise from C\$2 in January to a high of C\$9 in September. “Approximately 12 months ago, we only had two zones discovered, but we have now increased this to seven discovered zones,” stated Chris Taylor, GBR’s president and CEO, who elaborated on how, through regional drilling and the use of government data, GBR discovered a new zone of shallow high-grade gold associated with silicification of host rocks related to a crustal-scale structure, called the LP fault. “The fault marks a contact between mafic and felsic/intermediate rocks and is spatially associated with an 80 m to 200 m wide quartz sericite zone associated with highly anomalous to high-grade gold mineralization,” explained Taylor. “The Dixie project has

transformed from another high-grade gold in quartz vein story, to being something entirely different now,” he continued, likening the deposit to Hemlo as the mineralization is more disseminated in the rock, rather than in veins, with intercepts of high-grade gold mineralization going right to surface. “GBR is a great example of why our industry exists. There is hope for the exploration sector when you see good drilling results in a mature jurisdiction. We believe that thinking out of the box can lead to significant discoveries, and the Dixie project is testament to this,” he concluded.

A Red Lake redemption is in the works as Rubicon Minerals attempts to rise the Phoenix Gold project from the ashes after its meltdown in late 2015. At the helm of this task is president, CEO and director George Ogilvie, who was instrumental in improving operations at the Macassa mine and completing the acquisition of St. Andrew Goldfields as the CEO of Kirkland Lake Gold. He described how results of the 35,000-mt bulk sample processing at the Phoenix Gold project reconciled even better than expected with the new geological model developed by Rubicon Minerals in 2018: “We managed to mine 5,200 oz of gold from the three test stopes, whereas the model predicted approximately 4,500 oz. There was a 14% improvement over and above what the NI 43-101 2018 Mineral Resource Estimate predicted, in addition to 7% more per mt and 6% better grade.”

Premier Gold Mines is already a multi-asset producer through its 40% interest in the South Arturo property in Nevada and

Mercedes mine in Sonora, Mexico, and the company hopes to increase production by advancing its portfolio of exploration assets, which includes properties in Ontario. The Thunder Bay-based company announced in December 2019 that it would re-establish exploration on its Red Lake projects in 2020, including a renewed focus at the company’s 100%-owned Hasaga project. “Premier Gold Mines’ growth strategy is focused on reaching mid-tier producer status,” stated Ewan Downie, president and CEO, adding: “We envision the potential to quadruple production organically over the next five years.”

### Palladium reaches all-time highs

When producing the previous version of this report in December 2018, palladium’s remarkable performance was one of the key talking points, headlined by the now-acquired North American Palladium’s Lac des Iles mine near Thunder Bay. While the outlook for 2019 was bullish, few would have predicted just how well the platinum group metal (PGM) would perform, as rising demand from the hybrid automobile industry combined with a continued eight year deficit drove up the price by 83% for the year. On December 17, for the first time in history, palladium broke the US\$2,000/oz threshold, becoming more valuable than gold has ever been (US\$1,917 per ounce in 2011).

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## Jamie Levy

President & CEO  
GENERATION MINING



**In 2019, we came out with an update to the resource done by our predecessor. We identified 3.2 million oz of palladium, 1.2 million oz of platinum, 400,000 oz Au and 800 million lbs Cu. This works out to 7.1 million oz of palladium equivalent in the measured and indicated category. It is the largest undeveloped project of palladium in North America.**



### What were the circumstances surrounding the creation Generation Mining in 2018?

Generation Mining is a mining explorer and developer with a focus in platinum group metals and specifically palladium. The company was incorporated at the beginning of 2018 as a spin-out of Pine Point Mining when this company was acquired by Osisco Metals. The company started with some exploration projects that built on Pine Point's existing exploration work and their portfolio of properties. At the end of 2018, we reached out to Sibanye Stillwater to coordinate an option deal on the Marathon PGM asset in Northern Ontario. We struck a deal in April 2019 to acquire up to 80% of the Marathon PGM asset.

### What type of resource is Generation Mining's flagship Marathon PGM project in Northern Ontario?

In 2019, we came out with an update to the resource done by our predecessor. We identified 3.2 million oz of palladium, 1.2 million oz of platinum, 400,000 oz Au and 800 million lbs Cu. This works out to 7.1 million oz of palladium equivalent in the measured and indicated category. It is the largest undeveloped project of palladium in North America. The property has an area of 200 square kilometers. Later on we added two satellite deposits and a further 1.5 million oz measured and indicated, and an additional 900,000 oz inferred. There is a lot of exploration up-side to find more palladium and higher-grade material. The property is also privileged in terms of infrastructure.

### Considering the scale and potential of the Marathon Project, how was it left available until 2019?

We got the asset at a fortuitous time. Stillwater had acquired Marathon PGM in 2010 for US\$118 million. Over the next couple of years, they worked to get the property into production, before reaching a deal with Mitsubishi where they sold 25% of the company for US\$81.5 million. Mitsubishi wanted to secure the uptake. In 2014, Stillwater did an internal feasibility draft that was never released. From the findings and the inability to raise money, the project was abandoned. The company was also spread thin financially because they had acquired Peregrine Metals, a mining company with their main asset in Argentina for US\$450 million. There were management changes and Stillwater was sold to Sibanye. The merger was for US\$2.2 billion and the purchase was primarily motivated by Stillwater's assets in Montana. When we approached them, they had no interest in developing the property in Ontario. Sibanye's focus is in production rather than in developing the mines. For this reason, we managed to get the asset on very favorable conditions.

### Do you expect palladium's remarkable upward trend to continue?

I expect the price of palladium to continue increasing as supplies have been in deficit for the last six to seven years. Palladium requirements for emission converters in electric cars rose from three grams to five, which will also cause the demand to increase. I understand above ground stockpiles of palladium have been used to regulate the commodity's price but these are starting to run out. Finally, there has been increased awareness of the commodity and this has strengthened demand.

### What are Generation Mining's most important short-term goals moving forward?

Generation Mining's immediate objective is to secure the 80% share of the Marathon Gold project and this means investing US\$10 million dollars over the next four years. The company has managed to raise substantial capital and see its stock price almost treble in 2019, so we have the means to keep exploring within the property and capitalize on its potential fully. One of our key goals is to complete a definitive feasibility study in 2020. If you are looking for a PGM name in a safe jurisdiction, keep an eye out for Generation Mining. ■



## Chris Taylor

President & CEO  
GREAT BEAR RESOURCES



**GBR is a great example of why our industry exists. There is hope for the exploration sector when you see good drilling results in a mature jurisdiction. We believe that thinking out of the box can lead to significant discoveries, and the Dixie project is testament to this.**



### Great Bear Resources (GBR) has been the great success story of the Canadian junior mining community in the last 12 months. What were the key milestones that contributed to this success?

Great Bear Resources (GBR) has been fortunate to experience a sequence of back to back gold discoveries on the Dixie property. Approximately 12 months ago, we only had two zones discovered, but we have now increased this to seven discovered zones. The LP fault transects the property for approximately 18km of strike length.

The Dixie project has transformed from another high-grade gold in quartz vein story, to being something entirely different now. The mineralization along the LP fault has very large-scale potential, and there are big intervals of high-grade gold mineralization going right to surface, but it is not in veins. The mineralization is more disseminated in the rock, similar to something like the Hemlo deposit.

### Considering the grades GBR has found at Dixie and its location in the Red Lake Camp, how was it not developed before?

There is very little bedrock exposure on the property. On average there is approximately a 4m deep gravel blanket that covers the project. It is very shallow gravel cover, but it covers everything up which means if you are prospecting in the area, you do not see bedrock and you are not going to find gold unless you drill.

### In October 2019, GBR announced new near-surface high-grade zone discoveries at the Dixie project. Can you elaborate on these findings?

From our ongoing, fully-funded 90,000m drill program at the Dixie project, three new gold discoveries have been made – Yauro, Viggo, and the North Fault. The new Yauro Zone is located between the Yuma and Auro discoveries along the LP Fault, and a structural dilation has localized multiple high-grade gold mineralized intervals. The Yauro Zone occurs near a deflection point in the trend of the LP Fault and consists of several gold intervals spanning two drill holes collared 125m apart, with intervals of

mineralization observed over 300m of apparent width. Gold mineralization extends to within meters of surface in both discovery drill holes and this discovery marks the largest apparent concentration of near-surface high-grade gold intersected at the Dixie property to-date. Drilling 1km southeast of the Auro Zone the new "Viggo Zone" has extended the LP Fault gold mineralized system to 4km of strike length, which remains open to extension. The first drill hole testing the "North Fault" has intersected Hinge Zone style gold-bearing quartz veins. Follow-up drilling will test this new 18km long target which parallels the LP Fault.

### Do you think that there is any interest to consolidate the Red Lake region?

There is a lot of speculation on the consolidation front, and we have had opportunities presented along the lines of consolidation. However, we are much more interested in determining and showing the market how much gold we have.

We have had interest in our property from mining companies and investors across the board, but we are not in a rush to make any transactional decisions. A story like GBR helps attract investor interest back to the mining industry. We want to continue developing a good mining industry story so that speculative dollars can return to the sector.

### Where would you like to see GBR by the end of 2020?

By the end of 2020, GBR hopes to have a maiden resource published. We are fully funded to define our resource and the results might come a little sooner than the market expects. If we reach mutually agreeable terms, we might also enter into a strategic investment transaction. We are open to collaborating with parties for the advancement of the project. We aim to always be ready to develop the project to where we can take it to, but we are open to operational partnerships.

GBR is a great example of why our industry exists. There is hope for the exploration sector when you see good drilling results in a mature jurisdiction. We believe that thinking out of the box can lead to significant discoveries, and the Dixie project is testament to this. ■



## Vance White

President & CEO  
NOBLE MINERAL EXPLORATION



**The Canada Nickel deal is tangible proof of the potential of our land package, and we intend to continue developing projects into 2020 and beyond.**



### What is the focus and strategy of Noble Mineral Exploration?

Noble is a Canadian-based junior exploration company following the project generator model, holding approximately 79,000 hectares of mineral rights in the Timmins/Cochrane area of Northern Ontario, upon which we plan to generate joint venture exploration programs. The company also holds a portfolio of securities in its JV partners plus a gold-streaming and royalty interest in the Wawa-Holdsworth property. We are focused on seeking JV partners to further expand on all of the company's exploration and development programs.

### In December 2019, Noble announced the completion of the Crawford Nickel-Cobalt project property transfer to Canada Nickel. Can you explain the transaction?

The compensation for Noble in order to transfer the Crawford Nickel-Cobalt assets was C\$2 million in cash and 12 million shares of Canada Nickel. An additional benefit for the termination of the JV and the agreement with Spruce Ridge Resources (Spruce) was that we picked up an additional 2 million shares of Spruce. Spruce will end up with 10 million shares of Canada Nickel, 5 million of which will be spun out to the Spruce shareholders. The 10 million Canada Nickel shares that are being spun out to the Noble shareholders and 5 million Canada Nickel shares to the Spruce shareholders will generate a float of 30%. This float is going to help create the public market once Canada Nickel starts trading on the Venture Exchange. An important part of the transaction was the negotiation with the royalty holder to reduce the royalty from a 5% NSR to a 2% NSR. As a result, the reduction is going to make the project available to far more participants: majors and mid-tiers. It is contemplated that after we agree on the closure to the spin off, there will be additional option and JV deals put together on other nickel assets.

As a second point, the deal leaves all of the VMS assets on Noble's Project 81 land package open for exposure. We have taken out all of the early stage risks of airborne geophysics and data compilation to the point where the next

level, which is the drilling phase, can be picked up by third parties. That allows us to take back equity positions in those companies and provides Noble with an additional liquidity opportunity and at the same time it does not incur the risk of drilling on those other targets. At some point down the road, given the spend-to-earn model, Noble will have the right to be a JV partner with that third party.

### What potential do you see in the Project 81 land package and what type of exploration techniques are being utilized?

Project 81 is a contiguous parcel of land covering all or parts of 14 townships adjacent to the Kidd Creek mine complex, which has been in production for 53 years and has produced 160 million mt. It is not uncommon for mega VMS deposits to be associated with other satellite deposits that could run up to 50 million mt.

### Financing for juniors has been hard to come by. Do you see the tide turning in 2020?

I think it is a matter of time before equity flows back into the market. As political or geopolitical risks start to stabilize, whether it be the US-China trade deal or the 2020 presidential election in the US, uncertainty comes out of the market. All economies want to grow their infrastructure and the demand for commodities remains robust. New projects will have to be developed and these require capital. Looking at the nickel-cobalt scenario, huge growth is expected from the battery and electric vehicles industry.

### Do you have a final message for potential partners?

Partnering with Noble Mineral Exploration means partnering with a historically emblematic team with a reputation for success and an unbeatable knowledge of the area and the business. The Canada Nickel deal is tangible proof of the potential of our land package, and we intend to continue developing projects into 2020 and beyond. We are looking at anywhere between a C\$15 and C\$20 million spend over the next 36 months with 8-10 partners. ■

&lt;&lt;51

How then, did Toronto-based junior Generation Mining manage to acquire a 51% interest in the Marathon palladium project in Ontario from Sibanye Stillwater in 2019 for total consideration of under US\$6 million, considering that Stillwater had acquired the project in 2010 for US\$118 million when palladium was worth less than US\$1,000/oz? Jamie Levy, Generation Mining's president, CEO and director, expanded on how the project had been abandoned due to Stillwater's inability to raise money and its financial outlay with the US\$450 million acquisition of Peregrine Metals. "There were management changes and Stillwater was sold to Sibanye. The merger was for US\$2.2 billion, and the purchase was primarily motivated by Stillwater's assets in Montana," explained Levy, elaborating: "When we approached them, they had no interest in developing the property in Ontario. Sibanye's focus is in production rather than in developing the mines. For this reason, we managed to get the asset under very favorable conditions."

"The Generation Mining team negotiated an outstanding deal for their shareholders," affirmed Ryan Matthiesen from Haywood Securities, the sole bookrunner on the financing.

Generation Mining can increase its interest in the Marathon PGM and joint venture to 80% by spending C\$10 million and preparing a PEA within four years. Derrick Weyrauch, president and CEO of Canadian junior Palladium One Mining with projects in Finland and Ontario, observed that there is no easy solution to supply the palladium deficit, let alone deal with the increase in demand that is coming from diesel conversion and stricter standards. "What is really fascinating is the supply side. The existing producers are constrained from targeting that commodity and supplying the incremental demand," explained Weyrauch, noting that 10% of global supply is coming from two primary players and 90% is a by-product of other mining – of which over 40% is coming from Russia and South Africa.

If South Africans are getting two or three times the platinum for the palladium they are producing, they cannot simply increase production as this would further depress the platinum market.

"With North American Palladium gone and Stillwater logged up, where are you going to get palladium exposure? There are not many investment alternatives for palladium, so an asset in a secure jurisdiction is highly attractive," continued Weyrauch.

### Québec: a world-class mining jurisdiction

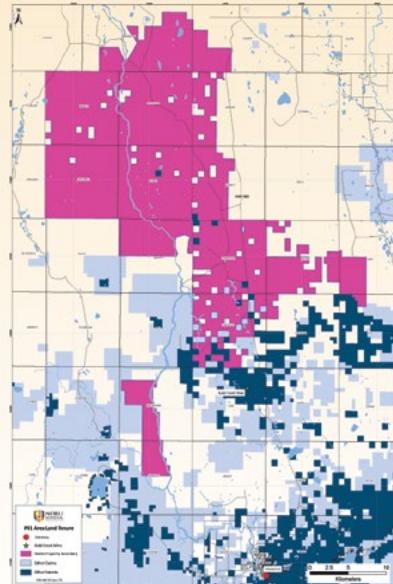
All neighborly rivalries aside, Québec is a world class mining jurisdiction, reaching the number four spot in the Fraser Institute's annual rankings in 2018 and number one in Canada. The province could and should be used as a model for how collaboration between the provincial government (with their pro-mining tax incentives), financial institutions (such as Investissement Québec and Caisse de dépôt) and industry can help fulfill the potential of a resource-endowed region. The first incarnation of Osisko Mining defined a new style of mineralization in Archean aged gold-only porphyries, ul-

timately discovering over 10 million oz of gold at Canadian Malartic. In recent years, no group has performed as much exploration in Canada as the second incarnation of the company, reaching a staggering 1 million meters of drilling in September 2019 in only four years. Now, in O3 Mining, the third iteration of the Osisko Mining Group has been created with the intention of adding significant value to the Garrison and Marban assets in Ontario and Québec, according to Jose Vizquerra, O3's president, CEO and director. In July 2019, O3 Mining completed an RTO with Chantrell Ventures, transferring a portfolio of exploration projects including Marban and Garrison. Additionally, a portfolio of selected securities was transferred by Osisko, which ended with just over 53% of O3 Mining's outstanding shares. Despite challenging conditions for juniors, Vizquerra and O3 Mining have shown that the right projects with the right backing can make quick progress, as the company has raised over C\$28 million to advance its exploration



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- ✓ Exploration and Development in the Timmins-Cochrane Area
- ✓ Canada's Most Prolific Mining District
- ✓ Using the Most Modern Technology Available to the Mineral Exploration Industry

- PROJECT 81 - 100% owned mineral rights on its flagship property, over 79,000 hectares
- Historical high-potential nickel-cobalt, VMS and gold targets
- State of the art modern airborne geophysics and gravity gradiometer surveys covering the project
- Significant industry services and infrastructure in place
- Drill programs proposed for 2020
- MoU signed with First Nations
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projects and acquired properties for a total value of roughly C\$50 million to consolidate its portfolio in Québec. "These initiatives allow us to move closer to our goal of becoming a multi-million ounce, high-growth company, with over 61,000 ha of prospective ground," stated Vizquerra, adding: "O3 Mining's properties hold 3.6 million oz of measured and indicated resources at 1.26 g/t of gold and 1.5 million oz of inferred resources at 2.14 g/t of gold, positioning us as a Tier 1 company in the junior mining space."

Another well-funded, Québec-focused junior is Troilus Gold Corp, which acquired the past-producing Troilus gold mine in Northern Québec in 2016 and worked privately on the asset before going public in January 2018. The Troilus mine was previously operated by Inmet Mining, which produced approximately 2 million oz of gold and 70,000 mt of copper in a US\$300/oz gold environment when it first entered production and operated profitably for the next 14 years. Justin Reid, Troilus Gold Corp's CEO and director, related the impressive resource growth his company has achieved through exploration: "Troilus publicly raised US\$25 million with the help of 25 global institutions and commenced an initial drill program of 36,000 m. This exploration took the resource from 2.5 million oz to approximately 5.1 million oz. We then drilled an additional 35,000 m and increased the resource to 6.4 million oz. Today, we have the largest developing gold asset in Québec." Having raised almost US\$50 million in under two years and maintained a tight share structure, Troilus aims to start a PFS

toward the end of 2020 with the goal of moving towards a production decision in 2021. "Troilus Gold Corp has over US\$400 million in inherited infrastructure and over 6 million oz in resources, having added more oz in the last two years than any gold company in the world," affirmed Reid.

**A new greenstone belt and "the crown jewel of Canadian mining" in British Columbia**

At Roundup 2020 in January, the Association for Mineral Exploration (AME) awarded its 2019 Celebration of Excellence H.H. "Spud" Huestis Award for significant contributions to enhancing the mineral resources of BC and/or Yukon to Peter Fischl of Westhaven Ventures. Fischl was recognized for his role in the discovery and ongoing definition of the South Zone high-grade epithermal gold-silver deposit at Westhaven's Shovelnose project in the newly emergent Spences Bridge Gold Belt (SBGB) in southern British Columbia.

Toronto-based junior Talisker Resources was able to gain control of 85% of this new gold belt in the largest single staking in B.C.- history, staking nearly 190,000 hectares in a 6-hour period, according to president and CEO Terry Harbort. "During the 2019 field season, we conducted an aggressive exploration campaign with 22 geologists in the field collecting approximately 2,500 silt fraction first order stream sediment samples resulting in over 100 new anomalies and, to date, 10 defined drill targets," he said, adding that a planned budget of C\$3.6 million has been allocated to continue the exploration at Spences Bridge in 2020, with Talisker's specialized greenfields team, in parallel to its program at the newly acquired Bralorne Gold Camp.

"The crown jewel of Canadian mining" was how Harbort described Talisker's Bralorne Gold asset in British Columbia, and the market seemed to agree, with the company's share price doubling in the wake of the November 2019 acquisition. The Bralorne Gold Camp is the source of the prolific Fraser River alluvial gold rush of the 1860's, producing 4.2 million oz of gold at 17.7 g/t for over fifty years. Two of the mines in the camp, Pioneer and King, were closed in the mid 1960s whereas the Bralorne mine continued until the early 1970s. "The gold price then was US\$35 per ounce; that's about US\$220 per ounce in today's dollars. I doubt there would be many mines today economic at US\$220 gold," observed Harbort, adding: "With a highway right to it, a camp, a mine and tailings permit, and being connected to grid power with a hydro plant several kilometers away, we view Bralorne as a world class opportunity."

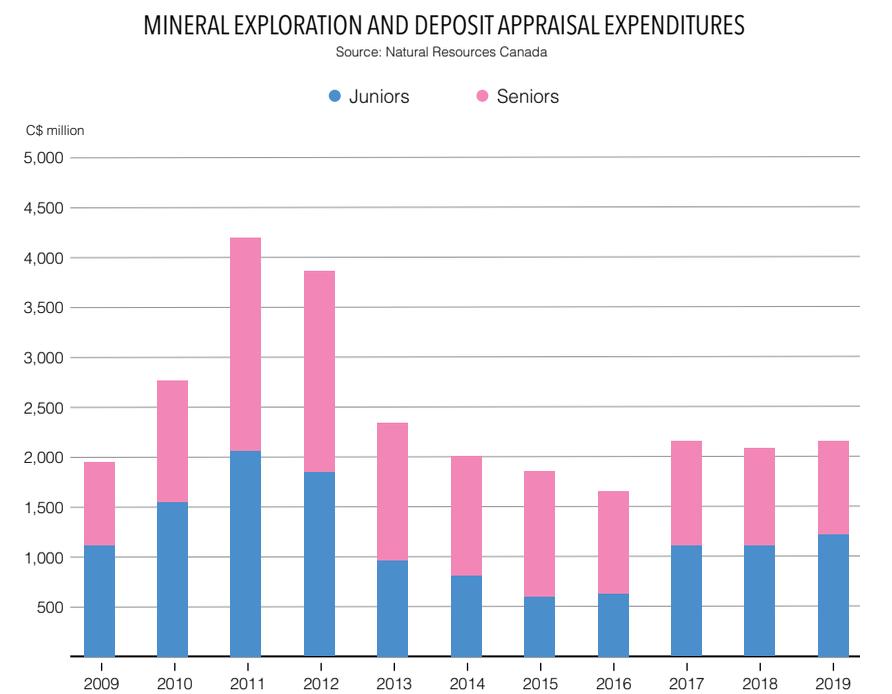
In northwestern British Columbia, Romios Gold Resources announced assays from its summer exploration program on its large claim holdings in the Golden Triangle. The results confirmed and expanded the porphyry copper-gold potential of two major prospects – Trek and JW – as well as outlining other high-potential targets, according to president, CEO and director Tom Drivas. "All of Romios' projects are located adjacent to producing mines and/or major deposits nearing the production stage," noted Drivas, suggesting that the economics of Romios' projects benefit greatly from existing or improving infrastructure.

**A path to near-term copper production in Manitoba**

Gold miners made hay while the sun was shining in 2019, as expectations of U.S. Federal Reserve rate cuts and geopolitical tension mounted between the United States and China to create the perfect storm for the safe haven precious metal. Copper, on the other hand, suffered as trade tensions threatened demand outlook from China, which accounted for 49% of global refined copper consumption in 2018.

However, copper is "poised for liftoff" in 2020, according to Jefferies analyst Christopher LaFemina, who pointed to low copper inventories, high short positions, supply constraints and better demand creating conditions for the metal to rally, in a note to clients. This optimism is matched by the likes of Goldman Sachs, Morgan Stanley, Bank of America and Citi, which see copper rising with an improving global economy.

In May 2019, a three-way tie up between private equity investor Greenstone Resources, capital merchant bank Norvista and the Rockcliff exploration company run by Ken Lapierre came together with a clear strategy of moving into copper production, according to Alistair Ross, president and CEO of Rockcliff Metals Corp. "The initial work is to bring three of the company's resources, Tower, Talbot and Rail, to an indicated level of between 3% and 4% copper equivalent, with a target size of approximately 2.5



million mt each," revealed Ross, discussing the company's asset portfolio in the Flin Flon-Snow Lake District in Manitoba near on the Saskatchewan border. Ross explained how Rockcliff is taking an innovative approach to change the way people see narrow veined, steeply dipping ore bodies, with the aim of mining a lot more on a daily basis than would traditionally be expected: "This is thanks to the adoption of a digital mine site design from the onset and from combining technologies that have not been used

in unison before," he said, elaborating: "We conducted a peer-reviewed study of our conceptual method and gained agreement that it could be possible to produce at a mining rate of 2,000 mt/d. This is more than double the traditional rate and would turn the seven-year project into a three-year project." With this timeframe, the project would rely on power generators instead of traditional hydro lines, be less intrusive to the environment and leave a minimized footprint. ■

Refer to the CTMF website for details.  
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**Contact:** Alistair Ross / President & CEO **Email:** [aross@rockcliffmetals.com](mailto:aross@rockcliffmetals.com) **Mobile:** (705) 507-4251 **CSE:** RCLF **FSE:** ROO

# Jose Vizquerra

President, CEO & Director  
**O3 MINING INC.**



## What were the circumstances surrounding the creation of O3 Mining?

O3 Mining is the third iteration of the Osisko Mining Group. It was created with the intention of adding significant value to the Garrison and Marban assets in Ontario and Quebec. In July of 2019, O3 Mining completed a reverse takeover transaction with Chantrell Ventures. The transaction was finalized with the company being renamed to O3 Mining, and Osisko transferring the Marban and the Garrison projects, and other exploration properties to O3. Additionally, a portfolio of selected securities were also transferred by Osisko, which ended with just over 53% of O3 Mining's outstanding shares. Since its inception in 2019, O3 Mining has raised over C\$28 million to advance its exploration projects and acquired properties for a total value of roughly C\$50 million to consolidate our portfolio in Quebec – these initiatives allow us to move closer to our goal of becoming a multi-million ounce, high-growth company, with over 61,000 ha of prospective ground.

## O3 Mining has a significant land package in Quebec and Ontario. Can you provide an overview of the company's portfolio of assets?

O3 Mining has a unique portfolio of assets in Quebec and Ontario, spanning more than 460,000 ha. Our current focus is in the Val D'Or camp, where at least four world-class deposits have been discovered (Canadian Malartic, La Ronde, Sigma-Lamaque and Busquet) and 30 million oz of gold has been produced. We currently own approxi-

mately 61,000 ha covering an extraordinary land position along the prolific Larder Lake-Cadillac fault. This was built up after the acquisition of properties from Alexandria Minerals, Chalice Gold Mines, and Harricana River Mining. Additionally, we own the Garrison project in Northern Ontario, located in the Larder Lake Mining Division, as well as the past-producing Buffonta mine and Gold Pike mine properties.

O3 Mining's properties hold 3.6 million oz of measured and indicated resources at 1.26 g/mt Au, and 1.5 million oz of inferred resources at 2.14 g/mt Au, that positions us as a Tier1 company in the junior mining space.

## What distinguishes the Osisko exploration model?

The Osisko approach to exploration has always distinguished itself from its competitors, through the intensive drilling campaigns they performed. We believe in building mines not just finding resources. O3 Mining embraces the same discipline by taking a systematic approach to our exploration and drilling, and our advantage is that we already have four areas where a resource exists. The strategy in Val D'Or is to minimize the risk and maximize the upside. O3 Mining will focus on expanding areas where resources exist but our exploration style will reveal the real size of the different projects.

Our team has come up with an aggressive exploration program for our Val D'Or properties to confirm, upgrade and increase the current resources with a 50,000m drill program.

Currently, our ongoing drilling program is focused on the Central and East Cadillac properties – Alpha, Akasaba and East Cadillac projects. During the first months of our drilling campaign in Alpha, new drill intercepts confirmed the extension of the Bulldog mineralized structure located 1,500m to the east of the original discovery. More importantly, this demonstrated the potential for gold-bearing structures in the Pontiac sediments. For our winter campaign, two additional drill rigs will be on the recently discovered Bulldog zone, which has returned important gold values including 10.87 g/mt Au over 4.5m. These excellent results will help focus our expansion drilling to the west of the Bulldog discovery. Additionally, we will be exploring the high-grade component of the Marban project to prove the continuity of this high-grade zone.

## Why do you believe Québec is the best mining jurisdiction in the world?

We believe that the capabilities for exploration are exceptional in Quebec for three main reasons. Through its long history in mining, there are a vast amount of talented professionals in the region and the Quebec community appreciates the value of mining and understands the benefit that it can bring. Also, attaining financing is easier compared to other jurisdictions, with flow-through shares schemes that boost exploration activities in the province. Finally, the regulatory environment is favourable as the rules are clear and predictable to obtain the social license to operate. ■



# Terry Harbort

President & CEO  
**TALISKER RESOURCES**



**Bralorne produced 4.2 million oz at 17.7 g/mt for over fifty years. On average, for every 50 meters they extracted at depth, 115,000 oz was recovered from the 30 mesothermal veins that were mined.**



## "The Crown Jewel of Canadian Mining" what can you tell us about the recent Bralorne Acquisition?

The Bralorne Gold Camp is one of the highest-grade, most structurally continuous gold deposits in Canada. The source of the prolific Fraser River alluvial gold rush of the 1860's, Bralorne produced 4.2 million oz at 17.7 g/mt for over fifty years. On average, for every 50 meters they extracted at depth, 115,000 oz was recovered from the 30 mesothermal veins that were mined. Two of the mines in the camp, Pioneer and King, were closed in the mid 1960's whereas the Bralorne mine continued until the early 1970s. The gold price then was US\$35/oz, that's about \$220/oz in today's dollars. I doubt there would be many mines today economic at US\$220 gold. With a highway right to it, a camp, a mine and tailings permit, and being connected to grid power with a hydro plant several kilometers away, we view Bralorne as a world class opportunity.

## What's your view of the upside potential at Bralorne?

We have an excellent database of historic drift samples and drilling for the Bralorne complex and have been able to wireframe numerous drill targets directly along strike and at depth of the 30 mined veins. Most of these targets are from 250m to 750m from surface. 29 of the veins were historically mined to less than 900m depth whereas the 77T Vein was mined to 1.9 km. From the historic sampling during mining we see incredible continuity of grades above 15 g/mt for up to 750m along strike and up to 1.3km down dip. We see no geological reason why this wouldn't continue. Our first phase of drilling will be to test these near to surface targets and then to test deeper potential to show that the historic continuity continues below the old mines. Considering the historic production average was in excess of 100,000 oz per 50m panel, we believe we have potential to add a lot of ounces at depth.



## What is your timing on beginning exploration at Bralorne?

We are fully funded and permitted to initiate drilling at Bralorne in Q1, 2020. Our initial program will consist of 10,000m with 3,000m targeting the close to sur-

face vein extensions. Come spring, we will be conducting a systematic review of all occurrences and anomalies on the 4200 hectare land package, many of which have never been drilled.

## Bralorne isn't the only interesting land package in Talisker's portfolio, can you elaborate on the Spences Bridge exploration program?

Our focus prior to the Bralorne acquisition was greenfields exploration for low sulphidation vein systems in the emerging Spences Bridge Gold Belt. The belt went from frontier to emerging in September 2018 with the discovery of the Shovelnose deposit by Westhaven Ventures. Talisker was able to gain control of 85% of this new gold belt in the largest single staking in British Columbian history, staking nearly 190,000 hectares in a 6-hour period. We have recently increased this land holding to 230,000 hectares by identifying other similar cretaceous belts with the same structural and metallogenic framework. During the 2019 field season, we conducted an aggressive exploration campaign with 22 geologists in the field collecting approximately 2500 silt fraction first order stream sediment samples resulting in over 100 new anomalies and, to date, 10 defined drill targets. With a planned budget of US\$3.6 million we will continue the exploration at Spences Bridge in 2020 with our specialised greenfields team in parallel to our Bralorne program.

## Talisker had a lot of land in southern BC, why do you like southern British Columbia so much?

When you compare the costs in the area we operate to the Golden Triangle, our exploration is significantly cheaper. Our geologists can easily drive to the field from Vancouver, we have no need for building camps or helicopter support and we have a whole list of eager drill companies just up the road in Kamloops, so our drill costs are US\$150-200/m all-in instead of US\$500-550/m. When you combine this with our extended field season of 10-11 months against 3-4 months up north, it means that more of our money goes into the ground faster, leading to a shortened discovery timeline. ■



# Alistair Ross

President & CEO  
ROCKCLIFF METALS CORP



### Can you provide a brief overview of Rockcliff Metals Corp?

The Rockcliff that is being traded today on the CSE is very different to the one that was traded on the TSX.V. In May 2019, there was a three-way tie up between Greenstone Resources, a private equity investor; Norvista, a capital merchant bank from Toronto with strategic property interests; and the Rockcliff exploration company run by Ken Lapiere. The outcome of the three parties coming together was a clear strategy of moving into copper production. The initial work is to bring three of the company's resources, Tower, Talbot and Rail, to an indicated level of between 3% and 4% copper equivalent, with a target size of approximately 2.5 million mt each. Additionally, we are continuing to explore other narrow vein steeply dipping ore bodies to add to the pipeline of our first three projects. The beauty of the tie up is that we obtained access to a fully permitted mill that was originally a nickel processing facility that can be easily permitted for copper treatment. We have a seven year lease on the Bucko Mill and have completed the necessary test work to allow us to file a notice of alteration to transition the mill from a nickel to a copper processor.

### Can you comment on the Flin Flon District in terms of its geology and infrastructure?

The Flin Flon-Snow Lake District is on the border with Saskatchewan and stretches significantly into Manitoba and is one of the most prolific greenstone belts in the world. The infrastructure is excellent with existing rail and road networks. The rail line that feeds Thompson has been heavily invested in by Vale and the owner.

### How do you view Manitoba as a mining jurisdiction?

Manitoba is excellent for permitting matters and assistance with logistics. We have met with the Conservation and Climate, and the Agricultural and Resource Development Ministries. The ability to meet first hand at a ministry level is special. When we expressed our time frame for permitting, they were collaborative and enthusiastic. The exploration work permits were granted in

a timely manner and with constructive consultation processes with First Nations.

### How is Rockcliff integrating technological solutions into its operations?

Our whole approach is to change the way people see narrow veined, steeply dipping ore bodies. We want to mine a lot more on a daily basis than would traditionally be expected. This is thanks to the adoption of a digital mine site design from the onset and from combining technologies that have not been used in unison before. It could be possible produce at a mining rate of 2,000 mt/d. This is more than double the traditional rate and would turn the seven-year project into a three-year project. Finally, we will have a fully electric mobile fleet underground. No diesel underground makes a big difference to the health of on-site workers and to the environment.

### What are your projections on how the market for copper will evolve?

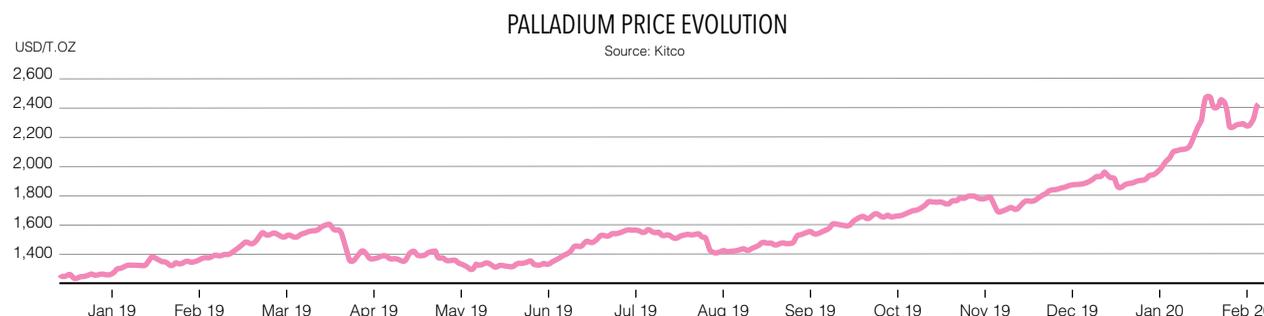
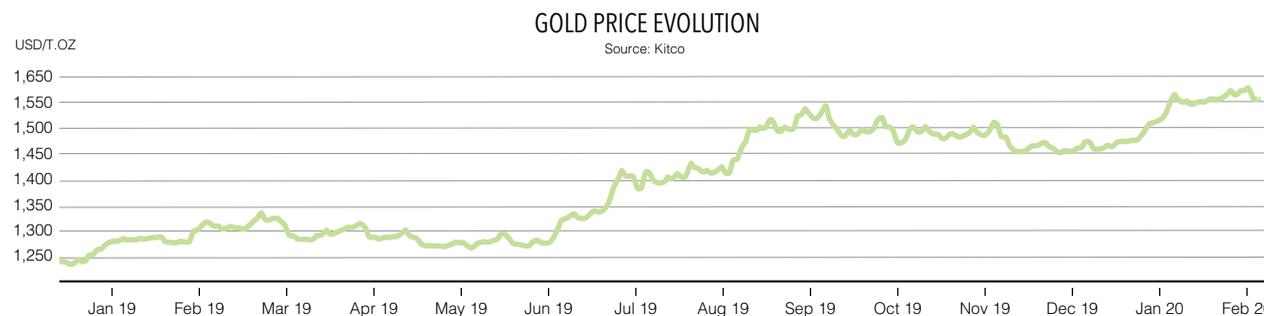
I believe there will be a copper price of around US\$3. We are targeting a mining method that will allow us to generate a positive cash flow even at the low parts of the cycle. The adoption of electric vehicles in the world automobile fleets will represent increased copper demand because the copper requirements in electric vehicles are four to five times those in cars with diesel or gas engines.

### What are Rockcliff's main targets for the next two years?

In the next three to four months we will have Preliminary Economic Analyses completed for the Rail, Talbot and Tower Deposits. We will then begin a bankable feasibility study on one of those in the second quarter of 2020, for completion by end of 2020, including any work needed in the Bucko Mill. They are near-surface deposits that do not require expensive shafts or complicated engineering – the rock characteristics are known due to the long history of mining in the area. Concurrently, we will finalize our financing plan and our permit applications. The construction of the mine and work on the mill will then be able to commence in 2021. ■



We want to mine a lot more on a daily basis than would traditionally be expected. This is thanks to the adoption of a digital mine site design from the onset and from combining technologies that have not been used in unison before.





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# GLOBAL REACH



» I believe that you mine a national asset. Whatever way you operate it, it belongs to the host country, and you have a role to deliver value out of that asset, otherwise you should leave it in the ground. «

- Mark Bristow,  
President & CEO,  
Barrick Gold Corp.

Image courtesy of Barrick Gold Corp.

## TORONTO'S GLOBAL REACH

# Mine the mines abroad, mine the markets in Toronto

⇒ "I always say asset quality overrides jurisdiction," professed Barrick chief Mark Bristow, a philosophy clearly shared by many mining companies headquartered in Toronto. From the biggest fish down to the micro-cap juniors, Canada is awash with companies headquartered in the home of mining, but with operations abroad.

Access to the capital markets and financial institutions, a wealth of mining expertise and a diverse international community all make Toronto an ideal hub for deal making and orchestrating financial support. As the home of the PDAC convention, which hosted attendees from 132 countries in 2019, what happens in Toronto invariably reverberates around the mining world.

On that note, Global Business Reports' annual guide to the Ontario mining industry would not be complete without an investigation into a variety of Toronto-based mining players plying their trade in countries with better coffee than Tim Hortons. Although jurisdictional stability has grown in importance in the eyes of investors in recent years, the tantalizing combination of underexplored and highly mineralized land with low operating costs continues to attract mining entrepreneurs.

### Are you a Mexican or a Mexican't?

While populist rhetoric from the President of the United States continues to stoke the price of gold and depress the price of copper, further south, the election of a populist of a different leaning, Andrés Manuel López Obrador (also known as AMLO), sparked fears that Mexico's government could interfere with a myriad of mining projects, many of which belong to Canada-based companies. Fortunately, AMLO announced that he will not interfere with current mining concessions. On the other hand, good luck getting new ones: "We will maintain these concessions, and we are not going to cancel them, but now we are also not going to continue issuing new mining concessions, because a lot have been handed out," the Mexican president declared in a press conference in Zacatecas state in August 2019. For those with concessions in hand, Mexico remains an excellent jurisdiction: "Mining is part of the fabric of the country and the country has many very strong mining laborers and professionals," commented Taj Singh, president and CEO of Discovery Metals (DSV), the well-funded silver explorer that received considerable financial backing in 2019, including C\$12 million from Eric Sprott in 2019 alone, who now owns 20% of the company. "In terms of costs to build a project and run a mine, it ranks very favorably to other nations in North America and South America," related Singh, adding: "Permitting and community engagement is transparent also and moves at a much better pace than other countries in this part of the world."

Also active in Durango state, Excellon Resources' Platosa mine has been Mexico's highest-grade silver producer, according to Brendan Cahill, president and CEO, who gave his views on the fundamentals of the precious metal with industrial uses: "At some point in time the global debt overhang has to be addressed. When those fractures start coming in to the market, gold and silver will be the place to be. We are already seeing this: there is huge sovereign buying of gold, and with negative interest rates there is no holding cost in gold. Silver is ultimately going to follow gold and then outperform it; but will not act independently."

On the gold side, one of the established Toronto-based mid-tiers active in Mexico is Torex Gold Resources (TXG), which saw its share price double from 2018 to 2019, a reflection of the transition of the company's El Limón Guajes mine to steady operation following the resolution to an illegal blockade in early-2018. "Since then, the mine has lived up to its potential, delivering record gold production in Q3 2019, following a record quarter in Q2 2019," clarified Fred Stafford, TXG's president and CEO. Operational performance combined with a resurgent gold price has allowed Torex to generate strong cash flow, which has been

directed towards strengthening the company's balance sheet, de-risking its Media Luna project and advancing its proprietary Muckahi Mining System.

The first blast of TXG's innovative Muckahi Mining System (pronounced "Muck-ah-high") took place in April 2019 and has been garnering attention from mine operators looking to reduce costs and optimize production. "If there is the potential of reducing costs by 30%, making an all-electric mine without any greenhouse gasses and producing less waste rock that must come to surface, you are going to attract interest from industry," remarked Stanford, who believes that once the integrated Muckahi system is demonstrated, it will become one of the cornerstones of TXG's growth strategy.

Minera Alamos is an advanced-stage exploration and development company with a growing portfolio of high-quality Mexican assets, which, according to vice president of business development Jason Kosec, has found a niche in the market: "There are a lot of orphaned assets that are not getting enough value on junior explorer's books. Our strategy is to develop low capex assets while expanding the near mine resource and pursuing complementary strategic acquisitions."

With near-term production targeted, Minera's Santana project is forecast to be in production in Q3 2020 and the Fortuna project in Q4 2021; Kosec praised the transparency of the Mexican permitting process, highlighting: "Typically, the process takes less than 12 months."

While brownfield projects that reinterpret historical data and utilize different exploration models can occasionally unearth elephants, such as Osisko's Canadian Malarctic discovery, establishing a new greenfield belt is the holy grail of exploration. While greenfield exploration has fallen out of fashion with the public markets, Sable Resources, led by a management team that has been responsible for discovering approximately 40 million oz globally, is focused on developing its large portfolio of greenfield projects to resource stage by utilizing an upper level epithermal strategy, according to president, CEO and chairman Tom Obradovich. Sable signed an option agreement to obtain 100% of the Margarita project, located in a region encom-

passed by Sunshine Silvers' claims associated with its 95 million oz Los Gatos discovery. "Initial sampling confirmed the validity of the first target with 3/4 of samples in the 100-900 g/mt Ag range. The project is drill ready, with permitting underway," said Obradovich, while discussing Sable's portfolio of assets, which also includes projects in Argentina and Peru.

The Canadian/Mexican alliance is also being utilized to strengthen the flow of mining talent throughout the LATAM region via Toronto-based recruitment agency Viarmosa International. "I realized that there were so many good mining companies headquartered in Canada which were struggling to find skilled labor and the right expertise for their operations in Latin America," observed executive partner, Victoria Moreno, adding: "Mexico has a very rich mining culture and a large mining workforce with skills and experience which can be used in operations elsewhere in Latin America."

### Diverse opportunities across Africa

London and Australia form natural hubs for Africa-focused mining companies, and China's growing influence in the region is apparent from its control of the cobalt supply chain in the DRC to its strategic infrastructure investments in East Africa. However, there are a number of success stories from the Toronto mining community active in Africa, with Teranga Gold being one of the standout performers in 2019.

"It has been a year of highlights for Teranga Gold," enthused Richard Young, president and CEO, who, in early December, announced plans to acquire the Massawa gold project from Barrick Gold. A non-core asset for Barrick, Massawa is ideally located right next door to Teranga's flagship Sabodala gold operation in Senegal and within 30 km of its plant. "As one of the highest-grade undeveloped open-pit gold reserves in Africa, the addition of Massawa is a game changing event for Teranga," Young stated, commenting that the acquisition is set to accelerate the repositioning of Teranga into a low-cost, mid-tier gold producer. 71>>



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**Torex Gold**  
RESOURCES INC.

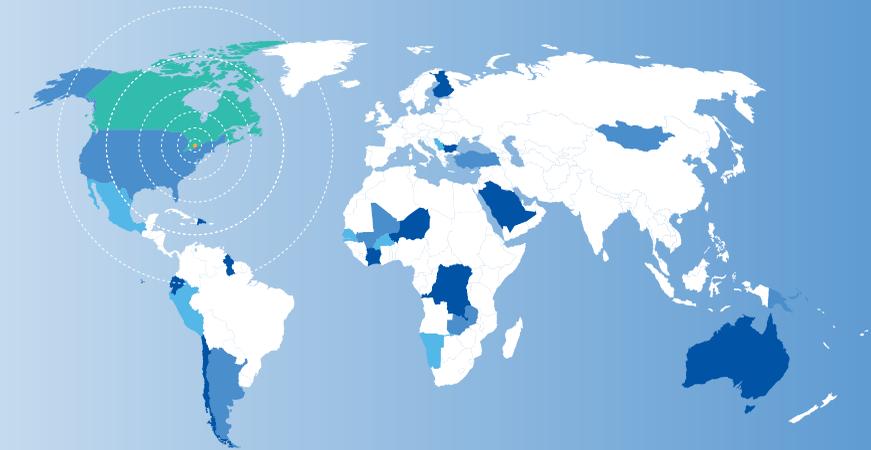
TSX: TXG

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**Muckahi**  
MINING SYSTEM

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# TORONTO'S GLOBAL REACH



This map includes those projects and companies mentioned in this editorial. It does not represent a complete list of exploration and production projects in the regions highlighted, and is intended for reference purposes only.

COMPANY	TICKER	COUNTRY	PROJECTS	MINERAL	STAGE
Adventus Mining Corp Alamos Gold	TSX.V: ADZN OTCQX: ADVZF TSX:AGI NYSE:AGI	Ecuador	Curipamba Project	Cu, Au, Ag	Prod, Dev, Expl.
		Mexico (Sonora)	Mulatos	Au	Production
		Mexico (Sonora)	El Chanante	Au	Production
		Turkey	Kirazli	Au, Ag	Development, Expl.
		Turkey	Agi Daği	Au, Ag	Development, Expl.
Aston Bay Aurania Resources	TSX.V: BAY, OTCQB: ATBHF TSX.V: ARU	Mexico	Esperanza	Au, Ag	Development, Expl.
		Turkey	Camyurt	Au, Ag	Development, Expl.
		United States	Buckingham Gold Project	Au, Cu, Zn	Development
		Ecuador	Lost Cities Project	Au	Exploration
		United States (Nevada)	Nevada Gold Mines	Au	Production
Barrick Corporation	TSX: ABX, NYSE: GOLD	US (Montana)	Golden Sunlight	Au	Production
		Saudi Arabia	Jabal Sayid	Cu	Production
		Democratic Republic of Congo	Kibali	Au	Production
		Peru	Lagunas Norte	Au	Production
		Mali	Loulo-Gounkoto	Au	Production
		Zambia	Lumwana	Cu	Production
		Mali	Morila	Au	Production
		Papua New Guinea	Porgera	Au	Production
		Dominican Republic	Pueblo Viejo	Au	Production
		Cote d'Ivoire	Tongon	Au	Production
		Argentina	Veladero	Au	Production
		Chile	Zaldívar	Cu	Production
		Mexico	Puerto Rico	Ag, Zn, Pb	Exploration
		Mexico	Minerva	Ag, Zn, Pb	Exploration
		Mexico	Cordero	Ag, Zn, Pb	Exploration
Mexico	Monclova	Ag, Zn, Pb	Exploration		
Excellon Resources INV Metals	TSE:EXN TSE: INV	Mexico	La Platosa	Ag	Production
		Ecuador	Loma Larga	Au	Exploration
		Australia	Fosterville	Au	Production
Kirkland Lake Gold	TSX: KL, NYSE: KL, ASX: KLA	Australia	Northern Territory	Au	Exploration
		Mongolia	Baavhai Uul	Li	Exploration
Ion Energy Minera Alamos	na TSXV: MAI	Mexico	La Fortuna	Au, Ag, Cu	Development
		Mexico	Santana	Au	Development
		Mexico	Los Reyes	Au, Ag	Development
Neo Lithium Corp Omai Gold Mines	TSXV: NLCX na	Argentina	Tres Quebradas	Li	Development
		Guyana	Omai Gold Mine	Au	Exploration, Dev.
		Mongolia	Altan Tsaagan Ovoo	Au, Ag	Production
Steppe Gold	TSE: TSGO	Mongolia	Mungo Discovery	Au, Ag	Exploration
		Mongolia	Uudam Khundii	Au, Ag	Exploration
		Senegal	Sabodala	Au	Production
Teranga Gold Corp	TSX: TGZ, OTCQX: TGCDF	Cote d'Ivoire	Miminvest Joint venture	Au	Exploration
		Cote d'Ivoire	Afema Joint Venture	Au	Exploration
		Senegal	Massawa	Au	Production
		Burkina Faso	Wahgnion	Au	Production
		Mexico	El Limon Guajes Mining Complex	Au	Production
Torex Gold Resources	TSX: TXG	Mexico	Media Luna	Au	Exploration
		Mexico	Margarita	Ag	Exploration
		Mexico	Vinata	Au, As, Sb, Hg, Ba	Exploration
Sable Resources	TSXV: SAE	Mexico	El Escarpe	Ag	Exploration
		Argentina	Don Julio	Au, Cu	Exploration
		Papua New Guinea	Ramu Nickel Cobalt Operation	Ni, Co	Production
Conic Metals Corp First Cobalt Premier Gold Mines	TSXV: NKL TSXV: FCC, OTCQX: FTSFFS TSX: PG	US (Idaho)	Iron Creek Project	Co, Cu	Exploration
		Mexico	Mercedes	Au, Ag	Production
		US (Nevada)	McCoy-Cove	Au	Exploration
		US (Nevada)	Rye-Goldbanks	Au	Exploration
		US (Nevada)	Cove	Au, Ag	Advanced Expl.
Trigon Metals	TSXV: TM	US (Nevada)	South Arturo	Au	Production
		Namibia	Kombat	Cu	Development
		Namibia	Gross Otavi	Cu, Ag, Pb	Exploration
Palladium One Global Atomic Corp	TSXV: PDM TSX: GLO	Namibia	Harasib	Cu	Exploration
		Finland	Läntinen Koillismaa Project	PGI, Ni, Cu	Exploration
		Niger	Dasa	U	Development
Dundee Precious Metals	TSX: DPM	Turkey	Befesa Silvermet JV	Zn	Production
		Serbia	Lenovac	Au, Cu	Exploration
		Serbia	Tulare	Au, Cu	Exploration
		Serbia	Timok Gold Project	Au	Exploration
		Bulgaria	Krumovgrad	Au, Cu	Production
Bulgaria	Chelopech	Au, Cu	Production		
Namibia	Tsumeb	Cu	Production		



## Fred Stanford

President & CEO  
**TOREX GOLD RESOURCES**



**If there is the potential of reducing costs by 30%, making an all-electric mine without any greenhouse gasses, and producing less waste rock that must come to surface, you are going to attract interest from industry.**



**From September 2018 to September 2019 Torex Gold Resources' (Torex Gold) share priced doubled. What has been the basis of this success?**

Torex Gold's share price performance over the last 12 months reflects the transition of our El Limón Guajes mine to steady state operation following the resolution to an illegal blockade in early-2018. Since then, the mine has lived up to its potential, delivering record gold production in Q3 2019, following a record quarter in Q2 2019. The operational performance in combination with a resurgent gold price has allowed Torex to generate strong cash flow, which we have directed towards strengthening our balance sheet, advancing our proprietary Muckahi Mining System, and de-risking our Media Luna project.

The operational performance in 2019 has been anchored by better than expected output from the open pits and Sub-Sill underground deposit. Exploration continues to find more resources from Sub-Sill and ELD. These higher-grade underground deposits provide a nice sweetener to the open pits, which are already relatively high-grade with a reserve grade of 2.9 g/mt gold. The process plant has performed excellently in terms of recoveries, and we are making steady progress at achieving targeted throughput of 13,000 mt/d.

**The first blast of Torex Gold's Muckahi Mining System (Muck-ah-high) took place in April 2019. What is the strategy for the development and implementation of this technology?**

Muckahi is a very different approach to material and personnel transport in an underground mine. The primary innovation is conveying muck from the tunneling face or production stope directly to surface or the shaft loading pocket. To make conveyors practical, innovation was required to steepen the ramps from a conventional 7 degrees to 30 degrees. 30-degree ramps cannot be excavated with rubber-tired equipment, so a further innovation was required. The adaption of a roof mounted monorail system made it possible to move equipment without rubber tires. The strategy for development is first to prove that the machines we have designed can achieve their purpose, and then to demonstrate that

when the machines are integrated into a mining system, that the system performs at the design rate.

The first big implementation decision has been taken. With the functional capabilities of the equipment proving up as per design, a decision has been made to dedicate the ELD deposit to testing the machines together as an integrated system. Once the integrated system is demonstrated we anticipate using it as one of the cornerstones of our growth strategy.

**Has Torex Gold been receiving global interest in Muckahi, and which type of companies have been contacting you?**

We have been receiving questions from various sources, especially from base metal miners. If there is the potential of reducing costs by 30%, making an all-electric mine without any greenhouse gasses, and producing less waste rock that must come to surface, you are going to attract interest from industry. We will wait until we prove Muckahi up before giving definitive answers to the questions posed.

Muckahi will fit in any type of underground mine, except a block cave operation, given fragmentation is the key variable to control. We believe we can potentially triple the productivity of an underground mine given the ability to achieve continuous mucking at the face, conveyors to transport ore directly from the stope to surface, and fewer stopes in cycle.

**What does the near-term future hold for Torex Gold, and what would the company like to achieve?**

We have achieved full year gold production of 430,000 oz (+/- 7%) in 2019 and will look to replicate a similar performance over the next few years. The solid cash flow from El Limón Guajes is expected to provide the capital required to advance Media Luna to production and prove out Muckahi. We believe Muckahi gives Torex Gold a spectacular platform from which to grow. We want to deliver on these aspects while maintaining the social processes that have been successful to date. We try to create a work experience where people willingly give their best, and the workplace is organized such that teams giving their best can be safe and highly productive. ■

# Rick Howes

President & CEO  
DUNDEE PRECIOUS METALS



⇒ **Dundee Precious Metals (DPM) announced record gold production for 2019. What were the main factors behind these results?**

This was as a result of our successful construction, commissioning and ramp-up completion in 2019 of our newest gold mine in Bulgaria, the Ada Tepe mine (previously referred to as the Krumovgrad Project). This is a high grade, low cost, open pit gold mine with an 8 year mine life, which will produce over 100,000 oz/y for the first 5 years on average. We completed the construction and commissioning of the mine in June of last year and ramped up to full production by September, generating 57,000 oz of production to the end of 2019. The first full year of production from Ada Tepe will be this year, so we should see another record year of gold production in 2020 also making us the largest gold producer in Europe. Our Chelopech Gold Copper mine, also in Bulgaria, had another strong year pro-

ducing 173,000 oz of gold and 37 million pounds of copper.

**Which technologies implemented in your mines in the last two years have had a particularly good impact?**

We have implemented a new flotation technology called Staged Flotation Reactors in both our Chelopech mill and in our new Ada Tepe mill. This has significantly reduced energy requirements and has shrunk the footprint required compared with conventional flotation cells. We are currently working to implement this full strategy in our mills. We have implemented autonomous drones for mapping of the underground mine excavations, and in particular, the open stope blasts. This allow us to get close to real-time feedback on the design and allow us to optimize the drilling and blast design to achieve minimal dilution (overbreak) and maximum recovery. ■

# Richard Young

President & CEO  
TERANGA GOLD



⇒ **In December 2019, Teranga Gold announced the acquisition of the Massawa gold project from Barrick. How significant is this acquisition for the company's development?**

In early December, we announced our plans to acquire the Massawa gold project from Barrick Gold. Massawa is located in Senegal, right next door to our flagship Sabodala gold operation and within 30 km of our plant.

As one of the highest-grade undeveloped open-pit gold reserves in Africa, the addition of Massawa is a game changing event for Teranga. Massawa is expected to transform our Sabodala mine into a top tier asset with higher grade and an extended mine life, and accelerate the repositioning of Teranga into a low-cost, mid-tier gold producer.

**What have been the main milestones achieved by Teranga Gold over the last 12 months?**

As of the beginning of November, Teranga's newest mine, Wahgnion, located in southeast Burkina Faso, achieved commercial production. Wahgnion is our second producing gold mine and was completed approximately US\$15 million

below budget and two months ahead of schedule.

Commencing in 2020, Wahgnion is expected to increase company-wide annual production by 50% and play an important role in advancing Teranga towards its vision of being a mid-tier gold producer. And while Wahgnion is a smaller operation than Sabodala, it is lower cost and is expected to double mine-level free cash flow.

Wahgnion was one of three assets acquired by Teranga as part of our purchase of Gryphon Minerals in 2016. The acquisition also included two exploration properties in Burkina Faso: Golden Hill and Gourma. Golden Hill is now our most advanced-stage exploration property and, in February of this year, we announced an early-stage initial resource. Multiple high-grade, near-surface and deeper gold discoveries at Golden Hill indicate district-scale potential.

**How has Sabodala performed in this time period?**

Last year we delivered our third consecutive year of record production with 245,000 ounces of gold. ■



# Stephen G. Roman

President & CEO  
GLOBAL ATOMIC CORPORATION



**From an environmental standpoint, compare the amount of resources needed and footprint left by a large-scale solar or wind power installation, to nuclear alternatives such as a small modular reactor (SMR), and you will realize the uranium's sustainable value to our future.**



**Can you provide an overview of Global Atomic Corporation's dual focus in Niger and Turkey?**

Global Atomic Corporation is a Canadian company trading on the TSX that is advancing the high-grade, large DASA uranium deposit in the Republic of Niger. The DASA project has a resource of 250 million pounds uranium and is in the middle of three existing plants, with excellent access to infrastructure. In addition, Global Atomic benefits from the significant dividend stream generated by its share in the Befesa Silvermet zinc concentrate production facility in Turkey. We are differentiated from other junior companies in that we have a positive cash flow and second, we have a project that is large, high grade and can be permitted very quickly.

**What is the timeline for development for the DASA uranium project?**

The permitting window in Niger is four to six months – as long as you provide a feasibility study and an environmental impact statement, both of which we are currently working on.

**Can you elaborate on Global Atomic's recently expanded zinc processing plant in Turkey?**

Befesa Silvermet acquires electric arc furnace dust ("EAFD") from steel mills and recycles the EAFD through its Waelz kiln to produce a high-grade zinc oxide concentrate which is sold to zinc smelters throughout the world. We just commissioned the new plant in Turkey, which had been shut down in 2019, so we could complete the construction. Global Atomic's EBITDA from 2018 was US\$13 million, and the new plant should double that in 2020 as it has twice as much throughput.

**How do you view the fundamentals of zinc and uranium pricing?**

The trade tension between China and the USA has affected base metal pricing including copper and zinc, and Chinese exports to the United States are down 25%. Zinc is trading at around US\$1/lb, down from a high of US\$1.50 a year ago. I expect construction will recover providing relief to base metal prices. Once things settle, the price should start rising to US\$1.10 or US\$1.20/lb.

I think the uranium market will stabilize and start to move up as utilities that have been accessing the secondary market start seeing reserves dry-up. The Kazakhs have started a new marketing project and taken Kazatomprom public. Clearly, it is in their interest to increase the value of their asset. Between the Kazaks and Cameco, the two biggest producers, they have cut back some production to stabilize the market. Being a lower quartile producer we can weather lower prices and when they rebound we should be making a lot of money.

**Where would you like to see the company by the end of 2020?**

By the end of 2020, we would like to have the mining permit process complete so we can move ahead with construction of the DASA mine. Once we have the capex nailed down, we could leverage the cash flow to raise financing, as we would like to keep share dilution to a minimum and expect to have sufficient capital to go through the feasibility study process. In Turkey, we expect to see greater revenue now the new facility is up and running and would also like to have debt related to the plant completely paid off.

**Do you have a final message for the readers of Global Business Reports?**

Global Atomic has two very solid businesses that we feel are going to do well in both the near and long term. Zinc is a very valuable metal that is used to galvanize steel and augment soil fertility – with robust demand forecasts for both uses. Specific to our project, Turkey is the second largest steel producer in Europe, the eighth largest in the world, and gets 80% of its material for production from scrap. We have excellent access to steel mills in the vicinity that supply our feed. A high-grade zinc producer in Turkey is excellent from a business case. ■





## Jed Richardson

President & CEO  
TRIGON METALS



**Country risk is what it is, the real risk is the next dollar... Too often mines have been built on excel spreadsheets without taking practical realities and the myriad of risks associated with development into consideration. In a sense, the market is a little smarter now, and companies need to work harder to prove their value.**



### Can you provide an overview of Trigon Metals and the company's portfolio of projects in Africa?

Trigon Metals is a TSX.V-listed, Toronto-based junior focused on African copper. The past-producing Kombat mine in Namibia is Trigon's flagship asset, and has a clear and quick path to be brought back in to production in one of the premier destinations for mining around the world.

Additionally, we recently acquired the Silver Hill project in Morocco, an earlier stage asset with vast exploration potential, with ancient slags grading 2.5% Cu distributed widely across one third of the concession surface. Trigon's local partners have also discovered silver at the property recorded in shallow drill holes (1m at 623 g/mt Ag or 4m at 263 g/mt Ag at 35m depth).

### Why did the Kombat mine stop producing in 2008 and what are the necessary steps to bring it back into production?

Mismanagement from the previous owners was the overarching theme, but specifically there was a flood that forced the closure of the mine. At the time just after the global financial crash, they were not able to go back to capital markets to finance themselves out of the issue. They had a guarantee that had been put in place with the Namibian government to do the expansion and the holders ended up taking the mine.

The key now is putting together the necessary finance to restart the operation. We have been looking at ways to do this without a lot of dilution. In March 2018, Trigon entered into an agreement with a Chinese engineering and procurement group call Xinhai, which is working on a study to present to Chinese banks, allowing us to use the export credit facilities of the Chinese government. The actual construction of the mine would take only six months, and studies suggest that the capex for construction would be only US\$7.5 million for an open pit resource. However, we are looking at a blended open-pit/underground operation for higher grade material, which would incur a slightly larger capex but would ensure a longer life of mine.

### What are your thoughts on the current climate for raising finance as a junior, and why do you think it has been so difficult despite robust metals prices?

Although there have been structural changes to the way projects are financed, I think this has not changed as much as some people would point to. There is still a fair bit of investment capital for exploration. The trouble is at this mezzanine level where you have done all your studies and have an operation you are trying to put in to production, it is very difficult to raise finance. The problem lies with a previous misuse of capital by the junior/development market, as companies were building mines with the view to sell them – rather than really building to move into sustained production. The few companies that have successfully navigated the path from exploration to production, such as Osisko, are held in a rarefied air because of they are the exception rather than the rule.

In Trigon's case, that is why we looked at what is properly financeable in today's market and decided on a low-capex restart. Too often mines have been built on excel spreadsheets without taking practical realities and the myriad of risks associated with development into consideration. In a sense, the market is a little smarter now, and companies need to work harder to prove their value.

### Do you have a final message for mining investors?

I want to emphasize the two key points on how you make money in mining investment. Firstly, through discovery: drilling and creating value for a piece of land where there was no value before. Secondly, the transition from spending to earning as a mine comes into production. Trigon has both of those opportunities in the Kombat mine in Namibia for a very low capital expenditure, and the Silver Hill project in Morocco which has superb exploration upside. There are a lot of risks in mining, in both geology and investment capital. Managing those risks is something Trigon will do very well because we operate in premiere jurisdictions that are very mine-friendly and friendly to international investment. ■

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Additionally, Teranga's newest mine, Wahgnion, located in southeast Burkina Faso, achieved commercial production C\$15 million below budget and two months ahead of schedule in August 2019. "We are really pleased with the work of our team and contractors throughout this project and in particular with the fact that it was completed with no lost time incidents over 5.3 million hours worked," added Young.

In the neighboring Republic of Niger, Global Atomic Corporation is advancing its large, high-grade, DASA uranium deposit with a resource of 250 million pounds and located in the middle of three existing plants. In contrast to the majority of junior companies, Global Atomic benefits from a positive cash flow from the significant dividend stream generated by its share in the Befesa Silvermet zinc concentrate production facility in Turkey, which was upgraded in 2019 and forecast to double throughput in 2020.

Stephen G. Roman, Global Atomic's president and CEO, would like to have the mining permit process complete by the end of 2020 so that the company can move ahead with construction of the DASA mine. Elaborating on the outlook for uranium, Roman said: "From an environmental standpoint, compare the amount of resources needed and footprint left by a large-scale solar or wind power installation to nuclear alternatives, such as a small modular reactor (SMR), and you will realize uranium's sustainable value to our future."

On the other side of the continent, Barrick expanded its footprint from north-eastern DRC into Tanzania, creating a new operating company called Twiga Minerals Corporation in partnership with the Tanzanian government to manage the Bulyanhulu, North Mara and Buzwagi mines. "With the launch of Twiga Minerals in Tanzania, we are breaking new ground and pioneering the way we share the economics of mining with host countries in a developing world," stated Bristow.

Trigon Metals is a Toronto-based junior focused on African copper, with projects in Namibia and Morocco. Elaborating on the company's decision to focus on a low-capex restart at its flagship past-producing Kombat mine asset in Namibia, Jed Richardson, president and CEO, underlined the importance of looking at what

Image courtesy of Major Drilling



is properly financeable in today's market: "Country risk is what it is; the real risk is the next dollar," he reflected, continuing: "If I come to you and say I need US\$100 million and I only raise US\$50 million, then I am in trouble because a half built mine is worth nothing. Too often, mines have been built on excel spreadsheets without taking practical realities and the myriad of risks associated with development into consideration. In a sense, the market is a little smarter now, and companies need to work harder to prove their value."

### Mongolia ramps up mining development

Mongolia's mining minister, Dolgorsüren-giin Sumyaabazar, reassured Rio Tinto in November by declaring that the company's US\$7 billion expansion of the Oyu Tolgoi underground copper-gold mine, the second largest copper deposit in the world, will not be stopped. The minister's words eased fears the government could try to renegotiate contractual agreements after the Mongolian parliament backed a petition to revise documents related to the asset's development. "The government understands that mining is a major contributor to the GDP and pays the vast majority of taxes in the country,"

observed Ali Haji, CEO of Mongolian lithium-focused exploration company Ion Energy, which plans to go public in early 2020.

Half of Ion Energy's board is Mongolian, including Bataa Tumur-Ochir, the new president and CEO of Steppe Gold appointed in December 2019. Since its IPO in May 2018, Steppe Gold has made rapid progress completing the mine build at its ATO project, commissioning the crusher, completing a trial mining phase at a positive grade reconciliation of 2.3 g/mt gold and receiving the last of its permits in December 2019 to move into production. Aneel Waraich, Steppe's executive vice president and director, explained how the company's projected sustaining costs going into 2020 are approximately US\$650/oz including refining and royalties: "In Mongolia there is a skilled labor force at a cheaper cost than anywhere else in the world. This means that we were able to build our mine cheaper than anywhere else. We had equipment coming in from China, which meant that logistical lead times were quite quick and the costs were also relatively cheap."

Underlining Steppe Gold's focus on becoming a mid-tier Mongolian precious metals company, Waraich gave his outlook for the new year: "By December 2020, Steppe Gold will be in commercial production and at full run rate at the

company's heap leach operation. We will also have completed strong exploration programs on our ATO, Mungu and UK projects."

Bayar Baatar, principal consultant and founder of Toronto-based Baatar Consulting, commented that Steppe's appointment of a Mongolian national as CEO is proof that the country is catching up with its human capital to act on a world stage in resource development. Additionally, Erdene Resource Development Corp becoming the first company to be dual-listed in Mongolia and the TSX "is a landmark move for the country and demonstrates the government's interest in seeing its citizens – the ultimate beneficiaries of the natural resources of the country – share the risk and reward of mining projects via stock ownership."

#### **Ecuador: vast resource potential vs. social tension**

A milestone was achieved by Ecuador's burgeoning mining community in 2019 as Lundin Gold poured its first gold bar from the giant, high-grade Fruta del Norte project in November. However, mining development has not been plain sailing in 2019 for the mineral-rich South American country that many believe will be the next hotspot of world mining.

In October 2019, after the government announced IMF imposed austerity reforms and the end to a fuel subsidy, protests brought Quito to a standstill for 10 days. "The government is now in a position where it must decide whether to implement austerity policies, which could possibly drive political instability and hamper economic growth, or run the risk of alienating international organizations during a time of significant financial need," reflected Keith Barron, chairman and CEO of Aurania Resources.

In November, Aurania announced it had found vestiges of an old road at the center of its flagship asset, The Lost Cities Cutucu project, which it believes provides evidence that its project sits within one of Ecuador's lost gold mining centers.

Another Toronto-based junior exploring in Ecuador is Adventus Mining, which, in 2019, updated the existing high-grade resource at its flagship Curipamba project, increasing the grade by approxi-

mately 20%, according to president, CEO and director, Christian Kargl-Simard. Adventus has not been impacted by any political and social turmoil in Ecuador, and Kargl-Simard has noticed continual improvements to the mining landscape: "In the last 12 months the government has made further mining policy improvements including the elimination of the sovereign adjustment and VAT on capital items for mining projects," he said, noting that the government sees the modern mining industry being potentially the main economic driver for the country moving forward. "Ecuador is developing into a mining country which is open for business with government and business leaders in the country working to attract further investment. In 2018, there was approximately US\$1.7 billion in foreign direct investment into Ecuador, of which two-thirds were investments into the mining industry," he noted.

Toronto-based junior INV Metals has the backing of IAMGOLD with a 35.6% stake, and Dundee Precious Metals with a 19.5% stake, partnerships that Candace MacGibbon, INV Metals' CEO, believes will help the company grow. Currently developing its Loma Larga project, the eighth lowest cost gold development project in the world (according to miningintelligence.com), she stated: "Ecuador's mineral potential is vast, I believe it is one of the few mining jurisdictions where "elephants" can be found in greenfield exploration."

#### **Guyana's extractive industries to rejuvenate economy**

The new decade looks bright for Guyana, as the IMF has forecast the South American country's GDP will triple within the next five years, making it the fastest-growing economy per capita in the world. The main driver will be ExxonMobil's vast Stabroek Block offshore oil discovery, which is expected to go into production in 2020.

Natural resource extraction has been foundational to Guyana's economy for many years, with the past-producing Omai gold mine being the largest employer in Guyana and representing 23% of the country's GDP during its productive years, according to Denis Clement,

chairman of Omai Gold Mines. After producing 3.7 million oz between 1992 and 2005 at an open pit average grade of 1.7 g/mt and annual production between 250,000 and 350,000 oz, the mine closed in 2005 due to low gold prices.

"The Omai gold mine is extremely underexplored," said Clement, mentioning that the limited drilling performed did, however, show that gold mineralization continues both along strike and to depth from both of the historic mining pits. "Our geological team also has extensive knowledge of the Omai deposit and the Guyana shield in general, and we believe that resources at Omai will be increased significantly to re-establish a major new gold mining opportunity in Guyana."

#### **Exploring the United States**

Closer to home, Toronto-based junior Aston Bay decided to shift its focus from base metals in Nunavut, to gold in the U.S. state of Virginia. Nevada may be the most famous and most prolific gold-producing region in the United States, but Virginia was the center of gold mining prior to the California gold rush, related Thomas Ullrich, Aston Bay's CEO. "We believe that there is great potential in employing modern techniques and mining methods to an area that has been minimally explored since 1850. Geochemistry, geophysics, drilling and mine dewatering/pumping technologies are all subsequent innovations," he explained.

Aston Bay acquired Don Taylor's private company Jack's Fork Exploration (JFE), which included the Blue Ridge project. Don Taylor, the former COO of Arizona Mining and the 2018 Thayer Lindsley Award winner for his discovery of the Taylor deposit in Nevada, has also joined Aston Bay as a technical advisor. "The Buckingham gold property was the first agreement we signed in early 2019, and we have already started drilling operations there. Considering the way the market has turned toward gold with its rise in price and away from base metals, our efforts will continue to focus on gold in Virginia," explained Ullrich, noting that when the market's appetite for base metals improves, Aston Bay has significant copper, zinc and cobalt plays to explore further. ■

## TORONTO'S INFLUENCE IN MEXICO

"There is a developing sovereign debt crisis and the prospect for risk-mitigation assets is strong. But the real trade may take time to crystalize, so it's simply the classic question of, can you stay solvent longer than the market stays irrational? Or, do you have the nerve to complete the trade? Nevertheless, at some point the global debt overhang has to be addressed. When those factors start coming into the market, gold and silver will be the place to be. We are already seeing this: there is huge sovereign buying of gold, and with negative interest rates there is no holding cost in gold. Silver is ultimately going to follow gold and then outperform it; but won't act independently."

- **Brendan Cahill, President & CEO,**  
**Excellon Resources**

"The Minera Alamos team has successfully built three mines in the last 12 years, including founding Castle Gold and developing the El Castillo mine for US\$8 million, which was later sold to Argonaut Gold for US\$130 million. We are focused on opportunistically acquiring and developing high-quality mining assets that are close to production, capable of high operating margins, and modest in size. Minera Alamos currently has two assets in Mexico; the La Fortuna open pit gold CIL project in Durango and the Santana open pit heap-leach development project in Sonora."

- **Jason Kosec, VP Business Development,**  
**Minera Alamos**

"Mexico, in our minds, is still one of the best mining jurisdictions in the world. As I said, it ranks as the first silver producer in the world but also ranks among the top countries in gold, copper, zinc, lead and coal. Mining is part of the fabric of the country and the country has many very strong mining laborers and professionals. In terms of costs to build a project and run a mine, it ranks very favorably to other nations in North and South America. Permitting and community engagement is transparent also and moves at a much better pace than other countries in this part of the world."

- **Taj Singh, President & CEO,**  
**Discovery Metals**

"In Mexico, we signed an option agreement to obtain 100% of the Margarita project, located in a region totally encompassed by Sunshine Silvers' claims associated with their 95 million oz Los Gatos discovery. Initial sampling confirmed the validity of the first target with 3/4 of samples in the 100-900 g/mt Ag range. The project is drill ready, with permitting underway. Also in Mexico, the Vinata project is an advanced asset generated by BlueJoint Resources as part of their extensive greenfields exploration program. The silica textures observed and geochemical signature of low anomalies of Au, strongly anomalous As, Sb, Hg and Ba, and low Ag, Cu, Pb and Zn are characteristic of the upper levels of an epithermal system."

- **Tom Obradovich, President & CEO,**  
**Sable Resources**

## Candace MacGibbon

CEO  
INV METALS



### Can you provide an overview of INV Metals portfolio of projects in Ecuador?

INV Metals acquired the Loma Larga gold-copper-silver project from IAMGOLD in 2012. INV Metals published the results of a feasibility study in November 2018, which confirm Loma Larga is a robust project with a 30% after tax IRR and a 5% after tax NAV of US\$486 million at a gold price of US\$1,450 per ounce. Loma Larga will be an underground mine with an initial 12 year mine life, producing over 200,000 oz/y and employing almost 500 employees when in production. We will be focused on the advancement of Loma Larga in 2020, with the goal of commencing construction in 2021. We also hold 4 greenfield exploration projects in Ecuador.

### How do you view Ecuador as a mining jurisdiction?

Ecuador is an emerging mining jurisdiction and the government's willingness to support the industry is very apparent. Ecuador's mineral potential is vast. I believe it is one of the few mining jurisdictions where "elephants" can be found in greenfield exploration.

### What are INV Metals' short-term objectives moving forward?

In addition to our focus on advancing Loma Larga, we expect to commence an initial 2,000m drill program at Tierras Coloradas to test the areas where high grade gold was discovered. ■

## Christian Kargl-Simard

President, CEO & Director  
ADVENTUS MINING CORPORATION



### What have been the main milestones achieved by Adventus Mining Corp. (Adventus) over the last 12 months?

When we last met, Adventus was preparing for three significant airborne geophysical programs on its projects in Ecuador. With the surveys completed, we have developed 14 regional targets at Curipamba outside of the known El Domo deposit and approximately 20 copper-gold porphyry targets at the Pijili and Santiago projects.

On the ground at our three projects, we have been working on soil sampling, chip sampling, trenching and reconnaissance on all the identified geophysical targets, with the view of ranking them ahead of drilling.

From an engineering and development perspective, we have updated the existing high-grade resource at Curipamba, increasing the metal grades by approximately 20%. For the first time, we have a measured component to the overall resource and have also put economics behind the project through a PEA, which shows a 40% after tax rate of return, a less than two year payback, and approximately 100,000 oz AuEq production for 15 years.

### What is Adventus' vision for the future?

We aim to get to a construction decision on our existing El Domo resource at Curipamba in 2022. We expect to be drilling at Curipamba imminently, and Pijili and Santiago during 2020. ■

## Dr. Keith Barron

Chairman & CEO  
AURANIA RESOURCES



### Can you take us through the major developments of Aurania Resources over the past 12 months?

Aurania Resources has completed a drill program on our Crunchy Hill gold target. The result did not come out exactly as we expected, and when we analyzed the data, we found that we have the right type of alteration, but probably did not go deep enough on this target. We moved on to another target, Yawi, where drilling equipment has been mobilized to site for the scout drilling on the first of the epithermal targets. The plan is to drill three to four holes of between 350m and 500m in length on each of the identified targets.

### What is Aurania Resources doing for the environment and the communities in the vicinity that the company works in?

We are committed to work with our host communities and find solutions which will benefit all. To date, we have had more than 1,000 indigenous persons working for the company. In many cases this is the first paying wage these people have ever had. We have set up and privately funded the Step Forward Foundation which is implementing health and education initiatives in the communities, especially for the young people. We have opened a health clinic for five communities. ■

## Aneel Waraich

Executive Vice President & Director  
STEPPE GOLD



### What have been the main milestones achieved by Steppe Gold over the last 12 months?

Steppe Gold has managed to complete the mine build at its ATO project and commissioned the crusher. The company has been trial mining at ATO since November 2018 and completed Phase I mining in the Spring with 275,000 mt mined at a positive grade reconciliation of 2.3 g/mt Au for approximately 17,000 oz Au.

In Mongolia there is a skilled labor force at a cheaper cost than anywhere else in the world. This means that we were able to build our mine cheaper than anywhere else. We had equipment coming in from China, which meant that logistical lead times were quite quick and the costs were also relatively cheap. Our projected cast costs going into 2020 are approximately US\$550/oz, including refining costs and royalties, and we expect the sustaining costs to be approximately US\$650/oz. We are also very fortunate that the price of gold is working in our favor.



### What were the circumstances surrounding the creation of Ion Energy and how the company has leveraged its relationships in Mongolia?

Ion Energy is a private company incorporated in 2017 and has been engaged in the business of seeking and identifying lithium assets in Asia. Ion Energy was looking at lithium assets in Mongolia and was seeking a licence. It took some time for the licence to come to tender and we only won the licence in March 2019.

### Can you provide details of the company's flagship Baavhai-Uul project?

The licence is approximately 81,000 hectares. Ion Energy's competitive advantage is the fact that the company's land package sits only 20km away from the largest consumer of lithium in the world – China. We are still very much greenfield and have an extensive exploration plan for the next 12 months that we will begin executing following the RTO. We have identified two targets on which to focus on, primarily around the areas where we initially performed sampling.

### What is the current status of the Mungu Discovery and its timeline for development?

The Mungu gold and silver discovery is located immediately northeast of the current resource at the ATO project. It is a structurally controlled epithermal gold-silver system with localized bonanza grades.

Since listing, Steppe Gold has managed to drill another 11,000 m in 2019. Some of this drilling was done on Mungu, some was done on the Mungu Gap, and some was done on ATO 2 and ATO 4. These results will be tied into our resource update. Mungu has never had a resource put out and we will thus reveal a maiden resource in the update.

### Does Steppe Gold plan to drill the Uudam Khundii (UK) project in 2020?

Steppe Gold did not have the chance to drill our UK project in 2019, based on time and resources. However, we have done all the groundwork and have four discoveries which we would like to follow up on. ■

## Ali Haji

CEO  
ION ENERGY



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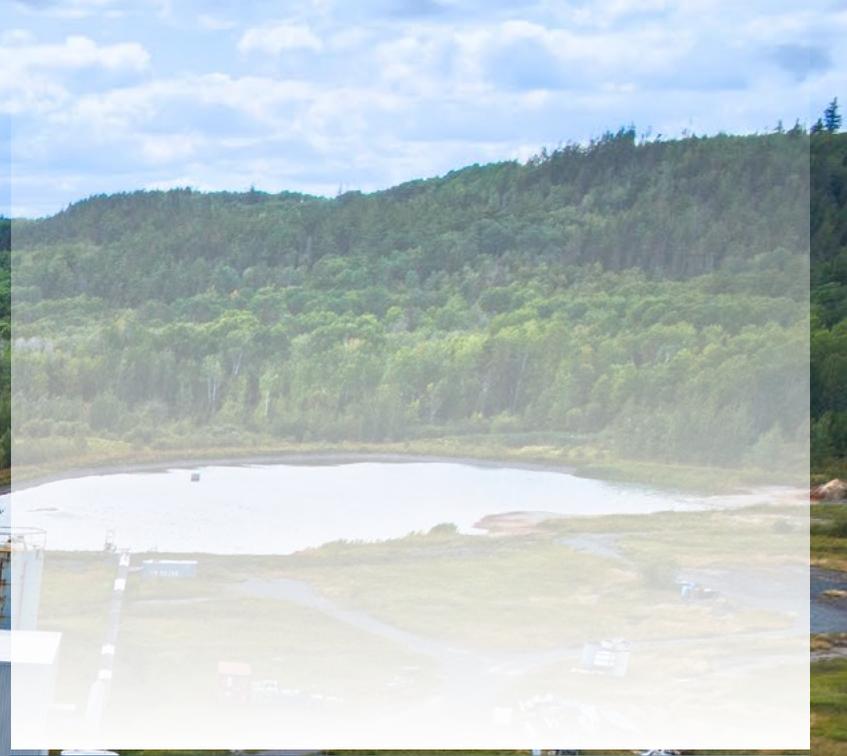
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### Can you comment on the current mining environment in Mongolia?

It has been reassuring to receive a unified pro-mining message from both political parties with the 2020 election coming up in June. The government understands that mining is a major contributor to the GDP and pays the vast majority of taxes in the country. We have not seen any drawbacks and we have a positive outlook for the mining climate in Mongolia.

### What do you believe is the company's strategic advantage moving forward?

Ion Energy has the advantage that we are extremely close to market, the terrain is favorable, the climate is ideal, and we are in close proximity to infrastructure. Terrain has a great impact on costs as well as time it takes to production. We think we can move quite quickly and aim to be in production within the next 24 to 36 months. We believe that the potential in the lithium market is vast and we would like to become the largest lithium holder in the Asia Pacific region. ■



GBR • Industry Explorations • MINING IN ONTARIO AND TORONTO'S GLOBAL REACH 2020

# THE BATTERY METAL SUPPLY CHAIN



» We have to look at supply chains and value chains in terms of what is driving the development. Instead of driving development from the resource, it should be driven from the magnet, battery or end product. «

- Janice Zinck,  
Director – Green Mining Innovation,  
CanmetMINING,  
Natural Resources Canada

Image courtesy of First Cobalt

## THE BATTERY METAL SUPPLY CHAIN

# North American collaboration in the effort to catch up with China

Although the United States and China announced a preliminary “phase one” trade agreement in December 2019, the future of their economic relationship remains uncertain. A defining feature of the Trump administration’s economic policies has been its embrace of international trade protection, and while the United States holds the upper hand in most markets, China’s dominance in the battery metals supply chain is indisputable. Electric vehicle (EV) sales grew to more than two million units globally in 2018: an increase of 63% on a year-on-year basis. Comparing the 2019 adoption

rates for EVs, China leads comfortably with 6%, compared to 2.6% in Europe and North America, and 2.2% for the rest of the world. However, adoption rates are less of a cause for concern than the fact that China currently dictates the supply dynamics for the majority of metals used in the production of EVs and batteries.

The fact that Tesla chose Shanghai as the location of its Gigafactory, built the plant in less than one year in 2019, and quickly raised an additional US\$1.6 billion (through a consortium of state-backed Chinese lenders) in December for a plant expansion, is emblematic of the speed and assertiveness being shown by the Chinese in the battery race. The new plant is expected to double production capacity of Tesla’s Model 3 sedan, will be the company’s first manufacturing site outside the US, and China’s first vehicle plant wholly owned by a foreign company.

On January 9, 2020, Prime Minister Trudeau and President Trump announced the Canada-US Joint Action Plan on Critical Minerals Collaboration had been finalized, aimed to advance the countries’ mutual interest in securing supply chains. Canada is already a leading producer of nickel and cobalt and has another 70 advanced projects for both metals, according to a July 2019 presentation by Hilary Morgan, director of international affairs at Natural Resources Canada. Additionally, Canada is home to 16 advanced rare earths projects and 17 advanced and near-stage lithium projects.

“Governments are now recognizing the need to create critical minerals supply chains outside of China,” reflected Don Bubar, president and CEO of Avalon Advanced Materials and one of the leading North American voices in the field of rare metals and critical minerals. “There is more urgency for other countries to develop their own critical minerals supply chains due to the risk of China restricting supply,” he added, continuing: “We have all of these minerals in the ground in Canada, and the time has come for us to take advantage of the opportunity by extracting these minerals and creating the value-added in Canada.”

Mark Warner, lawyer at Pilot Law LLP, suggested that Canada has the potential to be one of the countries to benefit from the current trade war by becoming a reliable alternative supplier for the United States, but such a context depends on the Canadian mining industry actually being able to get resources out of the ground. “The trade war has shown the need for a counter point to China. The demand and need is definitely there, but the question is if there is political will from North America, including Canada, to take advantage of this opportunity,” Warner pointed out, noting that Canada has seen a significant amount of mining investment coming from China, which could create challenges in the development of a North American supply chain.

Janice Zinck, director of green mining innovation at Canmet-MINING, part of Natural Resources Canada, commented that China’s dominance in the critical mineral space started 30 years ago and their long-term strategy allowed them to overtake competitors: “At that time, everybody was comfortable

allowing China to supply products. Our resource strategies are not nearly as long term in the Western world as they are in China,” she remarked.

“Canada is well-positioned to occupy a greater space in the value chain, but we need to be more strategic and invest in developing those resources,” added Zinck, commenting that Canada is rich in mineral resources and has the necessary expertise, but needs to accelerate the pace at which it is advancing projects. “We have to look at supply-chains and value-chains in terms of what is driving the development. Instead of driving development from the resource, it should be driven from the magnet, battery or end product.”

### Breaking the DRC/China stranglehold on cobalt

Currently, 72% of cobalt mine supply is controlled by the DRC and 60% of refinery supply is Chinese. At the Pilot Law LLP round table held in October titled “Trade and other International Law Issues Which May Impact Your Mining Business,” discussion centered around how the North American automotive industry is exposed to battery supply squeezes by way of political instability in the DRC or Chinese trade tactics. Robin Goad, president and CEO of Fortune Minerals, echoed the conference’s mood when he stated: “Having control over the critical minerals used in the batteries and the other parts needed to make EVs, means [China] can also influence where new factories will be built to produce these vehicles.”

Through investments in infrastructure and business interests from state-owned enterprises, China has accrued considerable influence over the vast Central African nation. Although efforts are being made to diversify production, the DRC’s role within the cobalt supply chain is expected to increase to 75% of global mine supply in 2020 rather than decrease. However, Goad highlighted the growing importance of transparent cobalt supply from a consumer standpoint: “Ethical raw material procurement and supply chain transparency are also important to global manufacturers that do not want their brands tainted by materials that are associated with conflict, child labor, dangerous working conditions or environmental degradation.”

From 2016 to 2018, the price of cobalt more than doubled, climbing above US\$42/lb in early 2018 before increased artisanal supply from the DRC caused the price to drop and plateau to its five-year median of around US\$16/lb. However, the fundamentals for cobalt are robust with demand accelerating incrementally due to its use in the cathodes of lithium-ion batteries needed for automotive electrification, in stationary storage cells to make electricity use more efficient and in portable electronic devices. Frank J. Basa, president and CEO of Canada Cobalt Works, gave his take on cobalt’s outlook: “This price move [from October 2016 to January 2018] is generally regarded as the beginning of a mega trend with stable supplies forecast to fall short for several years.”

While a number of high-potential cobalt projects are locat-

ed in North America, an absence of near-term supply looks set to be rectified by Toronto-based company First Cobalt, which recommissioned its cobalt refinery in Ontario in partnership with Glencore in early 2019. Glencore said in August that once a definitive feasibility study for a planned expansion is completed, which is expected to happen in early 2020, it would invest another US\$40 million into recommissioning and expanding the refinery, located 600 km from the U.S.-Canada border. “The intention is to complete the feasibility study by Q1 2020 and recommission the plant under its current 12 tonnes per day (mt/d) throughput rate in late 2020. Thereafter, we expect to permit and commission a 55 mt/d expansion, which will take approximately 12 months,” elaborated Trent Mell, president and CEO of First Cobalt.

### Lithium’s supply and demand outlook

“Despite volatility, the market for lithium is robust,” assessed Paul Fornazzari, partner at Fasken, observing that there is now clear and likely irreversible growth in demand for lithium as car companies, spurred by the success of Tesla, undergo a process of completely switching production to EVs or bringing out new electric car lines. “If production of EVs rises to just 30% of total vehicle production, there is not enough lithium production to meet the demand created by this growth,” he added, noting that only a relatively small amount of lithium is used in each battery and so it is unlikely to run the risk of being “engineered down” in the various battery formulations.

The production of lithium comes from two main sources – extracting lithium concentrate from brine waters, a complicated but low-cost process, and hard rock lithium, which is easier to explore, mine and process, but often comes at high production costs. The lithium triangle that straddles Chile, Argentina and Bolivia possesses 54% of global lithium brine resources, whereas Australia possesses the “mother of hard-rock lithium deposits” – the Greenbushes deposit. Trevor Walker, president and CEO of Frontier Lithium, stated that the company’s PAK asset in the Electric Avenue district of Northern Ontario contains drill intersections with grades and thicknesses comparable to the Greenbushes deposit. “Electric Avenue is the premier hard rock lithium jurisdiction in North America. It boasts the highest grade and the lowest impurity resources on the continent,” he said.

Walker went on to mention that establishing a stable and secure supply chain in the West will not happen overnight and should be approached in steps. For Frontier Lithium, the first initial market to target will be the industrial market, supplying clean high-grade concentrate for the large glass manufacturers, as the use of lithiated glass in mobile phone screens has become widespread. “If you have the opportunity to build a mine, first producing concentrate for the industrial market is how to build a reliable feedstock that allows access to downstream,” he added, noting the convenience of the OEMs present in Detroit and Southern Ontario. 82>>



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# The Lithium Ion Battery Megafactory Supply Chain – a Global Perspective



Robert Colbourn  
Manager – Benchmark Membership  
**BENCHMARK MINERAL INTELLIGENCE**

⇒ The world is undergoing a global energy storage revolution in which the advent of electric vehicles (EVs) and the emergence of energy storage has sparked a wave of lithium ion battery megafactory construction.

A megafactory is a battery factory capable of producing 1 gigawatt hours (GWh) or more of battery cells per year. Right now, each GWh equates to approximately 15,000-16,000 electric vehicles (EV) with an average battery pack size. The number of megafactories in production and planned for production continues to increase. Without battery megafactories, the EV industry would not be capable of challenging and displacing the auto industry's internal combustion engine.

Since Tesla announced its first Gigafactory in 2014, Benchmark Mineral Intelligence has been tracking the global development of battery megafactories. At that time, Elon Musk said of his Nevada battery factory plans: "it's not just going to be the biggest lithium ion battery factory in the world, but it will actually be bigger than the sum of all lithium ion factories in the world."

This sparked a worldwide battery arms race.

Five years ago, in Q1 2015, there were only three megafactories planned for development. As at the end of December 2019 there were 115 plants in the pipeline according to the Benchmark Minerals Lithium Ion Battery Megafactory Assessment. If all of these megafactories are built, by 2029 they would have a total capacity of over 2,220 GWh.

Batteries are becoming a fundamental aspect of the 21st century's economy. But batteries have complex and global supply chains, with a number of raw materials required.

## Feeding the lithium ion battery revolution

The lithium ion battery supply chain is developing at different rates globally and different points of the supply chain are at different stages of development. Right now, China is dominating the lithium ion battery supply chain. The first stage of the supply chain is raw material extraction. Some of the key battery raw materials include lithium, cobalt, nickel and graphite. Once extracted, these raw materials need to be processed into material suitable for batteries. Each one will follow a different processing route depending on many different factors, following a nuanced and complicated process.

Approximately half of the world's lithium supply is initially extracted from hard rock deposits in Australia, however, the bulk of this is then sent to China for processing. In 2019, Benchmark Minerals estimates China will produce 60% of the world's lithium chemical supply. Cobalt is another interesting case; the Democratic Republic of the Congo produces over two thirds of the world's cobalt, but refined cobalt supply is again dominated by China, controlling nearly 70% of production. The contrast between China and the US is stark, with

## BIO

**Robert Colbourn** holds the position of Manager – Benchmark Membership at Benchmark Mineral Intelligence, a London based price reporting agency and market intelligence firm covering the lithium ion battery supply chain. Robert's primary role is editor of Benchmark Minerals' online content and analysis, and quarterly review magazine.

## Benchmark Mineral Intelligence

(Benchmark Minerals) is the world's leading IOSCO-regulated price reporting agency (PRA), proprietary data provider, and market intelligence publisher for the lithium ion battery to electric vehicle (EV) supply chain. Our granular and expert focus on the entire supply chain makes us unique: from lithium and cobalt mining through to the manufacturing of cathode and anode functional materials, to battery cell and EV production.

the latter producing 4% of the world's lithium chemical supply and zero refined cobalt supply.

Once these raw materials have been made suitable for use in batteries, the next stage of the supply chain is anode and cathode material production for use in battery cells. This is another step dominated by China, with the country accounting for 74% of cathode capacity and 82% of anode capacity globally in 2019, whereas the US had no capacity, according to Benchmark Minerals Cathode and Anode Market Assessments. Finally, looking at battery cell production where these supply chains all meet, China had 83 megafactories in the pipeline with 1,526 GWh of capacity whereas the USA has 7 megafactories in the pipeline with 206 GWh of capacity for 2029.

The 2010s saw China develop its lithium ion battery supply chain, from raw material supply to battery production. This has been a strategic goal of the Chinese government as it built out its electric vehicle industry. The rest of the world has started to take note, with initiatives and political consensus developing in Europe and the USA. The 2020s will see the rest of the world attempting to catch up. ■

# Don Bubar



President & CEO  
**AVALON ADVANCED MATERIALS**



## Can you introduce Avalon Advanced Materials and describe the company's focus?

Avalon Advanced Materials is a mineral development company focused on rare metals and critical minerals for use in clean energy and new technology, such as rare earths, lithium, tantalum, cesium, indium and tin. We were one of the early movers in the space as we saw a bright future for these elements when new technologies started to create new demand. Governments are now recognizing the need to create critical minerals supply chains outside of China. We have all of these minerals in the ground in Canada and the time has come for us to take advantage of the opportunity by extracting these minerals and creating the value-added in Canada.

## What are the main projects Avalon is focusing on?

We have five critical minerals projects in Canada, including three in Ontario: the Separation Rapids Lithium, Lilypad Cesium-Tantalum-Lithium and Warren Township Anorthosite projects are all in Northern Ontario. Avalon's other projects include the Nechalacho Rare Earths project in the Northwest Territories and the East Kemptville Tin-Indium project in Nova Scotia, as well as a new project, Will Scarlett, in the US looking at extracting rare earths from coal mine wastes.

## What are your priorities in Ontario?

Separation Rapids Lithium remains our top priority in Ontario, although we are in the process of re-activating our Lilypad Cesium-Tantalum-Lithium project. The Warren Township Anorthosite proj-

ect remains inactive while we await new market opportunities.

At Separation Rapids, Avalon has an interesting opportunity to produce a high purity lithium mineral product for the glass and ceramics industry. While everyone recognizes the need for lithium in re-chargeable battery technology, few investors are aware that lithium is often the key ingredient in innovative, new high-strength glass and ceramic products, such as display screens. For these applications, the high purity (but very rare) lithium mineral petalite is often preferred. Separation Rapids represents one of the few significant potential new sources of supply in the world.

## Can you explain the development model Avalon is looking at for East Kemptville?

At East Kemptville in Nova Scotia, Avalon is looking at the potential to efficiently extract tin from previously-mined waste materials using new low-impact ore-sorting technology. The model also involves some select mining of higher grade fresh ore that will be used to create a clean tailing cover for the stacked tailings and fully remediate the long term acid mine drainage environmental liability at the site.

What potential do you see in the Will Scarlett REE project in southern Illinois? Will Scarlett represents an exciting opportunity to participate in implementation of an innovative, new extraction technology to recover rare earths from coal mine wastes. We see the potential to create a new supply chain in the United States by taking advantage of the fact that there are many coal mines that have elevated concentrations of rare earths in wastes and acid mine drainage.

## Avalon was named among Corporate Knights' "future 40 responsible corporate leaders in Canada". To what do you attribute to this recognition?

For eight years, we have produced an annual sustainability report that meets the Global Reporting Initiative's standards, and this attracted the attention of Corporate Knights.

Avalon is a leader among junior miners in adopting best practices to reduce its environmental footprint, prevent water contamination and engage with local communities. Acting sustainably creates company value by reducing risk for all stakeholders and by optimizing opportunities for individual and community prosperity. Many critical minerals are vital enablers of clean technology, such as renewable energy sources and energy-efficient automobiles. As a mineral development company focused on critical minerals, it is a strategic advantage for us to integrate principles of sustainability into our corporate strategy in order to align with cleantech customers, who audit their supply chains to ensure they are sustainably produced.

## How can governments be proactive towards establishing critical minerals supply chains?

In 2019, the United States and Canada agreed to collaborate in the effort to establish domestic supply chains. I believe that the area where the government can be most helpful is in facilitating the R&D of the process technology needed to extract critical minerals and establishing demonstration scale pilot plant facilities to support new producers' development plans. ■

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On the lithium brine side, Toronto-based Neo Lithium is developing its Tres Quebradas project in the province of Catamarca, Northern Argentina, having raised C\$90 million in under four years, US\$40 million of which has been invested in the property, according to Carlos Vicens, Neo Lithium's CFO. Acknowledging that the investment climate has been challenging for juniors regardless of metal value, Vicens explained that lithium investors tend to come from a different pool to precious metals specialists: "Financial markets are not buoyant at the moment, however lithium is a strategic asset, which sets it apart. Instead of attracting typical corporate financing such as bank financing and equity capital markets, the asset is interesting for a partner with a strategic vision for the resource. For example, a battery producer, a cathode-material maker or an OEM."

While creating a North American battery metals supply chain would benefit governments in the region, exploration companies these days can rarely afford to pick and choose where investment dollars come from in the interests of politicians. Therefore, proximity to the Chinese market has clear advantages, and strategic Chinese investment often comes with a more long-term vision that North American money has lacked. With this in mind, Ion Energy's Baavhai-Uul project in Mongolia is ideally located a mere 20 km away from the largest consumer of lithium in the world – China. Additionally,

the Mongolian authorities are supporting mining projects that can provide a cleaner source of energy, according to Ali Haji, CEO: "Ion Energy has received a significant amount of government support as lithium is deemed a green metal. Ulaanbaatar is not only the coldest city in the world, but also the most polluted as it sits in a valley powered and heated by coal."

Echoing the thoughts of Carlos Vicens, Haji mentioned the attractiveness of strategic investment in the lithium space: "We have been speaking to the Japanese, Koreans and Germans as they are the drivers behind EVs and the demand for lithium in the future. Obtaining strategic capital at the early stages of the project brings in partners that want to be with us through the course of the project lifetime."

**Nickel: the electric base metal**

Nickel was the best performing base metal in 2019, spurred on by the announcement from the Indonesian government in September that a ban on the export of raw nickel ore would be brought forward from 2022 to January 2020. While the bulk of the nickel market is currently driven by stainless-steel demand, it is estimated that as much as 50% of the nickel market could serve EV and energy storage applications moving forward, which would result in US\$70 billion having to be invested in new nickel mines over the next decade, revealed Justin Cochrane, president and CEO of Conic Metals Corp (Conic).

Conic, the spin out of Cobalt 27 Capital Corp that was acquired by Pala Investments in October 2019, owns an 8.56% joint venture interest in the Ramu project in Papua New Guinea, run by the Metallurgical Corporation of China (MCC), a subsidiary of the China Metallurgical Group Corporation, a Chinese state-owned enterprise publicly listed in Hong Kong and Singapore. Speaking of the difference between Chinese and Western investors, Cochrane observed: "The Chinese go into countries long term and help communities by providing infrastructure and other services. At Cobalt 27, we found that the investment horizon was very short for many of our investors, and this trend can be seen more and more in the mining sector today."

Ontario is also famous for its nickel production, with majors Vale and Glencore dominating supply from the Sudbury Basin, home of the Big Nickel – a landmark on the bucket list of every Northern Ontario-enthusiast. Jason Jessup, CEO and director of private Sudbury-based junior Magna Mining, noted that when his company acquired its flagship Shakespeare project in 2017, nickel was C\$4/lb, and the price has almost doubled since. Expanding on supply and demand dynamics for the base metal, Jessup remarked: "To make projections on the price it is important to look at the stock piles. They have been coming down steadily in the past two years, and we are at a point where we can expect the price will begin to reflect that," further pointing to the impact supply issues from Indonesia and the Philippines will have moving into 2020. ■



**CONIC**  
A LEADING BATTERY METALS INVESTMENT VEHICLE

Offering exposure to nickel and cobalt, metals integral to key technologies of the electric vehicle and energy storage markets.

**OUR ASSETS INCLUDE:**

- **Ramu Nickel Cobalt Operation**, Papua New Guinea (JV Interest 8.56-11.3%)
- **Dumont Nickel-Cobalt Royalty**, Québec, Canada (Royalty - 1.75%)
- **Turnagain Nickel & Cobalt Royalty**, B.C., Canada (2% NSR)
- **Flemington Nickel**, Australia (Royalty - 1.5% GRR<sup>2</sup>)
- **Nyngan Nickel, Cobalt & Scandium Royalty**, Australia (Royalty - 1.7% GRR<sup>2</sup>)

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TSX-v: NKL



# Justin Cochrane

President & CEO  
**CONIC METALS CORP.**



**How did the Cobalt 27 acquisition lead to the creation of Conic Metals?**

The largest shareholder of Cobalt 27 was a Swiss investment group, Pala Investments. In April 2019, they approached us with an unsolicited offer for the company. Discussions with shareholders led to a revised and improved offer for two of Cobalt 27's assets and the transaction was concluded on 25 October 2019. That left us with a joint venture interest in Ramu, our nickel-cobalt project in Papua New Guinea, and a collection of 11 other royalties, including Dumont, a nickel-cobalt project in Québec, and the Turnagain project in British Columbia, as well as other royalties in Canada and Australia. We created Conic Metals Corp., a new public company to hold those assets, and started trading on the TSX Venture Exchange in November 2019. Conic is an acronym for cobalt and nickel together, so that there can be no confusion in the company's focus.

**What interest does Conic have in the Ramu mine in Papua New Guinea?**

We have an 8.56% joint venture interest in the Ramu nickel-cobalt operation. It is run by the Metallurgical Corporation of China (MCC), which is a subsidiary of the China Metallurgical Group Corporation, a Chinese state-owned enterprise publicly listed in Hong Kong and Singapore. MCC is a global construction and engineering firm and has been operating the mine since 2012. Based on resources, Ramu has a 30-year mine life and is one of the top 10 nickel-cobalt projects in the world. Nickel is one of the few base metal commodities that has performed exceptionally well over the last six months and Ramu continues to generate significant free cash flow.

**Which of Conic's royalties do you see particular potential in?**

The biggest royalty Conic received is from Dumont, a construction-ready, fully permitted, nickel-cobalt mine in Québec. It is a joint venture between Waterton and RNC Minerals. The second significant royalty is the Turnagain nickel-cobalt project in British Columbia, which is owned by Giga Metals. Companies such as Tesla are looking for ethical and clean sources of nickel and cobalt, and Dumont and Turnagain are perfect projects for that. In addition, Conic has royalties in Australia – the Flemington project, owned by Australian Mines, and Nyngan, a nickel-cobalt-scandium project, owned by Scandium International Mining.

**Why do you think Chinese investors seem to have a more long-term vision than their North American counterparts?**

China has been investing in projects such as Ramu, as well as projects in Indonesia and the Philippines, but does not have a big stake in Class 1 nickel projects – the higher quality nickel that is required for batteries. The Chinese go into countries long-term and help communities by providing infrastructure and other services. At Cobalt 27 we found that the investment horizon was very short for many of our investors, and this trend can be seen more and more in the mining sector today. Conic regards having MCC as a partner in Ramu as a significant benefit. Not only has MCC done a tremendous job building and operating Ramu, China is the largest foreign investor in Papua New Guinea by a wide margin and MCC continues to invest in local infrastructure and community projects to benefit the local communities around the Ramu operation.

**Where would you like to see Conic Metals by the end of 2020?**

By the end of 2020, we will ensure investors are significantly better educated on the quality and value of our Ramu joint venture interest and royalty portfolio. At the same time, Conic will continue to work with our Chinese partners to evaluate opportunities to bring forward some of the Ramu cash flow directly into the company, and/or to repay our existing JV debt. Once that debt is repaid, the Company stake in Ramu automatically increases to 11.3%. In addition, Conic will continue searching for new royalty, streaming and other investment opportunities, with a particular focus on nickel and cobalt. ■



**The Chinese go into countries long-term and help communities by providing infrastructure and other services. At Cobalt 27 we found that the investment horizon was very short for many of our investors, and this trend can be seen more and more in the mining sector today.**



# Adriaan Bakker

President & CEO  
VANADIUMCORP



## Can you introduce VanadiumCorp and explain the company's focus?

VanadiumCorp Resource Inc. is an integrated company developing an exclusive supply chain for next generation vanadium redox flow batteries (VRFB). The company has jointly developed process technology that mitigates the cost and carbon footprint of vanadium which is successfully tested on many global feedstocks. The company's vanadium rich titanomagnetite resource base is located in Québec, and the first VRFB production facility is located in Karlsruhe, Germany.

## Can you elaborate on VanadiumCorp-Electrochem Processing Technology (VEPT)?

In 2016, after a decade of vanadium resource development in Québec, VanadiumCorp chose to explore innovative new approaches for processing to address the largest industry challenges and the global shortage of battery grade vanadium. VanadiumCorp partnered with Electrochem Technologies & Materials and developed a chemical process method applicable for vanadium, iron and titanium. The core benefit VEPT is that it enables efficient and green recovery of vanadium for infinite use in vanadium batteries.

## What are the characteristics and benefits of vanadium redox flow batteries (VRFBs)?

Vanadium represents approximately 80% of vanadium redox flow batteries (VRFB) and the electrolyte within the VRFB is 100% reusable and lasts forever. VRFBs are a mature technology capable of storing an unlimited amount of energy. VRFBs do not generate heat, they absorb intermittent renewable energy without

issue, do not degrade and can deep cycle repeatedly without any degradation or thermal runaway. The batteries also have the unique ability to charge and discharge power at different rates as vanadium is both the anolyte and catholyte of the battery, which means you have a full separation of power and energy. With VEPT, vanadium batteries would represent a truly sustainable energy storage technology many times cheaper than current energy sources.

## What is XRG and what makes it different than competing technologies?

XRG® is next generation VRFB energy storage technology developed with VanadiumCorp's wholly owned GmbH subsidiary in Germany. What sets XRG® apart from competing technology is components are both manufactured sustainably and are 100% reusable and recyclable. XRG® is uniquely powered by its own supply chain and integrates the leading improvements in flow battery architecture. With the lowest cost and carbon footprint, XRG® intends to revolutionize energy projects, renewable energy and entire power grids. A partnership focused model that utilizes the strength of industry leading companies allows further product evolution and cost-effective manufacturing. The acquired facility for planned production is located in Rastatt, Germany and news is pending.

## What are the latest updates from the Lac Doré project in Québec?

The wholly owned Lac Dore vanadium project encompasses a high-quality vanadium bearing titaniferous magnetite deposit with a concentrate grade of

1.08%. The Lac Dore vanadium project compares favorably to many vanadium deposits currently in production in other countries. The 2019 drill program targeted the company's Lac Doré vanadium prospect where historical drilling and surface channel sampling conducted between 1958 and 2013 have revealed over 2 km long by 200 m wide and open at depth corridor hosting multiple zones of vanadium-bearing vanadiferous(titano) magnetite "VTM" mineralization. The completed 2019 drill program was the largest conducted on the project since 1970. Assay results will target a resource statement and technical report in 2020.

## How do you see the fundamentals of vanadium moving forward?

Our company is focused on the bright future vanadium in energy storage. In flow batteries, vanadium can be reused forever, as it is both the anolyte and catholyte in liquid flow battery architecture. This is unique in the entire energy industry, which is why we have developed our own version of the vanadium redox flow battery "VRFB" with industry veterans and strategic plans to commercially produce VRFBs in the near term.

## What would you like to achieve with VanadiumCorp in the next two years?

We hope to reach commercial production of VRFBs directly or through contract manufacturing within the next two years. VanadiumCorp's key focus is vanadium for energy storage, and XRG® next generation VRFB energy storage technology vastly supersedes anything that has come before it. We are confident this will revolutionize the cost and sustainable nature of energy storage moving forward. ■

# Trevor Walker

President & CEO  
FRONTIER LITHIUM



## Can you comment on the denominated "Electric Avenue" – where Frontier Lithium is the largest land holder?

Electric Avenue is the premier hard rock lithium jurisdiction in North America. It boasts the highest grade and the lowest impurity resources on the continent. It was discovered by the Ontario government in the nineties and there has been minimal exploration. Recently, we tied up a 26,500 hectare land package of the most prospective grounds on the "Avenue". The land package includes the PAK deposit, the initial discovery, and the Spark deposit, the most recent discovery and other showings. We have invested over C\$1 million in the past year developing Spark. There are drill intersections with grades and thicknesses comparable to the "mother of hard-rock lithium deposits", the Greenbushes deposit in Australia.

## Why is it important to establish a domestic supply chain of critical minerals?

We are very mindful of the need to develop localized supply chains and work hard to make sure that we keep control of a strategic resource. Currently, all arrows point to China with regard to the conversion of critical elements such as cobalt and lithium. We think it is a flawed model and does not serve well future EV markets of EU and N.A. Washington and Ottawa are working very closely to make sure that there is more balance between the East and the West. ■

# Robin Goad

President & CEO  
FORTUNE MINERALS



## Can you provide an overview of Fortune Minerals and the NICO project?

Fortune Minerals is a Toronto Stock Exchange listed mining company with a focus on producing critical materials for new technologies and the growing green economy. Having all of its assets in North America makes Fortune a future reliable producer in metal markets otherwise dominated by geographic concentration of supply in counties with political risks. Fortune's primary asset is its wholly-owned and vertically-integrated NICO Cobalt-Gold-Bismuth-Copper project, comprised of a planned mine and a concentrator plant in the Northwest Territories, and a refinery in Southern Canada. NICO was an in-house discovery from 1996 and is now at the development stage. The Company has delineated a reserve, completed engineering reports and feasibility studies, test mined the deposit, validated the process technology with pilot plant tests, and has completed the environmental assessment to build the facilities in the Northwest Territories. We are currently optimizing the project while seeking a strategic partner to secure the project financing.

## Do you have a final message for the audience of Global Business Reports?

The world requires technology metals and we can expect strong demand for metals like cobalt, particularly from countries with reliable production and supply chain transparency. ■

# Trent Mell

President & CEO  
FIRST COBALT



## What were the circumstances surrounding the creation of First Cobalt?

First Cobalt was established in March 2017 as a direct response to the electric vehicle (EV) revolution. Within the first year and a half, we amalgamated four companies with extensive property and assets in both Canada and the United States. As a result, First Cobalt today has three key assets; the Ontario Cobalt Camp, a more advanced asset in Idaho called the Iron Creek, and the only permitted primary cobalt refinery in North America capable of producing material utilized in Li-ion batteries.

## Can you give insights into First Cobalt's Iron Creek deposit in Idaho and project in Ontario?

Iron Creek is a primary cobalt deposit in Idaho and is our most advanced exploration project. The Idaho Cobalt Belt is the only place, outside of Morocco, where you can find significantly sized (large) primary cobalt deposits. We have drilled cobalt and copper mineralization at Iron Creek over an almost 1 km strike length and up to 300m down-dip depth. Mineralization is contained along a metasedimentary rock horizon and is considered stratabound lending a high confidence in cobalt and copper continuity. We have published an ore resource in 2018 and will soon provide an update showing the resource is of reasonable size and is open to warrant continued exploration there. ■



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# ENGINEERING & CONSULTING



» The overall environmental awareness of individuals, who may also be stakeholders and investors in mining companies, is pressuring the industry to become aware of these issues. Sustainable technologies are available and there is more interest from mining companies. That being said, acting green can be difficult if a company does not have the right people to address these issues and manufacturers to provide equipment. «

- Eric Lannegrace,  
Managing Director & Founder,  
minera Solutions

Image courtesy of Teranga Gold

## EPCM &amp; CONSULTING

# Growth through consolidation

⇒ Consolidation in 2019 was not only confined to the precious metals producers, as a number of engineering companies and consultancies joined forces to enhance their product offerings to a market increasingly looking to trim down its supplier base as a focus on streamlined operations sharpened. The industry preference for engineering companies with the capabilities to design and manage projects from cradle to grave has been steadily growing during the downturn, with miners preferring to outsource to contractors rather than take on the risk of long-term salaries. Perhaps the highest profile example of this was Barrick's decision, announced in November 2019, to switch its Hemlo operation to a contract mining model, laying off many of its ageing workforce in the process.

Why is the service sector taking the M&A route instead of growing organically? "Over the last 12 months, the market has consolidated and there appears to be a decline with respect to the execution of larger projects," explained Justin Taylor, president, CEO and director of Toronto-based engineering firm Halyard, which has noticed an emphasis on smaller projects, sustaining capital and brownfield upgrades. "The big players, who historically have tended to focus on large projects, have been trying to get back into the smaller projects segment as there is currently a dearth of multi-year project execution work," he added, noting that a significant amount of the available project work is currently focused on upgrading and changing facilities, rather than building new ones.

In April 2019, Australian EPCM giant WorleyParsons announced the completion of the US\$3.2 billion acquisition of Jacobs ECR (Energy, Chemicals and Resources) division, rebranding to "Worley" in the wake of the transaction. "This merger is about more than capacity and capability. It's about opportunity. The opportunity to become the partner of choice for our customers, the employer of choice for our people and to deliver enhanced returns for our shareholders," said CEO Andrew Wood.

One of the Ontario-based engineering companies to have grown through acquisitions in 2019 was Cementation, which acquired California-based materials handling company Terra Nova Technologies (TNT) in March 2019, having previously acquired Montréal-based company Merit Consultants in January 2016. Roy Slack, director of Cementation Americas, expanded on the reasoning behind the acquisition: "As the mining industry is starting to realize that solutions must be found with regard to tailings, the Terra Nova Technologies acquisition could not have come at a better time," he stated, commenting that TNT has been involved in many projects where the safe handling of tailings was a focus. "We as an industry need to find a solution and I believe that Terra Nova Technologies may be a big player within this space," he continued.

In recent years Cementation has worked on some of the stand-out mining projects in Ontario, including the shaft design-build for Glencore's Onaping Depth project near Sudbury, the design and construction on new headframes and refurbishment of two shafts for Compass Minerals at its Goderich Salt Mine, and the shaft extension at Alamos Gold's Young Davidson mine. "It is a design-build project and a very unique design utilizing a large diameter borehole as a production shaft," Slack said of the Young Davidson contract.

Another Sudbury-based engineering consulting company to have leveraged its business partnerships to achieve growth is Black Rock Engineering, which span out from from Ionic Engineering five years ago but remains part of the Ionic Technology Group. "Consulting engineering is different from machine design and by spinning off we can now focus on our core strengths," remarked Christina Visser, General Manager, who elaborated on her company's focus on innovation, working in collaboration with Ionic Mechatronics as the first certified Safe-Box integrator. "SafeBox takes the principles of machine safety and applies them to industrial applications. In a plant with multiple crushers and conveyors, we were able to implement the technology so that the entire system can be shut down and

safely isolated with the push of one button," explained Visser.

In the consulting space, world-leading environmental and sustainability advisory group ERM (Environmental Resources Management) acquired mining consultancy CSA Global in July 2019. "Both companies were looking to grow and diversify their services," said Stan Wholley, president of the Americas at CSA Global, who mentioned that the synergies and shared culture between the two organizations made the merger seamless.

"CSA Global was undertaking more study work as we transitioned but had to outsource services, such as environmental, social license and permitting. At the same time, ERM had recognized a shift in the mining industry where investors were demanding stronger requirements for environmental, safety and governance. Reflecting this change, ERM was searching for a group with an excellent reputation in the mining market that could assist them in growing in this area," explained Wholley, who mentioned that 2019 was CSA Global's best year to date, pointing to increasing demand for hydrogeology services as one of the company's global growth drivers. "Access to water is always an issue and it is getting more scrutiny as it becomes a scarcer resource globally in light of people's fears about climate change," he concluded.

"We feel the brand of mining is at a tipping point. It is fighting an ambition to be seen as attractive to its customers, investors, employees and wider society – while facing the reality of tailings failures, fatalities, and sometimes questionable practices, or jurisdictions that put profit before people," reflected Louise Pearce, global mining lead at ERM, who spoke of the "mining trust gap" – a growing divide between what companies do and what they say, and the perception of how our stakeholders interpret that. "The wider the gap, the harder it is to rebuild trust – especially when it comes to ESG related issues," she added.

This sentiment was echoed by David Middleditch, business development manager at Blue Coast Research: "Trust has been eroded, partly because companies did not successfully deploy capital from the last boom cycle – investment is more cautious." Middleditch

urged companies not to underestimate the value and need of doing test work, as insufficient metallurgical work in the study phase can lead to costly impacts later on in the project lifecycle.

## Water management

"I have seen the mining sector's views on water change a lot in a relatively short period of time," observed Kristin Pouw, principal consultant and water management specialist at SRK Consulting, noting that today there is a better appreciation of the resource, as both a liability and an asset. "Water management is becoming an important consideration for investors," she added, expanding: "Evidence of this increase in attention is that frameworks for disclosing information on water-related risks and financial and social penalties are being developed, and companies are developing and implementing internal standards for water management planning."

On the trend of regulatory changes re-

quiring companies to understand, quantify and mitigate water impacts associated with mining, Pouw gave the example of a change to the federal Metal and Diamond Mining Effluent Regulations coming into effect in 2021, that will lower limits on some metals and impose a new limit on un-ionized ammonia for effluent discharges at all mines in Canada.

"My advice to project developers is to look at, and plan, water management early on. This will give you the best chance of avoiding risks and successfully tackling issues," suggested Pouw, highlighting the benefits of looking at water management at an integration level – combining water, waste, and mining. "If you do not have the necessary internal capabilities, seek expert help to develop a water management strategy appropriate to the site's climate, geology, geography and regulatory framework. This will help you to avoid poor decisions that initially seemed appealing from an economic perspective and to ensure that your project goals remain deliverable," she advised. 93>>

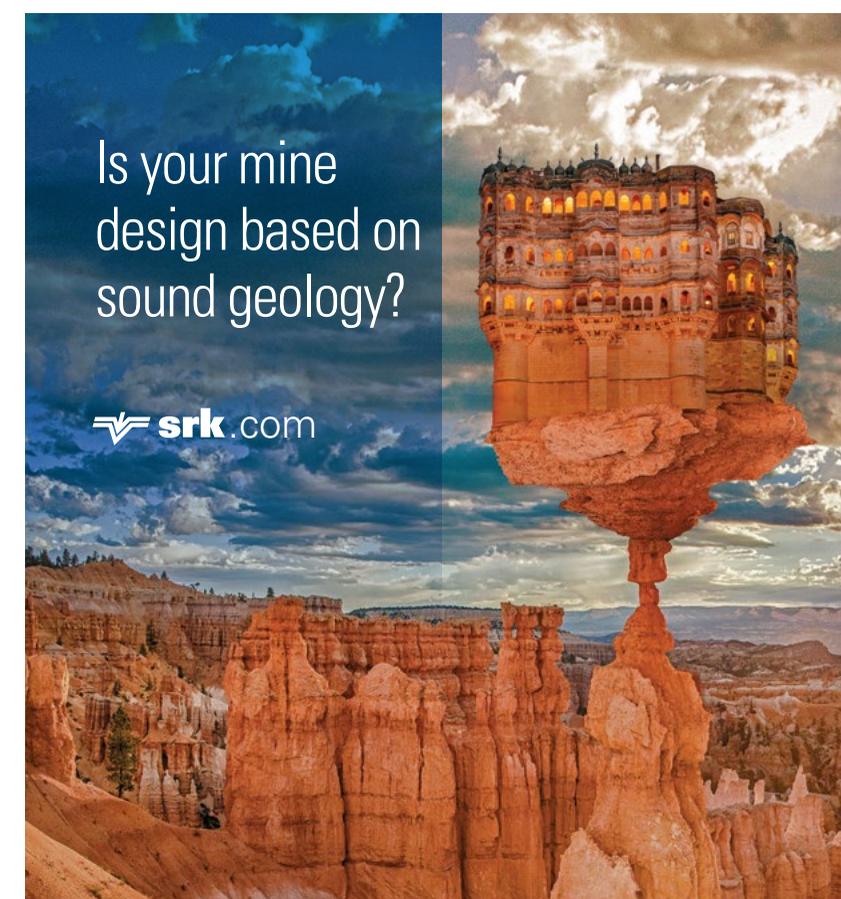


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## Roy Slack

Director  
CEMENTATION AMERICAS



As we extend our range of services within the project life cycle we believe that there are additional benefits to having one integrated group providing a full range of project services for mining clients. Better project budget and schedule forecasting through integrated teams, better identifying and mitigating risk on projects, and all the other benefits that come from a design-build approach.



### As market conditions have slowly improved, have you noticed an uptick in mining activity in Canada?

When the mining industry rebounded, we saw big capital projects that were on hold go online again. We also saw certain groups with high-grade portfolios attaining funding. It seems like grade is what interests investors. The junior companies, even in the gold market, are still experiencing challenges. This is where the opportunity for mid-sized companies comes in. A junior with a medium grade gold deposit, even if it is an advanced project, may be struggling to attain capital. If there is a mid-sized group with cash, they can partner with the junior to move the project forward. The time has come where mid-sized companies and majors are working up the appetite for mergers and acquisitions.

### What are some of the main projects Cementation has been involved in in Ontario in the last 12 months?

Onaping Depth, a Glencore project near Sudbury, is an iconic project for Cementation. We have been working on the engineering for the project off and on since 1998 and we are very pleased that the project has been approved and Cementation is Glencore's shaft design-build contractor for the project.

Ontario was where we started in 1998 and, although we have expanded our services and carry out work around the world, this area continues to be a strong market for us.

### Has Cementation been involved in the Ring of Fire development to date?

We have also been working with Noront Resources over the years, looking at the underground design for their McFauld Lake project in the Ring of Fire. The challenges at the Ring of Fire are not necessarily mining related, but more so infrastructure and social issues. The question about all-season access is not only about getting to the mine site, but also accessing a number of remote communities, which can result in positive benefits but may also create some challenges for communities as well.

### Can you give insight into Cementation's acquisition of Terra Nova Technologies?

As the mining industry is starting to realize that solutions must be found with regard to tailings, the Terra Nova Technologies acquisition could not have come at a better time. Terra Nova Technologies is a materials handling company and has been involved in many projects where safe handling of tailings was the focus. We as an industry need to find a solution and I believe that Terra Nova Technologies may be a big player within this space.

Cementation has a global footprint with a focus on design and build. Traditionally we have done more of the project lifecycle than other contractors and the company continues to expand its capabilities, service offerings and footprint through M&A.

### What are Cementation's objectives and strategy moving forward?

Capital projects in mining and industry in general struggle to meet budget and schedule goals. Cementation is structured and continues to evolve to meet those challenges through early contractor involvement and a wider range of integrated services. Cementation has always been focused on safety and understand that our clients are looking for safe work and engineering that adds value, and a contractor willing to work with them to meet budget and schedule challenges head on. As we extend our range of services within the project life cycle we believe that there are additional benefits to having one integrated group providing a full range of project services for mining clients. Better project budget and schedule forecasting through integrated teams, better identifying and mitigating risk on projects, and all the other benefits that come from a design-build approach. We are a project based company and have established and work to what we call our *best for project* philosophy, which helps align the efforts of contractor and owner. So our objective is to deliver successful projects for our clients and our strategy is through design-build solutions through a wider span of the project life cycle. ■

## Pierre Julien



Executive Vice President, Americas Region  
DRA GLOBAL



### How was 2019 for DRA Global and what were the main milestones achieved by the company?

We began 2019 with the redomiciling of our corporate head office to Perth, Australia, following the group restructure which saw DRA become an Australian company in mid-2018.

We also welcomed SENET into the DRA group in April 2019 and over the past months this partnership and specifically the addition of SENET's capabilities and experience in hydrometallurgy have added to DRA's minerals processing capabilities.

In 2019, we expanded our footprint into two new regions. An office in Lima, Peru was established and has quickly ramped up to approximately 35 employees delivering services to Tier 1 operators in the region. A presence was also established in Vancouver with great prospects for 2020.

We are also excited about the opening of our new office in Moscow and have commenced work for Polyus Gold.

### Can you comment on the company's merger with SENET and its significance to DRA Global's growth plans?

With SENET joining DRA Global the consolidated organization is without question the number one provider of services to the resources industry across the African Continent. The merger has combined two exceptionally successful companies with complementary skill sets to enhance our offering to clients with interests in the African projects market.

This collaboration creates an African and Middle Eastern powerhouse in mining and minerals processing, project delivery (EPC and EPCM) and operations, maintenance and asset optimization.

The broadly specialized business will service this market and secure a pipeline of future growth opportunities in EMEA (Europe Middle-East and Africa) and elsewhere. The combined company is set to enjoy strong positions in all key geographies and markets and create a more diverse and balanced global portfolio.

### Do you believe North American mining is experiencing a period of expansion after the downturn?

We're hearing chatter about miners remaining committed to supply and capital restraint, prioritising joint ventures and brownfield investment, and also a strong demand for cobalt, driven by the rapidly growing electric vehicle and battery storage sectors. This will prompt significant investment in growing the mineral sector in the Americas. We anticipate that gold will remain at the forefront but we're also seeing substantial activity in the copper sector. The battery elements (cobalt, lithium and graphite) also continue to be quite active and we are ready to provide our clients with the support they need.

### How are new technologies shaping the mining industry and how is DRA Global incorporating them into projects?

The digital transformation of the mining industry has remained topical for some time now. Increased adoption of automation technology by companies across the globe is driving growth of the smart mining market. Clients are looking for enhanced safety, productivity, and sustainability. However, innovation can be risky and the capital intensive nature of our industry requires a unique approach. DRA

is well prepared to assist clients in mitigating these risks. We have developed world class capabilities in game changing technologies such as sensor based ore sorting, coarse particle flotation, direct flotation and dry-stack tailings. As an operator of over 30 process plants, we have also developed and deployed extensive remote digital analytics and control technologies.

On the design front, we're making sure we are part of this transformation and DRA has responded to the growing digital demand through paperless workflows, automated 2D drawings from intelligent 3D models, 3D Scanning, virtual reality and the implementation of a globally accessible design data storage and reporting repository. Our engineering teams have been driving innovation across numerous projects and this remains a focus area for DRA.

New technologies help our clients to maximise their return on investment but also help us to deliver a superior solution. We can plan better for DRA and our clients, and anticipate challenges well in advance.

### What is DRA Global's outlook for 2020 and what are key areas the company will be focusing on?

For 2020 and beyond, we are setting new goals focused on delivering ever greater value to our clients and improving our own internal standards for service delivery excellence as well as risk management. Safety and sustainability will be recurring themes within many of our strategies. Our collective efforts will aim to support our clients in the mining industry and our other sectors at achieving these goals. ■

# Christina Visser

General Manager  
**BLACK ROCK ENGINEERING**



## Can you give an overview of Black Rock Engineering and the history of the company?

Black Rock Engineering is an engineering consulting company based in Sudbury, Ontario. We have been operating as Black Rock for the past five years, but prior to that, we were part of Ionic Engineering and we remain part of the Ionic Technology Group. Today, our focus is on engineering consulting for mining, heavy industry and some commercial and municipal clients. Our strengths are in the mechanical, electrical, automation and energy areas. Black Rock's dedicated team of engineers, designers and project managers boasts decades of experience from new construction to brownfield projects to feasibility and reliability studies.

We started during a downturn in the mining industry, but our business has developed significantly over the last few years.



Spinning out from Ionic Engineering was definitely the right decision as it gave us our own identity and the ability to do things our own way. Consulting engineering is different from machine design and by spinning off we can now focus on our core strengths.

## What services does Black Rock offer in each of its core strength areas?

Mechanically, Black Rock prides itself in our vast capabilities with mechanical equipment and infrastructure. Some of our core capabilities within this area include mine dewatering, HVAC, slurry pumping and piping, compressor systems, bulk materials handling, pneumatics and hydraulics, machine safety systems, and more. We were involved in an interesting dewatering project for Lakeshore Gold. This was an energy project where we reviewed dewatering systems and how they could be made more efficient in terms of energy consumption.

Our electrical and automation group is mainly involved in power distribution, power management, battery storage systems, process controls, instrumentation and automation. We are currently working on a project where we are implementing battery charging stations for an underground mine. Through implementing battery storage solutions, energy studies, backup generator systems, monitoring and targeting, and energy management services, Black Rock can reduce our client's energy costs while improving their processes.

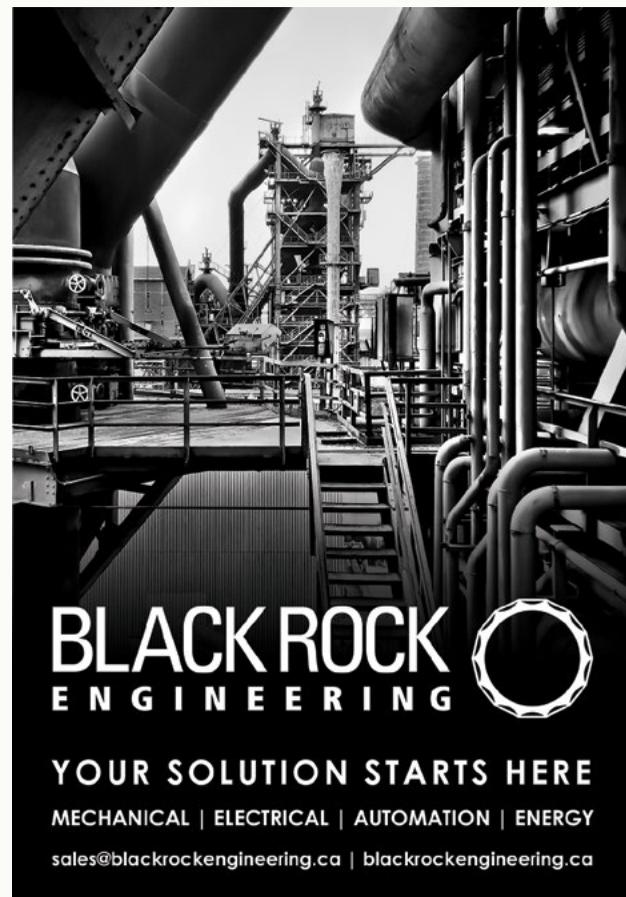
## Black Rock also has a strong focus on innovation. What type of technologies do you work with?

Black Rock has successfully implemented automation systems in some of the toughest environments. We did the detailed design for Electrale Innovation's hydraulic air compressor demonstration plant, and we are also working in collaboration with Ionic Mechatronics as the first certified SafeBox integrator. SafeBox takes the principles of machine safety and applies them to industrial applications. In a plant with multiple crushers and conveyors, we were able to implement the technology so that the entire system can be shut down and safely isolated with the push of one button. SafeBox saves our clients' time and money while making the work environment safer.

In the past, the mining industry was sometimes slow to adopt new technology, but that's been changing in recent years. We're seeing electric mines, autonomous equipment, and energy initiatives. We're lucky to be a part of it and we're excited about the future.

## Can you elaborate on the work Black Rock has done with North American Palladium?

Black Rock worked with North American Palladium on an underground fueling station, including the transfer of diesel from surface to the underground space. One of the challenges was that we could not allow excessive pressure to build up in the fuel pipe, which was accomplished by measuring and limiting the flow. Even though it was a mechanical piping project, the controls were extremely important. ■



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Eric Lannegrace, managing director and founder of Minera Solutions, a new Montreal-based consultancy with a network of partners to provide a one-stop shop for environmental management considerations, explained: "The overall environmental awareness of individuals, who may also be stakeholders and investors in mining companies, is pressuring the industry to become aware of these issues. Sustainable technologies are available and there is more interest from mining companies. Acting green can be difficult if a company does not have the right people to address these issues and manufacturers to provide equipment. If a mining company wants sustainable mining, Minera can help with water, energy and energy storage, but it comes down to getting the equipment in place."

"Mining companies are more cognizant of environmental needs and are making moves towards looking at more environmentally friendly operations," opined Jerry Hanna, president and founder of Clearflow Group, which has been summoned to some of the major mining disasters across Canada, including the highest profile environmental incident in Canadian mining history in 2013. "Six years later, we continue to provide our technology and expertise to this company," stated Hanna, whose company manufactures the patented Water Lynx Gel Block Flocculant, designed to assist clients to achieve a rapid reduction of total suspended solids for the safe release of water into the environment.

## The critical issue of tailings

On January 25, 2019, two years on from the Mariana tragedy in Brazil, disaster struck again, as the tailings dam at Vale's Brumadinho mine in Minas Gerais burst, killing 293 people and causing extensive environmental damage in the region. At Expositum in Belo Horizonte, August 2019, photos of all 293 victims were placed around Vale's stand in the exhibition hall. Before the first presentation at the tailings management round table, the lawyer representing the victims and their families described in detail how the chemical waste that had descended upon the town had killed them. If ever the industry needed to be shocked into

action, it was at this moment. How could a catastrophe on this scale, at a mine site owned by one of the five biggest mining companies in the world, take place so soon after similar failures in 2015 and 2017?

Geotechnical engineer, Nadine Miller PhD, was appointed a director of Westdome Gold Mines in part for her expertise with tailings management. Speaking frankly about the tailings issue currently facing the industry, Miller related that few mining companies have high-level specialists in-house: "Large companies have tailings review boards, with renowned engineering specialists to ensure oversight; however when mine staff receive these reports do they truly understand what they are reading?," she questioned, explaining that for someone to fully comprehend a geotechnical engineering report, they would need to be a geotechnical engineer (where the working degree is a masters). "The problem is, if every mine wanted to hire a specialist in tailings dams, they would not be able to do so, as there are not enough geotechnical engineers. It is an extremely specialized discipline with few graduates," she added. How can the industry as a whole deal with its tailings issue? Janice Zinck, director of Green Mining Innovation at CanmetMINING, Natural Resources Canada (NRCAN), suggested that NRCAN's Mining Value for Waste program could turn a liability into an opportunity: "After decades of mining and processing, the metal value of historic tailings is significant and there is an equivalent level of liability. Couple this with the public concern regarding mine waste, the opportunity to re-examine these wastes as resources is very compelling," remarked Zinck, observing that approximately 200 million mt/y of tailings are produced in Canada alone, noting that the grade of some tailings far exceeds what is mined today, and these tailings often contain several critical minerals such as tungsten and rare earths. "The Mining Value for Waste program is a pan-Canadian effort to develop tools, technologies, and policies to de-risk and accelerate demonstration and full-scale waste re-processing/repurposing projects. The goal is to reduce mine waste liability and environmental impact, while providing local and national value for Canada."

In November 2019, the Global Tailings Review drafted a new standard that would "develop a robust, fit-for-purpose international standard for the safer management of tailings". The challenge for mining companies will now be how to upgrade existing operations to meet these standards. Westpro Machinery has provided mineral processing technology solutions to the mining industry for over 34 years, and has seen an increased demand for tailings management services in recent years, according to Niraj Dave, Westpro's regional process technology manager: "It is important for mining companies, and us as engineers, to make sure that we provide the right solutions which can prevent any catastrophic event," said Dave, acknowledging that global tailings regulations are becoming stricter and the industry is going through a learning process. "Westpro has designed and manufactured a solution to dewater and treat tailings before they are sent to the tailing ponds," he added, commenting that Westpro can help clients by bringing in tailing technologies at the front end that can thicken the slurry before it is filtered.

On the topic of how to deal with tailings, Douglas Morrison, president and CEO of the Centre for Excellence in Mining Innovation (CEMI), commented that most of the changes currently being considered address the monitoring of tailings storage facilities and the removal of water from behind the containment structures. "While these changes should decrease the risk of catastrophic failure of tailings storage facilities, this is not the only risk posed by mine tailings; fugitive toxic dust severely impacts both local communities and neighboring ecologies," explained Morrison, revealing that CEMI believes a completely new approach to mine tailings management, one that removes contaminants from the materials left exposed to the environment, can be achieved. "Ensuring that the environment around mining operations will be secure from any long-term risk of exposure to toxic materials will make it much easier to obtain permits and license to operate and will see new mines come into production sooner," he added, underlining the importance for the industry to demonstrate progress in improving its environmental performance. ■

# Kristin Pouw

Principal Consultant  
**SRK CONSULTING**



## Have you seen changes in the approach to water-management, both from a business and government perspective?

Today, there is a better appreciation of the resource as both a liability and an asset. There have also been regulatory changes requiring companies to understand, quantify, and mitigate water impacts associated with mining. One of the drivers for this increase in concern is that the impacts of climate change on water resources are becoming evident and observable. This is especially true in places with high water risks. One example is northern Chile, where there are competing agricultural and industrial demands for groundwater resources and an increasing scarcity of surface water. Another example is Peru, where the rapid retreat of tropical glaciers in the Andes—where much of Peru's mining occurs—is threatening water supplies for downstream communities and industries. Another driver for the increase in water-related concern is recent tailings failures and the increased appreciation for water's role in dam failures and dam failure consequences.

In terms of business, water management is becoming an important consideration for investors. Evidence of this increase in attention is that frameworks for disclosing information on water-related risks and financial and social penalties are being developed, and companies are developing and implementing internal standards for water management planning.

## Can you comment on how the regulatory framework in Ontario is evolving?

One change that will come into effect in 2021, is that under the federal Metal and

Diamond Mining Effluent Regulations there will be lower limits on some metals and a new limit on un-ionized ammonia for effluent discharges at all mines in Canada.

Specifically in Ontario, in 2020 there will be some minor changes coming in industrial effluent discharge permitting at the Ministry of the Environment, Conservation and Parks. Generic discharge authorizations granted under the Municipal-Industrial Strategy for Abatement will be replaced by site-specific permits. This is part of a shift towards receiver-based permitting as opposed to emitter-based permitting.

The Ontario Ministry of Energy, Northern Development and Mines is now responsible for the review and construction inspection of new tailings dams as well as the review of dam safety reports and dam safety inspections for existing tailings dams.

The current Ontario provincial government has also promised stronger enforcement of environmental legislation by expanding the use of fines for environmental contraventions.

## Which notable water management projects has SRK been involved in recently?

One of our current projects has to do with mitigating ammonia at a gold mining operation in Northern Ontario, where we completed an evaluation of different ammonia reduction and treatment options. Our role was to identify the solution or solutions that would provide the greatest benefit with the lowest implementation risk. In parallel, we carried out a trial aimed at enhancing the natural degra-

dation of ammonia occurring with their existing water management infrastructure. The idea was to promote the right biogeochemical conditions so that more ammonia would be attenuated by microorganisms.

## What are the main risks and considerations for a mining operation from a water management standpoint?

There are some broad sets of precautions that I would urge decision-makers to consider taking. The first involves ensuring that the site has an adequate water supply, that the water balance considers a range of climatic conditions, and that discharge requirements are understood. Evaluate enough different scenarios to be comfortable there will be sufficient water to support operations.

Secondly, engage with regulators and communities early in the process of developing a water management strategy. Make sure that permitting requirements are well understood and that the community is on board.

And thirdly, make sure you have a good compliance record and that your water management infrastructure is doing what it was designed, built and permitted to do. Keep up with inspections, monitoring, and maintenance. Update models as required to reflect changes to water management infrastructure.

My advice to project developers is to look at and plan water management early on. This will give you the best chance of avoiding risks and successfully tackling issues. Also look at water management at an integration level—combining water, waste, and mining. ■

# Stan Wholley

President – Americas  
**CSA GLOBAL**



## How did the purchase of ACA Howe International expand CSA Global's North American presence?

CSA Global purchased ACA Howe, a well-known Canadian consultancy firm, in 2016 and used it as a platform to expand our business in North America. We transitioned from a junior exploration-focus to mid-tier production assets-focus and diversified our services in geology, exploration and mineral resources to include technology, data analytics and mine engineering, which has enabled us to reach a broader selection of the mining community.

## Can you elaborate on the recent acquisition of CSA Global by ERM?

CSA Global was recently acquired by ERM (Environmental Resources Management) in July 2019, a world-leading environmental and sustainability advisory group. CSA Global was growing rapidly and had expanded our service offering beyond our core strength in geology, mineral resources and mining into hydrogeology/hydrology, technology and

more corporate facing roles. The company was undertaking more study work as we transitioned but had to outsource services, such as environmental, social license and permitting. At the same time, ERM had recognised a shift in the mining industry where investors were demanding stronger requirements for environmental, safety and governance. Reflecting this change, ERM was searching for a group with an excellent reputation in the mining market that could assist them in growing in this area.

## Has the recent strong performance by the Australian mining industry been reflected in CSA Global's business?

In terms of financial performance, our year ending June 30, 2019, has been the best year in our history at CSA Global. We have spent a lot of effort making this happen – restructuring the business in the period 2013 to 2015, focusing on high-quality staff, making sure we have an excellent service mix that matches our client base and looking to expand that client base. ■

# Louise Pearce

Global Mining Lead  
**ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)**

## Have you noticed increased attention to ESG issues in the mining industry?

Trends around climate change, technology transformation and global interconnectedness, coupled with recent catastrophic mining disasters, have put pressure on the mining and metals ecosystem to operate and use resources more efficiently, safely and responsibly. As a result, the sector is under close scrutiny from all its stakeholders. We feel the brand of mining is at a tipping point. It's fighting an ambition to be seen as attractive to its customers, investors, employees and wider society - while facing the reality of tailings failures, fatalities, and sometimes questionable practices, or jurisdictions that put profit before people. We have labeled this growing divide 'the mining trust gap'. It's that difference between what we do and what we say, and the perception of how our stakeholders interpret that.

## Can you provide examples of innovations utilized by ERM that are contributing to more environmentally-friendly mining practices?

ERM's 'The Mine We Want to See' is a

model focused on sustainable mining practices developed in consultation with the industry and stakeholders. Through our service lines, we help our clients incorporate sustainable practices into their business – at both a site and corporate level. Examples include: Providing expert support to the G20 Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD); helping clients to understand their water risks from a catchment-wide perspective; contributing to the development of international and local mining benchmarking standards.

## How has the acquisition of CSA Global enhanced ERM's service offering?

The addition of CSA Global's services, including their core geology and operational performance, provides enhanced capabilities for us to address our clients' issues and challenges across the full life cycle of their business. Other recent acquisitions such as The Fifth business, a change management consultancy and the think tank, SustainAbility have also significantly enhanced our service offering to mining clients. ■

# Eric Lannegrace

Managing Director & Founder  
**MINERA SOLUTIONS**



We want customers to contact us so that we can provide the equipment via the manufacturer that we represent. Minera also works closely with companies that it does not represent. We do not necessarily sell their products, but can facilitate business with them. The relationships we have with service providers, legal companies, integrators and EPCs all over Canada are the true value our company offers.

### Which are some of the companies Minera collaborates with?

Minera works with WesTech, a well-established company from the United States. They have 500 employees globally, and can cover most of the needs in the mining sector, especially around mine water treatment. For the biological side, we work with Nexom, a local Canadian company with a depth of expertise in this area. We also work with EHP Environment, a Finnish company that provides equipment and data services for remote monitoring particularly well-adapted to cold climates. We may add one or two specialized manufacturers to complete our offer. The idea is to have synergy between these companies – they gain from being on the minera platform, but minera also provides value for people and companies that are related to mining, but do not have access to the market.

### What is Minera's growth strategy moving forward?

Things have been moving so fast for minera that managing growth is certainly a challenge. We are obtaining external help from consultants and mentors, and have found investors interested in minera as they see the growth potential and the impact we can have. Based on my experience of the water treatment industry, I am looking more into business partners than employees; people that will bring their networks and full dedication to the project.

As a business owner, I am trying to obtain balance and do not want to be only focused on gold or iron ore. Being involved in Ontario is important, but having projects elsewhere in Canada is important as well, as far as diversification and spreading the network is concerned.

### Do you have a final message for the audience of Global Business Reports?

Minera is concentrating on work in Canada, where there are currently many opportunities on the environmental side. We are client-focused and understand that relationships and reputation are built over time and based on success, so we are in this for the long-term.

Based on my experience and the network I have, I believe the best solution for responding to environmental needs is to work with one company that has a broad spectrum of partners and solutions to be able to respond to a multitude of environmental issues. Minera Solutions has a simple business model that is totally dedicated to the mining sector, with access to tier 1 manufacturers that are able to fully cover mining needs. ■



### What was the motivation and vision behind creating minera Solutions?

I have 20 years' experience and a master's in environmental science, and the industry's emphasis on the environmental impact of mining has been growing incrementally, which is why I wanted to create a company that was truly focused on mining and the environment.

Instead of integrating product lines, I downsized the business model of Minera to be a manufacturing agent, therefore opening the doors to all integrating companies and EPCs. My expertise is in water treatment, but I know that environmental directors of companies also have to deal with renewable energy and energy storage. That is why Minera has brought two renewable energy and energy storage experts into the company.

### Why do you think environmental issues become so important to mining companies recently?

The overall environmental awareness of individuals, who may also be stakeholders and investors in mining companies, is pressuring the industry to become aware of these issues. Sustainable technologies are available and there is more interest from mining companies. That being said, acting green can be difficult if a company does not have the right people to address these issues and manufacturers to provide equipment.

### Can you explain how Minera's business model works?

Minera Solutions will act as a one stop shop for a mining company's environmental needs. We obtain information from manufacturers and make it available to potential customers.

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## THE BIG FOUR HAVE THEIR SAY ON ESG



The EY Top 10 business risks and opportunities 2020 survey found that the top four considerations for mining companies are: License to operate (LTO), future of work, digital and data optimization, and reducing carbon footprint. Looking at the list year-over-year, we have seen a big shift from the traditional corporate social responsibility approach towards adopting a holistic environmental, social and governance strategy. That's why we weren't surprised to see LTO at the top of the list for the second year in a row. But considerations for LTO have evolved and are now more than just social. As our clients face a broader set of political, social, consumer and economic stakeholders, how they define LTO will change.

- **Theo Yameogo, Co-leader – Mining and Metals Canada, Ernst & Young**



In the past, companies often did not put their ESG statements at the forefront. However, it is now evident that they must get in front of the issue and demonstrate their contributions to government and the community from an early stage. Transparency is very important and companies are now being upfront and transparent on how mining in a community can be beneficial, for example through employment and local investment tax contributions to local governments and through environmental responsibility.

- **Daniel Ricica, Partner – Energy and Natural Resources, KPMG**



Mining is an inherently risky business. If you are in a jurisdiction that does not have a similar regulatory framework to Canada, it is important to address all the ESG issues. Without thorough due diligence in this regard you will be unable to run operations efficiently and your licence to operate could disappear. Whether it is through consultation with local governments or communities, companies need to ensure they have a good ESG strategy and engage early with all the stakeholders. That will take the political risk down. We have seen things like tax increases or local blockades when this aspect has been ignored. In Canada we have a strong framework of governance. Companies have to view transparency as more than compliance – there is an opportunity to tell the story of how mining is contributing to economic development and how it can provide opportunities for all stakeholders.

- **Kevin Chan, National Mining Leader, PwC Canada**



Social license is a key and recurring issue around the world. There is increasing demand on the part of communities to share in the benefits of a project and the expectations for mining companies to demonstrate their integrity and safety in operations continues to rise.

Predictability and stability are conducive to good business and poor social responsibility compromises companies by exposing them to strikes and blockages. There is an opportunity to add real value to communities and create a symbiotic relationship for success. Companies must look past compliance and go beyond the bare minimum regulatory and legal guidelines.

- **Andrew Swart, Global Mining and Metals Leader, Deloitte**



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# INNOVATION



» I would like to see the industry embark on digital transformation, as well as profound innovation. This is foundational to revolutionize the sector. The digital revolution is the new normal. But it doesn't necessarily mean that all companies must address this subject in the same way — there are opportunities for each company to do something different. «

- Theo Yameogo,  
Co-leader – Mining and Metals Canada,  
Ernst & Young

INNOVATION

# The risk of standing still

Operational costs are rising, mines are getting deeper, ore grades are declining, exploration success is decreasing and environmental regulations are becoming stricter. All of these factors are underpinned by a seven-year downturn that has seen investment leave the mining sector. When looked at from a macro perspective, the climate is ripe for new innovations to dramatically reduce the cost of production, improve exploration success and reduce environmental impact. In such a context, innovation should be a necessity, rather than an option. However, the mining industry's adoption rate for implementing new technologies lags behind other heavy industry such as the chemical, automotive and oil and gas sectors. "Having

worked in other industries, when you approach a company with a new technology, if they realize it will optimize performance and cut costs, they are willing to be first-adopters. Mining companies, on the other hand, almost always ask "who else has this in their mines?" observed Nadine Miller, strategic advisor at the Awz HLS Fund and director of Wesdome Gold Mines.

"When I entered the industry in the 1970s, there were significant changes taking place," said Alex Henderson, president of Alex Henderson Consulting, who mentioned that a high degree of everything the industry does today was developed during this period. "I often ask clients to show me what is different in the new mine they are developing from previous mines that have been built. They usually answer that there is nothing different," he added.

There are reasons for this caution. Mining is an inherently risky business, from early stage exploration that raises vast sums of money to invest in ventures statistically unlikely to be developed, through to the complicated and dangerous process of extracting ore in a remote location at depth. By the time a mine is ready to go into production, tried and tested methods are often more attractive to operators looking to guarantee output for management and shareholders. Jeff More, president and CEO of MineSense Technologies, touched on the practical reality mines have to deal with: "By definition, mines have a lot more complexity than other industries. For example, when your industrial processes are inside of one building you have more flexibility to try new things in comparison to the mass scale in a mine," he reflected, noting however, that the rate of adoption for new technologies in mining is starting to accelerate.

Chrysalix Venture Capital, a global technology venture capital fund that specializes in transformational industrial innovation, was one of the companies to have funded MineSense Technologies. Charlie Haythornthwaite, senior partner at Chrysalix, suggested that the various pressures facing the mining industry are starting to force companies to change their approach: "Generally, there is renewed recognition that sustaining incremental innovation may no longer be enough and there is an ever greater need for step-change solutions."

This sentiment was echoed by Ryan McEachern, managing director of the Mining Suppliers Trade Association (MSTA) Canada, who acknowledged that the industry knows that it



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has to change: "After the last downturn, there has been a focus on what we must do in order to survive moving forward," he said, explaining that this encompasses two aspects: having a social license to operate, and integrating technology more efficiently. "I still see companies struggling on the second aspect. I think both the understanding of the need and the will are there at a corporate level but operationalizing those changes has been more challenging. The difficulty comes in integrating new technologies into an already established system," remarked McEachern.

For Douglas Morrison, president & CEO of the Centre for Excellence in Mining Innovation (CEMI), economic pressure will be the driving factor for the implementation of technology that significantly reduces the costs for metals needed to achieve electrification of the economy. "Climate change will soon begin to threaten coastal infrastructure on a scale which most economies will not be able to tolerate," stated Morrison, warning that if the demand for metals means the price of copper, nickel and lead increases, it will be harder to drive lower-cost carbon out of the economy and the trends in climate change will continue.

Morrison insists that we need to see greater volume of base metal production, but at a lower price point, and this cost reduction must come not only from prospective mines which may not come into production within a decade, but from current mines as well. "If we change the cost of production significantly, we change the cut-off grade of ore, expand the

volume of mineable ore and increase the life of mine," he explained, adding: "This requires us to implement whole-scale change in metal mining operations globally within the next decade. The innovation imperative for mining globally is to achieve a radical increase in the electrification of the economy; the consequences of failing are not trivial."

Innovation of any kind, be it incremental or step-change, requires buy in from all parties. However, the initial push must come from the creators and developers of new technologies, and in this chapter we will explore some of the companies leading this charge.

**SMEs and start-ups: the lifeblood of innovation**

Although there are mining companies at the forefront of innovation, such as Torex Gold Resources, Dundee Precious Metals and Newmont, the small and medium enterprises (SMEs) whose sole business is to create and develop mining technologies are often the real agents of change. Across Canada there are a number of world-leading mining-tech hubs, most notably in Sudbury, Val-d'Or, Toronto, Vancouver and Montreal. Collaboration between innovation-focused associations such as CEMI, NORCAT and COREM with the start-ups and SMEs betting their houses on the success of their ideas, have spawned numerous technologies that are impacting the global mining industry. 104>>



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## Douglas Morrison

President & CEO  
CENTRE FOR EXCELLENCE IN  
MINING INNOVATION (CEMI)



**The innovation imperative for mining globally is to achieve a radical increase in the electrification of the economy; the consequences of failing are not trivial.**



**CEMI's first annual Future of Deep Mining Conference was held in September 2019 in Toronto. What does the event aim to achieve and what were its main themes?**

The aim of the conference was to profile the kinds of technologies which have been under development in Canada over the last four years. We believe that SMEs are the most innovative companies and we wanted to showcase the diversity of these innovative companies. We wanted to highlight that we are in a time where if you create an environment where people have opportunity, the innovators will take the opportunity and run with it.

The first day of the conference was focused on production intensity, which is everything to do with getting to the ore faster and moving ore to mill more quickly. The second day was focused on energy consumption, where there was emphasis on ventilation systems and battery systems for production vehicles.

**How can CEMi assist SMEs to penetrate the mining market?**

CEMI typically does not help SMEs with the sales process, but our role in the ecosystem is to develop government funded programs to accelerate the process of delivering the SMEs product or services into the economy. We will first do a profile of the SME to find any gaps in their business capabilities and then find other small companies in the ecosystem that they can work with to fill these gaps, and we also assist SMEs to find more established companies that might become partners. We aim to solve SME's technical issues as well as commercial and business issues in order to get their product or service to the market faster.

**From an innovation standpoint, what do you believe is the next big thing in underground mining?**

Continuous transportation systems for moving ore out of the mine are the next big thing in underground mining. Deep mines with dynamic, seismic conditions are not conducive to fixed infrastructure that can be damaged. Instead, simpler, mobile equipment systems are required. We have to move away from batch transportation systems to continuous transportation systems. In a conventional

batch process, roughly 80% of energy is used for moving the equipment and 20% of the energy is used to move the ore itself. On a conveyor belt, approximately 95% of the energy is used to move the product and only 5% of energy is used to move the belt. The challenge in deep underground mining is that the ore product is too dense and heavy for belts to be effective. Designs of steel conveying systems, which will consume approximately 25% of the energy for the moving parts of the equipment and 75% of the energy to move the ore, will allow mines to move the ore faster and much more energy-efficiently than using conventional batch processes.

**Do you believe the implementation of new technologies will be driven by social pressure?**

I believe that economic pressure will drive the implementation of technology to significantly reduce the cost of the metal society needs to achieve electrification of the economy. Climate change will soon begin to threaten coastal infrastructure on a scale which most economies will not be able to tolerate. But if more demand for metals means the price of copper, nickel and lead increases, it will be harder to drive lower-cost carbon out of the economy and the trends in climate change will continue. We need to see greater volume of base metal production, but at a lower price point. Therefore, it is paramount we significantly reduce the cost of base metal production, not only from prospective mines which may not come into production within a decade, but from current mines as well. If we change the cost of production significantly, we change the cut-off grade of ore, expand the volume of mineable ore and increase the life of mine. Extracting more metal from mines already in production gives us more time to find new mineable deposits and bring them into production. We will also have to find ways to mine much smaller and more remote deposits whilst still being profitable. This requires us to implement whole-scale change in metal mining operations globally within the next decade. The innovation imperative for mining globally is to achieve a radical increase in the electrification of the economy; the consequences of failing are not trivial. ■

## Ryan McEachern



Managing Director  
MINING SUPPLIERS TRADE  
ASSOCIATION (MSTA) CANADA



**What is the mandate and membership structure of the Mining Suppliers Trade Association (MSTA)?**

The MSTA is the national voice for the mining services and suppliers sector. The association's mandate for over 38 years has been to serve its members in connecting them to opportunities to grow their business. MSTA's three pillars of purpose are networking, mining intelligence information and education, and advocacy. Our members are mostly small to medium enterprises and they represent the whole life cycle of mining.

**How do you view the current climate for Canadian mining service providers?**

There are three main aspects. There is a commitment to reducing water intensity, reducing energy intensity and reducing environmental footprint. If you are a company that is providing services addressed to one of these solutions, you are in high demand. The market favors services that improve productivity. Safety used to be consid-

ered a value proposition but now it is implied that whatever you are doing is done in a safe and responsible manner. You must differentiate yourself in your ability to implement a solution that will improve productivity in a cost effective way. The productivity improvements are usually in terms of connectivity or reducing the time required for a process.

**Can you expand on MSTA's provision of advocacy services?**

We advocate by providing advice to federal and provincial agencies when they are making policy decisions. The main focus is to instruct government on how it can enable the sector's growth. I believe there are two guiding principles on how to do that. Reducing the barriers of doing business and increasing the access to opportunities. This can have many shapes and forms, and come from different angles such as infrastructure, taxation, funding innovation. Facilitating business does not mean that the industry should reduce its so-

cial and environmental responsibilities – it is about expediting the process. We have created requirements that extended the timeline from discoveries to production. The aim should be to condense that without reducing the quality of the regulation.

**Do you see the adoption rate for new technologies improving?**

After the last downturn, there has been a focus on what we must do in order to survive moving forward. This encompasses two aspects; having a social license to operate and integrating technology more efficiently. I still see companies struggling on the second aspect. I think both the understanding of the need and the will are there at a corporate level but operationalizing those changes has been more challenging. The difficulty comes in integrating new technologies into an already established system.

**What does the MSTA's annual forum held in Toronto in November aim to achieve?**

In 2019, the theme is "Unleashing the Canadian Mining ecosystem". The intent is to provide a platform for companies to show their work and contributions worldwide; from the government to mining services providers, mining companies and all stake holders. I believe we succeeded in our goals and objectives of this event. We also wanted to convey the message that we are a trusted and ethical partner of choice to develop your mineral resources. We are planning for our 2020 event and look forward to another great networking event. ■

**GET CONNECTED  
TO A WORLD OF POSSIBILITIES**

Ryan McEachern  
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**MSTACANADA**  
MINING SUPPLIERS TRADE ASSOCIATION

Image courtesy of SafeSight Exploration



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The Sudbury and North Bay area in Northern Ontario is the home of the largest mining service sector hub in Canada. Although steeped in mining tradition, the modern day Sudbury Basin region is far from old-fashioned, with a high-tech ecosystem of companies producing ground-breaking technologies. One such company is SafeSight Exploration, which celebrated its one-year anniversary of an underground drone program with Newmont in 2019. "This rugged utility drone integrates the latest LiDAR technology with an open platform flight controller and has the ability to go anywhere that a human should not go. The time for collecting data is also significantly reduced with the DB3 product being able to do a complete scan in approximately 15 mins," explained Mike Campigotto, president of SafeSight, who commented that his company is evolving to become more than just an underground drone specialist: "We are becoming a company that solves problems with innovative technologies rather than limiting ourselves to one type of technology. We can essentially become the technology extension of an innovation manager in a mine." On the subject of new-technology implementation, Campigotto acknowledged that the majority of mining companies do not want to be first-adopters, but having a high-profile partnership can lead to further collaborations once the innovation has been proven, as has been the case with SafeSight which built upon its work with Newmont to collaborate with Redpath

Mining, Wesdome Gold Mines and Barrick. "After just under three years in the field, SafeSight has already flown over 100 operational missions, so despite bringing innovation into a conservative industry, we have tangible proof that the best technologies can be adopted," he concluded. Another Sudbury-based company to have had considerable success disseminating its technology is Maestro Digital Mine, which now supplies solutions to over 130 mines world-wide, according to Michael Gribbons, co-founder and vice president. Maestro launched its Zephyr AQS solution in May 2019, a low-cost air quality monitoring station for underground mines, after studying market data to find out what its users were buying and designing a product to fit a profile that matched 75% of these buyers. "The flaw of many technology companies is to hang on to a product and fail to innovate, and the innovation cycle is slow," observed Gribbons.

When asked which factor seemed to be top of the agenda of mining companies in 2019, Gribbons replied unequivocally that productivity has been the number one focus. "A 10% reduction in energy use does not have the same impact as a 10% increase in production," he said, underlining the importance of understanding the operating principles of a mine and

how mine managers are being compensated. "The primary focus is on tonnage feeding the mill and second is health and safety. Energy is important but it is nowhere near those two parameters," he added, noting that Maestro's solutions can help dramatically in all three areas.

Revolution Mining Software (RMS) is another Sudbury-based tech company with a focus on optimization. Incorporated in 2014 for the commercialization of SOT, the Schedule Optimization Tool, the software was initially developed at MIRARCO (Mining Innovation, Rehabilitation and Applied Research Corporation) at Laurentian University. Lorrie Fava, RMS' president, explained how MIRARCO's Ventilation Constraint Module (VCM) interacts with SOT to facilitate the generation of optimized schedules: "By interacting with a ventilation network solver, the VCM automatically generates airflow-based constraints on the equipment over the course of the mine life. Using these constraints, SOT generates life-of-mine schedules with maximized net present value (NPV) that are feasible from a ventilation perspective."

On the West Coast, one of Canada's most successful mining-tech companies in the last two years has been Vancouver-based VRIFY. Stephen De Jong, VRIFY's CEO and founder, developed an app that uses 360 degree imagery to market Quebec-based gold exploration company Integra Gold, of which he was CEO before the company was acquired in

2017. In 2018, VRIFY had four clients using its platform, and by the end of 2019 the client-base had grown to approximately 110 companies. So why has this new approach to presenting information become so popular? "Mining companies have traditionally relied on two-dimensional tools to convey three-dimensional stories, but investors and stakeholders are demanding more in the current market," explained De Jong, continuing: "They want information presented in a way that allows them to actually understand where the investment potential lies. On the other side, companies deserve a chance to differentiate themselves from all the noise in the market if they have an opportunity worth considering. That's where VRIFY comes in."

When it comes to step-change technology, the potential to reduce the cost of material movement from US\$3.27 to US\$0.16 per ton is the type of impact that mining companies cannot afford to ignore, or perhaps, may find hard to believe, according to Jim Fisk, executive chairman of Rail-Veyor. Rail-Veyor's conveyor belt ore transportation technology has been implemented in mines across four continents, including Agnico Eagle's Goldex mine in Val-d'Or. Although the technology has gained traction through high-profile collaborations, Fisk commented that a resistance to change is still apparent when one does not have an engaged audience willing to consider a new process. "Many companies just look at the capital cost and forget about the operating cost, but in my experience mines shut down because of high operating costs, not because of high capex," he said.

While some innovations change or reinvent processes that have been in place for years, others enhance what is already in use. This is the case of Deep Cryogenics International, the Halifax-based start-up which addresses abrasive wear problems for mining tools and components. "Making items last longer is the eternal engineering challenge and this is what the Deep Cryogenics process does," stated Jack Cahn, founder and president, who explained how the deep cryogenics process takes the nitrogen in the air, separates and chills it to -196 C before warming back up and imparting a permanent wear resistance to the metals. "The process uses no chemicals, leaves no waste, causes no harm, is not dangerous, is environmentally neutral, infinitely renewable and recyclable," he added.

**Toronto's mining-tech hub**

The second biggest mining service hub in Canada outside of Sudbury is, surprisingly, Toronto. Despite being located relatively far from mine sites, service companies in Toronto reap the benefits of being located close to mining companies' HQs and the money markets, as well as a broader technology hub headlined by the world-class MaRS Discovery District, North America's largest urban innovation hub.

One of the mining-focused start-ups located at MaRS is Peytec, which launched its Muck Puck product in 2018, and had sold north of 1,000 units by October 2019, according to Peyman Moeini, president & CEO. Moeini explained the benefits of the Muck Puck over RFID (Radio-frequency identification) – the most commonly used quality-control product for mate-

rial handling: "RFID has a reliability of between 70% to 80%, compared with the Peytec standard of 99%. These tags also have the issue that when buried they cannot be detected, and when a problem is detected it is too late. The Muck Puck tags can send their signal through 20 tonnes of muck pile, which means drivers can know what they are carrying. In other words, Peytec's product closed the gap between automated quality assurance and quality control. This can represent savings of eight to nine figures."

Some companies move into the mining when they see their technology can be applicable to the sector, others are born from first-hand experience, noticing issues that need addressing and coming up with solutions accordingly. The latter is the case for Minetell, whose founder & CEO Michael Hartley was working as an enterprise risk manager in the mining sector and noticed that companies could not answer two fundamental questions: What is their material risk exposure and how effective are critical controls at any one moment in time? From this basis, Hartley created Minetell to gather intelligence to provide decision-makers with information that improves critical control performance and minimizes unacceptable exposure to material risks, with the vision to use performance data to change the way companies manage risk. "We see huge value in actually stewarding a project, rather than just minimizing the likelihood of events taking place. We must get away from the notion that risk management is perfect until something catastrophic happens," he remarked.

Minetell wants companies to move from results thinking to performance thinking, in a move away from the “react, repair, repeat” philosophy that is currently prevalent, to rather seeking information that helps proactively predict and prevent failures. “The absence of failure is not a metric of success and that is the big difference between results thinking and performance thinking,” he elaborated, giving the example of the extractive industries’ obsession with a totally recordable injury rate that drives companies to fall foul of ‘Goodhart’s Law’ – when a metric becomes a target, it ceases to be a useful metric.

One of the key takeaways from our research in Toronto was the importance of developing technology with the user in mind, something Tony Makuch underlined during his fireside chat at the Northern Miner’s Progressive Mine Forum in October 2019 – you need the operator on board for any technology to be successfully adopted. Shelby Yee, CEO and co-founder of RockMass Technologies, spoke of how her company’s main Axis Mapper product was developed with users at the forefront of its philosophy: “One of our core beliefs is that success will come from building the product in the hands of users... Users want digital solutions that work, can be used every day and are not overly complicated.”

RockMass Tech’s Axis Mapper is used for obtaining real-time joint orientations and geotechnical data in underground environments, with the goal of maximizing engineers’ efficiency and providing accurate, actionable data. “Users have told us the greatest benefit is that the Axis Mapper integrates data collection very quickly with data visualization and that they have better data to work with in real time. It can turn a six-hour process into minutes whilst still generating accurate and consistent datasets,” related Yee.

Another common theme in the innovation lifecycle is the role of universities in the research and development of new technologies, a dynamic leveraged by ApoSys Technologies, which has collaborated with the University of Toronto and Princeton University to create a laser alignment device with drilling rig setup. Oliver Wang, ApoSys Tech’s CEO, shared his thoughts on the importance of practical implementation for innovative technologies: “The most important thing in technology development is not innovation but its application. It is not a question of how innovative a technology is but how useful it is and how easily it can be integrated. The product drives the market and vice versa. We need to work closely with the customer so that both parties can understand the business case.”

### OEMs leading the electric revolution

While the move to battery electric vehicles (BEVs) at mine sites is still at a relatively nascent stage, every OEM we interviewed, without exception, was keen to underline its focus on the transition to electric. At new mines, such as Newmont’s Borden operation in Timmins, electric vehicles are already the norm and, as public pressure on diesel emissions intensifies and prominent examples of the cost and environmental benefits of BEVs become more prevalent, staying with diesel power will become a risk.

“We always get asked, why go electric? I think the question should rather be, why use diesel?,” questioned Brian Huff, co-founder and vice president of technology at Artisan Vehicles, the California-based company that exclusively designs and builds BEVs for the mining industry. Acquired by Sandvik in February 2019, Artisan grew its reputation through collaboration with Kirkland Lake Gold in Ontario with its Z50 50-tonne haul truck, the latest and largest in the company’s line of BEVs. “Electric vehicles have many benefits as they increase health and safety, reduce costs and optimize operations. I would like to see the conversation change from why go electric to why use diesel,” added Huff.

At the top of the service sector food chain, Epiroc maintained its leading position in Canada in 2019, despite an industry still yet to fully crawl out of the downturn. Jason Smith, general manager of Epiroc Canada, spoke of an evolving dynamic where mining companies are requesting, rather than waiting to be convinced of, new innovations: “These days clients are coming to us asking for the latest technologies, rather than the other way round, as mining companies have seen tangible evidence of the competitive advantages innovation can bring,” said Smith, observing that new technologies must be scaled in collaboration with customers in such a way that exposure is limited during the ramp up and learning phase.

To cater for a wide market, Epiroc also offers a unique opportunity to its customers with the Battery as a Service (BaaS) solution where the end-user does not need to invest in the battery pack and only pays for their usage. “As well as the cost benefits, there is a positive environmental impact as the customer takes ownership of the “full circle of life” of the batteries, including second powering options right up to the recycling and reuse of some materials – a win for our customers, for us and the environment,” added Smith.

The Sudbury-based OEM formally known as Minecat decided to rebrand as Kovatera in 2019, to signify the company’s new direction on a number of fronts, including a more global outlook, a new lean manufacturing process, and the release of new products in the EV space, according to general manager Will Gove. “There are two green colors in Kovatera’s new logo which is symbolic of the company moving towards greener and renewable technologies,” explained Gove, who noted that while the demand for EVs is increasing exponentially, he expected diesel machinery is still going to play a role in the mining industry for at least the next two to five years.

In parallel with the move towards electrification, the move towards automation is also gathering pace, as exemplified by Finish OEM Normet, whose North American headquarters is in Salt Lake City and has a base in Sudbury, Ontario. Greg Hallett, Normet’s senior vice president for North America, expanded on how the company’s SmartSpray line was inspired by customer feedback relating that the quality of the sprayed concrete can vary critically between operators: “Normet is thus developing its products so that the operator effect to the result is minimized and productivity of spraying is increased,” said Hallett, adding: “The ultimate goal would be for our sprayers to achieve a level of automation where operator confidence becomes less important and the machine can autonomously deliver the outcome the customer is looking for.” ■

# Jason Smith

General Manager  
**EPIROC CANADA**



### How has business been for Epiroc in Canada in the past 12 months and has there been progression with the move towards electric vehicles?

2019 has been a good year for Epiroc and we remain excited about the future. In terms of BEV development, Epiroc is now on generation two and has more than 100,000 hours of operational experience just in Canada. Currently, we have implemented battery technologies in our 14-tonne Scooptram ST14, Minetruck MT42, and drill rigs, but this technology will be rolled out into Epiroc’s entire product portfolio.

### Can you explain the benefits of Mobilaris technology?

Part of Epiroc’s digitalization offering is the Mobilaris product portfolio including situational awareness, emergency support and ventilation on demand. The offering is an important part to optimize our customers’ value chain through system integration and information management. The Mobilaris product allows real-time location, tracking and monitoring of vehicles, personnel and any equipment using a mixture of technologies from various vendors. It is the best fit for homogeneous and cost-efficient solutions to track assets in the mine. To integrate planning data, machine production and maintenance data or sensor data into one decision support system will help you increase the production efficiency and safety of your mine.

### What are some of the latest products added to Epiroc’s automation fleet?

We have added more products to our automation fleet and are very excited

about Epiroc’s SmartROC D65 surface drill rig, which is making evolutionary strides and was deployed with Newmont at the Hollinger open pit mine in Timmins in 2019. This tried and trusted rig now has Epiroc’s innovative automation-ready platform as its foundation. It has the intelligence and power to consistently and efficiently drill high-quality blast holes with accuracy and precision and is loaded with smart features such as automated drilling and rod handling. Digitalization is picking up tremendous momentum here in Canada and globally within our industry. At Epiroc, we optimize our customers’ value chain through automation, system integration and information management. We call this 6th Sense and it enables a smart, safe and seamless operation. Epiroc also offers a unique opportunity to its customers with the Battery as a Service (BaaS) solution where the end-user does not need to invest in the battery pack and only pays for their usage. As well as the cost benefits, there is a positive environmental impact as the customer takes ownership of the “full circle of life” of the batteries, including second powering options right up to the recycling and reuse of some materials – a win for our customers, for us and the environment.

### With regard to innovation, miners are often risk-averse. Have you noticed an uptick in the demand for new technologies?

Generally no one wants to be the first adopter of new technologies. However, I believe that the industry mindset is changing and mining houses are start-

ing to look for technologies which can improve efficiency and productivity. For example, these days clients are coming to us asking for the latest technologies, rather than the other way round, as mining companies have seen tangible evidence of the competitive advantages innovation can bring. In collaboration with customers, we must scale new technologies in such a way so that exposure is limited during the ramp up or learning phase.

### What are Epiroc Canada’s key focus areas moving forward?

Epiroc is focused on sustainability and innovation and always will be. The biggest single driver of change in the rock excavation business is, without a doubt, the advent of automation. Additionally, the amount and quality of resources Canada gives us a positive outlook for the region. What differentiates Epiroc in the market is the technologies and solutions that we bring to the table, and we aim to be a partner to our customers so that the products Epiroc develops fit seamlessly into their mining operations. This customer-focus will continue as we constantly help them make their operations more sustainable, safe and efficient.

An example of Epiroc’s commitment to stay close to its customers is the establishment of a remanufacturing facility in Sudbury with a focus on underground equipment and operations. We hope to open the doors of the new facility by Q1 2020, which will initially service local consumption, but also the North American, South American and international markets if the demands are there. ■



## Mike Campigotto

President  
SAFESIGHT EXPLORATION



**We are starting to realize that although drones are our first love, we are becoming a company that solves problems with innovative technologies rather than limiting ourselves to one type of technology. We can essentially become the technology extension of an innovation manager in a mine.**



**Do you think the mining sector has started to embrace new technologies and innovation?**

Currently, there is a lot of noise but still not enough action. There are a few companies that want to be first and want to lead the industry, but the majority are



**What was your vision and motivation to create Safesight Exploration?**

Our collective intention was twofold. We felt that we could make a great contribution to the digital transformation platform in mining and that the technology would dramatically change the level of safety in the mining industry. All of the technology that we use in our innovations is really at the bottom of its evolutionary curve and has nowhere to go but upwards. SafeSight's team of experts have applied a passion for thinking and seeing things differently beyond the latest drone, LiDAR, battery and camera technology and toward client challenges underground. The result has led to collaborations with leaders in the digital transformation of mining and the creation of step change solutions.

**How has the company evolved through its collaborations with mining industry partners?**

We have just celebrated the one year anniversary of Newmont's underground drone program collaboration with SafeSight. Their team have been believers from the get-go and had the attitude of wanting to lead digital transformation to a higher level of production and safety. This high-profile partnership has led to collaborations with Redpath Mining, Wesdome Gold Mines and Barrick. We are starting to realize that although drones are our first love, we are becoming a company that solves problems with innovative technologies rather than limiting ourselves to one type of technology. We can essentially become the technology extension of an innovation manager in a mine. With digital transformation, mines are appointing innovation leaders, but they do not always have the infrastructure from a technology perspective to give them the tools to innovate. For a company to thrive they need to continuously innovate and Safesight is capable of being the partner that leads this march.

more conservative and take a first to be second strategy. Fortunately, SafeSight has found the people who want to embrace innovation and they have found value in our products which has enabled us to rapidly develop technologies and put them into actual practice. The mining sector is looking to digitally enable itself in one form or another.

**Can you explain the benefits of SafeSight's DB3 drone technology?**

SafeSight's leading product with the most demand is the DB3 LiDAR enabled drone technology. This product is ideal for surface or underground georeferenced LiDAR scans and has the benefit of increased safety, improved reconciliation, reduced dilution and improved block scheduling. This rugged utility drone integrates the latest LiDAR technology with an open platform flight controller and has the ability to go anywhere that a human should not go. The time for collecting data is also significantly reduced with the DB3 product being able to do a complete scan in approximately 15 mins.

We like to proliferate the technology with clients by selling them an activation model where they actually have to activate the program with intention. It usually starts with clients using Safesight for a few service calls, after which they will buy the technology and go through a training program so they can progress on their own. As we get to know a client, we start to recognize some of the challenges they run into. We have therefore developed other tools such as robots and trucks for LiDAR enabled ground support, which is ideal for high risk or high ventilation areas where drone flight may not be feasible.

**How will the company manage growth as its technologies and services continue to gain traction?**

We have become highly efficient in innovation, project development and manufacturing, using lean methods and agile project management strategies and can thus do a lot with few people. We are trying to be mindful of our resource growth and we are very selective with who we work with. We choose our clients as much as they choose us, which allows for every implementation to be successful. ■

## Michael Hartley

Founder & CEO  
MINETELL



**How did your experience in the extractive industries help form your ambition to create Minetell?**

While working as the enterprise risk manager in the mining sector, I noticed that companies could not answer two fundamental questions: What is our material risk exposure and how effective are critical controls at any one moment in time? I created Minetell to gather intelligence to provide decision-makers with the information that improves critical control performance and minimizes unacceptable exposure to material risks, with the vision to use performance data to change the way companies manage risk. We must get away from the notion that risk management is perfect until something catastrophic happens.

**Have you seen environmental and risk awareness improve in recent years?**

We are experiencing an age where wealth is being transferred from boomers to millennials. At the very time the industry needs capital, capital is fleeing because we are not giving investors what they want. They are looking for evidence-based information, founded in data, to give them the

confidence that material risks are being well mitigated.

Minetell is working to develop an ESG index that is performance-based to help decision makers understand where to allocate capital and resources. A performance-based index gives stakeholders the confidence and comfort that the associated results are repeatable. This helps to differentiate a company from its peers, and could be the difference in opening a door into a new jurisdiction.

**What are your views on the adoption rate of new technology in mining?**

Instead of implementing the technology, we are focusing on getting companies to adopt it. There has to be engagement. It has to be treated as a change-management project. The client must think about what the future state looks like and whether the technology aligns with it. If you are not treating technology adoption as a change management project you are going to fail. Unless you get the buy-in from everyone operating it, it is not going to work. A company ignores the human component of technology adoption at its peril. ■

## Michael Gribbons

Co-Founder and Vice President –  
Sales & Marketing  
MAESTRO DIGITAL MINE



**What has been the important milestone achieved by Maestro Digital Mine (MDM) in 2019?**

The Zephyr AQSTM Air Quality Station, a new product launched at the CIM Convention in Montreal 2019, has been a huge success. The Zephyr AQSTM is a low-cost air quality monitoring station for underground mines that now completes internally with the gold standard – Vigilante AQSTM air quality station.

We now supply technology solutions to over 130 mines world-wide. An important development in 2019 was entering the Argentinian market through partnerships with Newmont and Yamana Gold.

**Does MDM tailor its products depending on client and mining environment?**

Because we are permanently innovating to cater to the mining operator's needs, they value our support and are repetitive customers. The products we develop are a direct response to operator needs and we distinguish ourselves in providing ongoing support to clients. That is the key to holding a reputation and allows us to go from mine to mine.

**Which factor seems to be top of the agenda of mining companies: energy efficiency, productivity, or safety?**

Productivity, definitely. A 10% reduction in energy use does not have the same impact as a 10% increase in production. We understand the operating principles of a mine and how mine managers are being compensated. The primary focus is on tonnage feeding the mill.

**What is in store for Maestro Digital Mine in 2020?**

This year we are releasing MaestroLink™ Server. Now that we have thousands of Vigilantes on the field and several hundred of Zephyrs, managing them effectively in the field requires on-going calibration and maintenance. All of Maestro's products are fully digital and have significant information in the form of status bits to determine the health of the sensors and the complete system. To leverage this information, MaestroLink™ was developed to monitor the equipment and allow easy and quick decisions from a centralized location. ■

“We have to ask ourselves, why has mining got such a bad name? You cannot blame the markets. Poverty is a responsibility we all have to deal with. If there is no focus on contributing to the economy and societal needs of a country, there is a great possibility of destroying very viable economies.”

**- Mark Bristow,  
President and CEO,  
Barrick Gold**

“Our philosophy is that there are many deposits out there waiting to be found. There is a misleading belief that all the easy discoveries have been found. We believe there is a systemic explanation why discovery rates are down. Exploration has been pushed down to the juniors; juniors are publicly traded and therefore have short term pressures from stake holders. This results in management decisions such as focusing on small geological deposits for drilling that could simply be an anomaly.”

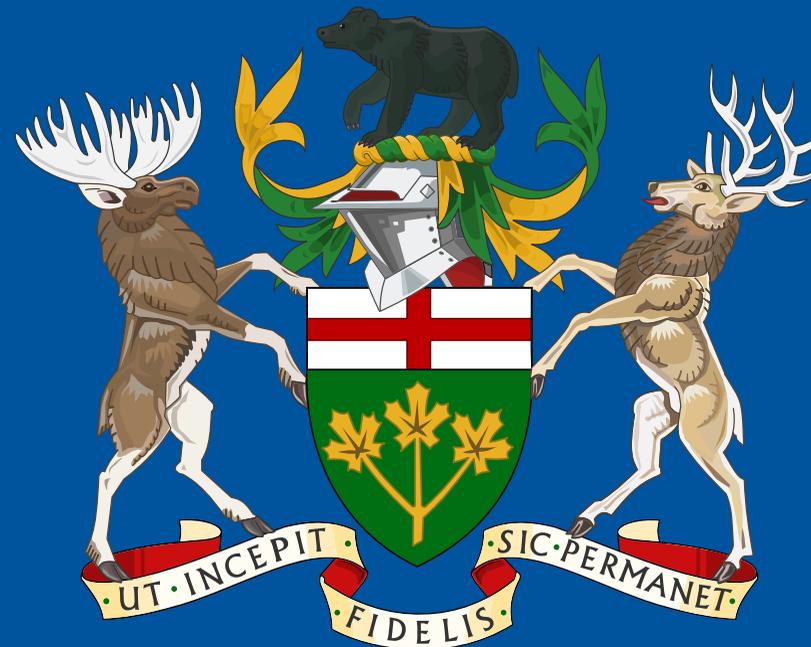
**- Shastri Ramnath,  
President, CEO and Director,  
Exiro Minerals Corp**

“Youth often perceives resource development, including oil and gas, as low-tech, manual and environmentally destructive. However, those with direct experience with the industry soon realize the opposite is true. Resource development is one of the most beneficial activities for society that can create a lasting positive legacy. We are working to help younger generations see this reality”

**- Dr. Ross Sherlock,  
Director of the Mineral Exploration Research Centre (MERC),  
Harquail School of Earth Sciences,  
Laurentian University**

“The amount of equity raised dropped off significantly in 2018, to the extent that the amount of equity raised in 2018 was actually below the previous low in 2013. PDAC is encouraging the government to keep in place certain fiscal incentives to drive investment into the exploration side of the business, such as the maintenance of the flow-through share (FTS) regime as well as the renewal of tax credits. Approximately 80% of all equity raises for exploration in Canada have been flow-through, which illustrates its importance.”

**- Felix Lee,  
President,  
PDAC**



“Canada is well-positioned to have a greater space in the critical mineral supply chain, but we need to be more strategic with regards to our resources and in investing in developing those resources. Junior companies are trying to survive in a tough market. We have to look at supply-chains and value-chains in terms of what is driving the development. Instead of driving development from the resource, it should be driven from the magnet or battery.”

**- Janice Zinck,  
Director – Green Mining, CanmetMINING,  
Natural Resources Canada**

“The digital evolution is uncontested. It is the only way to run your business, can help optimize and cut costs, and can also be used to address three key concerns: license to operate, talent and ESG. We must rethink energy and digital provides the necessary tools, allowing us to track consumption and think about how to optimize it.”

**- Theo Yameogo,  
Co-leader – Mining and Metals Canada,  
EY**

“We are experiencing an age where wealth is being transferred from boomers to millennials. At the very time the industry needs capital, capital is fleeing because we are not giving investors what they want. They are looking for evidence-based information, founded in data, to give them the confidence that material risks are being well mitigated.”

**- Michael Hartley,  
Founder and CEO,  
Minetell**

“I believe that economic pressure will drive the implementation of technology to significantly reduce the cost the metal society needs to achieve electrification of the economy. Climate change will soon begin to threaten coastal infrastructure on a scale that most economies will not be able to tolerate. But if more demand for metals means the price of copper nickel and lead increases, it will be harder to drive lower-cost carbon out of the economy and the trends in climate change will continue.”

**- Douglas Morrison,  
President and CEO,  
Centre for Excellence in Mining Innovation (CEMI)**

COMPANY/ INSTITUTION	WEBSITE
Adventus Mining Corporation	adventusmining.com
Alamos Gold	www.alamosgold.com
Alex Henderson Consulting	www.linkedin.com/in/alex-henderson-39671831
ApoSys Technologies	www.aposystech.com
Appia Energy Corp	www.appiaenergy.ca
Artisan Vehicles	www.artisanvehicles.com
Aston Bay	astonbayholdings.com
Aurania Resources	http://www.aurania.com
Avalon Advanced Materials	www.avalonadvancedmaterials.com
Awz HLS Fund	www.awzventures.ca
Barrick Gold	www.barrick.com
Baatar Consulting	www.linkedin.com/in/bayarbaatar
Benchmark Mineral Intelligence	www.benchmarkminerals.com
Black Rock Engineering	www.blackengtech.com
Blue Coast Research	bluecoastresearch.ca
C.J. Stafford and Associates	cjstafford.com
Canada Cobalt Works	www.canadacobaltworks.com
Canadian Institute of Mining, Metallurgy and Petroleum (CIM)	www.cim.org
Cementation Americas	en.cementation.com
Chrysalix Venture Capital	www.chrysalix.com
Centre for Excellence in Mining Innovation (CEMI)	www.cemi.ca
Clearflow Group	clearflowgroup.com
Conic Metals Corp	www.conicmetals.com
Covergalls	covergalls.com
CSA Global	www.csaglobal.com
De Beers Group	www.debeers.com
Deep Cryogenics	deepcryogenics.com
Deloitte	www2.deloitte.com/ca/en.htm
Discovery Metals	dsvmetals.com
DRA Global	draglobal.com
Dundee Corporation	dundeecorp.com
Dundee Precious Metals	www.dundeeprecious.com
Epiroc	www.epiroc.com
ERM	www.erm.com
Ethiopian Airlines	www.ethiopianairlines.com
Excellon Resources	www.excellonresources.com
Exiro Minerals Corp	www.exirominerals.com
EY	www.ey.com
Fasken	www.fasken.com/en
First Cobalt	www.firstcobalt.com
FLSmidth	www.flsmidth.com
Fortune Minerals	www.fortuneminerals.com
Frontier Lithium	www.frontierlithium.com
Generation Mining	www.genmining.com
Global Atomic Corporation	www.globalatomiccorp.com
Global Mining Capital Corp	globalmining.ca
Gold Fields	www.goldfields.com
GoldSpot	goldspot.ca
Government of Ontario	www.ontario.ca/page/government
Great Bear Resources	greatbearresources.ca
Haylard	www.halyard.ca
Haywood Securities	www.haywood.com
Hispanics in Mining	hispanomine.com
IBK Capital Corp	www.ibkcapital.com
INV Metals	www.invmetals.com
Ion Energy	www.ionenergy.co
JDS Energy & Mining Inc	www.jdsmining.ca
Kingsdale Advisors	www.kingsdaleadvisors.com
Kirkland Lake Gold	klgold.com
Kovatera	www.minecat.com

COMPANY/ INSTITUTION	WEBSITE
KPMG	home.kpmg/ca/en/home.html
Labrador Iron Ore Royalty Corporation	www.labradorironore.com
Laurentian University	laurentian.ca
Maestro Digital Mine	www.maestrodigitalmine.com
Magna Mining Corp	magnamining.com
Major Drilling	www.majordrilling.com/en
Minera Alamos Inc	www.mineraalamos.com
Minera Solutions	www.minera.solutions
Mineral Exploration Research Center (MERC)	merc.laurentian.ca
MineSense Technologies	minesense.com
Minetell	www.minetell.ca
Mining Suppliers Trade Association (MSTA)	mstacanada.ca
Ministry of Energy, Northern Development and Mines	www.mndm.gov.on.ca/en
Multotec Canada	multotec.ca
Natural Resources Canada	www.nrcan.gc.ca/home
Neo Lithium Corp	www.neolithium.ca
Newmont	www.newmont.com
Noble Mineral Exploration	www.noblemineralexploration.com/s/Home.asp
Normet	www.normet.com
Northern Light Technologies	northernlighttechnologies.com
O3 Mining	o3mining.ca
Omai Gold Mines	www.omaigoldmines.com
Ontario Mining Association	www.oma.on.ca/en/index.asp
Orix Geoscience	www.orixgeo.com
Ormston List Frawley LLP	www.olflaw.com
Palladium One Mining Inc	www.palladiumoneinc.com
PDAC	www.pdac.ca
Peytec	www.peytec.com
Pilot Law LLP	pilotlaw.ca
Premier Gold Mines	www.premiergoldmines.com
Proactive Investors	www.proactiveinvestors.com
PwC Canada	www.pwc.com/ca/en.html
Rail-Veyor	www.railveyor.com
Red Cloud Securities	www.redcloudfs.com
Revolution Mining Software	www.revolutionmining.com
Rockcliff Metals Corp	rockcliffmetals.com
RockMass Technologies	www.rockmasstech.com
Romios Gold Resources	www.romios.com
Rubicon Minerals	www.rubiconminerals.com
Sable Resources	sableresources.com
SafeSight Exploration	www.safesightxp.com
Sandvik	www.home.sandvik/en
SRK Consulting	/www.srk.com/en
Star Royalties	starroyalties.com
Steppe Gold	steppegold.com
Talisker Resources	taliskerresources.com
Teranga Gold	www.terangagold.com
Torex Gold Resources	/www.torexgold.com
Toronto Stock Exchange	www.tsx.com
Tradewind Markets	www.tradewindmarkets.com
Trigon Metals	www.trigonmetals.com
Troilus Gold Corp	www.troilusgold.com
Viamosa International	www.viamosainternational.com
VRIFY	www.vrify.com
Wesdome Gold Mines	www.wesdome.com
Westpro Machinery Inc.	www.westpromachinery.com
Women on the move	womenonthemove.club
World Gold Council	www.gold.org

*This list intends to include just a representative sample of companies operating in Ontario's mining sector, and as such it should not be considered a guide to take investment decisions.*

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