



GLOBAL BUSINESS REPORTS

ONTARIO MINING AND TORONTO'S GLOBAL REACH 2024



Pre-Release Edition

Introduction to Ontario

Legislation and labor in Canada's heartland province

This year, Ontario passed a series of important regulations that may pave the way to a brighter future for its mining industry. 2023 has also seen high prices for certain metals, boosting the margins of producers. On the other hand, the troublesome macroeconomic situation has meant that financing, particularly for juniors, has been problematic. All the while, Ontario's miners and explorers have had to adapt to changing regulations in Ontario and abroad, attract talent in a shrinking labor pool, and manage their ESG credentials in the face of an ever-growing climate crisis.

2023 has seen new legislation and amendments to bolster Ontario's mining industry. On a federal level, in October of this year the Ministry of Energy and Natural Resources announced a C\$1.5

"The success we enjoy today is a product of a strategy we pursued for 10 years, based on accretive acquisitions and an investment in organic growth through exploration, expansion and development of our various projects."

John McCluskey,
President and CEO, Alamos Gold



billion Critical Minerals Infrastructure Fund (CMIF). The CMIF is a key component of the Canadian Critical Minerals Strategy and will address key infrastructure gaps to enable sustainable critical minerals production and connect resources to markets. Eligible recipients include provinces and territorial governments, private businesses, not-for-

profit organizations, and Indigenous groups. The maximum funding available per project under the first call for proposal will be C\$50 million for most applicants, but provincial and territorial governments may apply for up to C\$100 million for public projects.

At the provincial level, the Ontario government continues to subsidize its local mining sector. The Ontario Junior Exploration Program (OJEP), for example, helps junior mining companies finance early exploration projects, with eligible juniors receiving up to C\$200,000 to cover costs. George Pirie, Ontario's Minister of Mines, shared updates on the program: "The OJEP launched in 2021 and is having initial success. Companies are eager to leverage the available funding and find the mine sites of the future. Our government is investing an additional C\$6 million over the next two years in OJEP, bringing the government's total investment in the program to C\$35 million."

Aimed to increase Ontario's competitiveness in mineral exploration and development, the *Building More Mines Act* received royal assent in May 2023. This Act made amendments to the Mining Act, aiming to reduce the administrative burden, clarify requirements for rehabilitation, and create regulatory efficiencies by eliminating overly complicated, duplicative and unnecessary rules. Most of the interviewees featured in this report were enthusiastic about the new Act; Chris Hodgson, president of the Ontario Mining Association (OMA), said: "We were very impressed with how the government conducted the consultation

Ontario's mining industry by the numbers

C\$13.5 B

Value of mineral production in 2022

C\$989 M

Spent in 2022 on approximately 300 mineral exploration projects

31,000

Direct mining jobs, plus another **47,000** indirect jobs have been created

over 376,000

Active mining claims in good standing (as of April 30, 2023)

Largest producer

in Canada of gold, platinum group elements and nickel, and the 2nd largest producer of copper

Source: Invest Ontario

process when developing the Act and regulations; they considered a broad array of perspectives and incorporated valuable input from expert practitioners."

Mining-related environmental regulations in particular are a hot topic. Finding an equilibrium between the need to develop the critical minerals mines needed for the green energy transition, while taking the time to consider the environmental impacts requires a fine balancing act. Mary-Jane Piggott, vice president, mining environmental group at Klohn Crippen Berger, a consultancy focused on tailing-related designs and assessments, shared her thoughts on how such regulations should be handled in her field: "I support keeping regulation and governance responsibilities for tailings management within the industry and its professional organizations. Most industry professionals are passionate about environmental responsibility and are motivated to operate sustainably."

Ontario's 2023 spree of new regulations, deals and initiatives extended beyond its borders. The premier of Ontario, Doug Ford, sat down with the governor of the state of Nevada to sign an Economic Cooperation Memorandum of Understanding (MoU) to increase collaboration on electric vehicles, advanced manufacturing, mining, critical minerals, and related supply chains, among others. In 2022, total trade between Ontario and Nevada exceeded C\$2 billion, with exports to Nevada totaling C\$1.1 billion. "This agreement is based on our regions' strong mining sectors," said Nevada Governor Lombardo.

connections and secure contracts in Nevada. "The 10-year relationship we had with the GOED and the NNRDA paved the way for the recent MoU signed between Nevada and Ontario," said Marla Tremblay, executive director, MineConnect.

Ontario's talent drought

In September 2023, the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Toronto branch held a panel discussion on critical minerals. As the panel began discussing how Canada would achieve the enormous increase in critical mineral production, one big question remained unanswered: Who is going to build these critical minerals mines?

The number of mining and mineral engineering graduates dropped by a third between 2016 and 2020 in Canada, according to Statistics Canada. Many other jurisdictions, like the UK and Colorado, reported similar drops in enrollment in mining-related degrees. This waning interest in mining and earth sciences from students poses a serious

Setting the stage for the MoU, MineConnect, Ontario's mining supply and services association, has partnered with the Nevada Governor's Office of Economic Development (GOED) and the Northeastern Nevada Regional Development Authority (NNRDA) for many years. This has allowed MineConnect members to make

Explore stories of human transformation connected to Ontario's mining industry.

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threat to the success of Ontario's Critical Mineral Strategy, and by extension, to Canada's net-zero plans. "The youth of today are not as interested in mining as a profession, which is truly unfortunate as there are great opportunities," said Frank Galati, managing partner at the Bedford Group TRANSEARCH, an executive search and professional services firm catering to the Canadian mining sector.

Market volatility, mining's reputation as a 'dirty' industry, and the remoteness and tough living conditions at many mining camps are just some of the factors driving young graduates away from the industry. "Improving facilities on site, improving rotation, and labeling mining companies as innovators will help to lessen the labor shortage in the years to come," continued Galati.

The shortage of talent within Ontario's mining industry extends beyond engineers and geologists to the tradespeople employed by service providers and contractors. Ryan Whissell, general operations manager at Patrick Sprack Limited (PSL), a Northern Ontario-based HVAC service company, shared how this has impacted PSL: "We have had to turn down work in the past year due to the lack of skilled trades. Particularly in the last 18 months, it has been difficult to find talent in the wide range of skilled trades we are hiring for. This is a problem being felt across our entire industry."

Making the industry more inclusive to attract a more diverse range of people might alleviate the ongoing labor shortage. "Companies should push themselves in the small things that can signal that they want their mine to be a comfortable place for a wide range of people and their families," suggested Heather Cheeseman, partner and national mining leader at KPMG in Canada.

With mine development taking upwards of 15 years in some cases, and an ever-windling supply of skilled professionals, the clock is ticking for Ontario's mining sector to deliver the minerals the world needs to decarbonize. ■



George Pirie

Minister of Mines,
Government of Ontario

"The Building More Mines Act, 2023 is an important piece of legislation that will allow us to build more mines faster across the province."

What are the highlights of the last year in the Ontario mining sector?

The Ontario Critical Minerals Strategy was released in March 2022, and it resulted in a 41% year-on-year increase in critical mineral production in 2022. Critical minerals exploration expenditures in Ontario amounted to C\$328 million in 2022 and accounted for 33% of all exploration expenditures in the province. The Ontario Junior Exploration Program (OJEP) was launched in 2021 and is having initial success; companies are eager to leverage the available funding to find the mine sites of the future. Our government is investing an additional C\$6 million over the next two years in OJEP, bringing the government's total investment in the program to C\$35 million. Ontario is now the number one mining jurisdiction for exploration in Canada. Our strategy around critical minerals is clearly working and exploration is at the heart of it.

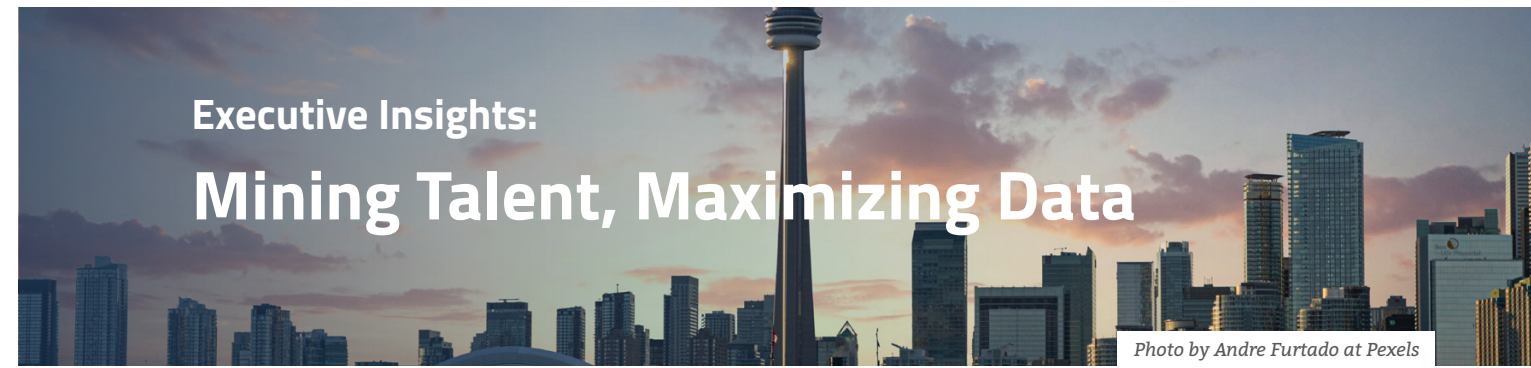
What was the strategy behind the Building More Mines Act, 2023?

The *Building More Mines Act, 2023* is an important piece of legislation that will allow us to build more mines faster across the province. Our government is improving the *Mining Act* to create the conditions for companies to build more mines efficiently, because it cannot take 15 years to build a mine. The changes are designed to cut red tape, improve Ontario's competitiveness, and attract investment to the province. We are currently developing regulations that we hope will be completed by the end of 2023. These adjustments will help companies build critical mineral mines, securing the supply chain for electric vehicle manufacturing in Ontario.

How does the Ministry of Mines intend to address the skilled labor shortage in mining?

Arrangements are being made with colleges and universities to ensure that the trades are emphasized. We have several existing programs to attract and retain talent, namely, the Ontario Immigrant Nominee Program and the Indigenous Workplace Development Program are making a difference. I was pleased to see 150 Indigenous community members receive training to support the construction of the new Equinox Gold operation.

I am enthusiastic about immigration because we need more people to build the workforce of the future. Our immigration programs are focused so individuals with the necessary skills start work immediately. ■



Executive Insights: Mining Talent, Maximizing Data

Photo by Andre Furtado at Pexels

On Talent

"The gray tsunami is coming: Around half of the industry will retire in the coming years, leaving a huge gap that needs to be filled. We are working with our clients to bridge that gap; this means rethinking the organization charts and bringing in people from different industries with transferrable skills and experience."



Frank Galati,
Managing Partner,
The Bedford Group TRANSEARCH

"Attracting millennials and younger investors to the mining sector has been difficult. In the long term, this could become a significant issue for our industry. It is crucial to attract and educate younger investors about the opportunities and benefits of mining."



André Tessier,
President and CEO,
Delta Resources

"We are trying to get our members to change the way they think about retention. It is not just about money, it is also about valuing employee contributions, giving them room and opportunities to grow, and providing training to allow them to envision a path for upward mobility."



Marla Tremblay,
Executive Director,
MineConnect

"We are seeing a significant increase in demand for secondment and training services, due in part to the current labor shortages across many sectors."



Kathy Kalenchuk,
President and Principal
Consultant, RockEng

On Data

"Mining companies and consultancies are now placing more importance on creating and maintaining robust documentation and change management practices. This focus is essential for creating transparency and accountability. Consequently, improved data management has been a prominent trend in the past few years."



Mary-Jane Piggott,
Vice President, Mining
Environmental Group,
Klohn Crippen Berger

"Bolting systems can now digitally capture information about an individual bolt's installation, such as its speed at installation, its location, and the load required to break out the bolt. This information can be used to improve the training of operators, for example."



Paul Stephenson,
Regional CEO - North America,
DSI Underground

"People are often comfortable with the status quo and using techniques they know, but things are changing rapidly in our industry. I would encourage mining companies to engage in conversations with companies like Bureau Veritas to see how they can generate and use the data more effectively."



Jon Landau,
VP Minerals North America,
Bureau Veritas

"With the ability to efficiently collect vast amounts of data, ensuring its accuracy, consistency and relevance is a crucial challenge. Ultimately, despite the technological tools at our disposal, the responsibility for data quality remains with humans."



Eugene Puritch,
President and Principal Mining
Engineer,
P&E Mining Consultants

Production, Development and Exploration

Digging into Ontario's riches

Photo courtesy of Alamos Gold

Ontario managed to maintain its status as a top mineral producer, generating C\$13.5 billion worth of minerals in 2022 – representing 22% of Canada's total mineral production value. In 2022, The Ontario Mining Association (OMA) reported that Ontario was expected to have C\$13.7 billion worth of mineral production in 2025. Should the current levels of growth continue, this forecast may be reached sooner than anticipated.

The passing of the *Building More Mines Act* and the MoU between Ontario and Nevada are just some of the major developments of 2023. However, it is not just government officials that have been busy – industry players have been raising capital, expanding mines and staking new claims. The exceptional Canadian mining M&A activity seen in 2021/2022 continued into early 2023, with Agnico Eagle announcing the completion of its acquisition of Yamana Gold's Canadian assets, including Yamana's properties in Ontario.

Gold production

Gold continues to be the backbone of Ontario's mineral production, with 21 out of the 41 operating mines in Ontario being gold mines. Ontario's annual gold production in 2022 amounted to 121,304 kg, an almost 22% increase from 2021 levels, maintaining its position as Canada's top gold-producing province. The strong gold price and increased production levels have resulted in a good year for Ontario's gold producers. This comes as Ontario's miners are busy exploring northern Ontario for new deposits and spending billions of dollars on expanding their existing mines.

Ontario's Minister of Mines George Pirie recently commissioned shaft #4 at Agnico Eagle's Macassa mine, the 9th largest gold mine in Canada, and listed other ongoing developments, during his interview with GBR: "Agnico's Detour Lake mine has a huge expansion program, McEwen Mining is expanding its Black Fox gold mine, and Alamos Gold has also been expanding its Island

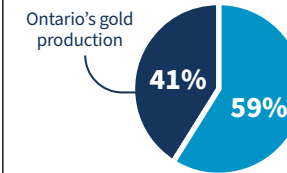
Gold Production in Ontario



3.9 million troy ounces
of gold produced in Ontario in 2022,
valued at C\$5.4 billion

*One icon represents 1 million troy ounces of gold produced.

Gold production in Canada (by value)



In 2022, 41% of Canada's total gold production value came from Ontario.

Source: Natural Resources Canada and the Ministry of Mines

Gold mine underground. Finally, Newmont is getting ready to re-develop its old open pit Porcupine mine", Pirie explained.

Alamos Gold's phase 3+ expansion at the Island Gold mine is due to be completed in 2026. Alamos' president and CEO John McCluskey takes a long-term view: "The earthworks associated with these types of tailings expansions have been responsible for problems in previous Ontario project developments, so we decided the best way to de-risk the whole project was to focus on that first. We ensured this was

underway before we announced phase 3+ of the study."

Alamos Gold performed well this year, posted strong Q3 results, and raised its annual production guidance by 5%. "The success we are enjoying today is a product of a strategy that we have pursued for 10 years based on accretive acquisitions and investment in organic growth through exploration, expansion and development of our various projects," said McCluskey.

Argonaut Gold's past-producing Magino mine achieved commercial production on

November 1st. Despite the slower-than-planned ramp-up of Magino, the mine is still expected to become Argonaut Gold's largest and lowest-cost mine. After Magino, the Côté Gold project, a JV between IAMGOLD and Sumitomo Metal Mining, is likely to be Ontario's next producing gold mine. Conveniently located between Timmins and Sudbury, construction is now 90% complete and production is expected to commence in early 2024. "IAMGOLD's Côté Gold project is being developed after a lengthy permitting process and is employing 1,600 people in the construction phase. They are using autonomous haulage vehicles that will eventually be electrified," shared Minister Pirie.

Hot on the heels of Côté Gold project, the Greenstone mine, located 275 km northeast of Thunder Bay, is being developed by Equinox Gold in partnership with Orion Mine Finance Group. Construction is on track to pour gold in the first half of 2024. The US\$1.23 billion mine is already 85% complete and will become Equinox Gold's largest mine and its only

Chris Hodgson

President,
Ontario Mining Association (OMA)



"We find ourselves with a once-in-a-lifetime opportunity to develop our abundant natural resources in a way that is environmentally sustainable and economically viable, becoming the global supplier of choice for critical minerals."

What are some of the key topics of discussion for the Ontario Mining Association (OMA)?

We are focused on areas that have the potential to improve the competitiveness of Ontario's mining industry, while promoting safety, environmental stewardship, and sustainability. This includes addressing energy capacity shortfalls in the province by developing a cost-sharing model with the government to ensure a competitive, predictable cost of energy. We believe that a forward-looking strategy needs to focus on energy infrastructure and capacity while incentivizing innovation to further bolster our competitive advantage. Another focal point for our members is advancing reconciliation and continuing to build strong, respectful relationships with Indigenous peoples.

As demand for responsibly mined minerals continues to grow, we find ourselves with a once-in-a-lifetime opportunity to develop our abundant natural resources in a way that is environmentally sustainable and economically viable, becoming the global supplier of choice for critical minerals and clean technology. Ontario needs decisive action on creating an enabling regulatory environment, and we are encouraged to see momentum building

on modernizing regulations, with the government signaling a willingness to accelerate projects.

Finally, we have been focused on the one thing without which we cannot possibly capitalize on the current opportunities, and that is people. We are facing a talent crunch and have been devising ways to support a future-ready workforce and boost labor market participation in the mining sector.

What impact do you see the *Building More Mines Act* having?

We were very impressed with how the government conducted the consultation process—they considered a broad array of perspectives and incorporated valuable input from expert practitioners.

The Ministry of Environment, Conservation and Parks' proposal of a permit-by-rule system holds great promise to shorten timelines without compromising environmental protection. We also see potential in a one-window approach, where the Ministry of Mines would be the environmental regulator for mining, with the closure plan as the key regulatory instrument that oversees mining activities. ■



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mine in Canada once in production. Being located in the traditional territories of four First Nations, Equinox Gold has a number of agreements and commitments in place around environmental management, employment and training, among others. "I was pleased to see 150 Indigenous community members receive training to support the construction of the new Equinox Gold operation," commented Pirie.



Luke Cox,
CEO,
Green Technology Metals

Junior exploration

2023 saw some exciting discoveries made by Ontario's juniors. Delta Resources was awarded the 2022 Bernie Schnieders Discovery of the Year Award by the Northwestern Ontario Prospectors Association for its Delta-1 gold project, 50 km west of Thunder Bay. Although many juniors have struggled to secure financing this year, for those that have the cash, Ontario's land still holds riches that are yet to be unearthed. "In April/May of 2023, we hit Bonanza-grade gold, including an intersection of 1.6 kg/t over 1 m. In summary, we have uncovered very wide intercepts of gold ranging from 1.2-1.5 g/t with some sweet spots of Bonanza-grade gold mineralization," shared André Tessier, president and CEO, Delta Resources.

High-grade discoveries like these are thanks in part to the Ontario government's continued efforts to incentivize exploration: "Ontario has some great programs, like the Ontario Junior Exploration

Program, which granted us C\$200,000 for exploration two years in a row," Tessier continued.

Magna Mining navigated the difficult financing environment for juniors and is fully funded to complete its exploration programs throughout 2024. Upon completing its acquisition of Lonmin Canada in late 2022, Magna Mining added the past-producing Crean Hill property to its portfolio. Magna's strategy of acquiring brownfield sites like Crean Hill is likely to make the permitting processes smoother. "Both the Crean Hill and Shakespeare projects are already impacted brownfield sites, so that's a great platform from which to achieve high standards of compliance with ESG objectives,"

explained Jason Jessup, CEO of Magna Mining.

Some juniors have taken different approaches to their business model. For example, Beyond Lithium, which has 61 properties spanning 180,000 hectares in Ontario, decided to adopt a project generator model, focused on lithium. Project generators maintain a portfolio of many projects and fund major exploration work by creating joint-venture partnerships with other companies. In addition to its project generator model, Beyond Lithium differentiated itself by focusing exclusively on Ontario. Allan Frame, Beyond Lithium's president and CEO, shared the strategy behind this move: "When we decided to focus on lithium, we saw that things were more advanced in Québec. There is good infrastructure and well-known deposits, however, the cost per hectare is very high now. A lot of the geology is similar in the region."

Critical minerals

The Ontario Critical Minerals strategy was released in 2022, and outlined the province's five-year roadmap to secure Ontario's position as a global leader in responsibly sourced critical minerals. Off the back of this announcement, 2022 saw a 41% year-by-year increase in Ontario's critical mineral production. Meanwhile, critical minerals exploration expenditures in Ontario amounted to C\$328 million in 2022 and accounted for 33% of all exploration expenditures in the province.

Ontario has immense potential to be a leading critical minerals producer. In 2022, Ontario was responsible for a third of Canada's copper production, 45% of its nickel production, and 77% of its Platinum Group Elements (PGE) production, by value.

Major deals were made downstream in the battery materials supply chain this year. Volkswagen committed to investing C\$7 billion to establish its first overseas electric battery manufacturing plant in St. Thomas, Ontario. Additionally, Stellantis and LG Energy Solutions continue construction of their NextStar EV battery plant in Windsor, Ontario, supported by provincial and federal tax breaks.

With increasing geopolitical tensions and pressure to decarbonize, critical mineral producers will be competing on more than just price. "Lithium can be sourced in many jurisdictions overseas. However, this can come with the risk of political uprisings and other uncontrollable risks," explained Allan Frame from Beyond Lithium.

Offtakers are increasingly considering ESG credentials and seeking to source from stable, safe jurisdictions like Canada. "As EVs become

more popular, companies are working to produce 'passports' for their batteries, allowing insight into where the nickel was sourced," explained Russell Bradford, managing director, Aston Minerals.

Indeed, digital battery passports (DBPs) are emerging as a digital technology that provides stakeholders with data in support of the sustainable management of batteries, with the EU mandating that every new battery of more than 2 kWh must have its own passport by 2027. "Battery manufacturers do not want their nickel originating from a supplier with poor ESG credentials," Bradford continued.

Ontario's juniors are confident in their jurisdiction's reputation as a socially and environmentally conscious mining destination. "Although there is potential supply coming online from Asia that could impact nickel prices, I think that the high-grade, low-carbon intensity nickel that we will be producing here in Sudbury will always have a place in the global supply chain," said Jason Jessup of Magna Mining.

In addition to ESG and geo-political risks, offtakers are increasingly choosing to source their raw materials closer to home to reduce their logistical requirements and to make their supply chains simpler and more robust. This trend has been spurred, in part, by recent black swan events like the Covid-19 pandemic and the 2021 Suez Canal obstruction, which wreaked havoc on supply chains across many industries worldwide. "There has been a rising demand for rare earth metals, driven by emerging markets like EVs and electronics. Additionally, the demand for domestically produced products has surged in the wake of supply chain risks associated with imports from other countries," said Martin Jette, President - Canada, Brenntag Essentials.

Some of Ontario's critical minerals players are taking things a step further - opting to become as vertically integrated as possible to reduce logistical hurdles and extend their control further down the supply chain. We spoke with Green Technology Metals (GT1), an Australian company looking to become the first lithium producer in Ontario, with multiple mines, spodumene process plants, and a lithium conversion plant planned to be built in Ontario. Having already signed offtake agreements with battery manufacturers like LG Energy Solutions, GT1 is positioning itself to tap into the

C\$1.5 billion earmarked for critical minerals by the Canadian government's Strategic Innovation Fund. "Having an entire vertically integrated supply chain in one region will decrease North America's reliance on China for downstream processing and substantially decrease the carbon footprint, as materials will no longer need to be shipped across the world to make one EV. That does not exist anywhere else on the planet, but soon, it will in Ontario," said Luke Cox, the CEO of GT1.

Ontario's Ring of Fire

Located 500 km northeast of Thunder Bay, the Ring of Fire has immense potential to produce the critical minerals needed to fuel the green energy transition, including platinum, copper, nickel, cobalt and chromite. The Ring of Fire is estimated to have the second-largest chromite deposit globally. In the last few years, juniors have been scrambling to stake claims and explore this remote part of Ontario. The Ring of Fire's isolation and lack of infrastructure will pose significant hurdles to mine development.

"The government is starting to install power lines and build roads to open things up in Northern Ontario, but this will take many years," shared Greg Ferron, president and CEO, Platinex, an exploration company active in the area.

With nine First Nations residing in the Ring of Fire, there are also social and environmental factors to consider as the area is developed. The Northern Road Link project, an all-season road access to the Ring of Fire, will greatly boost the chances of success of projects there, while benefiting the inhabitants. "Chief Bruce Achneepineskum of Marten Falls and Chief Cornelius Wabasse of Webequie First Nation are extraordinary leaders in their communities who are working on the environmental assessments for roads in the region," shared Minister Pirie.

With the impacts of climate change making the use of ice roads less viable, an all-season road link is becoming increasingly important to the success of the Ring of Fire. ■

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The high-interest environment seen in 2022 has continued into 2023, with the Bank of Canada's key interest rate rising to a 22-year high of 5% in 2023 – a dramatic rise from the 0.25% rate of early 2022. Moreover, rising geopolitical tensions have further complicated financing. For example, in November 2022, the Canadian government asked three Chinese companies to sell their stakes in Toronto-listed lithium explorers after a national security review, a move that raised questions about the future of other Chinese investments in the Canadian critical minerals sector. Canada may stand to benefit in the long run from its efforts to overturn China's dominance of critical minerals supply chains, however, Canadian policies limiting Chinese participation in its critical minerals sector may also create difficulties for local mining companies, particularly juniors, to fund projects.

In addition to the uncertainty around foreign institutional investment, retail investors seem to be increasingly attracted to non-mining stocks. According to a report by Morgan Stanley, the most popular types of stocks traded by individual investors are those in the communication, technology and consumer discretionary industries. Alexandre P. Boivin, CEO of Quimbaya Gold, shared his thoughts: "Mining companies are usually viewed as risky investments, but recently we have seen the more risk-tolerant investors investing in tech and crypto for example."

G2 Goldfields' CEO Dan Noone is however optimistic: "Over time, I anticipate that investors will return to mining as they seek tangible assets and real value-creation opportunities. Junior exploration companies play a unique role in the investment

landscape, catering to a niche segment characterized by higher risk and very high potential rewards."

Despite the troublesome macroeconomic environment, Canadian mining companies, particularly Ontario-based ones, continue to make some of the largest capital expenditures in the world. In fact, National Resources Canada projected Canada's CAPEX in the mineral sector to rise by 21% to C\$21.4 billion in 2023. Within Canada, Ontario was the biggest spender of any Canadian province and was responsible for 31% of Canadian mining CAPEX in 2022, dwarfing Saskatchewan's 21% and Québec's 19% shares.

Toronto

In 2022, the TSX and TSXV maintained their positions as the world's top mining and exploration listing venues, where 45% of the world's total equity capital for mining was raised in 2022. The TMX Group, which runs these two exchanges, launched the TMX ESG Data Hub in October 2023 to provide a range of real-time and historical data for both issuers and investors. Dean McPherson, head of business development - global mining for the Toronto Stock Exchange and TSX Venture Exchange, shared: "We launched this platform in response to the needs of our investor clientele. ESG has become a key decision element in investors' decision processes."

The boom in IPO activity seen in 2020 and 2021 is behind us, and Canadian IPO activity in 2023 has been minuscule compared to past years. There were 12 Canadian mining IPOs in H1 2023, 11 of which were on the Canadian Securities Exchange, resulting

"It will be interesting to see if any government initiatives can marry institutional capital with the development of industrial processing, which should strengthen Ontario's critical minerals value chain."



Denis Frawley,
Partner,
Ormston List Frawley LLP

in gross proceeds of C\$157 million. There were, however, two significant new mining listings on the TSX: Lithium Royalty Corp (LRC) and Allied Gold, with LRC's C\$150 million IPO accounting for 95% of the total mining IPO amount for H1 2023. "In a very challenging market, through the IPO Allied Gold, which is focused on West Africa, raised close to C\$300 million this summer. In the past, we saw London as the main competition for African companies. Allied Gold's decision to list on the TSX instead of in London underscores Toronto's position as a leader on the global stage," said McPherson.

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Data as at December 31, 2022. Mining capital raised from 2018-2022. Source: TSX/TSXV Market Intelligence Group and S&P Global Market Intelligence.

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Windows of opportunity

Timing is crucial for juniors seeking equity financing on the big exchanges. Windows of opportunity for IPOs can close as rapidly as they open. Dean McPherson shared his advice for juniors: "Nowadays, the periods of positive listing environments have been reduced from years to months. In such conditions, I would advise companies to 'get their ducks in a row' and ensure they are ready to list on short notice, not wasting precious time on administrative tasks when the right window of opportunity appears."

McPherson's comments come as the administrative burden on prospective Canadian issuers may be about to increase. The International Financial Reporting Standards (IFRS) Foundation, a non-profit responsible for developing global accounting and sustainability disclosure standards, recently released new disclosure standards. It is yet to be seen if the Canadian securities regulators will adopt some or all of these new standards that state that companies should release their sustainability information at the same time as their financial information. Heather Cheeseman, partner and national mining leader at KPMG Canada, explained how this may pose problems: "To date, most mining companies put out a sustainability report, but typically at a much later date than their financial information. Aligning these two processes

will be a significant undertaking for companies as there is limited capacity within companies to obtain, review and consolidate all the information needed to meet these new disclosure requirements; it is a time-consuming process".

Even though the conditions have not been ideal for new listings, Toronto-based law firms like Ormston List Frawley LLP (OLF) have been busy advising their mining clients, preparing them for when the next window opens. Denis Frawley, a partner at OLF, had this advice for juniors: "Companies need to ensure that their property ownership rights are clearly established and that they have satisfied their obligations under the agreements or laws whereby they acquired those projects. I would also urge that companies periodically refresh the geological data on their properties so that they are not relying on outdated information when embarking on a transaction."

Streaming and royalties

Traditional financing options such as equity and debt are not always sufficient to meet the needs of mining companies. As a result, alternative financing has become increasingly popular. This can include a range of financial instruments such as streaming and royalties that provide miners with access to



"Royalties are a passive financial investment, which allows operators additional flexibility."

**Ernie Ortiz,
President and CEO,
Lithium Royalty Corp**

capital while minimizing dilution and reducing risk.

The world's largest lithium-focused royalty company, LRC, made the biggest Canadian IPO of the year thus far. LRC has 33 lithium royalties, including four in Ontario. "Since the IPO, we have acquired six new royalties, including a 2% gross overriding royalty (GOR) from Power Metals on their Case Lake project in Ontario, where they are finding great lithium intercepts close to the surface and are hoping to have a mineral resource in 2024," said Ernie Ortiz, LRC's president and CEO.

Ortiz believes royalties can fill in the gap during times like these: "A key selling point of the royalty model is its non-dilutive nature. Valuations across the commodity space are fairly depressed, and this valuation mismatch presents a good opportunity for royalty investments as the issuer can then preserve their equity capital and prevent any equity dilution."

In the face of such strong headwinds, Ontario's exploration and mining companies can only focus on what is under their control and ready themselves for the next window of opportunity. For those who cannot wait, there is no better place to be, as Ontario's capital Toronto boasts the world's best mining finance ecosystem, where a breadth of alternative financing and support can be found on a company's doorstep. ■



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"With uncertainty and volatility in the capital markets, the windows of opportunity to raise capital and/or enter the public markets have been reduced from years to months."

What are the highlights of the past year at the TSX and TSXV?

In mid-2022, we launched the S&P/TSX Energy Transition Materials Index which tracks exploration and production stage companies that focus on critical minerals needed for this global transition. This summer, BlackRock launched and listed the iShares S&P/TSX Energy Transition Materials Index ETF based on our index. This offers more investors, particularly retail investors, an opportunity to gain exposure to the companies at the root of the global energy transition.

In October 2023, we launched the TMX ESG Data Hub that services investors seeking ESG data on companies.

Despite a challenging 2023, we saw two significant new mining listings: Lithium Royalty Corp and Allied Gold.

What advice do you have for mining companies considering an IPO given the current economic climate?

Nowadays, with uncertainty and volatility in the capital markets, the windows of opportunity to raise capital and/

or enter the public markets have been reduced from years to months. Companies must be prepared and ready to move on short notice. Do all you can to prepare in spite of the uncertainty of when that window will open.

Around 40% of public mining companies worldwide are listed on TSX or TSXV. How do you intend to maintain this dominance?

Our strategy is to be client-centric. We achieve this through three key areas: innovation, advocacy and quality of service. On the advocacy front, there is an opportunity to use our position to advocate for improving Canadian capital markets. We have already seen positive signs of these efforts with the federal and provincial governments with increased incentives to encourage participation in the critical minerals space, for example.

Finally, our adoption of new technologies in listing processes, like our Growth Accelerator service, which mentors early-stage companies on key success factors as a public company. ■

Toronto's Global Reach and Canadian Exploration

Mine the mines afar, mine the markets in Toronto

The latest data available from Natural Resources Canada shows a total of 1,412 Canadian mining and exploration companies possessed Canadian Mining Assets (CMAs) valued at C\$285.8 billion in 2021. Of these companies, 748 had CMAs located abroad worth C\$195.9 billion. Canadian companies were present in 96 foreign countries in 2021, and foreign assets abroad accounted for about two-thirds of the total value of CMAs. Additionally, around 40% of the world's public mining companies are listed on the TSX and TSXV. For years, foreign mining companies and international investors worldwide have been drawn to Ontario, thanks in part to the numerous Foreign Investment Promotion and Protection Agreements and Free Trade Agreements Canada has in place with other nations.

Gold

The spot price of gold rose from lows of around US\$1,100/oz in the summer of 2018 to record highs above US\$2,000/oz in May 2023. Sanctions on Russia, de-dollarization, and talk of a potential recession in the USA may all have contributed to gold's meteoric rise over the past few years.

Ontario's juniors have been venturing south in search of the next big gold deposit. Guyana is one of the fastest growing economies in the world due to the ongoing development of its oil and gas sector with the International Monetary Fund (IMF) stating it grew by 62% in 2022 and is expected to add another 37% this year. Due to the Commonwealth Caribbean Countries Tariff (CARIBCAN) – an economic and trade development assistance program for Commonwealth Caribbean countries established by Canada – 94% of all Caribbean exports to Canada enter duty-free. Cognizant of this, Toronto-based junior G2 Goldfields has been exploring for gold in the mineral-rich Guyana shield. G2 Goldfields released a maiden resource estimation in April 2022, indicating a combined resource of 1.2 million oz at just above 9 g/t at its flagship Oko project. The Guyanese government has been supportive of extractive industries, with giants like ExxonMobil investing billions of dollars in offshore oil projects. Although mining companies are unlikely to match the oil majors in spending, they do bring other benefits to the region, as Dan Noone, CEO of G2 Goldfields explained: "The oil sector tends to be less labor-intensive, primarily relying on skilled imported labor, unlike mining, which has the potential to generate numerous jobs for the local population. The Guyanese government reports that over 40,000 people are employed in mid-scale mining in Guyana."

Further west, another Toronto-headquartered junior, Quimbaya Gold (Quimbaya), is exploring in the Segovia region of Colombia. Colombia, being a relatively underexplored and less mature mining jurisdiction compared to some of its South American neighbors, is already home to many Canadian producers. This is likely thanks to the Canada-Colombia Free Trade Agreement, ratified in 2011, and the Framework for Cooperation in Natural Resources, signed by Natural Resources Canada and Colombia's Ministry of Mines and Energy in 2016 at the PDAC convention in Toronto. Quimbaya has now amassed over 40,000 ha of property, including Quimbaya's flagship Tahami project, adjacent to Canadian producer Aris Mining's operating gold mine. Quimbaya's CEO, Alexandre P. Boivin, is confident Quimbaya can replicate the success of its Canadian neighbors in Segovia: "I have noticed that the people who have success in Colombia always have certain traits in common. Take the teams behind Aris Mining and Collective Mining; they both have very similar backgrounds and seem to have a recipe for success; we are the next one."

Further to the north, in Mexico's Sonora state, Alamos Gold's Mulatos District produced 53,900 oz of gold in Q3 2023 and 164,700 oz year-to-date, nearly double the prior year period. Alamos' president and CEO John McCluskey shared the company's plans for the Mulatos district: "Unlike the oxide heap leach resources originally developed at Mulatos, we now have higher-grade sulfides that will require milling. We are preparing for a new phase of development for the Mulatos project, which will take some investment from the company to bring to fruition."

In recent years, Mexico's president López Obrador has been pushing through policies to reassert state control over natural resources. In May, Mexico reformed its mining regulations which included changes such as requiring all mining concessions to be awarded under a public bidding process, and a reduction in the term and scope of mining concessions,



Greg McKenzie,
President and CEO,
Silver Storm Mining

among others. The reform drew criticism from various industry leaders, and Canadian Trade Minister Mary Ng expressed her concern about the changes. Although the reforms have not impacted Alamos' Mulatos District, they are likely to impact Canadian players embarking on new mining projects. McCluskey shared his thoughts on the reforms: "In terms of new projects, I do not see us doing much outside the Mulatos area until there is clarity as to the associated risks of doing business there going forward. If you raise taxes and the treatment of certain costs, you are sending a signal to the market you do not want further investment in the sector. The market will respond to those signals, which is what we are seeing right now."

Silver

The silver spot has also significantly increased over the past five years, reaching highs of around US\$25/oz in mid-2023. In light of this, Silver Storm Mining, previously Golden Tag Resources, has been working on bringing its past-producing La Parrilla silver project in Durango State, Mexico, back into production. In choosing to re-start a past-producing mine, companies like Silver Storm are often able to re-use existing permits and licensing, potentially allowing them to bypass some of the hurdles introduced by the reforms that Canadian mining companies are likely to face going forward. Mexico is the largest producer of silver – an increasingly important metal for its use in solar panels, electric cars and 5G telecoms networks. Historically, La Parrilla produced over 3 million oz/y, until its previous owners, First Majestic Silver, put the mine on care and maintenance due to low commodity prices and its desire to focus on its larger mine, San Dimas. With silver prices significantly higher, Silver Storm saw an opportunity and acquired La Parrilla in August 2023, aiming to put the mine back into production in 2025. A 7,000 m drill program is underway to expand the inferred resource base in proximity to existing underground

development and infrastructure. "Although La Parrilla was last operated in Q4 2019, the care and maintenance program was executed very well. As such, the mine will be a relatively low capital restart for us and there is even a partial underground mining fleet that remains onsite," shared Greg McKenzie, president and CEO, Silver Storm Mining.

Uranium

Ontario Premier Doug Ford's government has been enthusiastic about nuclear power, announcing its desire to nearly double production at the Bruce Power plant and conducting feasibility studies to refurbish Toronto's aging Pickering nuclear plant. Canada's only uranium refinery is located at Blind River, Ontario, where uranium ore concentrates from Canada and abroad are refined to produce uranium trioxide. Ontario's refineries need not look far to fuel these future reactors, as Canada is endowed with the fourth largest uranium reserves in the world, after those of Australia, Kazakhstan and Russia. Cognizant of this fact, Latitude Uranium, headquartered in Toronto, has had a busy year investing around C\$8 million in 18 drill holes, including at its flagship Angilak project in Nunavut. Latitude

Uranium's CEO, John Jentz, explained why he took the approach of exploring in Nunavut, rather than more established uranium mining destinations like Saskatchewan's Athabasca basin: "While the Athabasca region offers even higher grades, it is a challenging and costly environment for mining. Angilak falls somewhere in between; it is high-grade, but not quite as high as Athabasca."

Saskatchewan's famous Athabasca basin is already home to the big Canadian uranium producers, Cameco and Orano, who rank among the largest producers of uranium globally, with Cameco's Cigar Lake mine being responsible for 14% of the world's total uranium production in 2022, making it the largest-producing uranium mine globally. Baseload Energy, another Toronto headquartered junior, has been exploring the Athabasca basin looking for near-surface, basement-hosted, high-grade uranium deposits, avoiding the sandstone that is prevalent in the Athabasca basin.

Uranium mining is an integral part of northern Saskatchewan, to such an extent that the provincial government established a small town named 'Uranium City' to service the mines in the region. "Canadian uranium mining is different from Saskatchewan uranium

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mining. Uranium is ingrained in Saskatchewan mining, nothing needs to be re-invented here, everything has been in place since the 1950s," said James Sykes, Baselode Energy's president and CEO.

The Uranium spot price has more than doubled in the last three years, and Toronto-based Denison Mines has been working hard to take advantage of the bull market, raising US\$55 million in October 2023 to fund the development of its flagship Wheeler River project, the largest undeveloped uranium project in the eastern portion of the Athabasca Basin. After a five-year de-risking process, Denison Mines announced the results of its feasibility study of Wheeler River's Phoenix deposit in June 2023. "We pivoted to engineering design efforts, focusing on readying for project execution and early procurement. It is an exciting time for Denison Mines, as a final investment decision on Phoenix approaches," shared David Cates, president and CEO, Denison Mines.

Geo-political turmoil, while detrimental for some of Ontario's juniors, creates opportunities for others. The 2023 Niger coup and the ongoing war in Ukraine have forced buyers away from the usual uranium suppliers like Russia. With the USA struggling to incentivize domestic uranium production, the number of stable uranium jurisdictions is narrowed down even further. "As geopolitical instability persists, there is great potential for Canadian supply to be seen as a premium source," pointed out Cates.

With the number of viable suppliers dwindling, and the push for green energy growing stronger, the fundamentals for a uranium bull run seem to all be in place – but uranium is not gold, and it presents its unique challenges for juniors seeking investment. "Marketing uranium projects can be challenging due to fears surrounding nuclear power. Effective communication and community education are key to addressing these concerns," explained Jentz. ■



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Ontario – A Progressive Tech Center

From pickaxes to pixels, how innovation is reshaping mining's future

Across North America, there is a malaise threatening the mining industry: Its public perception. For Ontario, the long-term impacts could be nothing short of life-threatening. The present situation paints a dire picture: Visiting the classrooms of Ontario high schools, Marla Tremblay, executive director at MineConnect, found that for students mining means "putting on overalls and working in a dirty environment for long hours."

Mining companies are looking to advances in technology for the solution to this problem. Ontario is home to over 1,400 mining supply and service companies, many of which are technology focused. Surveying the technology landscape during 2022, Canada's national statistical agency found that 30.9% of mining businesses adopt advanced technologies, the highest adoption rate of any industry in Canada. These technologies are advancing rapidly: "If you look at technology from the last 50 years, we are not 50 years ahead of the linear curve, we are thousands of years ahead," said Kevin Dagenais, CEO of Cascadia Scientific.

In 2021, Canada's Centre for Excellence in Mining Innovation (CEMI) launched a C\$112.4 million initiative, dubbed the Mining Innovation Commercialization Accelerator (MICA) Network, to accelerate the development and commercialization of innovative mining technologies. Supporting the project, the Government of Canada's Strategic Innovation Fund invested C\$40 million, and BHP, Vale, Glencore and Teck are all members. MICA has invested over C\$28 million in mining innovation technologies across Canada in the two years since its founding.

Technology and innovation can address diverse challenges that face Ontario's mining sector. "Deposits are getting deeper, meaning higher processing costs due to harder and lower-grade ore, while global demand is at an all-time high, creating tension that puts pressure on the assets that perform the mining work," said Ash Agarwal, president and CEO of Symbioticware, that developed 4-Sight-ai, the industry's first vertically integrated IoT and AI platform allowing companies to monitor asset health and reduce fuel use and carbon emissions.

In light of the green energy transition, the electrification of diesel-powered mining equipment and trucks provides the greatest avenue for innovation. Agnico Eagle's Macassa mine in Kirkland Lake was the first to introduce battery electric vehicles into operations and commissioned the world's first 50 t battery electric truck in 2020. Newmont's Borden mine in Chapleau was the first all-electric underground mine in Canada. "We have noticed an uptick in mining companies asking us to assess the tradeoffs between BEVs, diesel vehicles, or mixed fleets," said Morné Beukes,

"Cities like Sudbury are even surpassing places like Colorado, Nevada, and Toronto when it comes to mining technology."

Raffi Jabrayan,
VP, Business Development and Commercial Sales, Exyn Technologies



director of operations and Stephen Hardcastle, managing director, BBE Canada.

Despite these efforts, the electrification of mining equipment is not widespread. Currently, only 0.5% of mining equipment is fully electric, according to McKinsey & Company. Agarwal explained: "By 2030, not much will happen from an electric fleet conversion perspective. For example, large, publicly traded mining companies will only see a 5% impact on their electrification projects by 2030."

Cascadia Scientific CEO Kevin Dagenais developed: "No available technology will replace diesel-powered haulage equipment in the near term. For large and ultra-class haul trucks, we are probably a decade away from a fully deployable electric solution. Our tools offer a lens for companies to evaluate alternatives for immediate incremental decarbonization."

Cascadia Scientific's tool, SmartRView, resulted in average fuel savings of 15%, equivalent to 2,738 tCO2e at New Gold's Rainy River operation.

The switch from diesel-powered to electric requires a reliable and robust electrical infrastructure, especially in remote mining operations where the existing electrical grid may not support the increased electricity demand. This will likely be the case in Newmont's fly-in, fly-out Musselwhite mine, for example. The Pickering Nuclear Generating Station, responsible for 14% of electricity generation in Ontario in 2022, is set to shut down in 2025 or 2026, adding to the challenge of meeting demand. Luckily, a solution is on the horizon: "Moving to renewable sources of electricity is becoming increasingly feasible, even in off-grid environments, as the cost of battery packs is projected to decline 50% from 2017 to 2030," according to McKinsey & Company.

TECH-nically not laborious

Canada's mining industry is expected to experience shortages of around 80,000 to 120,000 workers by 2030, according to the Mining Industry Human Resource Council's 2020 Canadian Mining Labor Market 10-year Outlook. In Ontario, firms are turning to technology as a solution. "The shortage of skilled labor is a critical driver of our investment in technology, particularly autonomous machinery. These machines offer distinct advantages, such as increased productivity as they can operate continuously between shifts and tackle high-risk tasks," remarked Paul Healy, president Americas at Redpath Mining. "If people are not available, we can use a machine."

DSI Underground Canada is approaching the problem from another angle, reducing the number of required staff to begin



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with. “We are developing virtual reality training programs... these 3D training programs help mines leverage technology for training purposes, reducing the need for on-site training personnel,” said Paul Stephenson, regional CEO of North America.

Jannatec Technologies, a Sudbury-based radio communications company, is innovating to make mining more attractive to young talent. Originally, Jannatec developed SmartView, a modular underground wireless communication system, to enhance safety in mines. Now Jannatec is expanding into the mobile segment of the IoT space, as it provides an extra level of comfort, especially for new talent. “Clients increasingly want access to the same amenities available in a car or in their

home, which we aim to realize in the future,” said Rey Boucher, their president.

Leveraging technology to make mining safer and more comfortable is a surefire way of increasing its appeal to the young generation. This is especially true after the Covid-19 pandemic when many people grew accustomed to working from the comfort of their own homes. Companies like Seequent, which offers earth modeling and geo-data management software to Ontario’s mining industry, provide solutions that reduce the travel requirements for mining professionals. “The need to adapt to cloud strategies and remote work became prominent due to the pandemic. In response, we have developed our EVO cloud strategy, which will be a cornerstone for new cloud-enabled applications,” said Rob Ferguson, segment director, exploration and resource management, at Seequent.

Sudbury, the mining tech Mecca

Executives from Timmins, Thunder Bay and the glass towers of Toronto all agree that Sudbury is the center of mining tech innovation. This comes with reason; the greater Sudbury area hosts nine operating mines, two mills, two smelters, and a nickel refinery. It also houses 300 mining supply and service firms, including 157 of MineConnect’s 260 members. Across North America, no mining tech hub looks more promising. “Sudbury is even surpassing places like Colorado, Nevada and Toronto when it comes to mining technology,” said Raffi Jabrayan, vice president of business development and commercial sales at Exyn Technologies.

There is currently ample funding available for mining technology innovation, including the Sudbury Catalyst Fund, a C\$5 million venture capital fund accelerating the growth of tech start-ups in Sudbury. NORCAT, headquartered in Sudbury, invested C\$3 million into a building to provide office and meeting spaces for tech companies. Sudbury also hosts Mining Transformed, the world’s first technology exhibition in an underground operating mine.

Looking to the future, the greater Sudbury area has six post-secondary education institutions training the next generation of miners, while endeavoring to refresh the perception of mining in classrooms: “The Goodman School of Mines created and hosted a mine opportunity challenge for high school students to get them excited about mining,” said Tremblay.

“Looking through the lens of being a technology company, mining becomes more attractive to young talent,” said Frank Galati, managing partner at the Bedford Group TRANSEARCH. ■



Servicing the Green Energy Transition

How mining services are navigating Ontario's north

Photo courtesy of Exyn Technologies

Global demand for critical minerals will more than double by 2030, according to the International Energy Agency. Canada is not free from this demand chokehold, mandating that 60% of all passenger vehicle sales will be electric by 2030. In Ontario, the government is subsidizing US\$21 billion to Volkswagen and Stellantis-LG Electric Solutions to incentivize the establishment of electric vehicle (EV) plants in St. Thomas and Windsor, respectively. With the commencement of LG’s plant operations in 2024, critical mineral output in the province must be maximized to reap the benefits of a vertically integrated supply chain.

The buzz surrounding critical minerals has prompted mining companies in Ontario to redirect their exploration and development efforts to the north, in pursuit of unlocking a potential treasure trove of green gold. Yet, these colder, more remote regions pose unique challenges. Luckily, mining service firms across Ontario are ready to help.

Unmistakably good chemistry

“Clients operating in these challenging environments require partners that understand the unique challenges they face,” stated David Oliphant, the vice president of business development at Veolia Water Technologies Canada. “Veolia’s technologies are designed with a small footprint, making them particularly suitable for remote areas. This small-footprint technology is not only robust but also highly efficient, making it easier to transport and install in areas where logistics can be challenging,” explained Oliphant.

Remote operations deem onsite services more valuable. Bureau Veritas has developed an onsite lab service offering for battery minerals clients. “This helps to reduce their carbon footprint, remove the use of acids on site, and support the mine to have a cleaner and less labor-intensive process,” said Jon Landau, vice president of minerals North America at Bureau Veritas.

Mining for data

Mining to meet the green energy transition comes with the weight of monitoring an operation’s carbon footprint. According to EY’s Top 10 business risks and opportunities for mining and metals in 2024 report, ESG retains its position as number one, as it has since 2022: “ESG is attracting more scrutiny from investors and the community. Better use of data and a focus on net-positive impact can help meet growing expectations,” the report stated.

The collection, interpretation and use of data will be paramount for incorporating ESG into operations. For remote operations, though, data collection becomes complex. “Some regions may

have limited bandwidth and challenging connectivity,” emphasized Rob Ferguson the segment director of exploration and resource management at Seequent.

Seequent developed two new technologies to help. “MX Deposit, for instance, is designed for drill hole logging and data management, streamlining the process. We also offer Imago, a tool that captures photos of drill hole cores. These photos are then promptly uploaded to the cloud, where they can be accessed, analyzed and integrated into the modeling workflow. The cloud’s real-time accessibility is pivotal, allowing mining professionals to make informed decisions while drilling is in progress,

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reducing costs and environmental impact,” described Ferguson.

“Mine owners and operators are learning the value of robust data collection. For example, core scanning technology and underground use of LIDAR-based mapping are now being used to collect data quickly, and in areas that are challenging to access,” explained Kathy Kalenchuk, president and principal consultant at RockEng.

Modern electronics simplify the surveying of the diverse northern terrain. Drones have been especially helpful. “We see drones as a valuable instrument for gathering geophysical data. We use the same skills, equipment, and knowledge on our drone surveys as we would on our fixed-wing surveys. They are a tool that allows us to efficiently conduct surveys over a smaller area where a fixed-wing aircraft would not be suitable,” said Stephan Sander, co-president, Sander Geophysics.

For larger scale surveys, aircraft remain the preferred option. Ontario’s mining technology ecosystem has found ways to improve data collection on these legacy platforms too: “Axiom was one of the first companies to stack a specific array of sensors in aircraft for airborne surveys. For example, there are economic benefits to co-collecting LIDAR, spectral, radiometric, time-domain EM, and magnetic data in one flight. Our approach is to minimize data collection costs while maintaining data quality by working around the limitations of flight parameters and instrument interference,” said Doug Engdahl, president and CEO of Axiom Exploration Group.

How data is used afterward is just as important as how it is collected. “Too much data can lead to inefficiencies, making it

challenging to extract valuable insights from the overwhelming volume of information,” said Mary-Jane Piggott, vice president of the mining environmental group at Klohn Crippen Berger.

“Rigorous data validation and quality control processes, along with investments in error-reducing data collection methods, are necessary. Ultimately, despite the technological tools at our disposal, the responsibility for data quality remains with humans,” said Eugene Puritch, president and principal mining engineer at P&E Mining Consultants.

Critical flights

For airlines, explorers moving northwards is an opportunity. “The Ring of Fire is exciting. We have a flexible capacity model and strong relationships with other carriers, which we can leverage to bring in other aircraft to support our local mining clients there,” said Jeffrey Stout, president and chief operating officer of North Star Air.

Perimeter Aviation is leveraging its ownership by the Exchange Income Corporation, which grants the firm access to the services of its sister companies to extend its services north. Joey Petrisor, president and CEO, explained: “For exceedingly remote sites, we will deliver cargo and personnel as far as the runway will take us, and Custom Helicopters will complete the journey.”

Good connectivity will be as valuable as insightful data for Ontario’s miners and explorers as demand for critical minerals pushes them into the most isolated and unreachable corners of the Heartland Province. ■

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