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## QUÉBEC MINING 2022



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ON TRACK TO DELIVER  
LEADING GROWTH WITHIN  
THE ROYALTY SECTOR

## Dear Reader,

Québec has long been known for its gold endowment, and companies performing greenfield and brownfield exploration in the province continue to add to the legacy of the Abitibi greenstone belt. Meanwhile, momentum is mounting for projects pertaining to battery metals and other strategic minerals, underscored by government initiatives at the provincial and federal levels, to secure investment into materials that are critical for the global energy transition. Amid a period of heightened geopolitical uncertainty and cries for more localized sources of materials deemed essential for national security, Québec stands poised to play a leading role.

Of course, the robust nature of the industry cannot be attributed solely to the exploration and production companies – service providers are crucial to the health of the mining ecosystem, and they increasingly determine the direction the sector will head in the years to come. Innovative solutions powered by artificial intelligence, automation and electrification not only reshape the way miners and juniors interact with the environment – they also have the potential to transfigure the industry on a global scale.

GBR's research team traveled through Montréal, Québec City, Val-d'Or and Rouyn-Noranda to conduct face-to-face interviews with over 90 industry leaders driving growth within the province's mining sector. The following pages are the culmination of this investigation and provide an up-to-date analysis on the latest developments, highlighting the efforts of organizations and institutions whose support fosters an ecosystem uniquely conducive to mineral exploration, as well as large mining producers, junior explorers and service providers.

We would like to warmly thank these executives for their invaluable insights, as well as our partners at QMA, AEMQ, Ressources Québec, and THE Mining Investment Event of the North. We hope you enjoy the read.



**Alfonso Tejerina**  
Director and General Manager  
Global Business Reports (GBR)



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QUÉBEC MINING 2022  
Industry Explorations  
Global Business Reports

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“Québec is one of the world’s most promising regions for resource exploration and development. It offers political and economic stability, regulations that govern each stage of development, diversified mineral potential, ample high-quality water and energy resources, and world-class infrastructure.”

**Jean-François Béland,**  
Vice-president,  
Ressources Québec

# INTRODUCTION TO QUÉBEC MINING

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Image courtesy of Hecla Mining.



# Introduction to Québec's mining sector

**The world-class jurisdiction continues to excel**



Image courtesy of Hecla Mining.

Québec routinely ranks among the top within the Fraser Institute's annual survey of worldwide jurisdictions. In 2021, the think tank placed Québec sixth for investment attractiveness and fifth for policy perception. According to Québec's Ministry of Energy and Natural Resources, the province has the most diverse resource base in the country and accounts for one-fifth of Canada's overall mineral exploitation. In addition to its world-class endowment, Québec hosts a favorable financial environment, access to skilled labor, and publicly available geoscientific data – the latter of which the provincial government invests C\$15 million annually to acquire, process, and publish. The mining industry is also largely well understood by a general public that recognizes the role it plays within Québec's regional economy and the international energy transition.

## Stability – at what cost?

Amidst global geopolitical uncertainty, Québec attracts investor attention due to its strong level of certainty; if a company finds a commercial-scale ore body in the province, there is a fair chance it will be put into production. "The province provides a lot of public information and has a clear mining rights regime, which is key because if an exploration company doesn't have a clear title, it has nothing," explained Frank Mariage, a partner at the Canadian law firm Fasken. Éric Gamache, vice president of TACT, a Québec-based public relations and communications firm, concurs: "The

current government is open and willing to make deals to ensure the industry remains healthy and attractive. If a company has a transparent approach to its projects, ensures local communities are engaged, and the social and economic impact is taken into account, then the government will be unlikely to stand in the way of a project."

Nevertheless, many exploration companies believe the length and complexity of the permitting process is hindering development. Mariage said: "In the past, there was not enough consultation required to put a mine into production. We are now on the other end of the spectrum, though, and we have to find a middle ground."

The need to simplify the permitting regime is particularly important amidst a push towards resource nationalism and Québec's determination to position itself as a supplier of strategic minerals.

The Québec Mining Association's (QMA) president, Josée Méthot, cites the need to streamline the permitting process as one of the QMA's current focuses. She believes that this could be drastically simplified if companies could simply submit their documents to a single platform, and that the provincial and federal governments should further harmonize when it comes to environmental impact assessments, which are required at both levels. "Some might say that we should simplify regulations, which is interpreted as a wish for fewer regulations," said Méthot. "But really, it is the administrative burden of regulations

that must be reduced and simplified."

To this effect, Québec's government set up the Bureau de Coordination des Droits (BCD) in 2019 to shorten the length of time it takes to grant necessary permits and authorizations for mining companies to carry out a project in the province.

## Growing pains

"Québec is in a position such that if all mining projects currently on the table are realized, the scarcity of skilled labor will intensify, and we will face a new issue with the availability of electricity," commented QMA's Méthot.

Though the likelihood of even a majority of projects currently underway coming to fruition simultaneously is slim to none, industry players throughout the value chain are already experiencing a strain on talent supply, among other resources. While the challenge is not unique to mining nor to Québec, whose unemployment rate has hovered at slightly over 4% for most of 2022, the industry faces an added layer of complexity: a significant percentage of its workforce is about to retire. "When we look at the average age of employees in the mining sector, it becomes clear that we really need to incentivize young workers and entrepreneurs to enter the mining business," commented Mathieu Savard, chairman of the board of the Québec Mineral Exploration Association (AEMQ).

According to Savard, the labor shortage will become worse over the next

few years: "The peak of the manpower shortage is predicted to be in 2030, so we will need to implement various incentives rather than relying on a single solution."

Walter Schmidt, director of project development at ORE+PROS, a provider of temporary staffing for various roles in the mining industry, is keenly aware of the difficulties that arise when a large segment of an industry's population is set to retire. "The new people who will take their place will need training," said Schmidt. "The management staff in mining has to oversee more than simply mining-related activities. They have to look at food provisions, transport for fly-in fly-out operations, personnel sickness and injuries, all while being at the mercy of weather."

In this capacity, Nolinor Aviation offers a range of services to assist mining clients with more remote operations. "We will transport fuel to the mining site during the exploration stage, and once the project reaches maturity and construction starts, we have bigger aircrafts to meet increased cargo and passenger requirements," explained president Marco Prud'Homme.

Several proposals for initiatives to attract talent – especially young talent – are currently being investigated. Savard and Méthot both highlighted the possibilities of increasing training initiatives for indigenous communities and even looking at immigration to increase the labor pool altogether.

Brant Blackned, president of Tawich Holdings, which serves as the economic arm for the Cree Nation of Wemindji, believes mining companies should prioritize job creation for indigenous groups as a solution. "Anytime there is a job that a Tawich company can do, we should have the first option on it," he said.

Tawich's Wolf Camp corporation provides food, catering, and janitorial services to Newmont's Éléonore mine, and its construction companies have worked with mining clients in the past.

While a lack of manpower has stagnated the operations of several companies, it has forced the industry to adopt certain technologies faster than it might

have otherwise. "The silver lining to the lack of manpower exacerbated by the pandemic is that it has forced innovation," remarked René Branchaud, a partner at Lavery, a law firm headquartered in Montreal that has been involved in Québec's mining industry for over fifty years. "We now see more miners working in their office with a joystick to operate various pieces of equipment. This is great, as it is better to send a machine to the bottom of a mine than a person."

## Defining the future of ESG

A few decades ago, the governing themes behind ESG were on the radar of few mining executives' minds. Five years ago, they were topics of discussion. Today, environmental, social, and governance-related considerations are the driving forces that determine which projects gain the support necessary to make it off paper.


In Québec, the Ministry of Energy and Natural Resources (MERN) plays an important role from a project's inception.

Before a company applies for a mining lease, it has to file a rehabilitation and restoration plan with the MERN, as well as provide a financial guarantee for the proposed mine's closure, the first 50% of which must be paid within 90 days of receiving approval. The MERN also helped finance the development of ECOLOGO, the first sustainable development certification in mining exploration, and which has since been widely adopted throughout the province.

One of the main initiatives of the AEMQ is to help companies obtain ECOLOGO certification through providing support programs specifically tailored for exploration companies. "This is especially helpful for smaller exploration companies that may not have the in-house resources to go through the process on their own," commented Mathieu Savard, chairman of the board. "I am enthusiastic about the adoption of ECOLOGO standards in the industry because it is really changing the narra-

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When you think about it, metals are everywhere. It's the same even when you don't think about it.


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**Whenever a new policy may be adopted that will have an impact on mining, the relevant department usually calls the QMA first.**  
 ↙↙

## Josée Méthot

President and CEO  
**QUÉBEC MINING ASSOCIATION (QMA) / ASSOCIATION  
 MINIÈRE DU QUÉBEC (AMQ)**

### How does the QMA serve as a liaison between industry and government for Québec's mining sector?

The QMA's mission is to promote, support and proactively develop a responsible, committed and innovative mining industry in Québec. We liaise with the provincial government to represent the interests of the mining industry in the domains of environment, sustainable development, health and safety, human resources, regulatory and fiscal environment.

The QMA also establishes committees to consult directly with the government. For example, the Québec Ministry of Energy and Natural Resources is working on their new vision for the development of mining, and we have been consulted many times on the main pain points that remain for the sustainability and further development of our industry in Québec. We then consult industry players before returning feedback to the government. Whenever a new policy may be adopted that will have an impact on mining, the relevant department usually calls the QMA first as we are the reference point for the industry.

### What is the QMA's role in promoting ESG-related measures?

The QMA is responsible for the adoption of Towards Sustainable Mining

(TSM) in Québec. TSM is now the most developed ESG standard in mining globally. Here in Québec, if a company refuses to adopt TSM, they are not allowed to remain a member of the QMA. Furthermore, the QMA provides training on TSM and ESG to its members to keep them well informed and aware of innovations and best practices.

### Does Québec's mining industry have the requisite resources to support its growth?

Québec is in a position such that if all mining projects currently on the table are realized, the scarcity of skilled labor will intensify, and we will face a new issue with the availability of electricity. Regarding skilled labor, we are in discussion with the government on how they can help, and we have discussed topics such as immigration and increased training initiatives for indigenous communities. Right now, we also lack places for these workers to stay, which has led to more fly-in fly-out operations than we would like.

Similarly, all industries are working towards reducing their consumption of fossil fuels and replacing that dependence with electricity. But if all of today's projects come to fruition, where will we get the requisite electricity from? Hydro-

Québec is immensely beneficial to the industry in providing cheap, green energy. At the end of the day, however, hydropower is a finite resource and cannot charge everything at once. To properly transition, Québec will have to produce more electricity, which will require more infrastructure.

### How can the industry do a better job of attracting young talent?

Last year, the QMA ran a survey and focus groups with young people to understand how we could better attract their generation to join our industry. What we found is this generation places significant importance on the environment, so we need to demonstrate the strides the industry has taken and continues to take here. Younger people wish for a more active lifestyle with varied interests, a life full of challenges, novelties and adventures. They want challenges in their jobs and more free time for other activities. We are working on ways to attract young talent by showing that working in mining will meet their different lifestyle needs.

### How has Québec's government made the permitting process easier?

The Québec Ministry of Energy and Natural Resources recently established a Rights coordination office project that works directly with mining project developers to provide more support and prevent bottlenecks in the permitting process. The department allocates somebody to each mining project to accompany them through the process.

However, to develop a mine, you need to go through several departments to obtain different permits, and it would be much easier if companies could submit their documents to a single platform. Furthermore, when you do an environmental impact assessment, you need to get clearance on both the provincial and federal level, which should be further harmonized. Some might say that we should simplify regulations, which is interpreted as a wish for fewer regulations. But really, it is the administrative burden of regulations that must be reduced and simplified. Permitting processes and delays must be more predictable and delays must be reduced. ■



↘↘  
**Something that makes Québec one of the best jurisdictions to explore in is the presence of several pension funds and government related entities that invest in and support the sector.**  
 ↙↙

## Mathieu Savard

Chairman of the Board  
**QUÉBEC MINERAL EXPLORATION ASSOCIATION  
 (AEMQ)**

### Could you remind our readers of the role AEMQ plays in Québec's mining sector and highlight the main initiatives the association is currently focusing on?

The role of AEMQ is to promote the vital contribution of mining exploration to Québec's economy as well as the sustainable and responsible exploration of Québec's mineral endowment. We represent explorers and service providers on challenges impacting the mineral industry, and we play an important role in gathering everyone together in different venues for networking opportunities such as the Explo Abitibi and the XPLOR convention which will be held in Montreal in October 3-6.

Our top priority remains to continually monitor any regulatory changes, particularly with respect to the reduction of administrative burden impacting exploration. We work closely with the government and companies to ensure everyone understands the potential impact of any changes that may arise.

### In what ways can AEMQ assist companies on their journey to becoming ECOLOGO certified?

In Québec's mining segment, there are

approximately 50 companies that are either ECOLOGO certified or are currently in the process of obtaining certification. We provide support for companies looking to do so. This is especially helpful for smaller exploration companies that may not have the in-house resources to go through the process on their own. I am enthusiastic about the adoption of ECOLOGO standards in the industry because it is really changing the narrative from being reactive to being proactive when it comes to several sustainability measures and initiatives. It promotes communication channels between stakeholders to be established early on.

### What is your assessment of Québec's regulatory environment when it comes to administrative processes?

Over the past decades, there has been an increase in regulations and on the administrative burden of explorers. This comes from different ministries, and one of the challenges is to coordinate all the measures in place. The current administration has provided a lot of support to the mining industry. In certain aspects, they have made great strides. In others, there is still work to do, since it is no easy task for a government to streamline its administrative processes.

### To what extent does the mining industry face a skilled labor challenge, and what are potential solutions?

A challenge not unique to the mining industry is the fact that a significant percentage of the workforce is about to retire. When we look at the average age of employees in the mining sector, it becomes clear that we really need to incentivize young workers and entrepreneurs to enter the mining business. The peak of the manpower shortage is predicted to be in 2030, so we will need to implement various incentives rather than relying on a single solution. This could include increasing the amount of training initiatives for First Nations communities and looking at immigration to increase the number of people who can be trained. Ultimately, I believe that all challenges bring opportunity, and the current situation will likely translate into further innovation and automation. One of AEMQ's main priorities is to promote the profession of the mineral exploration industry to help offset the shortage in labor.

### What makes the financing environment in Québec so conducive to exploration?

Fiscal incentives related to mining exploration have had a huge impact on the robustness of the financing environment. For an exploration company, hard cash invested in your project benefits from tax credit incentives that allows you to reinvest back into your project, creating a favorable environment for success and discovery. It is like investing in R&D – you do so with the commitment that whatever you invest in will come to a discovery and amplify your initial investment. Because the industry requires so much from private investors, the measures Québec has put in place that encourage people to invest are immensely beneficial for all stakeholders. Another thing that makes Québec one of the best jurisdictions to explore in is the presence of several pension funds and government related entities that invest in and support the sector. ■



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tive from being reactive to being proactive when it comes to several sustainability measures and initiatives.”

Furthermore, the Mining Association of Canada’s Towards Sustainable Mining (TSM) standard has become a globally recognized sustainability program, having been implemented by mining associations in Finland, Australia, Sweden, and throughout South America. In Québec, companies must adopt TSM measures if they wish to retain membership within the QMA.

The engineering and geosciences company Terrapex launched its auditing segment Auditex in May 2022 to offer environmental auditing services for industries like mining, and offers services to train companies on the protocols of the TSM program. From director Jean-Marc Léger’s perspective, the spirit behind the standards is taking root: “Within today’s mining industry, there is a competition over who is the most proactive when it comes to minimizing their carbon footprint.”

Québec is serving as a world leader in the creation and adoption of ESG standards within the mining industry. The current challenge is how to make the frameworks more adaptable to the stages of development of various companies in the mining industry. Industry players have demonstrated their commitment to clean operations through a willingness to increase transparency and adhere to initiatives as they evolve. Yet with no flexibility in standards, complications arise; the challenges of a mine operator are far different from an early-stage exploration company.

Interestingly, this lack of clarity has flipped the narrative on who gets to define the rules. “While the government has not provided specific legislation for ESG, some issuers have started to produce their own annual reports,” explained Branchaud. “For example, our client Dynacor Gold Mines recently issued its second annual ESG report. Other issuers have started to do so as well, constructing reports based on disparate pieces of legislation rather than what will inevitably become uniform.”

Within the current legislative regime, institutional investors have the opportunity to define their own standards, and in doing so force corporations to adapt to receive financing. Benjamin Gross, a partner at Borden Ladner Gervais LLP (BLG), explained: “Clients ask us to design their internal ESG policies that we then build into a credit agreement. BLG is at the forefront of this practice, as we are involved in creating what policies will look like over time.”

The emerging field of green finance – such as sustainability-linked bonds and green loans – is creating a new niche for corporate finance lawyers and potentially catching the attention of investors who had not previously considered the mining sector as attractive. “These new financing tools based on ESG factors or green taxonomies will favor participants in the mining industry that have integrated ESG factors in their operations or who are engaged onto a carbon neutral pathway, protection of biodiversity and air and water pollution mitigating measures,” commented Bruno Caron, a partner at Miller Thomson. “These new financing tools have the potential to attract new investors who are not currently investing in mining companies because of their perceived negative environmental and social impacts.”

The evolution in the relationships between mining companies and First Nations communities is a hallmark example of just how quickly the landscape can evolve. Mining companies used immediately begin exploring upon receiving their mining titles, only sitting down with nearby communities once they had found something of value. Now, exploration companies must communicate with local stakeholders from day one. “First Nations communities are more business-oriented and organized than they were even 10-15 years ago,” said Josianne Beaudry, a partner at Lavery. “These negotiations take on a completely different nature today.”

To help fortify communication between mining project promoters and local stakeholders, the provincial government has deployed a network of project managers throughout all regions of Québec to provide both parties with information and key updates. The Québec government has been proactive in creating its own agreements with indigenous communities as well. As of 2021, the province had already signed treaties with the Cree, Inuit, and Naskapi nations that cover nearly 1.1 million square km, equivalent to over 65% of the province’s total area. The Grande Alliance, signed in February 2020 by the Québec government and the Cree Nation to allow for the planning and execution of a 30-year infrastructure program, is indicative of the degree of collaboration between industry and communities. ■



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**EXPERIENCE** *Signed*  
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RB



JB

## René Branchaud & Josianne Beaudry

Partners  
LAVERY

### What work has Lavery taken on in the mining sector over the past year?

RB: Examples of recent clients include Osisko Gold Royalties, Osisko Development Corp., Osisko Metals, Midland Exploration, Hecla Mining, Yamana Gold, Fancamp Exploration and Abcourt mines. We were also recently involved with Gold Royalty Corp’s purchase of a portfolio of royalties from Monarch Mining. The mining world in Québec is small – we have worked with nearly everyone.

### How would you assess the current regulatory environment pertaining to ESG standards?

JB: The challenge regarding ESG from a legal standpoint remains the lack of comprehensive standards that are adaptable to the stage of development of the corporation. Currently, all corporations look at the same criteria, but companies at different development stages will face different challenges in meeting them. That said, for over a decade the mining industry has taken social acceptability seriously, and today, it is well understood by all players that you cannot develop a mine without first attaining social acceptability from the First Nations and surrounding communities.

### How have mining companies been responding to this lack of streamlined regulations?

JB: There has been a need expressed across all industries for clearer criteria that corporations can adhere to. Everybody wants to mention their clean operations, but with no fixed standard that accounts for the stage of development of the corporation, it gets complicated. RB: While the government has not provided specific legislation for ESG, some issuers have started to produce their own annual reports. For example, our client Dynacor Gold Mines recently issued its second annual ESG report. Other issuers have started to do so as well, constructing reports based on disparate pieces of legislation rather than what will inevitably become uniform. In the current climate, there is room for an institutional investor to set their own standard, thereby forcing corporations to adapt to these standards to receive financing.

### To what extent do mining companies in Québec interact with their First Nation counterparts?

RB: In Canada, companies have the obligation to sit down with the First Na-

tion before even starting exploration activities. This model works well, especially with certain communities such as the Cree in Chibougamau. Both parties recognize the benefits of these negotiations; the First Nations can provide local manpower instead of mining companies having to constantly fly in and out their labor. These communities also have a lot of wisdom to share.

JB: First Nations communities are more business-oriented and organized than they were even 10-15 years ago. These negotiations take on a completely different nature today

### What are some benefits you see for mining companies to operate in Québec??

JB: There is an abundance of inexpensive, easily available energy in Québec. It is also a politically stable place to operate with good technology and skilled people.

RB: We take it for granted, but Québec has a lot of minerals, particularly critical minerals, and we have seen large corporations such as BHP and Rio Tinto return to the province to explore for this reason.

### Are there any trends you will be tracking in the industry over the next few years?

JB: A current challenge for the sector is the volatility of the market, meaning financing a project right now is difficult. It is clear, however, that critical minerals will remain very attractive to investors.

RB: The lack of manpower makes it difficult for companies to recruit and keep miners, and this will remain a challenge over the next few years. Even the availability of qualified persons for the preparation of a technical report is low. The silver lining to the lack of manpower exacerbated by the pandemic is that it has forced innovation – we now see more miners working in their office with a joystick to operate various pieces of equipment. This is great, as it is better to send a machine to the bottom of a mine than a person. We anticipate innovation will continue in the mining sector at an accelerated rate. ■





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**The mining industry is the largest employer of the Indigenous population. Over the years, we have collectively developed a sensitivity to the issue, recognizing the importance of dialogue and respect.**

↙↙

## Frank Mariage

Partner  
FASKEN

### Can you provide an overview of Fasken's work in Québec's mining sector?

Fasken is a large Canadian firm with offices strategically located around the world and a team of over 150 professionals devoted to mining. In Canada, we provide cradle to grave services, helping clients ranging from start-ups to large producers. Recently, we assisted Gold Fields in its acquisition of Yamana Gold. We are also working with several future lithium producers. Importantly, we recognize that an exploration company will not have the same pre-occupations as a producer in operation or closing a mine, and we specialize in understanding the realities of our clients.

### Why is Québec's financing ecosystem so successful at attracting investment?

Through funds such as Sidex, Investissement Québec, FTQ Solidarity Fund and Caisse de dépôt, companies with significant potential have unparalleled access to long-term investors committed to supporting the next Québec mining success story. They are also sophisticated partners that can offer their mining expertise throughout the development of a project. Mining investment is venture capital given how risky it is. Investors are used to that – what they dislike is

uncertainty because uncertainty cannot be measured. Québec provides a strong level of certainty that attracts capital because if you find a commercial ore body here, there is a reasonable chance it will be put into production.

### In what ways does Fasken help clients with ESG-related matters?

Fasken has one of the larger ESG focused departments in Montreal and is very well versed in mining and environmental legislation. From this vantage point, I have watched the permitting landscape change considerably. We play a role in this new dynamic, especially with Indigenous communities, either during that first discussion or later on for Impact Benefits Agreements. Additionally, Fasken has the expertise to support its clients with federal and provincial reviews on environmental impact. Importantly, we can assist with government relations, helping provide the opportunity to sit down with decision-makers.

Canada in general has strong expertise in ESG given its experience with Indigenous communities. Throughout the country, the mining industry is the largest employer of the Indigenous population. Over the years, we have collectively developed a sensitivity to the issue,

recognizing the importance of dialogue and respect.

### How cumbersome is the permitting process in Québec?

There are now over 230 permits required to put a mine into production in Québec. The government is currently focusing on how to lighten the burden on companies, and they have assembled a task force that consults regularly with the mining industry on how to streamline the process. In the past, there was not enough consultation required to put a mine into production. We are now on the other end of the spectrum, though, and we have to find a middle ground. This is especially important given the strong push towards resource nationalism and how Québec is positioning itself as a supplier of strategic minerals. Western economies are saying they need to secure their own materials and production capabilities to become less reliant on countries like China and Russia, but if it takes 20 years to put a mine into production, it will be too late when that day comes. Governments will have some tough decisions to make in the next handful of years because certain projects will have to be fast-tracked for national interest.

### Have multinational sanctions on Russia had an impact on the mining sector?

Doing business with a company that has a significant Russian shareholder can be enough to trigger sanctions. We are fielding many questions from clients regarding the scrutiny of who they are dealing with. Fasken has a group in Ottawa that is specialized in dealing with this.

### What makes Fasken stand out from its competitors?

Fasken competes on an international level with top international law firms and is recognized worldwide for its mining expertise. We have lawyers who are also personally involved in the industry, such as my involvement in the Québec based mining investment fund Sidex, which gives us localized knowledge. We offer legal advice, but it is not uncommon for CEOs to call us for strategic advice on other matters given our boots-on-the-ground experience. ■



## Bruno Caron

Partner  
MILLERTHOMSON

### Have you noticed an increase in strategic minerals-related work in the past year?

There is a lot of work needed to secure the supply of strategic minerals. Competing with China's

monopoly over the refining of these strategic metals is critical, and the passing of the Inflation Reduction Act in the US will improve the dynamic in implementing a North American autonomous ecosystem able to supply the battery critical minerals required for the electrification of transport and the transition to a carbon neutral economy. Throughout 2021 and again during the first six months of 2022, Miller Thomson was active in financing and M&A transactions involving companies active in the development, production or trade of critical minerals, such as lithium, palladium, cobalt and manganese.

### To what extent does the increased focus on ESG standards impact the work of law firms like Miller Thomson?

The new emerging field of green finance (green equity, green and/or sustainable bonds, sustainability-linked bonds and green loans) is cre-

ating new opportunities for corporate finance lawyers like me. These new financing tools based on ESG factors or green taxonomies will favor participants in the mining industry that have integrated ESG factors in their operations or who are engaged onto a carbon neutral pathway, protection of biodiversity and air and water pollution mitigating measures. These new financing tools have the potential to attract new investors who are not currently investing in mining companies because of their perceived negative environmental and social impacts. Despite the potential pushback of some industry players against the popularity of ESG based investment that may be amplified by a recession looming on the horizon, ESG factors are here to stay. The mining industry is always hungry for more capital; therefore, mining-industry executives should learn to embrace ESG principles since they are becoming critical. ■



## Benjamin Gross

Partner  
BORDEN LADNER GERVAIS LLP  
(BLG)

### How has the increased focus on ESG impacted the work BLG takes on?

One of the most interesting aspects of ESG is when clients ask us to design their internal ESG policies and

then we build those into a credit agreement. BLG is at the forefront of this practice, as we are involved in creating what policies will look like over time. Mining companies need to realize that ESG is now a key business priority.

### What steps could the provincial government take to help foster rare earths projects amidst global competition?

On the public level, Québec is already investing heavily in rare earth exploration projects. One could question whether Québec's protectionist rules, particularly regarding foreign investment, negatively impact the influx of cash from foreign sources to bolster mining activity. It seems that foreign investors are discouraged as these laws prevent them from owning a certain percentage of the project. The bigger issue is not the government,

however, but rather the private sector. The need for capital here is so important, and investors are wary of investing billions of dollars into projects that do not guarantee returns.

### What key trends do you see driving the mining sector forward in the next 2-3 years?

The themes of ESG, social acceptability, and financing will keep mining executives busy looking forward. M&A trends will continue to be important, along with the musical chairs of large groups buying and selling mines. Companies will probably continue to figure that they can raise more capital if they have 10,000 mining claims as opposed to 5,000. As far as BLG is concerned, we have done loads of work in the past years to consolidate our presence within the mining space, particularly during the pandemic. ■



# A favorable financial climate

## Québec's financial ecosystem is a safeguard against market turbulence



Image courtesy of Hecla Mining.

The current financing climate for mineral exploration is harsh. Markets are altering their pricing structures in anticipation of a recession, and the US Federal Reserve interest rate increase has added fuel to the fire. Yet Québec has an advantage when attracting the attention of investors.

“Right now, there is a markedly low tolerance for risk, especially when it comes to the more speculative mining prospects,” said Chad Williams, chairman and founder of Red Cloud. “Despite this, there has been a strong demand for Québec flow-through financing, as this style of financing is extremely investor friendly.”

Indeed, the province has designed a particularly robust business climate for mining investment that helps the industry weather the storms that inevitably arise. On the investors’ side, the province’s flow-through share system allows individuals to deduct up to 120% of the cost of their investment. For mining companies themselves, the Mining Tax Act offers various measures to support actors throughout different phases of the mining cycle, such as a

refundable duties credit for losses and an allowance for community consultations. To encourage exploration, the Québec government outlines a refund tax credit that provides a refund of up to 38.75% of eligible exploration expenses.

What is truly unique to Québec’s financing ecosystem is the role of quasi-governmental institutions such as Ressources Québec, a business unit of Investissement Québec that manages a C\$1 billion Natural Resources and Energy Capital Fund, thereby enabling the provincial government to acquire equity interests in energy and natural resources companies. The role of SI-DEX in helping to finance early-stage exploration, Caisse de dépôt du Québec (CDPQ) during the engineering and feasibility phase, and Investissement Québec closer to commercialization cannot be understated, as unlike private investors, these provincial institutions take a more holistic approach towards deciding which projects to fund. As a result, they can afford to take on greater risk when it is deemed to be in the interest of the jurisdiction.

“We are willing and able to take

risk when we believe the project has clear benefits to Québec’s economy and is in alignment with our vision of what will drive the industry forward,” commented Jean-François Béland, vice president of Ressources Québec. “The beauty of our model is that we do not look only to financials.”

Instead, Béland highlights that when selecting which projects to fund, Ressources Québec considers the financial viability of a project alongside the impact it will have on the economy and the relationship it has with the Québec social contract.

In many ways, this is how the broader provincial government approaches fostering mining development – putting money where its priorities lie. The support exploration companies receive when conducting activities in the north of the province is a great example; the Mining Tax Act provides an exploration allowance that adds an additional 25% to exploration expenses incurred in the more remote region to help offset the high costs associated with bringing a mine into production in the north.

### The royalty model thrives in an inflationary environment

The royalty sector provides an additional element of security to the mining investment climate. Unlike debt, which can be a burden to an early-stage company, the financing via a royalty company is only repaid when the mine begins to do well. Given the closer correlation to risk royalty companies have, they play the long game on leveraging astute allocations of capital for bigger payouts down the line.

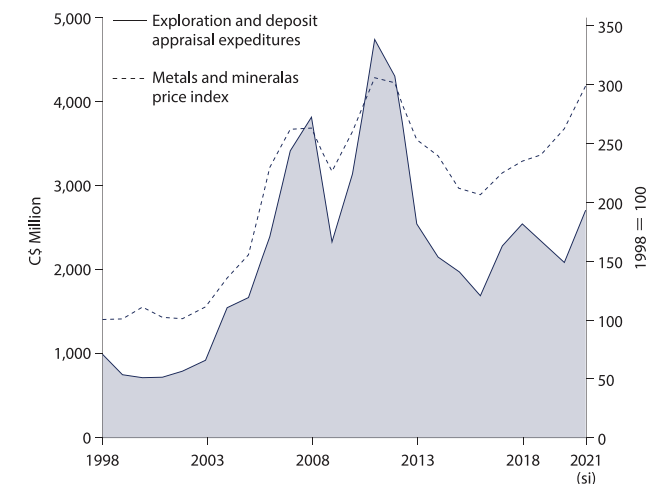
“Royalties are phenomenal financial instruments to hold, particularly in an inflationary environment, as they commonly come off the gross revenue of a mining operation and are not exposed to increases in costs for discovery and exploration towards new mineral deposits, for building mines, and for maintaining mine operations,” explained David Cole, president and CEO of EMX Royalty Corp. “Royalty holders are exposed to increases in commodity prices, however. I see no better hedge on inflation than royalties.”

An additional benefit to royalties is the potential for a producing royalty to grow without requiring more capital from the royalty company itself. Osisko Gold Royalties has a royalty on Canadian Malartic, the largest within the gold royalty sector. When Agnico Eagle and Yamana Gold announced a US\$1.3 billion investment to take the mine underground, Osisko Gold Royalties did not have to contribute a cent. “The royalty model is a go-to for investors looking for gold exposure,” offered Sandeep Singh, the company’s president and CEO. “The mix of lower risk (through greater diversification and lesser opex and capex exposure) and significant upside (through exposure to additional ounces that are discovered on our grounds) has tended to outperform in the mining sector over long periods.”

This long-term advantage becomes all the more apparent in inflationary periods when input costs escalate dramatically. Even if gold remains strong, mining companies will struggle with the burden of cost inflation, thereby undermining the very leverage proposition that investors want. David Garofalo, CEO of Gold Royalty Corp, believes this conflict provides royalty companies an opportunity not only to stand out to investors seeking exposure to commodities, but also to play an important role in financing exploration activities. “In the royalty business, we are purveyors of capital and provide an important element of the capital structure that is fundamental to building new mines,” said Garofalo. “The equity capital markets are not currently open to junior explorer or the developers, but they certainly are open for royalty companies, and we can thus provide access to capital for those developers and explorers which otherwise could not afford to further their assets.”

The advantages to the royalty model have become all the more apparent in the context of mounting geopolitical risk on a global scale, and the endurance of such a model will likely ensure royalty companies maintain their solid footing in mining’s financing ecosystem in the future. ■

### Exploration and deposit expenditures vs. commodity prices



Source: Natural Resources Canada

**GMEA CONVENTION**

**2023 X PLOR**

**OCTOBER 30**  
TO  
**NOVEMBER 2**  
**2023**

**LE WESTIN MONTREAL**

**THE EVENT THAT UNITES THE MINING INDUSTRY**

## Expert Insights: Investment appetite for commodities



*"Québec has strong prospects in gold, silver, and copper, so I see a recovery coming in H2 2022. I like to remind people that markets are cyclical, and we are preparing for the upswing."*

**Chad Williams, Chairman & Founder, Red Cloud**



*"Current metal prices should incentivize development, particularly after a decade of underinvestment leading to dramatic declines in reserves across the entire metals complex. There will likely be more opportunities to build and operate new mines, which engenders a need for capital."*

**—David Garofalo, CEO, Gold Royalty Corp**



*"Over the past two years, there has been a great lack of liquidity especially in the small cap mining sector, with only short-term windows where there is an appetite for investment."*

**Mathieu Séguin, VP Corporate Development, Monarch Mining**



*"Vior is focused on exploration for gold, which is widely regarded and recognized, has a highly liquid market, and we believe is in a long-term secular bull market and has a very favorable supply/demand profile."*

**Mark Fedosiewich, President & CEO, Vior Inc.**



*"The government of Québec supports the mining sector in raising capital, but operators are often interested in foreign investments as well. In many ways, the mining industry is connected at the international level, through capital as well as ideas."*

**Jean-Marc Léger, Director, Terrapex**



**The beauty of our model is that we do not look only to financials.**



## Jean-François Béland

Vice-president  
**RESSOURCES QUÉBEC**

### What is Ressources Québec's role within the state's mining industry?

Ressources Québec is a business unit of Investissement Québec charged with managing the C\$1 billion Natural Resources and Energy Capital Fund, which enables the Québec government to acquire equity interests in energy and natural resources companies. We also offer an extensive array of financial products and solutions, including equity investments, debentures and various types of loans. We supplement private funding for projects that have favorable yield prospects and can help grow the Québec economy. We aim more specifically towards the mining, energy and forestry sectors where we act as a single point of contact for investors. We are willing and able to take risk when we believe the project has clear benefits to Québec's economy and is in alignment with our vision of what will drive the industry forward.

### How does Ressources Québec select which projects to fund?

The three main criteria are its financial viability and profitability, the impact it will have on the economy, and whether it is linked to the Québec social con-

tract. If you check all three boxes, Ressources Québec will be there. The alignment with our social contract is especially important. The beauty of our model is that we do not look only to financials.

### What is your assessment of the current appetite for M&A among mining companies?

From a macro level, there is a need in the industry for consolidation in the market. Consolidation helps companies reach an optimization of resource, workforce, working capital and equipment capacity. One option is through M&A activity, and I believe we are seeing a peak in this behavior because people cannot find a way to work in partnership. When people are not interested in forming joint ventures, M&A activity becomes an attractive alternative.

### Are there any challenges the industry is currently facing?

There is something going on where we have the equipment, financing, and a market hungry for more projects, but we lack the people to get the job done. We need to work collaboratively in the industry to find a solution to the

labor gap. I believe more effective training as well as implementing technology could play a key role.

### What other benefits are there to operating in Québec as a mining jurisdiction?

Québec is one of the world's most promising regions for mineral resource exploration and development. It offers political and economic stability, regulations that govern each stage of development, diversified mineral potential, ample high-quality water and energy resources, and world-class infrastructure to transport and ship large volumes of materials around the world. Additionally, Québec's mining system is linked to that in Ontario and in other parts of Canada. We are close to the US, and in half a day's travel by train you can arrive in Detroit, the heartland of North America's auto industry.

Lastly, Québec is involved in all segments of traditional mining, but we are clearly becoming one of the top hubs in battery metals in the world. We are directly linked to the North American industrial ecosystem, which is a position we will be keen to foster moving forward. We are also looking to integrate the full process of cell manufacturing, starting with mining. We are committed to doing this and have a clear strategy as well as the financial investment to bring this forward.

### Looking at the next few years, which trends have the potential to reshape Québec's mining sector?

The rush for strategic minerals, especially battery metals, is the most important push the industry has seen in at least a decade. Québec has everything it needs to set up a complete value chain, from ore extraction and refining, to battery manufacturing and recycling. It has an abundance of raw materials such as lithium, nickel, carbon (graphite), and copper, all of which are strategically important minerals that are essential for battery manufacturing as well as hydroelectricity, which guarantees clean production. We are seeing significant exploration, investment, and a ramp-up of capacity. For example, Sayona Québec acquired North American Lithium with the plan to restart production. ■





**Projects in Québec have higher chances of being developed than projects in other parts of the world.**



## Pascal Lussier Duquette

Managing Director of Investment Banking–Metals & Mining,  
BMO CAPITAL MARKETS

### What does BMO Capital Markets' involvement in Canada's mining sector look like?

Metals and Mining is one of the most important sectors that BMO Capital Markets serves in Canada and globally. As an example of our recent activity here, we advised Kirkland Lake Gold during their merger with Agnico Eagle, which was one of the largest ever mergers in the gold sector. We also advised Pretivm Resources on their sale to Newcrest Mining, another incredibly large transaction.

### How do you predict this type of M&A activity will impact the operational efficiency of the industry?

In the gold sector, we see a trend towards consolidation. This is good for investment because it makes companies stronger financially and better positioned to take on new projects and growth. I believe we will also see increased M&A activity in metals used for the energy transition. For example, we saw Rio Tinto recently acquire a lithium project in Argentina and BHP attempted to acquire a nickel development project in northern Ontario. Ultimately M&A activity of this nature will facilitate the development of mining projects, which involve significant financial and operational risks, and

which larger companies are often better equipped to face.

### In what ways will increased demand for battery metals influence the markets moving forward?

If you spoke with investors five years ago about lithium, most of them would not understand or would be careful about investing in lithium companies. Today, lithium is well understood by investors, and good lithium projects can find capital. The same will happen for other energy transition materials, such as graphite and rare earth metals. The knowledge supporting these resources is still a bit behind the curve compared with lithium, but we can see the progression.

### To what extent do mining companies have to factor environmental concerns into their operations to receive funding in today's investment climate?

It's a central concern for mining companies. As an example, mining companies are highly conscious of the fact that if they are producing resources that will be used in making battery cells; doing so with coal power plants or other carbon-intensive measures is counterproductive. The number of mining companies that have incorporated net zero targets into their strategies has jumped over the past

year. Whereas it used to be a few, now most major producers have projects in place to reduce their carbon footprint. The same applies to new projects. If you are building a new project and say it will be all hydroelectric with an electric fleet, you will have a much better chance of attracting capital.

### How important is it for North America to have its own localized source of critical resources?

If you stood in front of investors a year ago and said your project was based in a Western world jurisdiction close to the source of demand for your product, that would have been seen as an advantage. This advantage has only grown, given recent geopolitical turmoil and most recently the adoption of the Inflation Reduction Act in the US, which includes strong incentives for electric car makers to source critical materials from Western world jurisdictions. Currently, several critical materials such as graphite and lithium come mainly from China. This is a huge opportunity for Québec, which could not only become a key supplier of key raw materials, but also of value-added battery materials.

### Looking ahead, how do you see increased activities in Québec's mining sector impacting demand for BMO Capital Markets' services?

In Québec there is a good alignment between the government, project developers and producers, the investment community, and many in the general population. There is a view that responsible mining and transformation, particularly for critical minerals, is a wise strategic investment. As such, projects in Québec have higher chances of being developed than projects in other parts of the world. I see potential for BMO Capital Markets to have significant growth in this segment, especially as the trend towards producing materials in safe jurisdictions with the best environmental standards becomes increasingly important. From our perspective, this activity will drive a need for capital, strategic advice, and M&A guidance, and BMO Capital Markets will continue to be there to support companies active in Québec. ■



**We enjoy looking back with the hindsight that we gained royalty assets cheaply and without competition.**



## Sandeep Singh

President and CEO  
OSISKO GOLD ROYALTIES

### How does Osisko Gold Royalties' hybrid model enable the company to sustainably expand its royalty portfolio?

Osisko Gold Royalties' hybrid model has been a unique feature of the company since its founding in 2014. There was a lot of technical talent already in the building following the construction and operation of the Canadian Malartic mine, and the company's leadership decided that rather than losing this talent to the sector, it would be smarter to retain it. Thus, we lean on our significant expertise to create royalties at times rather than paying the full price of competing against our royalty peers. We find appropriate assets, typically earlier-stage, then deploy our team and capital into the opportunity, unlocking value for us and its shareholders. This model has enabled us to build a portfolio from a standing start, and we enjoy looking back with the hindsight that we gained royalty assets cheaply and without competition. Having the ability to create some of our own assets is a strong differentiating factor for Osisko Gold Royalties. Especially in times like these when royalties are more expensive as there is significant capital chasing the same ideas.

### Can you provide an overview of your company's asset portfolio?

Canadian Malartic is our largest producing royalty, and it only continues to get stronger. Agnico Eagle and Yamana Gold announced a US\$1.3 billion investment to transition the mine from open pit to underground, which costs us nothing. Accounting for 35,000 oz of our 80,000 oz total in 2021, this is the flagship asset within the entire gold royalty sector. Osisko Gold Royalties also holds several other meaningful assets, including a silver stream on Mantos Blancos, a Chilean copper mine, and a 5% NSR on Victoria Gold's Eagle mine, one of the newer mines in Canada. Osisko Gold Royalties invested heavily in royalty growth during the last down market and has significant organic growth from assets such as Windfall, Cariboo, Hermosa, Upper Beaver and others.

### What are the key criteria you consider when selecting assets?

We always start with the geological and technical merits of an asset. Our asset base is centered in some of the safest mining jurisdictions in the world, something we are not looking to change. Thereafter, we make sure that the assets can be economic in most commodity price environments.

### What makes royalties especially attractive to investors in today's financial climate?

The royalty model is a go-to for investors looking for gold exposure. The mix of lower risk (through greater diversification and lesser opex and capex exposure) and significant upside (through exposure to additional ounces that are discovered on our grounds) has tended to outperform in the mining sector over long periods. That advantage has grown as miners are undergoing significant inflation as well as dealing with rising geopolitical risks.

### How important is the theme of ESG to Osisko Gold Royalties?

Our portfolio was built in safe jurisdictions where environment and social issues are paramount. We have also aligned ourselves with operating partners who share our ESG values. As an example of our proactiveness on ESG matters, we were early investors in Carbon Streaming Corp, a company that invests in projects that reduce or offset carbon emissions and promote biodiversity.

Looking at ESG more broadly, we have internal and external criteria we use to evaluate and report on a variety of measures. Our approach to identifying and mitigating ESG related risks is continuously evolving to meet or exceed industry best practices. When we decide to get involved with a new partner, a thorough evaluation of risks is at the forefront of our investment process and helps us make responsible investment decisions with the goal of generating long-term value for our shareholders, communities and partners.

### What makes Osisko Gold Royalties an exciting story?

Osisko Gold Royalties has matured as a royalty company. We have the assets that we purchased in the last market downturn that should lead to peer leading growth over an extended period. The combination of significant and growing cash flows, diversification and upside make us both an exciting growth and value story, which is extremely rare in the gold sector. ■



## David Cole

President and CEO  
EMX ROYALTY CORP

### Can you introduce our readers to EMX Royalty Corp (EMX)'s business model?

EMX Royalty Corp has been around for 19 years, driven by the belief that royalties are phenomenal financial instruments with immense embedded optionality. There are two main ways we capture the value of mineral real estate. The first is through our prospect generation business model, in which we acquire prospective mineral rights around the world, add value by coalescing geological and other applicable data, illustrate the attractiveness of the asset, then market it to an industry hungry for discovery opportunity. Ultimately, we sell these assets for a combination of cash, shares, work commitments, and of course royalties on the back end. This is a great way to inexpensively accumulate a royalty portfolio over time. The second way we derive value is through purchasing royalties. Unlike most of our competitors who solely buy royalties, we primarily own royalties that we have grown organically, meaning we can have greater patience and only buy when we see compelling value. We are the value players in the royalty space, which is in alignment with our core value of astute allocation of capital.

### Could you highlight the main assets within EMX's portfolio?

There are five key royalties within EMX's portfolio of over 300 mineral property positions worldwide that span nearly five million acres. First is the Caserones open pit mine, developed on a significant porphyry copper-molybdenum deposit in the Atacama region of Chile, which currently pays US\$8 million per annum after tax. Second, we have a royalty on the Leeville property operated by Nevada Gold Mines that currently pays US\$2.5 million per year. Moving to the Tethyan metallogenic belt, our key royalty is the Timok project, which is Europe's largest copper and gold mine. We expect significant cash flow from Timok and see potential for it to become our most valuable royalty, as the resource is substantial with over 1.8 billion tons of close to 1% copper equivalent within just the lower zone. Further south lies a lead-zinc-silver system called Balya that we generated through our royalty generation business model. Balya is currently going into full-scale commercial production and will

become a multimillion dollar per annum royalty for EMX in the near term. Fifth is our largest near-term cash flowing royalty, the 10% Net Smelter Return (NSR) on the upper gold-silver oxide zone at Gediktepe, operated by Lidya Madencilik in Turkey. The royalty here kicks in after 10,000 oz of gold have been poured, and the threshold is upon us. We expect to cash approximately US\$12 million here.

### Why are royalties particularly attractive during periods of high inflation?

Royalties are phenomenal financial instruments to hold, particularly in an inflationary environment, as they commonly come off the gross revenue of a mining operation and are not exposed to increases in costs. Royalty holders are exposed to increases in commodity prices, however. I see no better hedge on inflation than royalties.

### How does EMX's business model allow the company to sustainably grow its royalty portfolio with minimal dilution to shareholder value?

We acquire prospective mineral rights inexpensively by staking claims and obtaining exploration licenses from governments around the world. We coalesce publicly available data, engage in field work, then immediately sell the property before we have spent a significant amount of money. Through this process, we have generated royalties extraordinarily inexpensively..

Additionally, the company makes strategic investments that can be transformative to its bank account. We have netted over US\$50 million through strategic investments throughout the company's history, most of which we immediately reinvest into the royalty generation and royalty purchase aspects of the company to further build our portfolio

### How important is Canada to EMX's operations?

EMX enjoys being headquartered in Canada. Most Canadians are supportive of the natural resources sector, recognizing its importance not only for today's economy but also the economy of the future. Québec is particularly supportive with its cash rebates back to explorers and a fiscal and structural environment that is conducive to mineral property development. We have continued to grow our portfolio in Canada, mostly in the central and eastern parts of the country. ■



Unlike most of our competitors who solely buy royalties, we primarily own royalties that we have grown organically.



## David Garofalo

CEO  
GOLD ROYALTY CORP

### How has Gold Royalty Corp grown so quickly since its founding in 2020?

Gold Royalty Corp is a spin out from our former parent company Gold Mining Inc. The company had a portfolio of 14 royalties across development stage assets in the Americas. While this was a modest number of royalties, there was nothing modest about the mineral endowments we had, which comprised over 32 million ounces of 43-101 resources. This provided us the foundation to IPO in March 2021 and raise US\$90 million on the NYSE, achieving an initial post-IPO valuation of US\$200 million. We recognized the need for consolidation in the sector, as there were many smaller royalty players that individually did not have access to capital markets. Gold Royalty Corp acquired Ely Gold, which grew its portfolio to 105 royalties. Shortly thereafter we acquired Abitibi Royalties and Golden Valley Mines and Royalties, bringing that number to nearly 190. At the same time, we also acquired individual royalties on properties like Beaufor, a restart Monarch Mining is undertaking in northwestern Québec, and Cote Gold, Iamgold's new gold mine in Ontario, expected to start up in late 2023.

Gold Royalty Corp now has a portfolio of 195 royalties, eight of which are currently cash flowing, and another 20 in development. This underpins a growth trajectory in revenues of approximately 60% annual compounded growth over the next 5-10 years and has allowed us to introduce a dividend only 10 months after our IPO.

### Can you share highlights of the company's royalty portfolio?

Our most preeminent royalties in Québec include Canadian Malartic, Canada's largest gold mine. We have significant royalty coverage on Odyssey, the underground extension of the Canadian Malartic mine on which Agnico Eagle and Yamana have committed US\$1.6 billion towards the transition from open pit to underground in the coming decade. This is a cornerstone asset with over 30 years of reserves and significant exploration potential. In addition, we helped provide foundational financing to Monarch Mining, not only at Beaufor but also on all the material going through the mill in their

hub-and-spoke operation. Looking at our broader portfolio, 75% of the underlying value of our business is in Québec, Ontario, and Nevada – by far the best mining jurisdictions for geological potential and low regulatory risk.

### What drew you to the royalty model?

Having built and operated mines for 32 years, I decided to pursue the royalty business, which is especially desirable in inflationary periods when input costs escalate dramatically. I believe gold will remain strong in this inflationary environment but that mining companies – particularly operators – will struggle with cost inflation, undermining the leverage proposition investors are looking for. The best place to be positioned for optimum leverage to the gold price is in the royalty and streaming business, as we are not exposed to cost inflation.

Additionally, the business is incredibly scalable. Gold Royalty Corp has seven full time equivalent employees, and we have every confidence we could run a business 10 times the size with the same number of employees. The beauty of the business is that our cost structure is extremely low, meaning every dollar of incremental revenue goes right to the bottom line for our shareholders

### Why is Québec an attractive place for investment?

In addition to geological potential and low regulatory risk, Québec has excellent human resources. The region has been a fountain of talent for many decades because of the importance of mining to the regional economy.

### How do you see Gold Royalty Corp evolving?

As our asset base matures, we have industry leading growth in revenues and are looking at a 60% compounded average growth rate each year over the next five to ten years. There remains significant scope for consolidation in the sector, and the industry needs a mid-tier player in the royalty space to capture the imagination of capital markets and institutional investors. If we can capture that mid-tier, I believe we will capture the best multiple in this space. ■



The industry needs a mid-tier player in the royalty space to capture the imagination of capital markets and institutional investors.







# GOLD

“The Abitibi greenstone belt is a tier-one district with over 100 years of proven endowment that has provincial and national support backing its development. In the last bull run from 2003-2006, no less than ten mines were brought into production.”

**Philippe Cloutier,**  
President and CEO,  
Cartier Resources

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Image courtesy of Agnico Eagle.



# Gold production

## Québec-based gold producers espy opportunities within the province and beyond

When both of George Burns' grandfathers worked as underground miners, they did everything manually. Today, from his vantage point as president and CEO of Eldorado Gold, Burns watches as the industry shifts towards mechanized, and increasingly remote, operations.

Eldorado Gold holds a diverse portfolio of assets in Canada, Turkey and Greece. One of its top mines is Lamaque, an underground mine in Val-d'Or that is expected to mine and process over 815,000 tons of ore at an average grade of 6.75 g/t Au. The company's maiden PFS at Lamaque stated the peak production rate would be 130,000 oz/y; the mine now produces over 200,000 oz/y. At the mine, Eldorado has implemented modern technologies, such as drills and scoops that can be operated remotely from the surface, thereby making shift changes smoother and enabling some work to be done during the blasting and clearing process. "The industry is heading towards autonomous mining, in which certain parts of the cycle will happen without human interaction,"

commented Burns. "I believe virtual and augmented reality will play important roles in the future."

Another major gold producer that uses its mines in Québec as the testing grounds for innovative technologies is Agnico Eagle. Founded in 1957, the company now has 11 operating mines, including seven in Canada. Of these, Canadian Malartic (which Agnico Eagle holds 50% ownership in partnership with Yamana Gold), Goldex and LaRonde are all in Québec. The three mines are instrumental to Agnico Eagle's overall production, which the company anticipates will hit 3.2 to 3.4 million ounces in 2022.

Extending over three kilometers underground, LaRonde is the deepest mine in the Americas. The mine achieved commercial production in 1988, but its operations are far from outdated. "To mine at these depths requires innovative technology, and Agnico Eagle was the first producer to deploy a private 4G LTE network in an underground mine in the world at LaRonde," said Daniel Paré, the company's vice president of operations in Québec. "It is our oldest mine, yet it is our most advanced in terms of technology."

Québec will remain a jurisdiction of strategic importance for Agnico Eagle for years to come. Canadian Malartic was Canada's largest operating open pit gold mine in 2021, producing 714,784 oz Au and representing 41% of Agnico Eagle's annual production. With the underground Odyssey project currently under construction, Agnico Eagle and Yamana Gold are taking steps to extend the overall mine life to 2039. Furthermore, the company still focuses on acquiring early-stage opportunities and adding value through its mine building expertise. In this regard, Agnico Eagle conducted a joint venture with Maple Gold Mines on its Douay and Joutel gold properties. Additionally, the successful completion of the company's merger with Kirkland Lake Gold in February 2022 will ensure eastern Canada remains a priority in years to come.

Hecla Mining is the largest silver producer in the US, and its 2022 acquisition of Alexco Resource Corp will make it the largest silver producer in Canada as well. When it comes to Hecla's operations in Québec, however, gold carries the day. The company purchased its Casa Berardi gold mine in 2013, and in 2022 it is forecasted to produce around 132,000 oz Au. Nearly a decade ago, however, initial work suggested the mine should be shut down. "Since then, we have doubled production capacity and extended the mine life to 20 years," commented CEO Phil Baker. "That is the type of opportunity the region provides. For that reason, we pay close attention to the activities of exploration companies in the region."

It is this outlook on the geological promise of the province that has encouraged Hecla to pursue a host of exploration activities in Québec, including at Opinaca/Wildcat in James Bay and its Heva-Hosco property in Rouyn-Noranda. Opinaca/Wildcat is currently undergoing an evaluation phase, whereas surface work is the priority at Heva-Hosco in order to evaluate further drill targets. In addition, the company is open to JVs with exploration companies operating in Québec in the future.

### Québec's global reach

In addition to attracting the attention of some of the largest producers in the world, Québec serves as a home base to mining companies that operate outside of its borders. Aya Gold & Silver, for example, has found commercial success in Morocco. Its Zgounder mine has been in production since January 2019 and saw a record year in 2021 with 1.5 million oz of silver production. In the first half of 2022, the company completed a feasibility study for its plant expansion to transform Aya Gold & Silver into an eight million oz producer in 2024.

In addition to being situated along a belt that has remained relatively underexplored and thus holds significant potential, CEO Benoit La Salle



# Invested in the long-term.

**In over 65 years**, we have become the largest producer of gold in Canada and the third largest globally. We are focused on driving the long-term future of our business by operating responsibly and with a commitment to clear values that allow us to explore the full potential of our assets while continuing to invest in innovation, our people, and working with our host communities.

**That's how we make mining work.**







Image courtesy of Hecla Mining.



**In mining, you create value through exploration. We are situated along a belt in Morocco that has not been looked at extensively in the past – only 35% of the South Atlas Fault has been explored.**

**– Benoit La Salle,  
CEO,  
Aya Gold & Silver**

believes Zgounder's location offers cost- and permitting-related benefits. In terms of costs, Aya Gold & Silver benefits from Morocco's inexpensive energy and controlled salary rates. Additionally, the company enjoys the advantages of being in proximity to an industry hub. "Marrakesh is the equivalent of Val-d'Or for Québec, and everything the mining industry requires is manufactured there or in Southern Europe," explained La Salle. "Our predominately local supply chain and workforce protect us from logistical difficulties and from major cost fluctuations."

Furthermore, the CEO believes the permitting process is far more streamlined in Morocco as compared with the long list of bureaucratic steps companies must proceed through in Québec.

G Mining Ventures was established in 2020 with the aim of becoming the next intermediate gold producer, and through its Tocantinzinho asset in Brazil, the company is well on its way. G Mining Ventures published a recently updated feasibility study and completed a financing package that provided full construction funding; the

US\$481 million financing package announced in July 2022 brought in two new investors in Franco-Nevada and La Mancha, while demonstrating continued support from Eldorado Gold. Given these milestones, the company will make a construction decision on the project by the end of 2022.

Looking at the location of Tocantinzinho, which sits in a high rainfall environment that the company's management team had operated in previously, CEO Louis-Pierre Gignac sees opportunities to tap into the excitement of being at the forefront of development. "The project is in a relatively new mining area within Brazil with very few industrial mines in the region," Gignac said. "There are other smaller exploration companies in the area, but we will be the first large-scale producer here. We hope this opens many more doors into the Brazilian market for us."

Whether in South America or Africa, Québec-based companies operating abroad can reap the benefits of Canadian mining expertise and proximity to money markets while tapping into global resource bases. ■



## Daniel Paré

Vice-President – Québec  
**AGNICO EAGLE**



**Agnico Eagle is now the third largest gold producer in the world with 3.2 to 3.4 million ounces anticipated production in 2022.**



### Can you provide an overview of Agnico Eagle's global footprint, highlighting its presence in Québec?

Agnico Eagle was founded in 1957 with its first mine in the cobalt region of Ontario. The company has experienced tremendous growth since then and now has 11 total operating mines, seven of which are in Canada, two in Mexico, one in Finland, and one in Australia. In Canada, we have two operating mines in Nunavut, two in Ontario, and three in Québec. Fifteen years ago, we envisioned increasing production to 1 million oz Au in a year. Agnico Eagle is now the third largest gold producer in the world with 3.2 to 3.4 million ounces anticipated production in 2022.

Beyond its operating mines in Québec, Agnico Eagle participates in exploration projects in the province. For example, we made a joint venture with Maple Gold Mines on the Douay and Joutel gold properties, close to our former Joutel mine. We also have other smaller investments in the Abitibi region.

### What have been the operational highlights at Canadian Malartic, Goldex, and LaRonde over the past year?

Agnico Eagle achieved commercial production at the Goldex mine in 2013, and it officially hit one million oz produced at the end of 2021. In 2021, Goldex produced 134,053 oz Au at total cash costs of C\$684/oz. Production guidance for 2022 is in the range of 130,000 to 140,000 oz with a cash cost of \$776/oz. The mine still has over 1 million ounces in mineral reserves, with a life of mine that goes past 2030. Goldex is a low-grade underground mine which is run very efficiently. For instance, the Rail-Veyor system, a new technology installed in 2017, is an electrically powered haulage system that can be operated remotely.

We also have the LaRonde Complex in the Abitibi region, which is comprised of the LaRonde mine that has achieved commercial production in 1988 and the LaRonde Zone 5 mine (LZ5). Extending below 3 km underground, LaRonde is the deepest mine in the Americas; we even have to use two shafts to access the orebody at depth. To mine at these depths requires innovative technology, and Agnico Eagle was the first producer to deploy a private 4G LTE network in an underground mine in the world at LaRonde. It is our oldest mine, yet it is our most advanced in terms of technology. Adjacent to LaRonde is LZ5, which had been exploited by open pit mining by its previous operator. We achieved commercial underground mining production at LZ5 in 2018, with ore processed at the same milling complex as the LaRonde mine. Here, we have implemented trucks that can operate autonomously with a collision avoidance system.

Of course, the Canadian Malartic mine, of which Agnico Eagle owns 50%, is a key asset in our portfolio. The mine produced 714,784 oz (on a 100% basis) in 2021 and was Canada's largest operating open-pit gold mine. It represented 41% of Agnico Eagle's Québec production in 2021. Importantly, we also see significant growth potential here, with the underground Odyssey project currently under construction. This will extend the overall mine life to 2039 and be the largest underground gold mine in Canada.

### Do you anticipate any corporate synergies to arise from Agnico Eagle's merger with Kirkland Lake Gold?

There are several advantages to this merger. First, the company consolidated the Kirkland Lake camp and enhanced its position in one of the most prolific gold regions in the world. This consolidation provides a unique opportunity to unlock significant operational and strategic synergies along the Abitibi-Kirkland corridor.

### How does Agnico Eagle act upon its commitment to high ESG standards?

Sustainability has always been integral to our operations. We maintain strong community relations and implement good neighbor frameworks for our mines. We purchase local and have invested around C\$750 million in goods and services purchased through suppliers in the Abitibi region in 2021. On the environmental side, Agnico Eagle has one of the lowest GHG emissions intensities of any senior gold producer. We are excited to adopt battery electric vehicles into our operations, but the technology is still under development for large underground equipment. diversity. ■





**We are very excited about future growth potential in Val-d'Or and our updated Lamaque Technical Study in February 2022 highlights potential for increased economic upside and extended mine life.**



## George Burns

President and CEO  
ELDORADO GOLD

### Can you provide an overview of Eldorado Gold's activities in Québec?

Eldorado has a diverse portfolio of long-life, high-quality assets in Canada, Türkiye and Greece. While the Lamaque underground mine in Val-d'Or is a relatively new mine in our portfolio, it's been an outstanding acquisition for Eldorado. We acquired Lamaque from Integra Gold Corp in 2017 and reached commercial production less than 2 years later. After three successful years of operations, the mine continues to create value for our shareholders and for the community in Val-d'Or. In February, we released an updated technical study showing an extended mine life with approximately 5.5-years of production from the Upper Triangle reserves, the top portion of the orebody, and another potential approximately 8.5 years of mine life from inferred resources at the Lower Triangle, the deeper portion of the underground mine, and from Ormaque. We made the Ormaque discovery a few years ago, which is situated midway between the Sigma Mill and the Triangle underground mine. Eldorado has already invested in infrastructure that allows us to drill Ormaque from underground to support continued growth at Lamaque.

### What has been the most exciting development at Lamaque over the past year?

In December 2021, we completed a decline project or underground ramp from the surface at the Sigma Mill down to the heart of the Upper Triangle underground mine. Previously, we had an underground truck fleet haul the ore to the surface up a spiral ramp and a contractor would bring it to the Sigma Mill. This required roughly 50 truckloads of contract shipments of ore per day on public roads. With our new decline, our trucks now go directly to the mill, thereby eliminating the cost of contract surface haulage, and we have reduced dust, noise, and risk related to road safety on a public road.

Last year, we acquired the exploration company QMX Gold, which increased our property footprint by 5.5 times.

### Can you highlight any innovative technologies Eldorado currently employs?

At Lamaque, for example, we can operate a drill or a scoop remotely from the surface that removes people from hazardous areas, making shift changes smoother and enabling some work during the blasting and clearing process. Looking at current technologies, El-

dorado has an e-tagging system that monitors the location of individuals and equipment underground, leading to safety and productivity benefits, such as ventilation on demand. Because mines run 24/7, worker fatigue is a concern on night shifts. Eldorado has a monitoring system that tracks the eye movements of an equipment operator and can predict when fatigue is coming on. The system then sends the operator a wakeup alarm and also sends a message to the dispatch team. On the environmental side, we have implemented a prototype R&D technology called ECOMUD to treat sludge and water generated from drilling activities which recirculates water for surface drilling and allows us to reduce water consumption.

An important benefit of these innovations is that they are shifting the nature of how work gets done. As roles change in the industry, from what's traditionally been perceived as more physically demanding work to a more technology-enabled industry, this will help our industry be more inclusive and attract a more diverse workforce.

### How does your company approach the topic of ESG?

Our sustainability framework and sustainability integrated management system help us to deliver on our commitments of safe, inclusive workplaces, engaged and prosperous communities, responsibly produced products and healthy natural environments. As an example, we believe in the importance of hiring locally and 81% of our employees are from local communities and 99% are from the countries of operation. In Val-d'Or, we focus on partnering with the First Nations communities in proximity and encouraging more women to join our workforce. We are also ambitious with our greenhouse gas targets and have set a target to mitigate our emissions from our global operations by 30% by 2030 on a "business as usual" basis from 2020 levels (equivalent to 65,000 t of carbon dioxide equivalent). ■



**Our aim is to significantly grow our silver production from 12 million oz/y at present to 20 million oz/y.**



## Phil Baker

CEO  
HECLA MINING

### Can you provide an overview of Hecla Mining's portfolio and the importance of Québec for the company?

Hecla is the largest silver producer in the US. We have grown to a position where we produce 40% of all silver in the US. The acquisition in 2022 of Alexco Resource Corp, which holds the highest-grade silver deposit in the world, will make us the largest silver producer in Canada as well, producing close to 40% of all the silver in Canada. We expect to complete the transaction by Q3 2022.

Québec is a leading jurisdiction for mining, which explains why we have been present here for almost a decade with our Casa Berardi gold mine. We still see significant potential in the province to further our exploration and production presence. We already mine twice as many tons at Casa Berardi than we did in 2016.

### To what extent does Casa Berardi embody the mining potential in Abitibi-Témiscamingue?

Hecla purchased Casa Berardi in 2013. Back then, initial work suggested the mine ought to be shut down. Since then, we have doubled production capacity and extended the mine life to 20 years. That is the type of opportunity

the region provides. For that reason, we pay close attention to the activities of exploration companies in the region. At Casa Berardi, we plan to grow the number of tons that go through the mill, which we have made more reliable to increase production levels. The mine will produce 125,000 - 132,000 oz Au in 2022.

### Can you expand on exploration activities at Opinaca/Wildcat in James Bay and the Heva-Hosco exploration property in Rouyn-Noranda?

Opinaca/Wildcat is currently going through an evaluation phase. Surface work is our priority at Heva-Hosco, as we are creating a geological model to evaluate further targets to drill. There is a huge resource sitting there, and the infrastructure available is tremendous.

### How does Hecla factor ESG in its operations?

Silver is a crucial part of the solution towards the transition to green energy. Unlike other silver mines that exceed 1 million tons of ore production, our mines operate on a smaller scale and produce around 100 - 300 tons silver. As a result, we inherently emit less greenhouse gases. This means we can invest

in credits supporting sequestration of greenhouse gases. Hecla has now been net zero for scope 1 and 2 emissions for two years in a row, and we plan to tackle scope 3 before 2024.

We make sure the communities around us are fully engaged to create a joint dynamic from the early stages of a project.

### What is your forecast for the long-term demand for silver?

The solar industry is going to be a big driver for demand. Today, about 10-15% of the total demand for silver is solar, representing 120 million oz/y. The US Energy Information Administration (EIA) suggests that solar energy will account for 50% of renewable energy generation by 2050 and that has the potential to increase the demand for silver in solar to half a billion oz/y. The US Inflation Reduction Act of 2022 also provides a lot of incentives for renewable energies.

### How have the recent geopolitical tensions highlighted the importance of mining regionally?

Prior to the Ukraine-Russia war, the pandemic opened the public's eyes on the need to shorten supply chains in the mining sector. Since February 2022, the war made political decision makers realize nations need to strengthen the supply of elements needed for national security. A notable shift has been in the Democrats' narrative at the US Senate. Historically lukewarm to the idea of increasing mining activity in the US, they are now supporting critical minerals-linked discussions in a way they would have not considered in 2019.

### What are the priorities for Hecla in the short term?

Our aim is to significantly grow our silver production from 12 million oz/y at present to 20 million oz/y. This will be achieved thanks to a new mining technique called the Underhand Closed Bench we developed at our Lucky Friday mine in Idaho. The Keno Hill operation in Yukon that will be in production at the end of 2023 will also contribute to that goal. ■

# Gold exploration

## The need for consolidation

The past several months have not been favorable for junior share valuations. Though the price of gold rose in response to Russia's invasion of Ukraine, a looming sentiment of uncertainty has led to a broader pullback in investment into mining exploration, which is deemed high risk. There is no simple solution to the current downturn, nor is it necessarily alarming – observers of the industry are well aware of its cyclical nature. That said, some industry experts believe consolidation may be part of the answer. "There are too many juniors out there with too many projects with limited funding. As an industry, we need to consolidate either geographically, by commodity, or by focus to create critical mass," said Normand Champigny, CEO of Quebec Precious Metals, whose flagship project Sakami is located in the Eeyou Istchee James Bay territory. "In today's world, if you don't have a market cap of C\$15 million, you are not on the radar of any significant institutions, leaving you at the mercy of retail investment." Retail investment in Québec's junior sector is largely done in the form of flow-through shares that provide tax benefits to investors but can ultimately end up hurting the exploration companies themselves, which have witnessed the effects of retail investors selling their shares without hesitation, thereby putting pressure on share price and pushing it further down. This perpetuates the cycle; less exploration leads to less funding and ultimately a depletion of the resource bases of producers.

Similarly, companies with too much on their plate may find it strategically beneficial to streamline their story for investors. Exploration companies have finite resources at their disposal, and knowing how and where to allocate capital is part of the game. Fury Gold Mines is a great example. The company raised C\$5.5 million in 2021 from key supporters. At this stage, Fury recognized it would be better off to sell its Homestake Ridge gold-silver asset to Dolly Varden Silver, receiving in return not only an additional C\$5 million and 76.5 million shares, but also a much more simplified strategy. "At this point, we became a lot more attractive to new investors which enabled us to raise C\$11 million in April 2022," said CEO Tim Clark. "This shifted Fury into a position of strength, and shortly thereafter we were able to start our 2022 drilling program."

### The Osisko legacy lives on

In June 2014, Agnico Eagle and Yamana Gold acquired the old Osisko Mining for C\$4.3 billion, gaining ownership of its Canadian Malartic mine and indirectly leading to the creation of various spinout companies to live on in Osisko's legacy. After a merger in 2015 of five companies that resulted in the re-uniting of the

executive management team of the original Osisko Mining, the new Osisko Mining Corporation was born.

Located within the traditional territory of the Cree First Nation of Waswanipi, situated within Eeyou Istchee James Bay around 200 km northeast of Val-d'Or, lies Osisko Mining's flagship Windfall project. Osisko is racing to bring Windfall into production by 2025. As one of the fastest advancing projects in Canada, the company has been drilling for the past five years in the hopes of turning Windfall into the largest high-grade gold deposit ever discovered in the province. So far, it is on track; Osisko's recent NI 43-101 report stated 3.2 million oz Au in the measured and indicated category grading 10.5 g/t Au and 3.6 million oz Au in the inferred category grading 8.6 g/t Au, and the company has finished drilling to update its mineral resource estimate that will form the basis of the Windfall feasibility study, which president Mathieu Savard hopes to have completed by the end of 2022. The feasibility study, in turn, will form the basis of Windfall's production decision.

Savard is optimistic that Osisko's other regional exploration projects – Windfall is part of a 2,400 square km contiguous land package – may help it transition to being a district-scale player. "Golden Bear's recent discovery located less than 1 km from Windfall confirms the favorable environment could potentially host additional gold deposits in the area," he commented. "We believe that over time, we will find additional deposits as was done in comparable mining districts such as Val-d'Or or Timmins, which have each produced over 100 million ounces of gold over time."

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**Orford Mining**

**Exploring for Gold and Nickel on 1,400 km<sup>2</sup> of land in Quebec**

Orford is exploring the high grade Qiqavik Gold project and high grade West Raglan Nickel project in the Nunavik Region and the Joutel Gold projects in the Abitibi Region.

**Orford Mining Corp.**  
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**José Vizquerra**

President and CEO  
**O3 MINING**

### What progress has been made at O3 Mining's Marban property over the past year?

O3 Mining completed a pre-feasibility study (PFS) in early September 2022 and has been working towards the completion of a Definitive Feasibility Study (DFS) set to be released in Q3 2023. Since we published the PEA in 2022, we have released an updated resource estimate now having 2.3 million oz Au in the measured and indicated category. We have also conducted metallurgical test work, which has increased the gold recovery in the Marban Pit. With robust economics, Marban has shown itself to be a profitable standalone project. Using a long-term gold price of US\$1,700 oz, the project has a post-tax unlevered IRR of 23.2% well above the 15% IRR investment threshold used by many larger gold miners, and a post-tax NPV of C\$463 million, as well as an NPV/CAPEX ratio of 1.1x, with an all-in-sustaining cost (AISC) of US\$882 oz. This is a key achievement in an inflationary environment. The project has also an improved production profile of over 160,000 oz/y Au, for an approximately 10-year life of mine compared with our 2020 PEA. Ultimately, we aim to be in production by 2026.

### Do you see potential for Marban and Alpha to go underground?

There is no shortage of underground potential at the Marban project, where nearby mines including Goldex, Kiena, Lamaque, and LaRonde all have underground deposits descending up to three kilometers. Currently, drilling at Marban has only gone 500 m below the surface but we are confident there is potential for Marban to go underground. That said, we are conscious of capital allocation and want to focus our exploration on near-surface targets that can positively impact the NPV of the Marban project in the first 10 years of production, and anything underground would likely occur 10 to 20 years down the line. Our Alpha project also holds the potential to go underground.

### How is O3 Mining able to maintain low capital expenditure in relation to similar gold projects?

Being in Val-d'Or holds many advantages; not only has the district produced over 30 million oz Au, but it also provides the company access to key infrastructure including roads, railroads, hydropower, and manpower. We have the privilege to be developing Marban in a jurisdiction that has a green-powered grid with 99.6% renewable power and that has a strong carbon policy. Compared to other jurisdictions developing gold mines, carbon intensity is one of the lowest in the world.

### What led to the company's decision to sell its East Cadillac property in exchange for shares of Cartier Resources?

We saw a strategic opportunity in reallocating components of our portfolio to maximize value. We had previously sold the Garrison project to Moneta Gold forming the very robust Tower Gold project. Most recently, we exchanged the East Cadillac Property for 17% of Cartier Resources, a company that has around 2 million oz Au in one single ore shoot. With our tenements, they will be able to explore systematically to increase the resources of the project. If they do that on a US\$1 per share basis, we will see a positive impact.

### What is O3 Mining's approach towards ESG-related topics?

Within the mining industry, ESG has become a talking point for many companies without concrete actions. O3 Mining takes ESG seriously and prides itself on having taken a proactive approach to our ESG initiatives. We were one of the first companies to achieve the ECOLOGO Certification for Mineral Exploration, which is a third-party verification in Québec awarded to companies for their environmental, social, and governance practices.

On the social front of ESG, we have taken a proactive approach in initiating dialogue and consulting key stakeholders as we value their participation in the development of our projects. We value and respect our host communities; in fact, I have learned French so I can give presentations and we can initiate dialogue in their primary language. Additionally, O3 Mining believes in providing equal opportunities. We are proud to have a workforce of which 39% are women. We also have two women on our Board of Directors, and we are working to increase our board diversity. ■



**With robust economics, Marban has shown itself to be a profitable standalone project.**







## Victor Cantore & Kelly Malcolm

VC: President and CEO  
KM: VP Exploration  
AMEX EXPLORATION

### Can you update our readers on the progress at Amex Exploration's flagship Perron gold project?

VC: We will complete 100,000 m of drilling in 2022 and expect to reach 100,000 m in 2023. We plan to release a NI 43-101 resource calculation along with a PEA by the end of 2022.

We have also made a great discovery within a copper rich VMS zone. It is highly beneficial that Glencore's Horne smelter is located just 1.5 hours away by truck, as they need copper rich VMS which we can provide.

### What aspects about Perron's location excite you?

KM: The project is fully accessible by highway and is approximately an eight-hour drive from Montreal. The property is host to very high-grade gold, and we have already made a number of significant gold discoveries at the Eastern Gold Zone, the Gratiem Gold Zone, the Grey Cat Zone, the Central Polymetallic Zone, as well as

various new discoveries we have made over the past few months. In addition to high-grade gold, we have large, low-grade bulk tonnage mineralization and high-grade copper mineralization. What makes Perron unique is the geological setting that provides the opportunity for both high-grade gold and copper.

### Has Amex Exploration experienced an increase in operational costs?

KM: Our costs are relative to inflation and have gone up since the discovery in 2019. At that time, we were drilling holes for approximately C\$150 per meter, but now, that is closer to C\$275 per meter.

### How does Amex Exploration incorporate themes related to ESG?

KM: We are in the process of obtaining the ECOLOGO certification. We are learning a lot through this process and growing as a company in a sustainable way. ■



## Mathieu Savard

President  
OSISKO MINING

### Can you update our readers on recent progress made at Osisko Mining's flagship Windfall gold project?

We have been drilling here for the past five years to make the project the

largest high-grade gold deposit ever discovered in the province. Our recent NI 43-101 report stated 3.2 million oz Au in the measured and indicated resources category grading 10.5 g/t Au and 3.6 million oz Au in the inferred resource category grading 8.6 g/t Au. In July 2022, we completed the extraction of the Lynx 600 bulk sample in the Triple Lynx zone with results from processing expected in Q4 2022. In parallel, we finished the drilling to update the mineral resource estimate that will form the basis of the Windfall feasibility study, which we anticipate being delivered by the end of 2022. This feasibility study will form the basis of Windfall's production decision.

### How do Osisko Mining's other exploration activities underpin the company's confidence in the region?

Windfall is part of a 2,400 square kilometer contiguous package that represents a district scale position. We

believe that over time we will find additional deposits, as was done in comparable mining districts such as Val-d'Or or Timmins. Thus, while Windfall remains the main focus of Osisko Mining, the company has other regional exploration projects underway to help transition it to being a district scale player.

### In what ways does Osisko Mining work to foster positive relations with indigenous communities?

One of our focuses is to establish positive relationships with the Cree first nations. This begins with constant communication. One main way Osisko Mining is able to positively impact this community is through employment measures. At Windfall we have employed over 100 First Nations workers who are either direct employees or working for contractors. We also work closely with several Cree owned contractors. ■

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Another spinout of the old Osisko that has carved out a name for itself is O3 Mining, a gold explorer and developer focused on its Marban and Alpha properties with the aim to be in production at the former by 2026. At Alpha, O3 is conducting advanced exploration in two main areas of the property, including the Bulldog zone, where it is working towards a new resource. The company has also been drilling the Omega sector close to Eldorado's Lamaque mine and on the eastern side of the property at the Akasaba sector, close to Agnico Eagle's Akasaba West project.

Further along at Marban, situated 12 km from Canadian Malartic and eight km from Wesdome's Kiena mine, O3 completed a PFS in early September 2022. Since publishing the PEA in 2022, the company has released an updated resource estimate now having 2.3 million oz Au in the measured and indicated category in addition to conducting metallurgical test work that increased the gold recovery in the Marban Pit.

While currently focusing on the exploration of near-surface targets, CEO Jose Vizquerra is confident both Marban and Alpha have the potential to go underground, particularly given Marban's proximity to nearby mines such as Goldex, Kiena, Lamaque, and LaRonde that have underground deposits descending up to three km in depth. "Currently, drilling at Marban has only gone 500 meters below the surface, but we are confident there is potential for Marban to go underground," said Vizquerra.

### Brownfield exploration in the Abitibi greenstone belt

The Abitibi greenstone belt is a tier-one mining district with a rich history of proven endowment. From 2003 to 2006, no less than 10 mines were brought into production in the region. Among them ran a striking similarity: none were new discoveries. Canadian Malartic, a shining example, was the combination of four past-producing mines turned open pit. It is this time-honored consistency that attracts resource companies and investors alike, who see brownfield projects in the Abitibi as low-risk alternatives to fresher prospects in less explored regions. After all, many believe the best place to find a mine is in the shadow of an old operation.

Cartier Resources president and CEO Philippe Cloutier hopes his company's flagship Chimo project will be another tri-

umph of the strategy for exploration companies to pursue advanced-stage gold projects. Chimo had produced in the mid-1960s and mid-1980s before being sold to a final operator who mined it until 1997 before shutting it down. "Chimo ceased production not for lack of ore but because of the price of gold at the time and the negative light the Bre-X scandal cast on the mining industry," explained Cloutier. "Yet its endowment did not go anywhere, and we were thrilled to acquire it."

In acquiring the property, Cartier also gained access to a database of 4,000 drill holes and 60,000 assays, enabling the company to kickstart a robust exploration program. To further its efforts, Cartier is conducting a full year, C\$6 million drill program at Chimo.

In addition to advancing its Springpole project in northwest Ontario, one of the largest undeveloped open pit gold deposits in Canada, First Mining Gold is making significant moves in the Abitibi region based on a shared enthusiasm for historic projects that have significant data but have been overlooked in recent years.

The company's Duparquet gold project consists of several properties, including a 25% interest in Beattie, which had been the largest producing gold mine in Québec in the 1930s. The site had 260,000 m of drilling done in the early 2000s, and had up to a pilot plant scale metallurgical test program completed. "They were able to crack the code, but this was after 2013 when the equity markets were on a downturn," explained CEO Dan Wilton. "Since then, people forgot about the fundamental work done here at the last end of the cycle, making it an incredibly advanced-stage project completely off the radar."

First Mining Gold announced it will consolidate ownership of the Duparquet project, including the Beattie mine, to take its portfolio to the next level: "This acquisition closed in September 2022, and we now have more than nine million oz indicated and another 3.4 million oz inferred, which will be one of the largest resource bases of any developer in the gold sector."

Through its 50/50 JV with Agnico Eagle, Maple Gold Mines gained access to the Joutel project, part of a past producing

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**FIRST MINING GOLD**

**ADVANCING SPRINGPOLE AND DUPARQUET**

**TWO OF THE LARGEST GOLD PROJECTS IN CANADA**

- Recently acquired Duparquet Gold Project in Quebec – advanced stage development project with 3.4 Moz M&I Resource and 1.6 Moz Inferred Resource
- Advancing the Springpole Gold Project in Ontario – PFS released in 2021 outlined annual gold production of 300+ koz per year with an NPV5% of US\$995 million at US\$1,600/oz gold
- Exploration upside in the under-explored Birch-Uchi Greenstone Belt
- First Mining owns significant equity and project interest in other development assets being advanced by partners
- Significant and growing royalty portfolio presents longer-term upside value
- Experienced and growing team in place to unlock value

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## David Christie

President and CEO  
ORFORD MINING

↘↘  
**Québec has extra kick on the flow-through side – if you spend hard dollars in Nunavik, they give you up to 38% of your money back**



### Can you provide a brief overview of Orford Mining's portfolio?

Orford Mining's portfolio is divided into three parts. We have the West Raglan nickel project in the Nunavik region of Québec, for which Wyloo Metals signed an earn-in agreement in January 2021 where they can earn up to 80% by spending C\$25 million. West Raglan is a very high-grade nickel project, and we already have several discoveries on the 707 square km property which is 100% ours. Wyloo is spending C\$5 million on 3,000 m of drilling this summer and Orford operates.

The company also owns the 390 square km Qiqavik gold project, also in the Nunavik region. There are high-grade gold multi-ounce assays across the entire property, and we are drilling 3,000 m there this summer as well. It is a brand-new gold district with no exploration history before us.

Thirdly, the company has picked up four properties in the Joutel region of the Abitibi district of Québec and recently finished drilling the Joutel Eagle project. Joutel is where Agnico Eagle started its gold mining, and we are located right next to the original Agnico Eagle gold mine that closed in 1993. We drilled three holes to confirm our

theory on some mineralization, and we hit a large thick package of low-grade gold mineralization which would be quite amenable to an open pit mining.

### Why do you believe the area surrounding Qiqavik was historically underexplored?

Qiqavik is in the same volcanic belt as our West Raglan property. There is a big fault that runs between the nickel-bearing rocks and the prospective gold rocks. No one paid attention to gold in that area as everyone was looking for nickel. It is a remote area, and unless you were already there, it's a difficult place to start exploring for gold. Orford Mining was already exploring in the area looking for nickel and decided to expand its exploration for gold ore as well.

Drilling has confirmed shear-hosted and lode gold mineralization along several trends in various structural zones, including the newly discovered IP Lake Shear Corridor (IPLS). We are using glacial exploration methods to locate mineralization, and our work in 2021 has confirmed we are in the right area. We have extended the Annick boulder trend to 3.7 kms and believe we have found the source of that trend. We will be completing geophysics, geological mapping and drilling on this trend this

year and will also conduct further work on the Eric boulder trend, Interlake shear zone, and IPLS zone.

### Can you elaborate on the results of the Joutel Eagle drilling program?

We drilled three holes, sampled the entire drill hole, and intersected 46 m of 0.97 grams, which is a great intersection that close to surface. There was 28 m of 1.24 grams within that number, and we believe there is potential for low-grade gold ore bodies. We are in the early stages and our next steps will be to define scale and mineral tenure.

### What are Orford Mining's goals for the C\$5 million exploration program at the West Raglan property?

In 2021, our MLTEM-SQUID survey returned 435 conductors, of which 72 are classified as high priority. The plan is to drill up to 15 of these high priority conductors which have been modeled against the mineralization we already have on the property, and we are quite hopeful that we will be intersecting massive sulfides similar to what we have seen before. We are drilling some new areas and are hoping for new discoveries.

### How would you evaluate the financial climate surrounding Québec's mining industry?

The way the regional and provincial governments treat mining is spectacular, probably the best in Canada. Québec has extra kick on the flow-through side – if you spend hard dollars in Nunavik, they give you up to 38% of your money back. There are also several funds that invest in Québec mining, which is a great benefit.

### What are Orford Mining's priorities for the next year?

We are working towards an ECOLOGO Certification which we hope to attain by the end of the year. We always ensure that we work well with our stakeholders and various local communities and employ as many local people or First Nation or Inuit-owned enterprises as possible. ■



## Dan Wilton

CEO  
FIRST MINING GOLD

↘↘  
**In the Abitibi, we are sitting in one of the most sought-after exploration terrains globally.**



### How significant will the acquisition of the Québec-based Duparquet gold project be for First Mining Gold's portfolio?

First Mining Gold has a suite of development projects in Canada, some of which we are moving forward ourselves and others we have partners to help fund. Our largest project is Springpole in northwestern Ontario, an open pit project with approximately 5 million oz Au. We completed a PFS on Springpole in 2021, and we published our draft environmental assessment document in June 2022. We announced in July 2022 that we will be acquiring the Duparquet gold project in Québec (closed in September 2022), a project near Rouyn-Noranda that we own a small piece of but are consolidating what will likely be a 100% interest in a resource that is 3.4 million oz indicated and, combined with other components of our portfolio, over 2 million oz inferred. This acquisition closed in September and now we have more than 9 million oz indicated and another 3.4 million oz inferred, which will be one of the largest resource bases of any developer in the gold sector.

The company has other portfolio in-

terests such as Pickle Crow and Cameron in Ontario, as well as Hope Brook in Newfoundland. We are also the largest shareholder of Treasury Metals, who is advancing the Goliath gold project in Ontario.

### Why is it so popular for exploration companies to go after previously operating gold mines in the Abitibi region?

The largest mining companies are just as interested in exploration potential as the resource itself. Where Duparquet is located ties into to other projects First Mining Gold already owns – the Pitt and Duquesne projects, the latter of which is a past-producing mine, meaning we have access to an underground shaft and infrastructure. Several smaller high-grade mines in the Abitibi had been developed previously, and we are now seeing successes in consolidation. What Osisko did with Canadian Malartic is a great example. We saw you can grow a resource in this way to a point of critical mass where it becomes very strategically interesting to some of the biggest gold mining companies in the world. In the Abitibi, we are sitting in one of the most sought-after exploration terrains globally.

### What attracted you to the Beattie Gold mine and the Duparquet Gold project?

Beattie, which makes up part of the Duparquet project, had been the largest producing gold mine in Québec in the 1930s. It then had 270,000 m of drilling done in the in the late 2000s and early 2010s, but when the equity markets were on a downturn, people forgot about the fundamental work done here at the last end of the cycle, making it an incredibly advanced-stage project completely off the radar.

The mineralization and geology at Beattie are distinct from what you envision as a traditional gold mine in the Abitibi. This is a disseminated orebody with areas of higher grade and better continuity in its mineralization. It also has enormous potential at depth, and we have just scratched the surface. Everybody looked at the larger bulk tonnage potential, but the reality is there is a grade of 2 g/t million-ounce deposit sitting inside Beattie at a much lower strip ratio. This means there is potential for more economic high-grade starter mineralization that could be the foundation for a start small and expand scenario as opposed to a campaign that needs C\$1 billion of upfront capital to get off the ground. In general, we are excited by projects that have a ton of data but have been overlooked by other people.

### What does First Mining Gold hope to accomplish over the coming year at Duparquet?

With the closing of the Duparquet acquisition, First Mining will conduct environmental baseline work, as we want to update what had been done by Clifton Star. We will brainstorm whether there are new ways we can think about approaching the scale of the asset, which we can do given the data we have. In the next 12 months, we plan on being able to give investors, regulators, and the surrounding community a sense of a solid, sensible plan forward that we can wrap an economic study around. This is one of the largest and highest-grade projects in Québec. ■





## Matthew Hornor

President and CEO  
MAPLE GOLD MINES

### What does Maple Gold Mines' portfolio look like after its joint venture with Agnico Eagle?

Maple Gold Mines has a 50/50 JV with Agnico Eagle for two of its proj-

ects. We contributed the Douay gold project, which has over 3 million oz currently defined, with approximately 15,000 m not in the resource update. It is a relatively shallow resource base that is still growing, and we will be conducting further exploration including testing the depth potential up to 1,500 m with the support of Agnico Eagle. For their part, Agnico Eagle introduced the Joutel project to the JV, which is contiguous to the Douay project area and was part of a past producing high-grade mine complex that closed in 1993. Outside of the JV, Maple Gold Mines also acquired a 100% option on the Eagle mine property, which was part of the Eagle-Telbel mine complex in the Joutel area. Thus, we currently have three projects – two within the joint venture and one operated 100% by Maple Gold Mines.

### How does Maple Gold Mines factor ESG considerations into its operations?

Maple Gold Mines is focused on building relationships and involving local communities in its operations. We use local labor as much as possible to give the community the benefit of us being there. We have a focus on equal opportunity and diversity and always aim to hire the best people, regardless of gender or culture.

### Are there any highlights to operating in Québec?

I have operated in many jurisdictions globally, and Québec stands out as the best place I have ever worked. I would rather have 3 million ounces in Québec than 10 million ounces in the DRC, as I can get 37 cents back on every dollar put into the ground here, the government is supportive, and the environment is predictable and safe. ■

### What are Monarch Mining's goals with the past producing Beaufor mine?

JML: The Beaufor mine was in production for over 30 years and produced approximately 1.2 million oz Au. Monarch Mining has aggressively been exploring since 2020 and is looking to extend the mine both laterally and at depth. We are currently looking at a different version of exploiting the mine via a ramp and a shaft. From the two different entrances to the mine, we will be able to produce significantly more tonnage per day, which we have the milling capacity to take on.

### Can you give an update of the McKenzie Break property?

JML: The McKenzie project is a well advanced exploration project with just over 400,000 oz Au of discovery thus far. We have finished our first drilling program, are currently moving drills, and expect to have four drills operating on the project by the end of summer 2022.

### How is Monarch Mining currently allocating its exploration budget?

MS: We are in the process of completing a 20,000 m drilling program at McKenzie, are completing a 10,000 m drilling program at our Swanson property, and are continuing to drill at Beaufor. Given the proximity of our assets to each other, we're always able to adjust capital allocation along the way depending on visual interpretation of the core and drilling results. Our exploration budget is also linked to the availability of flow-through dollars, but for the 2022 fiscal year, Monarch Mining's exploration budget is approximately C\$7.5 million.

### Can you elaborate on progress at the Swanson property?

JML: Like McKenzie, the Swanson project has great open potential to start. We were not expecting some of the recent discoveries that were below the actual projected pit, and we are excited to be hitting some very wide intercepts of gold mineralized zone. ■



## Jean-Marc Lacoste & Mathieu Séguin

JML: President and CEO  
MS: VP Corporate Development  
MONARCH MINING

<< 35

high-grade mine complex that closed in 1993 after operating for 19 years. For its part, Maple Gold Mines contributed to the joint venture its Douay gold project, which has over 3 million oz Au currently defined and approximately 15,000 m not included in the resource update. With the support of the largest operator in Québec as its partner, Maple Gold Mines plans to conduct step out and deep drilling at Douay, testing the depth potential up to 1,500 m.

Matthew Hornor, the company's president and CEO, is excited about the potential the project holds given the geologic similarities he notes between Douay and Canadian Malartic, Canada's largest gold mine. According to Hornor: "The scale, age of rocks, and type of geology that host the resource are all similar to Malartic. The Malartic JV recently defined an additional 6 million ounces at over three grams gold down to nearly 2 km depth. This is similar to what we are chasing in our deeper drilling campaign."

A half hour car ride northeast of Val-d'Or sits the Beaufor mine. Production activities were suspended at Beaufor in June 2019, and the mine was placed under care and maintenance. Two years later, Monarch Mining announced its plans to reopen the mine by summer 2022. Right on schedule, the company announced the production of its first bar of gold in July.

Monarch Mining, created as a spinoff of some assets held by Monarch Gold prior to its 2021 acquisition by Yamana Gold, has four advanced properties and the Beacon Mill. The company's operations center around the past producing Beaufor mine, which previously produced 1.2 million oz Au over the course of three decades and, as of July 2022, had nearly 24,000 tons of ore averaging 4.76 g/t Au currently stockpiled and ready to be processed. According to the company's president and CEO Jean-Marc Lacoste, Monarch is currently looking at different ways to exploit the mine via a ramp and a shaft. "From the two entrances to the mine, we will be able to produce significantly more tonnage per day, which we have the milling capacity to take on," Lacoste explained, referencing the fact that Beacon is the only mill in the eastern part of the Abitibi with current capacity. "This paves the way for many good years to come at the Beaufor mine, hopefully at a much higher tonnage rate than what has been produced over the last 30 years."

95 km south of Rouyn-Noranda, Vior is advancing its flagship Belleterre gold project. The property includes the past producing high-grade Belleterre gold mine, which produced over 750,000 oz Au between 1936 and 1959 but is part of a sector that has been underexplored since. Vior designed its phase I and II drill campaigns to better understand the geological framework of the historic mine trend, and executive vice president Laurent Eustache commented that the company is liking what it is seeing thus far: "The mineralized system appears to widen and become more complex at depth, which is exactly what one is looking for when exploring for economic gold mineralization."

110 km north of Rouyn-Noranda, Amex Exploration continues to advance its flagship Perron gold project with its significant drilling activities; the company plans to complete 100,000 m of drilling to support the release of an NI 43-101 resource calculation and a PEA by the end of 2022, as well as an additional 100,000 m in 2023. Victor Cantore, president and CEO, acknowledged these timelines remain flexible as the company continues to build out its resource and economic study to de-

cide whether to take Perron into production or sell it. "We keep making new discoveries and want to bring out the biggest maiden resource possible," said Cantore.

### New opportunities for discovery

Though popular, brownfield exploration is not the only strategy of choice in Québec. In 2020, Kenorland Minerals made a significant greenfield discovery in the Frotet-Evans greenstone belt that the company has been aggressively advancing alongside its JV partner, Sumitomo Metal Mining. The Frotet project, located an hour's drive north of the town of Chibougamau, is exemplar of the company's strategy to advance greenfield exploration work by partnering with major mining companies. "Greenfield exploration is extremely high risk, and it takes a significant amount of time and money to advance a project from a vast area of moose pasture to drill targets, with the odds of success approaching zero," said Zach Flood, the company's CEO. "As part of our risk-mitigated approach, Kenorland prefers to partner with major mining companies which have larger budgets and longer times to explore."

In this way, his company dilutes at the project level to limit shareholder dilution at the corporate level. It is in partnering with the likes of Sumitomo, Newmont, Barrick, Centerra Gold, and Antofagasta that Kenorland will manage C\$23 million in exploration expenditures in 2022, of which C\$3 million is funded from their own treasury. ■

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↘↘  
**There is no need to worry about the long term – gold in the ground does not rust. Fortunately, Cartier Resources has more cash than most, so we will continue to push forward.**  
 ↙↙

## Philippe Cloutier

President and CEO  
**CARTIER RESOURCES**

### What makes the Abitibi greenstone belt so attractive to Cartier Resources, and how do the historic activities of the region fit with the company's strategy to focus on advanced gold projects?

The Abitibi greenstone belt is a tier-one district with over 100 years of proven endowment that has provincial and national support backing its development. In the last bull run from 2003-2006, no less than ten mines were brought into production. The one common denominator for all ten deposits was that none of them were new discoveries. As an example, Canadian Malartic was four past-producing mines turned open pit.

Cartier Resources' flagship Chimo is another example. It produced in the mid-1960s and mid-1980s before being sold to a final operator who mined it until 1997. Over a 30-year period, Chimo produced just under 400,000 oz Au. It ceased production not for lack of ore but because of the price of the gold at the time and the negative light the Bre-X scandal cast on the mining industry. Yet its endowment did not go anywhere, and we were thrilled to acquire it.

### How much potential does Chimo presently hold?

When Cartier Resources changed its strategy from focusing on grassroots exploration to shopping for projects that had great historical resources, Chimo, Benoist, Wilson, and Fenton all stuck out to us and are all part of our present portfolio. It just so happened that Chimo had infrastructure from past production, so we had access to a database of 4,000 drill holes and 60,000 assays. The resource estimate at Chimo indicated the mine grows laterally and at depth, and at depth we would be crossing onto O3 Mining territory. As a result, O3 sold us the property in exchange for a significant share position alongside Agnico Eagle, and by consolidating, we increased the ounce count considerably.

### Has the current investment climate impacted Cartier Resources' operations?

One sentiment investors cannot tolerate is fear. When fear takes hold of the market, the last thing you want to hold is junior stocks. Unfortunately, when this happens, you crystalize your loss, and everybody suffers. What should be done instead is to pause for reflection

on whether a project has strong fundamental geological value, cash in the bank, corporate sponsors, social acceptance, and drillers available. If this is the case, there is no need to worry about the long term – gold in the ground does not rust. Fortunately, Cartier Resources has more cash than most, so we will continue to push forward.

### How do considerations for Cartier Resources' shareholders factor into your plans?

It is more responsible to let the big players develop mines. From an ESG standpoint, they have the environmental departments and resources to do things well. From a financial standpoint, when a junior attempts to do what the seniors do, they spend significantly more money given economies of scale. Producers are happy to watch you dilute your shareholder value to begin construction and wait to buy the project off you once you have significantly de-risked it and are no longer able to proceed. It is our fiduciary duty to protect shareholder value and recognize this. That said, we are pricing out the process of building the mine to compare it with bids.

Along those lines, seniors have encouraged exploration companies to consolidate. The problem is that unlike when producers consolidate, when juniors consolidate, they do so at the detriment of their shareholders.

### What role does ESG play in Québec?

Unfortunately, many companies do a lot of lip service when it comes to ESG. This is not the case for companies based at or near their operations. Those living near or on-site will naturally be better stewards of the environment than those who cannot directly see their impact. Québec is proactive in the sense that when you start a project in the province, you must bond the money for a reclamation. Something else I appreciate about Québec is that the money stays near the mine. possible.■



## Zach Flood

CEO  
**KENORLAND MINERALS**

### Can you give an overview of Kenorland Minerals' portfolio?

Kenorland Minerals Ltd. (TSX-V: KLD) is an exploration company focused on the discovery of new mineral deposits in North America. A large part of our project portfolio is located in Québec

and we've been actively exploring in the province since 2016. In 2020, we made a significant greenfield gold discovery, named 'Regnault', in the Frotet-Evans greenstone belt, which we've been aggressively advancing with our joint venture partner, Sumitomo Metal Mining. Elsewhere in Québec, we have partnered with other major mining companies on several projects: Chebistuan in the northern Abitibi with Newmont, Chicobi in the central Abitibi with Sumitomo, and Hunter in the southern Abitibi with Centerra Gold. Outside of Québec, we are exploring the South Uchi project in Ontario with Barrick Gold, and in Alaska we have a joint venture with Newmont on the Healy project, and the Tanacross porphyry copper-gold project is currently held under earn-in with Antofagasta. In 2022, we will manage approximately C\$23 million in exploration expenditures, of which around C\$3 million is funded out of our own treasury and C\$20 million is funded through our partners.

### How does the Frotet project highlight the attractiveness of Québec?

Quebec is an amazing place to make a new discovery. The province is well known for large gold deposits and operating mines, so there's very prospective geology. Québec also offers attractive financial incentives such as the exploration tax credits and potential support from institutional funds. But most importantly, there's been progressive consultation with First Nations at the government level, creating a foundation and framework for companies trying to advance their projects through early stage exploration and hopefully into development. The Frotet project is about an hour drive north of the town of Chibougamau, and the Regnault gold discovery sits just off the Route du Nord. It's amazing that we found a large, high-grade, gold system this close to infrastructure and generally supportive communities. ■



## Mark Fedosiewich & Laurent Estache

MF: President and CEO  
 LE: Executive VP  
**VIOR INC.**

### What have been the highlights at Vior's operations over the past 12 months?

MF: The biggest milestone achievement has been the advancement of our flagship Belleterre gold project in Québec, which includes the past producing high-grade Belleterre gold mine (produced over 750,000 ounces of gold at 10.73 g/t; source: Sigeom, MERN). In addition to consolidating this district-scale gold project with 37 km of strike length, we completed a comprehensive summer 2021 field exploration program that yielded some excellent surface results. We also completed a Phase I drill program of 4,000 m in Q4 2021 and a Phase II drill campaign of 4,000 m in Q2 2022, both successfully identifying extensions of the old mine, as well as wider intercepts at depth plus some new high-grade intercepts.

### What makes Québec a favorable mining jurisdiction?

MF: The Québec government offers some very generous tax incentives and mining exploration deductions, plus there is a highly experienced workforce and mining ecosystem. Great geology, excellent government support and incentives, a highly skilled labour supply, and good relations with the First Nations all make for a great recipe for a highly desirable jurisdiction.

LE: Québec is a well regarded and very safe mining jurisdiction considering today's many challenges with various environmental, political, and economic issues globally. Mining is a long-term process, and you do not want to be exploring in a jurisdiction where you end up creating value for shareholders, but then lose it all due to a dramatic change in mining code or the rule of law. ■





## Tim Clark

CEO  
FURY GOLD MINES

### How has Fury been able to raise financing in such a volatile market?

In the fall of 2021, Fury raised C\$5.5 million from key longtime support-

ers of the company. The next step was to sell our Homestake Ridge gold-silver asset to Dolly Varden Silver, which not only gave us C\$5 million in cash and 76.5 million shares, but also helped to simplify our strategy. At this point, we became a lot more attractive to new investors, which enabled us to raise C\$11 million in April of 2022. This shifted Fury into a position of strength and shortly thereafter we were able to start our 2022 drilling program.

### Where will Fury be focusing its exploration efforts in the near term?

In 2022, our drilling strategy is to maximize our capital allocation by focusing on our Eau Claire project which, in addition to its exceptional infrastructure, has an existing Measured and Indicated resource of 808,000 oz, as well as 458,000 oz

in the inferred category with potential for significant expansion. The most prolific targets are the Western Hinge, North Limb, and Percival Prospect. We feel that the Western Hinge target is an area that was historically misunderstood and drilled too shallow. Last fall we hit our best target on the Hinge, and we are excited to go back. The North Limb has never been drilled and hosts the same rock package as the 450 zone, which makes up the bulk of the defined Eau Claire resource. When Fury acquired Eastmain Resources, the Percival Prospect was the most exciting target at Eau Claire with a historical drilling intercept of up to 2.22 g/t gold over 93.1 m. We currently have two drills turning and are 6,000 m into a 15,000 m drill program with assay results pending. ■



## Normand Champigny

CEO  
QUEBEC PRECIOUS METALS

### What is Quebec Precious Metals (QPM)'s mission?

Quebec Precious Metals was created four years ago with support from

Newmont and the Caisse de dépôt et placement du Québec (CDPQ). Our goal was to find the next gold mine in the Eeyou Istchee James Bay territory, and we are currently focused on our Sakami flagship project. This region is being explored by seven significant explorers. We have good infrastructure, are close power lines and a paved road, and we can work 12 months of the year.

### What attracted you to James Bay?

James Bay is like the Abitibi region back 100 years ago. Although gold has been known here for some time, it has not been systematically explored using modern exploration methods. Part of this was due to the difficulty to access the region. Additionally, it took a while for the territory to be organized and to allow for easy claim staking or acquisition of exploration rights. Agreements

had to be made between the Cree authority that governs James Bay and the Québec government to foster economic activity. Today, there is significant potential, gold can be found on surface, the Cree are supportive so long as you follow guidelines, and the infrastructure exists. All these factors make James Bay an attractive region for exploration.

### What next steps will QPM take to advance Sakami?

Sakami has a 23 km long geological structure, which is basically the equivalent of having a whole Québec's prolific Val-d'Or mining camp in one project. QPM has only explored a small fraction – around 4 km. There is a lot more work to be done. We released encouraging drill results in May 2022 and have since paused exploration activities for a simple reason: we need money. ■



↘↘  
**We acquired the Tocantinzinho project (TZ) in Pará State, Brazil from Eldorado Gold in 2021, which became our founding asset.**

## Louis-Pierre Gignac

President and CEO  
G MINING VENTURES CORP.

### What led G Mining Ventures to select Tocantinzinho as its founding asset?

G Mining Ventures was established in 2020 with the aim of becoming the next intermediate gold producer. At the time, G Mining Ventures owned no assets, but based on a strong senior management team was able to raise C\$42 million to incorporate the company and begin searching for a promising project. We acquired the Tocantinzinho project (TZ) in Pará State, Brazil from Eldorado Gold in 2021, which became our founding asset. We chose TZ because it was an advanced stage project, meaning we could begin construction and production quickly, leveraging our inhouse project development expertise. Additionally, the project was in a high rainfall environment in which the management team was familiar with.

### What progress has your company made towards advancing this asset?

We have managed to achieve major milestones at TZ within a short period of time that will allow us to make a construction decision on the project by the end of 2022. These include the publication of a recently updated feasibility study and completion of a financing package that provides us with full construction funding. The US\$481 million

financing package announced in July 2022 brought in two new supportive cornerstone investors in Franco-Nevada and La Mancha, and enjoyed the continued support of existing strategic shareholder, Eldorado Gold.

G Mining Ventures received the vegetation suppression authorization and the main site installation licenses, which are essentially construction permits that allow us to construct the mine site. Other extension-related permits still outstanding are expected to be received soon. The permits we currently have will allow us to begin certain construction activities, including doubling the capacity of the exploration camp.

### How has G Mining Ventures been able to attract funding?

The project is in a relatively new mining area within Brazil, with very few industrial mines in the region. There are other smaller exploration companies in the area, but we will be the first large-scale producer here. The deposit has 2 million oz of reserves and will allow us to produce an average of 175,000 oz/y Au for at least 10 years. In addition, we have a large exploration land package surrounding the deposit where we anticipate finding additional deposits.

Franco-Nevada, who invested

US\$350 million, structured a \$250 million gold stream in such a way that it contemplates TZ having 3-5 years of mine life extension beyond the current mine plan. This demonstrates that they clearly see the geological potential of the property.

### Are there any advantages to your company's relationship with G Mining Services?

↙↙  
A huge advantage we have over our competitors is our ability to transfer skilled and experienced talent from G Mining Services, a well-known and trustworthy mine construction company, to G Mining Ventures during the construction phase. In this way, we can quickly assemble a team of talented people who have worked together in the past to successfully complete numerous projects.

### How does G Mining Ventures interact with its environment?

Brazil's national power grid is 80% renewable. Attaining access to this was key, as it provides us with a clean and cost-effective source of power for the project. To do so, we will make a substantial investment to build a 190 km powerline to connect the mine to the grid. We will also invest in reforestation projects as artisanal miners have previously caused degradation in the region. Besides environmental considerations, we aim to improve the quality of life of the communities. We operate in poor regions with limited infrastructure, and we will support education, health and cultural initiatives.

### How do you envision your company's portfolio evolving?

We hope to be in construction at TZ in the second half of 2022. This is our primary asset, and we will explore potential acquisitions opportunities in the medium term. We also have our Cameron Lake project in Québec, which is a grassroots exploration property surrounded by land staked by other exploration companies. We may look to sell or enter a JV agreement if we deem it to be noncore to GMIN going forward. ■





“People now accept battery materials as essential to the planet’s future, and see the decarbonization trend as irreversible and a priority.”

**Arne Frandsen,**  
**Co-CEO,**  
**The Pallinghurst Group**

# BATTERY AND BASE METALS

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Image courtesy of Nouveau Monde Graphite.



# Battery metals

## Québec seizes on global demand for battery metals



Image courtesy of Hecla Mining.

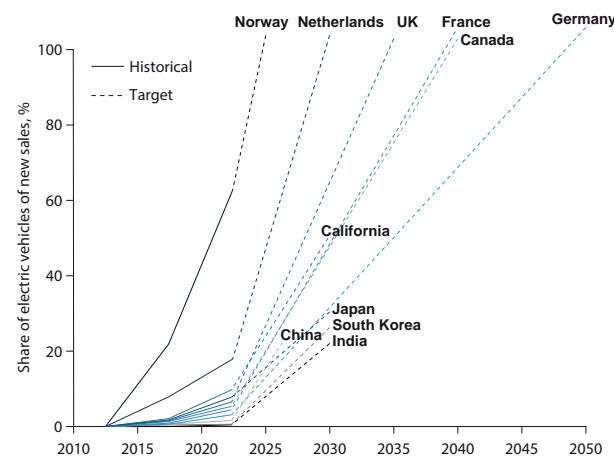
Against the backdrop of a world mired in uncertainty and distrust, one element of solidarity shines through: politicians across party lines, multinational corporations, environmental activists, and local stakeholders share a common vision of a ‘green revolution.’ In this fast-tracked fantasy, windmills tower over battery-powered vehicles zooming past fields of solar panels as an electric plane flies overhead (the first of its kind recently completed a point-to-point flight from the Canadian mainland to Vancouver in August 2022). The ones who will come out winners are those who realize it all begins underground.

Canada’s federal government has proven itself to be ahead of the curve over the past few years when it comes to supporting the production of battery metals. In April 2022, senior government sources announced the country’s national budget will include an investment of at least C\$2 billion as part of its strategy to boost the production and processing of critical minerals going into the battery supply chain. In a national poll, the Mining Association of Canada (MAC) discovered that this scale of public sector commitment does more than just promote advancements directly within the mining industry; funding into battery metals projects is providing the sector with a much-needed public relations boost as mining is becoming associated with the worldwide energy transition. MAC announced levels of support for Canadian mining were at an all-time high due to a heightened understanding of the industry’s crucial role in the production of materials essential for a low carbon future, with two thirds of respondents approving of government incentives to encourage more investment in mining in Canada and 80% acknowledging they have positive feelings towards current

producers of minerals and metals in the country.

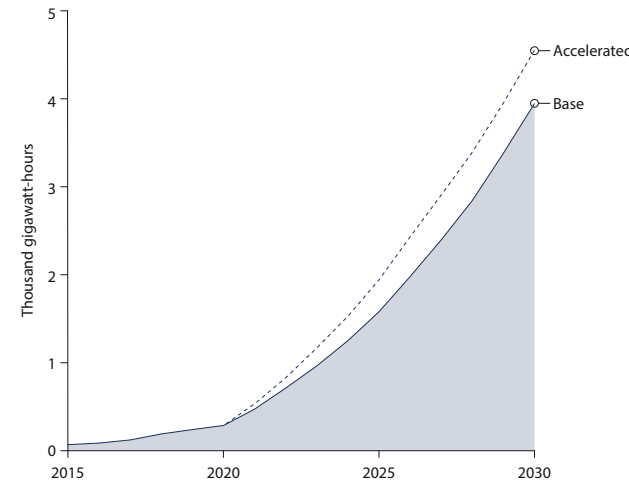
Right in step is the provincial government of Québec, which had outlined its ‘Québec Plan for the Development of Critical and Strategic Minerals’ in 2020 as a five-year initiative to advance geoscientific knowledge, provide financial support for exploration and R&D, and support development projects within the province that focus on battery metals like cobalt, nickel, graphite and lithium. The C\$90 million plan

### Historical and target electric shares of new passenger vehicle sales by market



Source: Manganese X

### Global lithium demand could reach 4,500 gigawatt-hours by 2030



Source: McKinsey & Company

has already made strides in helping Québec to take advantage of its mineral endowment on an international level, and in gaining the attention of the goliaths of the global energy transition, including General Motors, who announced in March 2022 a plan to spend C\$500 million on the construction of a new battery cathode materials plant at Bécancour as part of a joint venture with South Korean chemical producer, POSCO Chemical. Importantly, the impacts of the plan are also being felt closer to home, helping to spur sustainable economic development in the province and enabling it to take steps towards self-sufficiency in its battery supply chains and recycling capabilities.

The proactivity of the federal and provincial governments to accelerate the production and processing of critical minerals is grounded in a sense of urgency associated most prominently with the electric vehicle (EV) revolution. In late August 2022, German carmakers Volkswagen and Mercedes-Benz struck cooperation agreements with Canada to secure access to battery materials including nickel, cobalt and lithium to help hit production targets, avoid certain tax and tariff-related issues, and shorten their supply chains heading towards car factories in the US. Volkswagen is targeting construction of six large battery cell factories in Europe by 2030, but it also hopes to announce the plant location of an upcoming North American factory by the end of 2022, in addition to potential mining and refining partners on the continent. For its part, Mercedes-Benz plans to go fully electric by the end of the decade wherever market conditions allow.

The assembly lines of auto manufacturers around the world are evidence that the EV revolution is already well underway. The International Energy Agency (IEA) announced that sales of electric vehicles doubled in 2021 from the previous year to a record total of 6.6 million. While only 120,000 electric cars were sold worldwide in 2012, a mere decade



Over the past year, the industry has not gained significantly more knowledge about how the markets will play out in the long term, but we have seen considerable shifts in perceptions. People now accept battery materials as essential to the planet’s future, and see the decarbonization trend as irreversible and a priority.

– Arne Frandsen, Co-CEO, The Pallinghurst Group



later, this number is hit on a weekly basis. These figures will only rise in response to the Biden administration’s passing of the Inflation Reduction Act in August 2022, which introduces several changes to the tax credit regime for new EV purchases in the US, allowing consumers to receive as much as US\$7,500 in tax credits for qualifying vehicles with final assembly in North America.

The rapid uptick in EV sales during the pandemic put pressure on battery supply chains, and Russia’s war in Ukraine turned that pressure up a notch. According to the IEA, lithium prices were over seven times higher in May 2022 than at the start of 2021. “Any way you slice it, there is demand that cannot be met by the currently outlined resources, including in North America,” explained Nicole Brewster, president and CEO of Renforth Resources, a junior company focused on exploration for battery metals at its Surimeau district property in Québec. “These metals are heavy and expensive to move, so you want to have the supply close to where you are using the metal to build batteries. Given the intent to build batteries in Canada and the US, we will need more metals.”

As the West seeks to further isolate itself from a dependency for critical materials from China and Russia and to fortify its own downstream production of batteries, Québec becomes all the more poised to take advantage of the North American vision to decouple battery supply chains.

### Lithium

In July 2022, Tesla CEO Elon Musk urged entrepreneurs to enter the business of refining lithium, telling his millions of devotees that this would be their “license to print money.” In many ways, he was correct. The lithium-ion batteries that go into electric vehicles are an order of magnitude larger than their cellphone counterparts, and the hundreds of billions of dollars being invested into EV developments are predicated on theoretical lithium supply. Over the next decade, global consulting firm McKinsey & Company forecasts continued growth of lithium-ion batteries at an annual compound rate of approximately 30%, meaning batteries could account for





**We are opening new areas for lithium exploration across Canada.**



## Killian Charles

President  
**BRUNSWICK EXPLORATION**

### What is the vision driving Brunswick Exploration?

Brunswick Exploration seeks to remediate a major gap in the lithium sector. As we move towards decarbonization, there is simply not enough known lithium to supply the demand created by regulations and laws that governments around the world are pushing to combat climate change. Even if you were to turn on all existing lithium deposits we know of today, it would not be enough to meet this rapidly forthcoming demand. This lack of supply is witnessed in the dramatic rise of spodumene and lithium hydroxide pricing over the last twelve months. Brunswick recognizes the urgent need for grassroots exploration to find new lithium discoveries. This is inherently a high risk, high reward endeavor and few companies are willing to put in the work. Québec is among the best place for this type of work given its strong institutional and governmental support of mining.

### How does this vision inform Brunswick's exploration strategy?

We have amassed a robust portfolio of pegmatites across Canada. Many areas within our portfolio have never been explored for lithium. Case in point, we are the first to explore for lithium on Québec's Cote Nord. We are opening new areas for lithium exploration across Canada.

As we continue to increase the size our portfolio, we view our operations in three stages. The first step is desktop compilation where we generate targets. Next, we turn to boots on the ground prospecting with multiple field crews active in various provinces to identify which pegmatites have the potential to contain lithium. By the end of 2022, we hope to begin drilling select targets in our portfolio.

### What is your company's strategy to finance its activities?

Brunswick is very well financed and backed; we have very tight ownership. Investors are incredibly supportive of our ideas because we've previously had substantial exploration success. Additionally, our current exploration activities are cost efficient field work. This allows us to be extremely active with a relatively small budget.

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### Can you highlight some innovative exploration technologies you are using?

We consulted scientific literature to better ascertain which techniques could assist us to filter and select pegmatites. Using specific geochemistry tools markers, we can rapidly identify the pegmatite's potential directly in the field if it could contain lithium. Surprisingly, we also have had great success with satellite imagery.

### How do you see lithium prices evolving over the next several years?

I believe it is helpful to use terminology from the oil and gas industry such as upstream and downstream to better understand the opportunity in lithium. Downstream is when you convert a lithium product into batteries. When you take a step back and look at the C\$220 billion dollars being invested worldwide into battery manufacturing capacity, the few hundred million that has been put into exploration and development seems inconsequential. There is a major disconnect. That gap will only get wider, which will further exacerbate lithium supply issues. I anticipate a sustained increase in lithium pricing for years to come, and I do not see a simple solution to resolving the problem given how long it takes to build a mine. Even in a favorable environment like Québec, if I were to make a new lithium discovery tomorrow, it would still take 7-10 years before a truck laden with lithium concentrate left the mine gates. There will be years of undersupply before we catch up with demand, so the price for lithium will remain high for a while.

### If we were to speak again in a year, what do you hope the company will have accomplished by then?

Grassroot exploration is inherently a high-risk endeavor. There will always be substantially more failures than successes, and the only way to mitigate that is by ensuring that you have sound ideas to build upon and a plethora of targets. By next year, I hope to have at least one new discovery. We are already active in Nova Scotia, New Brunswick, and Newfoundland, and we are looking to expand into more Canadian provinces. We will continue to grow the company with an emphasis on grassroots exploration. ■



## Gordana Slepcev

COO  
**LOMIKO METALS INC**

### Can you give an update on Lomiko Metals' recent developments?

Lomiko Metals published a Preliminary Economic Assessment for its La Loutre graphite property in July 2021, which was produced by Ausenco. It outlined a 15-year mine life for the project, with a very attractive NPV of approximately US\$185 million after tax at an 8% discount rate, with an IRR of 21.5% and a payback of four years, producing about 100,000 tons of graphite per year. The PEA also delivered great metallurgical results with recoveries of approximately 95% at flotation concentrate grades of around 97.5% and 98.5%. We used a fairly low selling price at US\$916/t to derive the economics, but have since seen selling prices rise much higher. In addition to drilling, we continue to test the graphite at La Loutre to develop the optimal processing required to produce very high-purity, battery-grade graphite concentrate

as our end product. In the future, we will also look at vertical integration where we could be producing spherical graphite or working with battery manufacturers. Finally, we have acquired six new graphite properties within 100 km of the La Loutre property so we can create a pipeline of projects to feed into the Canadian and North American supply chain for battery and EV use.

### What is the latest on the lithium side?

On the lithium side, we have been working towards 49% ownership of our Bourier lithium property with Critical Elements Lithium Corporation. During 2021, we identified a 2.5 km long anomalous area with increased lithium, tantalum and cesium values. We also completed another summer field program in July with Gold Spot IA support. We are awaiting results obtained from 1,100 soil and 400 rock samples, and these results will guide us in planning a drill program. ■

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As societies are moving towards electrification, the number of lithium-ion batteries in circulation worldwide is drastically increasing. The need for lithium-ion battery recycling is growing exponentially, and managing waste from batteries at the end of their life has become a significant new environmental issue.



– Yves Noël,  
VP and Chief Business Development  
Officer, Lithion Recycling



95% of lithium demand by 2030. Despite these figures, there is limited grassroots lithium exploration currently underway in North America.

"As we move towards decarbonization, there is simply not enough known lithium to supply the demand created by regulations and laws that governments around the world

are pushing to combat climate change," said Killian Charles, president of Brunswick Exploration. "Even if you were to turn on all existing lithium deposits we know of today, it would not be enough to meet this rapidly forthcoming demand."

Charles, whose company holds the largest lithium grassroots land package in the province, believes targeting pegmatites may hold the key. Brunswick Exploration has amassed a portfolio based on its search for the igneous rock composed of interlocking crystals, which is vastly underexplored for lithium when compared with brines.

Yet even in a mining favorable jurisdiction like Québec, it can take 10 years from a company's production decision until the moment a truck laden with lithium-bearing minerals leaves its gates, given stringent permitting regulations. The closest Québec has to lithium production comes from Sayona Quebec, a joint venture owned 75% by Sayona Mining and 25% by Piedmont Lithium that purchased North American Lithium (NAL) in August 2021 with the hopes of recommencing spodumene concentrate production at the site as early as Q3 2022. The NAL restart has called for significant operational upgrades totaling roughly C\$100 million.

The carbonate plant at the NAL site is part of Sayona's goal to become a leader in the production of lithium concentrate and a major player in the manufacture of high-grade carbonate/hydroxide. Unlike gold or silver, which can be exported without transformation, lithium must be processed before use in the battery value chain. "The market is asking us to move downstream," explained CEO Guy Laliberté. "For the moment, in March 2023, we will become the first and only spodumene producer in North America."

To the west of Sayona's Moblan high-grade lithium deposit sits Vision Lithium's Sirmac property. President and CEO Yves Rougerie believes Sirmac, acquired in 2017 from Nemaska Lithium, could host another Moblan-type deposit given the geological similarities. "Vision has the only other lithium occurrences in the same greenstone belt as Sayona, and the main dike hosts a half million-ton deposit of high-grade Li<sub>2</sub>O," said Rougerie.

Beyond traditional mining approaches for lithium, Québec is also home to an "urban mine" that recycles battery-grade materials to be reintroduced into the battery value chain. Lithion Recycling, a spinoff of Seneca that has developed a patented technology to extract critical battery materials from lithium-ion batteries and production waste streams, has received financial support from the Québec government as part of its interest in bolstering the province's circular economy approach to resource consumption.

The Québec-based company can recover 95% of battery components before treating them to be reused in new batteries. Importantly, Lithion Recycling's hydrometallurgical approach can work with different battery chemistries, meaning it will stay relevant as the landscape continues to unfold. The need for lithium-ion battery recycling is growing drastically, particularly as managing waste from batteries at the end of their life becomes a growing environmental concern. "In North America, approximately 100,000 tons of material are currently recycled annually," said Yves Noël, the company's VP and chief business development officer. "By 2040,

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**brunswick**  
**brw** exploration

Rapidly advancing the largest lithium grassroots exploration package in Canada

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Brunswick Exploration is one of the few companies aggressively and systematically conducting grassroots exploration for lithium in Canada using state-of-the-art exploration technology to rapidly evaluate and uncover new opportunities in the lithium space.



Yves  
Rougerie

President and CEO  
VISION LITHIUM



The Québec government is very proactive in the lithium field, mainly in the industrial end use at this time, but we expect they will increase their support for the exploration and development phases in the coming years



**How have the past few years been for Vision Lithium?**

Vision Lithium has three main lithium exploration properties. We acquired the Sirmac property in 2017 from Nemaska Lithium, the Godslith property in Manitoba from prospectors in 2019, and the Cadillac property just West of Val-d'Or in 2021. The Godslith property is likely to become the company's flagship project, as it hosts an historic resource of close to 10 MT grading well above 1% Li<sub>2</sub>O. We are looking forward to advancing this project once we have finalized an exploration agreement with the Manto Sipi Cree First Nations community. We hope to be drilling there by late 2022 or early 2023 in order to confirm the historical results. The Sirmac property in Québec is located West of Sayona Mining's Moblan high-grade lithium deposit, which is growing by leaps and bounds in 2022. Vision has the only other lithium occurrences in the same greenstone belt as Sayona, and the Main dike hosts a half million ton deposit of high grade Li<sub>2</sub>O. The property has economic lithium drill intercepts over 5 km East-West and more than a dozen untested LCT dikes. Finally, our newly acquired Cadillac property is within miles of major mining infrastructure and has low exploration costs relative to northern projects. Several thousand claims have been staked around this new property where Vision is drilling multiple lithium bearing dikes.

**Can you elaborate on the findings at the Cadillac property announced in April 2022?**

Vision Lithium acquired the Cadillac property in December 2021, just before the snow covered the ground. Fortunately, we were able to take several grab/channel samples from one of several known mineralized pegmatite dikes and received great results – relatively high grade at over 3% locally. Encouraged by these findings, we started drilling in January 2022, and have confirmed the sizes of the main three dykes at 5-10 m wide and lateral continuity at over 300 metres. Spodumene is observed at surface over the entire strike length of the main dike tested to date. Mineralization is typically composed of large spodumene crystals. We have drilled 25-30

holes to date and have mitigated results, with high grade results in some holes.

**What excites you about the Sirmac lithium property?**

Vision Lithium conducted approximately C\$1 million worth of work at the Sirmac property in 2018-2019. The Main dike is a very prominent feature rising well above its surroundings. There are several dikes on the property, and economic lithium intercepts over a 5 km strike. We believe that the property could host another Moblan-type deposit. We have been conducting a series of reviews and studies, particularly LiDAR as the area is covered with sand. We will be drilling prospective targets in late summer 2022.

**Vision Lithium acquired the Decelles property in March 2022. What made this property attractive to the company?**

Decelles is located 40 km South East of the Cadillac property. At Decelles, we staked and/or acquired a total of 70 claims. We knew there were many dikes in the area, as we had done some reconnaissance there in 2021. We have not started work on the property this summer yet, as we are focused on our other lithium properties in the short term. The property is also very easily accessed South of Val-d'Or by existing roads.

**How has Québec strategically positioned itself as a favorable jurisdiction for mining operations?**

The Québec government is very proactive in the lithium field, mainly in the industrial end use at this time, but we expect they will increase their support for the exploration and development phases in the coming years. Having three years to renew a new claim is a great benefit to attract investors to the province. The province has also built a world-class online geoscientific database where you can access all historical exploration data for anywhere in Québec. Additionally, the province has a well-known, highly effective flow-through system, which benefits investors as well as companies looking for exploration financing. ■



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over two million tons of lithium-ion batteries will need to be recycled annually in the US alone. In Europe, that volume is expected to be almost twice as large."

Lithion Recycling is part of a growing number of companies operating in the lithium-ion battery recycling market, many of which are based in North America, Europe, Australia, and Japan. According to Fortune Business Insights, the lithium-ion battery recycling market is projected to reach US\$6.55 billion by 2028. For its part, Lithion Recycling hopes to commission 20 recycling plants in cities around the world over the next 15 years.

**Nickel**

Nickel plays a key role on the cathode side of lithium-ion batteries used by EV manufacturers. Within current battery chemistries, the metal makes up one third of nickel manganese cobalt cathodes and 80% of nickel cobalt aluminum cathodes. Battery makers pay attention to nickel given its correlation with a battery's energy density, and thus with how far an EV can travel.

While considerably more nickel will be needed to supply the growing battery market, most nickel is not of high enough grade to suit this application. The war in Ukraine has only exacerbated the need for increased North American production of high-purity nickel; according to the IEA, Russia currently produces 20% of the world's supply.

Glencore's Raglan mine is Québec's largest producer of nickel, operating four underground mines to produce nearly 40,000 t/y of nickel-in-concentrate. Raglan is located in the Cape Smith Belt in Nunavik, which hosts Québec's other operating nickel mine, Nunavik Nickel. The belt has become known for its high-grade polymetallic nickel deposits, which is what caught the attention of Orford Mining, whose West Raglan project is a 707 square km property where the company will spend C\$5 million on its summer 2022 drill program.

Beyond its exploration activities targeting nickel, Orford Mining made a major discovery in 2016 that led it to shift its attention to gold. "Nobody paid attention to gold in that area, as everyone was looking for nickel," explained president and CEO David Christie. "It is a remote area, and unless you were already there, you would not be exploring for gold. Because we were already in the area looking for nickel, we decided to expand exploration for gold ore as well."

Further south, Murchison Minerals is advancing its Haut-Plateau de la Manicouagan (HPM) project, which hosts a high-grade zone of Ni-Cu-Co mineralization at the Barre de Fer zone. According to president and CEO Troy Boisjoli, the HPM project has quadrupled in size since spring 2021, rendering 85% of the property subject to EM work to identify near-surface nickel-bearing sulfide mineralization. "We want to define near surface high-grade nickel resources at Barre de Fer to produce a maiden resource estimate for the zone by Q1 2023," outlined Boisjoli. "We see very few nickel projects as advanced as we are, and we believe HPM has camp scale potential."

**Manganese**

Manganese plays an important role in lithium-ion batteries as a stabilizer on the cathode side. Regardless of other components of the battery's chemistry, manganese can be used to increase density, robustness, and rechargeability. Ma-

terials used to produce batteries must be readily available and cheap enough to scale, and this is where manganese shines. Automakers are increasingly turning to the abundant mineral as a means to make batteries and EVs affordable to mainstream buyers, as it can help replace expensive cobalt in battery cathodes. "Major companies like Tesla, Volkswagen, Stellantis, and BASF are all increasing their manganese consumption at a rapid rate," commented Martin Kepman, CEO of Manganese X, who noted that new BASF EV batteries use 70% manganese in the cathode.

While manganese is one of earth's most abundant metals, experts predict the deficit will grow to a magnitude of seven times production levels by 2030. Steel production accounts for over 90% of global consumption of manganese, with less than 2% being converted to high-purity manganese for the battery sector. Manganese X's flagship Battery Hill project is one of the largest manganese carbonate properties in North America. The company took on the challenge of turning a 9% carbonate into a high-purity manganese sulfate EV-compliant product and collaborated with Vancouver-based Kemetco Research on a proprietary technology that bypasses the costly, high-energy process of turning product into electrolytic manganese metal (EMM). Kepman believes the project's location will present a strategic advantage for downstream production in North American battery supply chains, as it is located just 10 miles from the US border, near the gateway to the St. Lawrence Seaways shipping channels in Maine.

**Graphite**

While there is much focus on cathode materials like lithium, nickel, cobalt, and manganese, the predominant anode material being used in nearly all EV batteries is graphite. Lithium-ion batteries use graphite anodes because they are well suited to handle the flow of lithium ions during charging and discharging. China has historically dominated both natural and synthetic graphite production capacity, but the country is shifting away from being a low-cost exporter to the rest of the world in order to better supply its domestic value-add market. In this context, other regions are left scrambling. "Looking at graphite, the European market currently calls for 150-180,000 t/y of spheroidized and purified graphite (SPG) or its synthetic equivalent based on plans already in construction," commented Reiner Haus, managing director of ANZAPLAN, a consultancy and engineering company that focuses on specialty minerals and metals. "Production capacity for SPG in Europe is currently zero."

Though investors have largely come up to speed on the longevity of lithium, Pascal Lussier Duquette, managing director of investment banking for metals and mining at BMO Capital Markets, sees a need for ongoing education about other energy transition materials. "If you spoke with investors five years ago about lithium, most of them would not understand or would be careful about investing in lithium companies. Today, lithium is well understood by investors, and good lithium projects can find capital," Duquette commented. "The same will happen for other energy transition materials, such as graphite and rare earth metals. The

knowledge supporting these resources is still a bit behind the curve compared with lithium, but we can see the progression."

Nouveau Monde Graphite's Matawanie project is currently the largest graphite mine being planned in the western world according to the company's president and CEO, Eric Desaulniers. Nouveau Monde is working to update its feasibility study on the project, which they anticipate will produce 100,000 t/y flake graphite once running. To add to the attractiveness of the mine as an alternative supply of graphite against Chinese producers, Nouveau Monde has committed to having all equipment for its mining operations and core concentration and processing activities be fully electric within the mine's first five years of production, which the company believes will reduce CO2 emissions over the mine's lifespan by up to 300,000 tons.

Arne Frandsen is both chairman of Nouveau Monde and co-CEO of The Pallinghurst Group, which is the largest shareholder of the company. For Frandsen, the strategic opportunity at Matawanie is immense: "Everyone talks about lithium, nickel, cobalt, and copper on the cathode side, but few pay attention to the anode. This is a strategic mistake because you can build all the cathodes in the world, but without the equivalent number of anodes, you will not have the batteries. Anodes are made with a minimum of 85% graphite, meaning that half of the battery will be primarily graphite."

In July 2022, Nouveau Monde expanded its graphite reach in Québec by entering an option and joint venture agreement with Mason Graphite to acquire a 51% interest in its Lac Guéret property. When the project was designed 10 years ago, it was amidst a climate of uncertainty regarding the longevity of the battery market. Today, the need for graphite is well recognized, and the activities planned to be undertaken within the JV reflect this. "Understanding the growing graphite market, we now prefer processing the ore on-site, as with bigger scale we can justify the required infrastructure developments," explained Desaulniers. "We have leveraged our development, permitting, and process teams to design the project which we expect to start construction for in 2025."

Closer to the border with Ontario, Lomiko Metals is advancing its 100% owned La Loutre property in the Laurentides administrative region of Québec. Its PEA published in July 2021 outlined a 15-year mine life of approximately 100,000 t/y graphite production. The company has also acquired six new graphite properties in the Grenville belt, all within 100 km of La Loutre, to create a pipeline of graphite properties. "We continue to test the graphite at La Loutre to develop the optimal processing required to produce very high-purity, battery-grade graphite concentrate as our end product," said Gordana Slepcev, the company's COO. "In the future, we will also look at vertical integration where we could be producing spherical graphite or working with battery manufacturers."

From lithium to nickel, manganese, and graphite, Québec's pipeline of exploration opportunities is particularly enviable at a time when countries are far more concerned about securing domestic supplies of critical and strategic resources than in recent years. ■

**VISION LITHIUM**

**FOCUS ON BATTERY MINERAL EXPLORATION**

Vision Lithium (TSX.V – VLI) is a junior exploration company focused on exploring and developing high quality battery mineral assets including lithium and copper in safe jurisdictions, primarily Canada.

**Cadillac Project:**

- Continued DDH on suite of main pegmatites; minimum 3,000 m
- Summer 2022: 200 km<sup>2</sup> propertywide exploration and sampling
- Over 400 pegmatite targets identified for ground proofing

**Sirmac Project:**

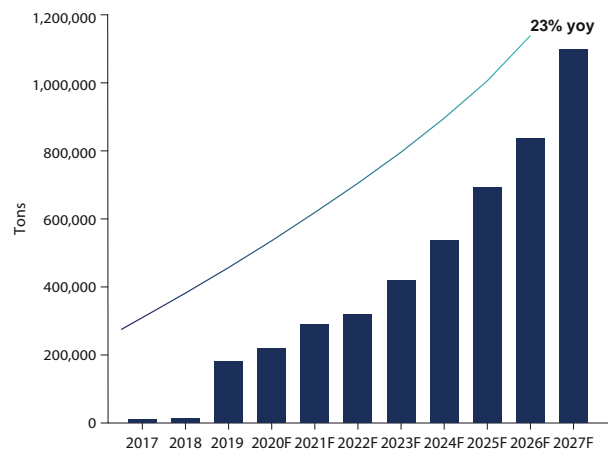
- Field prospecting and evaluation of numerous untested pegmatites
- DDH of priority targets, 1,500 m to 2,000 m

**Godslith Project:**

- Negotiate exploration agreement and submit permit
- Prep work ahead of a 10,000+ m first phase DDH program in 2022-2023

visionlithium.com

**Manganese for batteries demand forecast**



Manganese demand, just from lithium-ion batteries, expected to grow at a compound annual rate of 23% to 2027.

Source: Manganese X





GL



CV

## Guy Laliberté & Cindy Valence

GL: CEO  
CV: Chief Sustainability Officer  
SAYONA IN QUÉBEC

### Sayona has changed dramatically over the last year. Can you walk us through the main milestones?

GL: 2021 was an outstanding year for Sayona. In 2020, our market cap was US\$10 million, and in two years we have grown that to over US\$1 billion. Our main milestone was the acquisition of North American Lithium (NAL) in August 2021. We are investing US\$98.5 million to restart the concentration plant in La Corne, with production planned for March 2023. Also in the Abitibi, we are the owners of the Authier mine and the Tansim project. With the NAL acquisition, both Authier and Tansim are planned to be developed as satellite mines. We have enough mineral to keep the La Corne concentrator running for the next 25 years, at 3,800 t/d capacity.

Beyond the Abitibi, in October 2021 we acquired 60% of the Moblan project in James Bay. We are now on drilling mode. There was a pre-feasibility study done by DRA-Metchem, and now we are doing a feasibility study, as that site should have its own concentrator. In May 2022 we raised A\$190 million to cover for the concentrate production in the Abitibi and the studies for the Moblan project.

### What role can Sayona play in going downstream and providing strategic products to the battery market?

GL: The NAL site in La Corne has a carbonate plant that is 50% complete. We are doing a feasibility study to evaluate if we can restart that plant and become a lithium carbonate producer, or other options related to hydroxide production – this carbonate option will require possibly a US\$285 million investment, and would place us in a unique position as the only lithium carbonate producer in North America. The market is asking us to move downstream (carbonate to hydroxide, and concentrate to hydroxide). For the moment, in March 2023, we will be the first and only spodumene producer in North America.

When we launched the project in the Abitibi, we needed to grow our team. Last year we had five employees, now we are 50, and we will be 200 by the end of 2022. Many of the job applicants are showing their motivation to work for a company that will make a positive impact in the global decarbonization process.

### How does hard-rock lithium compare to production from the salars triangle in South America?

GL: Hard rock mining is a great option for the environment compared to other productions, where you need to use huge plots of land and there are potential issues around underground water. Hard-rock mining is for sure the most stable production method for lithium.

### Could you walk us through Sayona's main sustainability and community-related initiatives?

CV: We are part of the Québec Mining Association (QMA), and as such we must follow the Towards Sustainable Mining Initiative (TSM), with protocols around climate change, tailings management, biodiversity, and water stewardship, among other areas. At La Corne, 85% of the water used by the plant comes from the dewatering of the mine, for example. Also, in exploration, we are in the process of obtaining the Ecologo certification from the Québec's Mineral Exploration Association (AEMQ).

In terms of local relationships, we have three First Nations communities in the Abitibi: Lac-Simon, close to Val d'Or; Abitibiwinni, close to Amos; and Long Point near Témiscamingue. We also work with the Cree Nation of Mistissini, close to the Moblan project. Our projects are at different stages, so we need to keep the communities constantly informed. Moreover, The Pikogan community (Abitibiwinni) is a shareholder of Sayona since 2019, and they are growing together with the company's growth.

### What are the next steps for Sayona?

GL: Today we own 35% of the lithium resource base in North America, with 99 million tons measured and indicated, so we have a leadership position. Our most important milestone is to restart the concentrator in March 2023 (commissioning will start November 2022). Our second goal is to permit the Authier mine. The third milestone is to finalize the 215-hole drilling campaign at Moblan by the end of 2022. ■



## Éric Desaulniers

President and CEO  
NOUVEAU MONDE GRAPHITE

### What is the latest status of Nouveau Monde Graphite's Matawinie project?

The Matawinie project is being advanced in phases. Phase one has been completed, and we now have the capacity to produce 1,000 t/y of natural

flake and 2,000 t/y for transformation into battery grade material. We are currently fully permitted for phase 2, have started construction of the mine, and are completing the full feasibility study (FS) for publication by July 2022. Over the next 12 months we will focus on publishing the FS and announcing our offtake agreement with an anchor customer.

Matawinie is currently the largest graphite mine being planned in the Western world, and we aim to become the largest graphite mine in the world in partnership with Mason Graphite.

### Can you elaborate on the joint venture between Nouveau Monde and Mason Graphite on the development on Lac Guéret project?

Lac Guéret was designed 10 years ago when there was still uncertainty regarding the longevity of the battery market. Mason Graphite thus designed the mine a bit smaller at 51,800 t/y, and due to this small scale, they needed

to truck the ore approximately 300 km to Baie-Comeau. Understanding the growing graphite market, we now prefer processing the ore on-site. We have leveraged our development, permitting and process teams to design the project, which we expect to start construction for in 2025.

### Matawinie will be an all-electric mine. Can you tell us about the environmental benefits?

We are targeting carbon neutrality. This means we will need to compensate for cutting down trees and will have to implement processes to emit minimal amounts of carbon. We are working with Caterpillar to develop a full zero-extraction solution which can then be duplicated in other mining operations. We are focusing on carbon capture, storing CO2 under the right conditions, and transforming CO2 into CO3, which is something I hope all mines will adopt in the future. ■



## Nicole Brewster

President and CEO  
RENFORTH RESOURCES

### Can you introduce Renforth Resources?

Renforth Resources holds properties in Québec, with a focus on our Surimeau District project, a 330 km<sup>2</sup> property containing the Victoria Structure, a 20

km polymetallic magnetic anomaly. The magnetic structure is associated with ultramafic rock, which gives us nickel and cobalt, but is also coincident with visible mineralization of zinc and copper. The mineralization in the Victoria Structure commences at surface and goes as deep as approximately 180 m, the deepest we have drilled in our 5,600 m drilled to date. We have more work to do to determine the depth extent of the mineralization. Located in Québec's newest battery metals district, we see great promise here. The next furthest advanced areas of mineralization on the property include LaLonde, which has been historically explored, and Huston, where we have done initial prospective work.

Renforth Resources also holds the Parbec gold deposit on the Cadillac Break, located next to Canada's largest open pit gold mine, as well as other exploration properties in Québec and a small gold occurrence in Ontario.

Part of the company's funding strategy might be to sell Parbec and/or to joint venture the Ontario property to refine Renforth Resources into a battery metals polymetallic story.

### Can you speak to the demand you see for a new North American source of EV metals?

Québec is working to position itself as integral to the battery energy storage story with downstream and upstream innovation on the science side. There is demand that cannot be met by the currently outlined resources. These metals are heavy and expensive to move, so you want to have the supply close to where you build batteries. There are several established battery centers in the US, and there have been plants announced in both Québec and Ontario. Given the intent to build batteries in Canada and the US, we will need more metals. ■





## Yves Noël

VP and Chief Business Development Officer  
LITHION RECYCLING

### What is Lithion Recycling's mission?

Lithion Recycling is a spinoff of Seneca Experts-Conseils, a process engineering firm, that has developed a patented low

carbon footprint, safe, and sustainable technology to extract critical battery materials from lithium-ion batteries and production waste streams. We can recover 95% of these battery components before treating them so they can be used again in new batteries. Our demo plant, the Lion project, has been in operation for 30 months. Using the data we collect there, we are working towards a first-generation commercial plant.

### Is there a difference in performance between batteries made with new versus recycled materials?

There is no difference between mined critical materials and recycled critical materials coming out of our innovative process. This means that in theory, there is no limit to the number of recycling cycles a battery can undergo.

### How do you see the market for recycled batteries evolving?

The need for lithium-ion battery recycling is growing exponentially, and man-

aging waste from batteries at the end of their life has become a significant new environmental issue. In North America, approximately 100,000 tons of material are currently recycled annually. By 2040, over two million tons of lithium-ion batteries will need to be recycled annually in the US alone. Additionally, most battery materials are in short supply. Therefore, recycling batteries contributes to the balance between supply and demand while having a carbon footprint much smaller than mining.

### What are Lithion's commercial aims moving forward?

We closed a series A financing round earlier this year in which the Québec government invested some equity into Lithion. This financing will allow us to start construction of our first shredding operation in Québec.

Our goal is to commission over 20 battery recycling plants in the next 15 years in cities where the need is most urgent. ■



## Troy Boisjoli

President and CEO  
MURCHISON MINERALS

### What is Murchison Minerals' current portfolio?

Murchison is a Canadian-based exploration company focused on the discov-

ery of critical minerals in Québec and Saskatchewan. In Saskatchewan, we have the Brabant-McKenzie project, which is a 627 square km land package hosting a VMS copper-silver-zinc deposit. It has a modern mineral resource estimate with inferred resources of 7.6 million tons of 6.3% zinc grade equivalent. The indicated resource base shows 2.1 million tons with 6.98% zinc grade equivalent. VMS systems typically occur in clusters, so we are keeping our eyes on several highly prospective targets in the area.

The company's priority is its Québec-based HPM project, a nickel-copper-cobalt system that currently covers 650 square km. This property hosts the Barre de Fer zone, a high-grade zone of Ni-Cu-Co mineralization that currently has dimensions of 315 m on strike, a width of 150 m, and a model depth of 295 m. There is extensive mineralization outside the zone, including down to a depth of 440 m.

### What will Murchison's 2022 summer drill program at the HPM project entail?

We plan to drill 7,500-10,000 m during our summer drill program. The majority will take place at the Barre de Fer zone for expansion and delineation drilling with the objective to produce a maiden resource estimate for the zone by Q1 2023. The remaining meters will be focused on the Syrah target, which lies just a few hundred meters from Barre de Fer. Murchison recently closed a financing round in which it raised C\$5.35 million, so the company is well financed to support the exploration activities planned for 2022.

We believe the HPM project has camp scale potential, so we will continue to build up the portfolio of highly prospective de-risked exploration targets, allowing us to have a pipeline of targets moving forward. ■

# Rare earths

## Why motors matter

In the flurry of activity surrounding the EV rush, battery materials like lithium, cobalt, and even manganese parade across headlines and seduce investors into providing more than generous sums of money. The attention they receive is well-deserved; batteries are large and expensive, and nobody knows which chemistries will prove to be triumphant in the burgeoning landscape. Equally as important, yet more often overlooked, is the role of the motor. Engineers have long determined that permanent magnet-based motors are the most efficient. This is crucial in the world of EVs, as a car with a less efficient motor will need a larger battery to meet the same driving range. As the battery is the most expensive component, even when prices rise for the rare earths used as motor material, these prices never soar high enough to justify making the battery itself larger. According to Christine Burow, VP marketing of Torngat Metals, approximately 95% of passenger cars use permanent magnet-based motors for the drivetrain, a trend she anticipates will continue.

"To get a sense of demand, first look at the number of passenger cars that will be electrified globally and the targets set out from governments and auto makers," Burow explained. "Next, multiply the number of passenger cars by rare earths required for the motors, and you will arrive at a number so large that China could not supply all of it even if it wanted to."

### A dirty myth

When rare earths do gain media attention, they are oftentimes cast in a negative light. This is because China

historically dominates the rare earth elements (REEs) market, and for several years, the country mined without consideration for the surrounding people, communities, and environment.

China became a net importer of REEs in late 2018 when policies emanating from Beijing outlined guidelines for production and onsite processing that called for an end to damaging mining practices. As a result, nearly 20% of global production that had previously come from ionic clay deposits in South China was shut down. Rather than solving the problem, however, many experts in the rare earths space argue the policies simply encouraged China to export its environmental malpractices to neighboring Myanmar, which now supplies the economic powerhouse with REEs mined in horrible working conditions while fattening the pockets of the Myanmar junta. Geopolitically, this presents a stain in any automaker's supply chain and has contributed to the myth that REEs can only be mined in an environmentally destructive manner, supporting the narrative that rare earths play a counterproductive role at best in reducing the world's dependence on fossil fuels.

Even if purchasers of rare earths were to overlook the troubled origins of this supply, they still would not be able to receive the quantities needed in today's market. China has identified rare earths as critical to its industrialization, making it clear it would rather make cars to be exported than sell rare earths or magnets directly. As the global demand for rare earths rises, the world's top producer may cease exporting within the next decade.



### Québec spies opportunities

It is within this context that mining projects for rare earths in Québec are beginning to turn heads, as companies are committed to proving it is possible to carry out a profitable rare earths operation with high ESG standards in



a geopolitically stable environment while still being cost competitive with Chinese producers. In May 2022, Rio Tinto announced the production of its first batch of high purity scandium oxide at its commercial scale demonstration plant in Sorel-Tracey, Québec, making it the first North American producers of the critical mineral that goes into solid oxide fuel cells and aluminum alloys.

"The permanent magnet value chain needs a long-term, sustainable, secure supply of REE. We want to position ourselves as one of these suppliers," said Burow.

Tornat is a privately-owned company focused on rare earth elements used in permanent magnets such as dysprosium, neodymium, and praseodymium. Its flagship project, Strange Lake, has one of the largest rare earths deposits in the world and is notable for its quantity of heavy rare earths.

Commerce Resources has also been working to put Québec on the rare earths map. The company began conducting due diligence in the space back in 2005 and discovered that over 80% of REEs were hosted in a single geology: carbonatites. "Furthermore, of hundreds of different minerals that can host rare earths, only four were ever commercialized. That has not changed in the last 17 years despite over a billion dollars of unsuccessful R&D metallurgy attempted on those other minerals," commented president Christopher Grove.

Commerce Resources holds the world's largest monazite dominant defined resource of REEs hosted in a carbonatite,



The approach to get critical and strategic metals out of the ground today requires different methods, technologies, and processes which are sustainable and more cost effective, yet extractive metallurgy for critical and strategic metals has not improved greatly

over the last 50 years.

– Kiril Mugerma,  
President and CEO,  
Geomega Resources.



which Grove believes to be the most attractive fundamentals for an REE project when compared with the geologically similar Bayan Obo mine in China that currently produces over 40% of the world's supply of rare earths. "At Ashram, mineralization starts at surface, and we have drilled the deposit down to below 600m, which gives us potentially hundreds of years of production," said Grove of his company's flagship asset.

Within the past 17 years, there has been only one successful, commercially significant new producer of REEs: Lynas in Western Australia. Yet Lynas alone hardly makes a dent in global annual demand. Grove hopes the scale of the Ashram deposit will be a game changer. Fortunately, the project resides within a jurisdiction that views REE exploration as necessary for future decarbonization. Québec's government has invested directly into these types of projects, such as Resources Québec's private placement financing of Commerce Resources in 2017, and has worked to align stakeholders.

The province is also a strong candidate for the development of other steps in the value chain. While making the metal from the oxide is energy-intensive, Hydro-Québec's provision of low-cost, green electricity makes this acceptable from an environmental standpoint. Furthermore, the process is similar to aluminum smelting, which the province has experience with at its aluminum smelter in Bécancour.

As global magnet demand surges, Québec-based Geomega Resources is constructing the world's first sustainable rare earths recycling facility. The company is building a commercial demo plant in the greater Montreal area that will be able to process up to 1.5 tons of magnet scrap per eight-hour shift. "This is going to be the first facility of its kind in the world and the first rare earths magnet recycling facility outside of Asia," commented president and CEO Kiril Mugerma.

The EV train has left the station, and the need for REEs will only intensify. If Québec can develop an economically viable alternative to Chinese supply, it will be a huge step towards making the green revolution even greener. ■

COMMERCE RESOURCES CORP.  
TSX V: CCE OTC QX: CMRZF Frankfurt: D7HO

Ashram REE / Fluorspar Deposit  
A Secure Long Term Solution

Gisement de terres rares et spath-fluor Ashram  
Une solution durable et sûre

Rare Earth Elements & Fluorspar in Nunavik

commerceresources.com  
info@commerceresources.com



Our Ashram rare earth element and fluorspar project has the most attractive fundamentals of commercialized REE mines globally.



Christopher  
Grove

President  
COMMERCE RESOURCES

What does Commerce Resources bring to the table in the rare earths space?

In 2005, Commerce Resources conducted due diligence on rare earth elements (REEs) and the main producers. We quickly discovered that over 80% of REEs were hosted in a single geology: carbonatites. Furthermore, of hundreds of different minerals that can host rare earths, only four were ever commercialized. That has not changed in the last 17 years despite over a billion dollars of unsuccessful R&D metallurgy attempted on those other minerals. Within these four commercialized minerals, there is a hierarchy. The most abundant one currently in production may be bastnaesite, which is what MP Materials in California processes. However, the most attractive mineral is monazite, as it hosts more of what the market currently wants and values, which is magnet feed.

Our Ashram rare earth element and fluorspar project has the most attractive fundamentals of commercialized REE mines globally, as we now have the world's largest monazite dominant defined resource of REEs hosted in a carbonatite. Monazite dominant carbonatites are the most attractive fundamentals for a REE project, as evi-

denced by the Bayan Obo rare earth mine in China, which produces over 40% of the world's supply of REEs. At Ashram, mineralization starts at surface, and we have drilled the deposit down to below 600 m, which gives us potentially hundreds of years of production. This is an unparalleled combination of the right mineralization, good grades, and size.

Can you share your goals for the summer drill program at Ashram?

We began a summer drill program at Ashram in July 2022 with the primary focus to continue the work we have been doing over the past decade to increase the amount of measured and indicated resource. The total resource currently sits at 249 million tons based on the original 15,000 m of drilling. We have added 13,000 m and have conducted a few step-out holes, which aligns with our second priority of increasing the size of the deposit.

What makes Commerce Resources' Ashram project so relevant in today's rare earths market?

There is a strong misconception that rare earths mining and processing has to be damaging to the environment.

This fits into an ongoing narrative that REEs are dirty and their role in reducing global dependence on fossil fuels is counterproductive for the environment. China became a net importer of REEs in late 2018 when policies emanating from Beijing outlined guidelines on certain styles of production and on-site processing. Nearly 20% of global production previously came from ionic clay deposits in South China that were shut down.

Today, China is a net importer of not only REEs but also of fluorspar, again due in large part to the country's shifting environmental policies. Current prices for rare earths are a clear reflection of increased global demand coupled with significant issues on the supply side. We see Commerce Resources playing a major role in the global picture, given the scale of the deposit and the mineral and geological fundamentals that allow us to be as competitive as possible outside China. We will be able to produce 50,000 tons of a 50% rare earth carbonate concentrate that is completely radioactive free for over 100 years of production given the current resource.

How does Commerce Resources factor ESG concerns into its operations?

We address the social license to operate as soon as possible, and this has manifested in strong relationships with the Inuit in Nunavik and other indigenous groups we meet with regularly. We also have the highest standards for environmental stewardship and are one of the few juniors that have an environmental and sustainability manager. For this work, we were awarded the E3 Plus award from the AEMQ in 2015.

Do you have a final message?

REEs are the most difficult commodity to find economic deposits of, and only rarely do you come across a deposit like Ashram. Ashram has more magnetic feed material than Bayan Obo, the world's largest producer, and it also has an extremely valuable byproduct, fluorspar, which is in huge demand right now for the manufacturing of aluminum. ■





DN



CB

## Dirk Naumann & Christine Burow,

DN: President and CEO  
CB: VP Marketing  
TORNGAT METALS

### Can you introduce our readers to Torngat Metals and provide an overview of its operations in Québec?

CB: Torngat Metals is a privately owned company focused on rare earth elements (REEs), particularly those used in permanent magnets such as dysprosium (heavy REE), neodymium, and praseodymium. Our globally-recognized Strange Lake project is unique for its quantity of essential heavy rare earths.

The extraction and concentration of REE will take place at the mine site adjacent to Lac Brisson on the Québec-Labrador border, while the processing and refining of the concentrate will be done in Bécancour, Québec. We selected this attractive industrial park given its access to green electricity, as well as all needed resources. Our end product will be high purity separated rare earth oxides, with a focus on the rare earths required for the global permanent magnet supply chain.

### Why is there a misconception that the mining of REEs has to be environmentally destructive?

CB: China is interested in exporting finished goods (cars, wind turbines, etc.), and has been clear in their policies to limit the exports of REEs and semi-

finished products. Therefore, supply security is a big issue, as is sustainability of supply. China has not prioritized sustainability in its rare earth industry, and despite recent efforts to address sustainability, issues remain. Historically, they mined and refined REE without consideration for the health and safety for the environment, people, and communities affected. In addition, in recent years, China has come to rely on imports of heavy REEs from Myanmar, where the military executed a coup in 2021 with violent repression of its citizens. Do companies recognize that these REEs are in their supply chain? The way China has developed its REE industry has given the impression to many that REEs can only be produced in an environmentally destructive way. This is a myth. Like any other mining, mining for REEs can be done environmentally responsibly while maintaining profit margins. That is the context in which Québec is such an attractive location. We believe that our project can demonstrate the possibility of having a profitable rare earth operation with high ESG-I (Environmental Social Governance and Indigenous) standards in a geopolitically stable environment that is cost competitive with China. The

permanent magnet value chain needs a long-term, sustainable, secure supply of REE. We want to position ourselves as one of these suppliers.

### What makes Québec an attractive jurisdiction for the development of a rare earths supply chain?

CB: The Québec Government has a clear strategy for developing its REE industry, aligned with its electrification, circular economy and climate change strategies.

To produce permanent magnets, first the rare earth oxides must be turned into rare earth metals. There is currently not much capacity for this outside China, and we are strong supporters that Québec is an ideal location for the development of this and other steps in the value chain. Producing metal from oxide is energy-intensive, and globally Québec ranks as a top location for this given its low-cost, green electricity. Québec also has world-class environmental regulations and expertise, as the process is very analogous to aluminum smelting. Over time, the supply chain could be developed all the way to permanent magnet production. Québec is already making and designing drivetrain e-vehicle motors – companies like Dana TM4 with their permanent magnet electric motors, as well as Lion Electric, which are building vehicles with permanent magnet motors. With existing elements of the value chain already in Québec, and with secure, sustainable and traceable rare earth supply from Torngat and others, there is a strong business case for the development of a rare earth permanent magnet value chain here. Additionally, the Québec government's work to promote investment provides a solid base upon which we can succeed.

### What does the future hold for Torngat?

DN: Torngat is currently working on developing its pre-feasibility study. There has been extensive drilling and geological work, as well as process development, therefore currently a key focus is piloting at larger scale, to allow us to do equipment sizing. We are working with a potential strategic investor, which would allow us to accelerate our PFS work and Bankable Feasibility Study. ■



## Martin Kepman

CEO  
MANGANESE X

Our next goal is to proceed with a plant pilot project, proving to the world that we can produce our high purity manganese sulfate on a larger scale.

### Please introduce our readers to Manganese X?

Manganese X is excited about pursuing high purity manganese, demonstrating how quickly this market is evolving since April 2021 when we began our PEA. The prices for manganese were C\$750 per ton. Since then, this price more than doubled, with predictions reaching C\$4,200. When conducting our PEA, Wood set the price conservatively at C\$2,900. From this vantage point, we are excited about what the future holds in store.

Our flagship Battery Hill project, one of the largest manganese carbonate properties in North America, is strategically located 10 miles from the US border, near the gateway to the St. Lawrence Seaways shipping channels in Maine. The Battery Hill site is just 5 km from Trans-Canada Highway, covering 1,225 hectares encompassing 54 claims.

### Can you share highlights from your recent PEA?

Our PEA demonstrated robust economics, with an average annual gross revenue of C\$177 million per year over 47 years. Within the first seven years of operation, it projects an annual gross revenue of C\$220 million with an operating cost of C\$122/t material processed. Importantly, it indicated low environmen-

tal impact with a filtered residue leach product with initial acid-base accounting and non-acid generating test results showing no acid drainage risk. Our project is now advancing towards a pilot project, a pre-feasibility study, as well as advancing a drilling program to upgrade and expand manganese resources.

### What role does Manganese X's proprietary technology play?

Taking on the challenge of turning a 9% carbonate into high-purity manganese sulfate monohydrate EV-compliant product was a game changer for Manganese X because we developed an incredible technology. We worked for years with Vancouver-based Kemetco Research to create a solution that can take carbonate, add sulfuric acid, leach it, and end up producing the chemical compound of manganese sulfate. This is groundbreaking, compared to other companies who produce their product into electrolytic manganese metal (EMM), which is a metal.

### Why is it especially important for North America to produce its own supply of high purity manganese sulfate?

Manganese is critical for the production of battery metals. China now controls and produces 92% of the market

for high purity manganese sulfate. Currently there is 197,000 tons of high purity manganese sulfate produced, with predictions of more than 1.5 million plus tons required in 2030. Experts predict that the deficit will grow to a magnitude of seven times production levels by 2030. Manganese will be a major player of predominant battery chemistries, regardless of the other components. Major companies like Tesla, Volkswagen, Stellantis and BASF are all increasing their manganese consumption at a rapid rate. It was recently discovered that manganese could be introduced into the lithium iron phosphate battery chemistry, reducing iron by 50% while increasing density robustness, distance and rechargeability – a chemistry used extensively in Europe. Every day, new information gets published about how important manganese will be within the green revolution.

Manganese is known as the once forgotten, now remembered mineral, which I believe will end up as the defining mineral of the 2020s because of how economical and stable it is. Our continent desperately needs its own supply, especially as North American markets place an heightened importance on ESG standards. There have been suggestions that the market would pay a 25% premium on our product compared with Chinese alternatives to ensure what they are purchasing is environmentally produced. Looking at the initiatives Biden has put in place with securing green supply chains in the US, Manganese X is a critical story.

### What do you hope Manganese X accomplishes over the coming year?

We have worked hard on our PEA, and our technology has taken us to another level. Our next goal is to proceed with a plant pilot project, proving to the world that we can produce our high purity manganese sulfate on a larger scale. This may be followed by a demonstration plant. Additionally, we will continue with our PFS. With our great team and fabulous credentials, we want to jumpstart the project as quickly as possible. Additionally, there is interest in our proprietary technology, and we will consider licensing or partnering with other companies to share its benefits. ■



# Copper

The red metal remains a promising commodity



Image courtesy of Hecla Mining.

In addition to its traditional uses in electrical wiring, industrial machinery, building material, and as a constituent of various metal alloys, copper is a major component in electric vehicles. It is critical for the manufacture of motors, batteries, inverters, and wiring, as well as playing an important role in the charging stations themselves. According to the IEA, a pure electric vehicle can contain over a mile of copper wiring in its stator windings. Robust demand has been a strong factor driving copper prices, which hit a record price of US\$5.02 in early March 2022, before pulling back considerably.

When it comes to copper production, countries like Chile and Peru typically dominate the conversation. Yet political instability coupled with mounting concern over environmental and social vulnerabilities are leading to heightened production costs without a grade boost to match. Elsewhere, limited new copper projects are slotted to enter commercial production over the next five years. Demand is raising, while mine development is not.

Though Québec's mining sector historically centers around gold, and more recently on critical metals and rare earths that feed into the battery value chain, a few exploration companies in the province are trying to change this narrative. Kintavar Exploration is focusing on the Mitchi-Wabash mineralized district, which CEO Kiril Mugerma believes shares strong similarities with sedimentary basins in Poland and the Democratic Republic of Congo that host high-grade horizons.

"We are going after high-grade metamorphic terrains that have been extremely underexplored because they are harder to reach and even harder to understand," said Mugerma. "These are areas with unique rock formations, and we believe they are a new frontier for base metal exploration in Québec."

Given the lack of copper exploration in the province, Kintavar Exploration has received support from the government and regional institutions.

Doré Copper is hoping to take advantage of the global copper deficit

with its hub-and-spoke model of having several mines feed into a central mill. The company has increased the size of the resources at its flagship Corner Bay deposit from 1.5 million tons to approximately 8.5 million tons, and the grade has remained over 3% copper. Doré plans to have its secondary deposits, including Joe Mann and Devlin, capitalize on existing infrastructure.

President and CEO Ernest Mast believes the high density of potential deposits in the broader Chibougamau camp make the company's hub-and-spoke model attractive, as it can amass several deposits within a 100 km radius of the mill: "As part of the hub-and-spoke Chibougamau mining camp, we have a number of deposits that can enter into the operation, and we believe we are creating a very long-life business."

According to Mast, Doré has the most advanced copper project in Québec and one of the most advanced in all of North America. ■



## Ernest Mast

President and CEO  
DORÉ COPPER

### Can you share highlights from Doré Copper's 2022 drill program at the Corner Bay project?

Corner Bay is our flagship deposit. We have increased the size of the resource from 1.5 million tons to approximately 8.5 million tons, and the grade has stayed over 3% copper. Doré Copper recently announced results from its infill program from 13 different holes. We attained spectacular results with 13 m at 3.47% copper, 2 m at over 5% copper, and another hole of 10 m at over 4% copper. Through the infill program, we are converting inferred resources to indicated, and we are drilling the deposit at a 60 m spacing. So far, the work is going according to plan.

### What are the benefits to Doré Copper's hub-and-spoke model?

The benefit of a hub-and-spoke model is that we can develop a regional play where we have several mines feeding a central mill. Essentially, we

have our fixed costs in place for running the company and we also have the mill in place. At our secondary mines, such as Joe Mann and Devlin, we can capitalize on this existing infrastructure. The Devlin asset is a copper-rich deposit with a small gold byproduct, and the Joe Mann asset is a gold deposit with a small copper byproduct.

### What makes Chibougamau an ideal location for this model?

Chibougamau is a prolific mining camp, having produced 1.6 billion pounds of copper and over 3 million ounces of gold. This is a mining region with great social acceptability for the industry. There is a lot of exploration activity in the area now, and the high density of potential deposits allows us to execute a hub-and-spoke model whereby we can have many deposits within 100 kilometers of the mill that we can truck from. ■



## Kiril Mugerma

CEO  
KINTAVAR EXPLORATION

### Could you provide a brief introduction to Kintavar Exploration?

Kintavar Exploration is an exploration company focused on base metals, particularly copper, in the Central Metasedimentary

Basin in the Grenville province of Québec. We are going after high-grade metamorphic terrains that have been extremely underexplored because they are harder to explore and harder to understand. These are areas with unique rock formations, and we believe they are the new frontier for base metal exploration in Québec.

### What makes the Mitchi-Wabash region of Québec an attractive destination for a copper project?

Until three years ago, there was no copper exploration in Québec. This is a main reason why we have so much support from the government and regional institutions. Around 20% of the company is held by the Québec institutions, and another 20% is held by local shareholders. We are bringing in new business, and the enthusiasm for this can be seen in our financial backing.

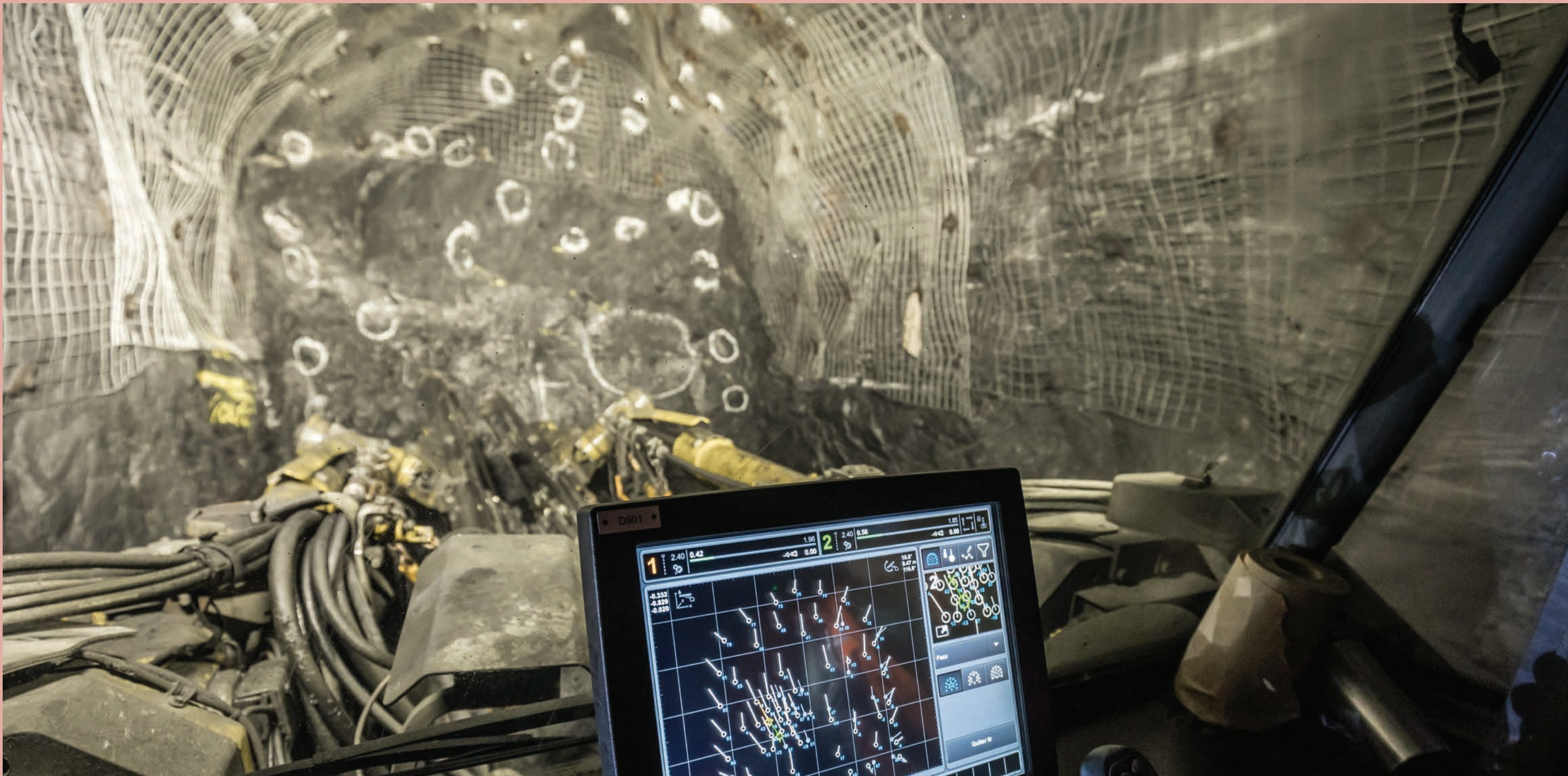
### Why did Kintavar decide to partner with IAMGOLD on its Anik gold project?

Anik is a very interesting project that we wanted to keep exploring with the right partner. We decided to option it out to IAMGOLD, who already had an active presence in the region and are very well familiar with the geology. Given their knowledge of the area, they will be able to accelerate the project and generate value much faster than we could have in exploring it by ourselves.

### What do you hope to accomplish over the next year?

We have been advocating that there are high-grade horizons within the sedimentary basin, just like deposits that exist in Poland and the Democratic Republic of Congo. As we advance, we are demonstrating the validity of this model. In a year from now, Kintavar could have either additional high-grade horizons throughout the sedimentary basin or a larger volume that we will demonstrate. ■





“I am eager to see what direction electrification will go over the next five years. No matter which way things turn, there will be a major disruption.”

**Jean-Francois Couillard,**  
**President & CEO,**  
**Adria Power Systems**

# INNOVATIVE SOLUTIONS



# Organizations driving innovation

## A spirit of development



Image courtesy of Agnico Eagle.

Québec is host to several organizations whose express purpose is to stimulate technological and operational advancements within the mining sector. CONSOREM is a research consortium with over 20 members from the mining industry, including smaller mineral exploration companies, larger mining producers, government, academic institutions, and service providers. Its members are responsible for choosing the annual projects that are executed by CONSOREM's dedicated researchers, which range from collaborations with specialists in geophysics or geoscience to AI.

As part of CONSOREM's mission to provide more companies with access to quality research, the non-profit organization can also serve as a liaison between academia and industry. "We are in the unique position to transfer academic knowledge from the university level to industrial members. We also offer training courses to transfer knowledge, bridging the gap between academic knowledge and how it can benefit industry players," said director Benoit Lafrance.

Over the pandemic, CONSOREM has begun developing more online training courses, which has expanded its audience reach as far as France and Northern Africa.

COREM has the largest concentration of resources dedicated to research and development for mineral processing in Canada. One component of its business model is its pre-competitive research program that includes Champion Iron, Agnico Eagle and ArcelorMittal as members. According to Francis Fournier, president and CEO, participating companies contribute financially but also through sharing their needs and resources. In taking a collaborative approach,

Fournier believes the probability of innovation deployment increases: "COREM plays an important role in de-risking and validating the performance of new technologies, scaling them up, and encouraging deployment of innovation in the mining sector. The key is to find the right partners to de-risk new technologies."

Leadership within the non-profit organization Groupe MISA also believe its members benefit from collaboration. The organization's general manager, Alain Beauséjour, advocates that Groupe MISA's most important assets are its expert networks. "Groupe MISA provides its clients with unparalleled introductions to representatives of the top mining operations in the province who collectively comprise six expert network groups along the mineral process," Beauséjour explained. "We propose collaborative projects to these groups, and they provide funding to support initiatives that address problems they share. This method highlights the collaborative spirit within Québec's mining culture, where nearly everybody is willing to share information and best practices."

Groupe MISA offers its Essor process as a means to reduce business risk and maximize financial leverage. Within the process, the organization provides customized support and coaching before helping companies plan and execute the direction of their projects. Similarly, 48 Nord International developed its ReActor 48 program towards the beginning of the pandemic to better assist companies in promoting their products and services in new markets. "In the first stage, companies are placed in large groups to conduct certain diagnostics such

as the identification of competitors and market analysis," explained Valérie Lemay, who became general manager of the organization in January 2022. "They are then coached by 48 Nord's team to create an impact value proposition as well as an identification and classification of clients, partners and suppliers."

In the final stage, 48 Nord's team continues to support these companies and ensure they develop appropriately. Among the list of current and previous participants includes such companies as Meglab, InnovExplo, MBI Global, and Adria Power Systems.

The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) has operated as a technical society of minerals professionals for over 124 years. The CIM supports the industry through the curation of knowledge and professional development, the promotion of best practices, and through hosting events that help people form meaningful connections with other industry members. As part of its three-year strategic plan articulated in 2021, the institute will spend 2022 focusing on the theme of renewal. Angela Hamlyn, the CIM's CEO, made sure this theme was on display at the institute's conference held in Vancouver in May 2022. "Our theme was 'Mining for Future Generations,' and we sought inspiration from both inside and outside our industry to examine mining's critical role in a sustainable future."

In this way, organizations working to foster innovation within the industry can make an impact not only by centralizing resources and knowledge, but through uniting sharp minds willing to collaborate towards making a difference. ■



## Valérie Lemay

General Manager  
48 NORD INTERNATIONAL

### Can you introduce 48 Nord International (48 Nord)?

48 Nord is a regional export promotion organization (ORPEX) that has been providing companies in Québec with services to facilitate

market development for nearly 25 years. In the Abitibi-Témiscamingue region, we work with all companies regardless of their industry. 48 Nord also assists mining companies in all other parts of Québec. Our services help companies solidify their value proposition and understanding of the key players and competitors within their market, and how to best market themselves when looking to commercialize or expand their geographic footprint. A significant percentage of the companies we work with is in the mining industry, and I believe this will always remain the case given our history and expertise in the sector.

### How does your organization's ReActor48 program assist participating companies promote their products or services?

48 Nord developed its three step ReActor48 program towards the

beginning of the pandemic to better assist companies in promoting their products and services in new markets. In the first stage, companies are placed in large groups to conduct certain diagnostics such as the identification of competitors and market analysis. They are then coached by 48 Nord's team to create an impact value proposition as well as an identification and classification of clients, partners, and suppliers. Lastly, we continue to support these companies as they apply the new concepts, ensuring they stay on the right track. Individuals or groups who register for the program become members of 48 Nord for a year, and the list of current or previous participants includes highly innovative companies such as Meglab, InnovExplo, MBI Global, and Adria Power Systems that saw value in the program. ■



## Alain Beauséjour

General Manager  
GROUPE MISA

### Can you provide an overview of Groupe MISA's role in spurring innovation within Québec's mining ecosystem?

Groupe MISA is a non-profit organization with over a decade of experience fostering innovation within the mining sector. Our portfolio typically

includes 80-100 projects and touches all aspects of mining – from innovations in equipment like pumps and ventilators to better data management solutions for geologists. Our Essor process reduces business risks and maximizes financial leverage by providing customized support and coaching. After a company consults with our expert network, we help them plan, execute, and control the direction of their project.

Groupe MISA provides its clients unparalleled introductions to representatives of top the mining operations in the province who collectively comprise six expert network groups along the mineral process. We propose collaborative projects to these groups, and they provide funding to support initiatives that address problems they share. This method highlights the collaborative spirit within Québec's mining culture.

In addition, we help companies pitch their innovative projects to these experts.

### How is Groupe MISA's VORTEX program promoting innovation in autonomous mining?

Our VORTEX project is a C\$14 million program that we will pass through within the next 24 months. It is half funded through the Québec government and half through the private sector. The goal is to bring a minimum of 10 equipment manufacturers to market with functional business solutions, i.e. connected equipment marketed as a service. We are particularly focused on data transfer and security solutions that provide the end user with the business intelligence needed to make informed decisions.

### What do you think the future of mining may look like?

In 20-30 years from now, we could be talking about one control center operating several mines simultaneously. The solutions we are looking at today may be precursors to tools that will completely transform the mining landscape. ■





## Angela Hamlyn

CEO  
CANADIAN INSTITUTE OF  
MINING, METALLURGY AND  
PETROLEUM (CIM-CIM)

### Could you highlight the three phases of CIM's strategic plan and how these have manifested thus far?

CIM's strategic plan focuses on a three-year outlook consisting of three phases: Recalibrate (2021), Renew (2022), and Revitalize (2023). In formulating this plan, we undertook extensive consultation with major industry players to better understand what issues were most important to them. Something that came up often was the foundational work that CIM undertakes in the development of standards, guidelines, and leading practices—particularly in the area of mineral resource and mineral reserve definition—to foster greater standardization of reporting, specifically under NI 43-101.

### What main priorities will drive the institute in the future?

CIM is reflecting on the role a technical institute will play in the mining sector in one, or even two, decades from now. People will always want ways to connect, learn and collaborate, but we realize that the methods and tools we use will need to evolve to remain relevant in an ever-changing world. Additionally, CIM sees an important role in promoting the positive and essential role our industry has in our everyday lives by sharing the safe, responsible and sustainable practices, promoting careers in the minerals industry and inspiring tomorrow's generations. ■



## Marco Gagnon

President  
CONSOREM

### How does CONSOREM contribute to the development of the mining sector?

We provide research projects, create innovative exploration tools, and provide adaptive training activities based on the needs of our members. Our goal is to improve efficiency in exploration and day-to-day-mining activities, reduce costs associated with exploration, and improve the industry's environmental impact. CONSOREM carries also transfer of knowledge activities ranging from open to public conferences to small group trainings on specific projects and innovative tool for the members. CONSOREM lies in between and work on collaborative and pre-competitive research projects as well as partner with MISA for some projects closer to the application.

### Can you share an example of a research topic CONSOREM has recently worked on?

CONSOREM had been receiving magnetic geophysical data from members with geophysicist interpretations alongside their geologists' interpretations. We noticed there were differences in interpretation from person to person, so we developed automatic ways to interpret the data using AI to recognize patterns and conduct automatic classification of the signal in different classes. Today, geologists' members use the software developed by CONSOREM which enhanced the magnetic data and then produce better geological interpretations. ■



## Francis Fournier

President and CEO  
COREM

### What has been the main driver of growth for Corem over the past year?

Corem's mission is to develop and deploy innovation in mineral processing for a sustainable mining sector. Over the past 2 years, there has been an evolution in our focus. Everything related to fighting climate change and reducing environmental impacts is increasingly important and driving our innovation agenda while still helping the industry to improve its competitiveness.

We are extremely active in energy substitution, reduction and transition as well as in the area of the critical and strategic minerals necessary for the production of batteries.

### What are the benefits to operating in Québec?

Québec has a great ecosystem for mining innovation. There are universities that develop highly qualified people and spur the development of fundamental research. A culture of close collaboration also helps to accelerate the development of technologies. We can work at lab scale with small samples but we can also de-risk and scale-up technologies with our state-of-the-art pilot plants. Québec also has great service providers and equipment suppliers with strong expertise. ■

# Innovation in exploration

## Not your father's mining

The mining of today is a far cry from the mining of even a decade ago, and perhaps one of the areas this is most true is in the technologies and resources that geologists have at their fingertips at the exploration stage of a project. When starting up, many juniors inherit information about their properties in the form of old, clunky data sets, maps, and wisdom trapped inside PDFs. What they do with it is up to them.

Mira Geoscience was founded on the idea that digital data integration in the form of exploration models can lower exploration risk. It has since evolved into a two-branch company, with a software side that builds custom solutions like its new geophysical inversion tools, alongside a consulting branch that helps companies make use of their existing data. Jean-Philippe Paiement, director of global consulting at Mira, believes the mining sector is witnessing a significant shift in how users interact with the data they have available to them, a shift that is largely generational. "We are at an inflection point in the industry where you still have the old-timers working on paper using pencils and crayons, and then you have the younger generation that is all about coding," he explained. "We try to bridge the gap and at least get everything into a 3D viewing platform."

Despite a few boomers dragging their feet behind the transition, digitalized information has become a mainstay in the exploration space. In fact, thanks to synergies at play between GoldSpot Discoveries and its recently acquired subsidiary Geotic, clients can now log and linearize data directly from pictures. Mineral exploration companies are legally required to photograph drillcore as they collect

it, meaning that over time, many deposits generate thousands of photographs that often end up abandoned in servers. LithoLens, GoldSpots' proprietary core imaging technology, automatically examines these old core images to generate geological logs using AI and machine learning. Users of Geotic's GeoticLog can now use the platform in conjunction with the AI imaging solution to maximize their data input and interpretation. According to Joel Jeangrand, managing director of Geotic, the beauty in this pairing lies in its potential: "The AI and machine learning components of this solution mean the more it is used, the more it will train itself and become more accurate."

Artificial intelligence can also be used to suggest rock type at surface, and IOS Services Geoscientifiques has developed a method to do so with gold. According to Réjean Girard, the company's CEO and general manager, the shape of gold grains reveals several clues about the type of deposit it comes from. "If the grain is coming from a quartz vein, it is

going to have a specific type of shape, whereas if it is in a sulfide, it will have a different shape," Girard explained. "We have developed algorithms that can recognize the shape of the gold grain according to the type of deposit."

This allows exploration companies to revise their geophysical techniques as necessary.

Some companies such as Abitibi Geophysics are focused on developing specialized methods that allow for deeper exploration. Particularly when it comes to gold, projects are increasingly targeting deep-lying deposits, and according to Nadine Veillette, Abitibi's president: "One of our core focuses is to create innovative methods by using new ways of acquiring data that meet the needs of the market to find deeper deposits and mineralization."

Others look to introduce technological advancements from outside the mining sector. Vision 4K provides drone magnetic geophysics surveys. By implementing a collision avoidance system within

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Rithmik uses artificial intelligence to provide early insights into mobile equipment issues, trustworthy alarms, and better end-of-life planning for longer-lasting assets. It also enables reductions in fuel burn up to 15% — all while integrating with existing data collection systems and without adding sensors or hardware. With proven onsite results from 3 continents, Rithmik helps mines reduce greenhouse gas emissions while increasing the bottom line.

To learn more, contact [info@rithmik.com](mailto:info@rithmik.com)





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"Quality control of data is becoming increasingly important as companies are using data to drive decisions. Quality control helps significantly in tracking the process from beginning to end."



— Hugues Guérin-Tremblay,  
President,  
Laurentia Exploration,



its drones, the company can conduct surveys in the 20 to 30 meter range above ground, which is important given the significant relationship between the proximity of sensors to the target and the resolution of the data. "Data gets exponentially better the closer you get to the source," explained Pierre-Olivier Dostie, the company's director of operations. "For this reason, drones can offer far better results than helicopters if flown at lower altitudes."

Géophysique TMC has also experienced steady demand for its drone services. Co-owner Gabriel McCrory acknowledged that for large areas, helicopter surveys tend to be more effective. "That said, in small to medium areas, using a drone is perfect," he asserted.

As companies have more access to information at their disposal, ensuring it is of sound quality becomes all the more important. "Quality control of data is becoming increasingly important as companies are using data to drive decisions," commented Hugues Guérin-Tremblay, president of Laurentia Exploration, whose company provides mining clients with a range of specialized geology and consulting services.

Finding the right balance between optimizing data and assuring its quality will be key for service providers and their mining clients moving forward.

### The dark side of innovation

As information accumulates from maps, photos, and various other sources, a new concern arises: how to keep this virtual stockpile safe? Information is valuable, yet ironically, in an industry so accus-

tomed to protecting its most prized assets, this tends to be overlooked.

"A problem we have seen worsen over the past 2.5 years is the theft of information from organizations," acknowledged Claude Sarrazin, president of Groupe SIRCO, a company specialized in investigation and protection services.

More often than not, according to Sarrazin, this theft is carried out not by outsiders but rather by authorized personnel or subcontractors who are responsible for maintaining the software systems. "They may be taking the information for a competitor, to re-sell, or to be used as blackmail, but there is always a financial component fueling their motives. Unfortunately, we usually get called in when something problematic has already occurred. Everything is always okay until it suddenly isn't."

Ben Sharpe, senior industry consultant at Rockwell Automation, further underscored the need to properly scrutinize and implement network security: "Firewalls around the whole site are not enough; you must break it down inside as well. People will bring a thumb drive into a network even if they are explicitly told not to, so there must be security between networks that ensures any leakage only impacts a small portion of process operations."

Rockwell Automation can provide its clients with both cybersecurity and network analysis, two services which are on the rise within the mining sector. With new tools comes new responsibilities, and to neglect the security concerns of modern mining could be a mistake of monumental proportions. ■



To be able to grow, you need to offer something to the world that nobody else has, which we believe we are doing with our services.



## Réjean Girard

CEO and General Manager  
IOS SERVICES GEOSCIENTIFIQUES



### Can you provide an example of how IOS Services employs artificial intelligence in its solutions?

When we do gold exploration and process sediments to extract gold grains, the shape of the gold grain gives several clues about the type of deposit it comes from. We have developed algorithms that can recognize the shape of the gold grain according to the type of deposit. This is not bullet proof, but it gives an idea of the rock type containing the gold, and from that you can adopt your geophysical techniques.

### How do shortages such as a lack of helicopters, drills or qualified people impact the industry?

In a complex project, if one segment of the supply chain is missing, the whole chain fails. A project is dependent on the supply and availability of drillers, geologists, helicopters, hotels, laboratories, trucks, etc. If the drill rig brakes, and it takes weeks to get replacement parts, what is to be done with the helicopter and trucks? By the time the drill is available, the helicopter or trucks might not be. The way in which we circumvent these challenges is by not looking at it project by project, but rather by chain of production in which we build a team with mid-term contracts for suppliers or partners.

### What is your vision for the future of IOS Services?

IOS Services had to make a choice either to be a big fish in a tank or a small fish in the ocean. We have decided upon the latter. To be able to grow, you need to offer something to the world that nobody else has, which we believe we are doing with our services. ■

### IOS Services Geoscientifiques celebrated its 30th anniversary in 2022. How is the company evolving?

IOS Services is in the process of transferring the company's ownership to employees and hopes to complete this process soon. Establishing a structure that is attractive to the acquirers takes around two years. I am confident this takeover will positively change the image of the company, as we are teaming up with young people with fresh ideas and a lot of will power.

In our last strategic meeting, we kept the plan that roughly half of the business will come from juniors, a quarter from majors, and a quarter from government. In the current market, the big money is with the juniors. Working with the government is less profitable, but if the market crashes, it will be our bread and butter. To expand globally, we have to reach out to major companies.

### The industry has moved from chemistry to mineralogy in terms of exploration techniques. Can you elaborate on why this is?

Nickel mines do not sell nickel, they sell pentlandite, which is the mineral that contains nickel. Copper mines sell

chalcopyrite. Mining is about minerals, not metals. The industry is moving from measuring metals towards quantifying valuable minerals, as mines make their money by selling mineral concentrate. The value of mineral concentrate is not dependent only on the amount of metal there is, but instead on which minerals contain the metals. This changes the mindset of how mining, mineral processing, and consequently exploration is done.

### Looking at geometallurgical challenges such as the nugget effect of gold, how can you help solve gold grain size distribution?

This is a good application of quantitative mineralogy. When doing gold assays, you are pulverizing rocks to determine the amount of gold they contain. In a typical gold deposit, large grains or nuggets account for a large proportion of the metal content, but have an erratic distribution. Any attempt to divide a sample by taking alternate shovels or duplicates will invariably yield erratic results. So we developed techniques to measure the size and abundance of the gold grain in a sample set. Through mathematics, we can model the abun-





# Tove Andersen

CEO  
TOMRA

## How has TOMRA evolved over time into the company it is today?

50 years ago, the Planke brothers invented the first automated reverse vending machines which formed the basis of TOMRA. Since then, we have grown into three distinct business areas, but half of our business remains linked to these reverse vending machines for collecting beverage containers, plastic bottles and cans. A third of our business is linked with food sorting, and the remaining deals with our recycling and mining divisions. The commonalities between these business units are that they are all linked to our vision of Leading the Resource Revolution, employing a circular economy model to eliminate waste and improve resource productivity. To do so, they all use sensor-based technology. TOMRA has also grown through acquisitions over the past few decades, which is how we entered the mining segment. Our mining solutions reduce waste and increase recovery in a very efficient way. Sensors-based sorters can, as an example, be placed at the beginning of the process after the ore has been extracted, and take out non valuable materials in this early stage. In doing so, companies process less material and therefore need less energy, water and chemicals.

## Within the mining sector, where do you see the most demand for TOMRA's sorting solutions?

In the diamond segment our technology is the first to accurately sort diamonds based on their properties and not their proxies, achieving market-leading recovery with the highest recovery factor to date. TOMRA is also busy in metal ores, where an increasing market need is seen to fulfill the decarbonization targets across industries. The world is changing, and mining companies are more willing to explore technologies that will allow them to become greener. We are also seeing interest in the reopening of old mines to secure access to resources and in utilizing mine waste that was previously not processed. In both scenarios, you need high extraction rates to make the whole process economic. This drives interest in TOMRA's sorting solutions. No matter the specifics of the operations, our

equipment can simultaneously reduce energy consumption, cut costs, lower CO2 emissions and reduce the ecological footprint.

## How can the circular economy model be applied to the mining industry?

We believe in a resource hierarchy: first, we should always try to use less, then reuse, then recycle. Though, mining will play a vital role as the entry point of the circle. The opportunity for TOMRA is to increase the recycling rate and increase the sustainable productivity of the mining industry.

## In what ways does TOMRA innovate its current offerings?

There are several types of sensor technologies implemented in our sorters, including X-ray, laser, color, electromagnetic, infrared and other technologies. Depending on the needs, we can apply different combinations. TOMRA is constantly improving the accuracy and efficiency of its technology. An example of what we are currently working on is a type of X-ray sorter that will use 70% less air. We are also introducing new laser technology to improve how we sort small particles. TOMRA's digital platform called TOMRA Insight connects to our sorters, which can then be used to optimize the client's process, and we employ deep learning and artificial intelligence to improve throughput and accuracy even further.

## What role do innovative tools play in the evolution of the mining sector?

Canada is well known for being advanced in mining, and competition drives development here. Companies are willing to adopt new technologies. The sector is under a lot of pressure, and it is the responsibility of mining companies to take control and prove how serious they are about contributing to a net zero society. The mining sector has traditionally been risk averse, but this is the time to learn from other industries and evolve. Given the new sense of urgency, we have to look into advanced technologies, like sensor-based sorting, to ease the licensing process, to produce less contaminated waste, to operate the mine at an optimum and reduce the environmental footprint drastically. ■

The opportunity for TOMRA is to increase the recycling rate and increase the sustainable productivity of the mining industry.

# Expert Insights: Exploration Technologies in Québec



*"Working in northern Québec, many of the conductors are subvertical, so we wanted to create a magnetic field that went deep and was horizontal to couple well with the subvertical geography. With that configuration, we were able to achieve a depth of investigation of about 1,000 m."*

**Nadine Veillette, President, Abitibi Geophysics**



*"Weather forecasting is one of the most critical factors for surveying methods in Québec, especially in relation to wind speeds, visibility, and atmospheric conditions. A helicopter is limited to daytime flights, pilot flight hours, and wide windows of time to take off and conduct mapping. Vision 4K, on the other hand, has very flexible drone crews that can work in 15-minute intervals, even when the weather is challenging."*

**-Pierre-Olivier Dostie, Director of Operations, Vision 4K**



*"There are many companies that have old data sets and maps from decades ago, as modern exploration began in the 1990s. There is also a lot of publicly available data that has been stored in PDFs which we have been working on integrating into our clients' databases to generate new exploration targets."*

**Jean-Philippe Paiement, Director, Global Consulting, Mira Geoscience**



*"The battery minerals and strategic metals space is currently an extremely busy sector. With the copper and nickel prices being at a high last year, there was significant demand, especially for electromagnetic surveying (EM). We have also seen increased activity in the lithium and graphite space."*

**Gabriel McCrory, Co-Owner, Géophysique TMC**



*"The industry is moving from measuring metals towards quantifying valuable minerals, as mines make their money by selling mineral concentrate. This changes the mindset of how mining, mineral processing, and consequently exploration is done."*

**Réjean Girard, CEO and General Manager, IOS Services Geoscientifiques**



# Innovations in operations

## Digitalization, roboticization, and automation



Image courtesy of Meglab.

From digital twins to automation and robotics, advancements within mining operations have transformed the image of the industry from being associated with pickaxes and shovels to resembling a science fiction movie. Innovations are aimed at helping mining companies optimize their performance and minimizing their impact on the environment.

### Digitalization

The use of digitalization tools in the mining sector caught the attention of HP Hydraulique, a company that historically specializes in the sale and repair of hydraulic components, planetary gearboxes, and electro-mechanics. Identifying a need in the market for stronger engineering services, HP Hydraulique created its mechanical engineering division Forceteck Consultants in 2015 to work with 3D scanning technologies. The segment can provide HP Hydraulique's clients with a simulation service to reproduce parts. "We can digitize the environment to create a model to see if we can add conduits throughout existing structures," explained Viviane Doyon, the company's communications and marketing manager. "In doing so, we can modify, add, compare, or create concepts

and make manufacturing plans without having to use equipment."

Howden, a company specialized in air and gas handling products, has applied the concept of 3D model-

ing to the underground ventilation space with its Ventsim DESIGN software. "3D modeling helps determine and visualize numerous factors such as tunnel size, ventilation raises and

overall ventilation strategies. Based on those outcomes, we can more accurately determine the required ventilation infrastructure," explained Raphaël Pelletier, account executive of the Americas of Howden.

In addition, the company offers its Ventsim CONTROL software to remotely monitor, control and automate airflow. In using ventilation on demand systems, mine operators not only cut costs but also lower their carbon footprint.

Innovative solutions providers are increasingly offering solutions called digital twins, which function as virtual representations of objects or systems throughout their lifecycles. In comparing the real with the simulated through the use of machine learning, AI, and simulations, companies can compare processes in their ideal state with either a new process to see if it is living up to expectations or with an older one to determine whether mechanical issues or signs of wear are present.

Rithmik Solutions was founded out of the realization that there was unlocked value dormant within data being collected from mobile mining equipment. "Through studying AI and machine learning, we realized these technologies were the ticket to

unlocking the potential of this data to drive better maintenance-related decision-making," said co-founder and COO Kevin Urbanski.

Rithmik builds optimal replication models using AI that capture the characteristics of a piece of equipment running at its best. "We then run the model at the same time as the actual assets, enabling us to see which sensors are deviating – for instance low oil pressure with high exhaust temperatures – essentially capturing the failure mode signatures from the equipment," Urbanski explained.

In this way, Rithmik Solutions' Asset Health Analyzer, or AHA, uses AI to predict what might go wrong with machinery before it even happens. Through its work in different mining operations, the company has found its customers can save upwards of US\$10 million per year for an average-sized fleet of haul trucks, and they have already measured opportunities to save nearly 8,000 tons of CO2 per year at the site level.

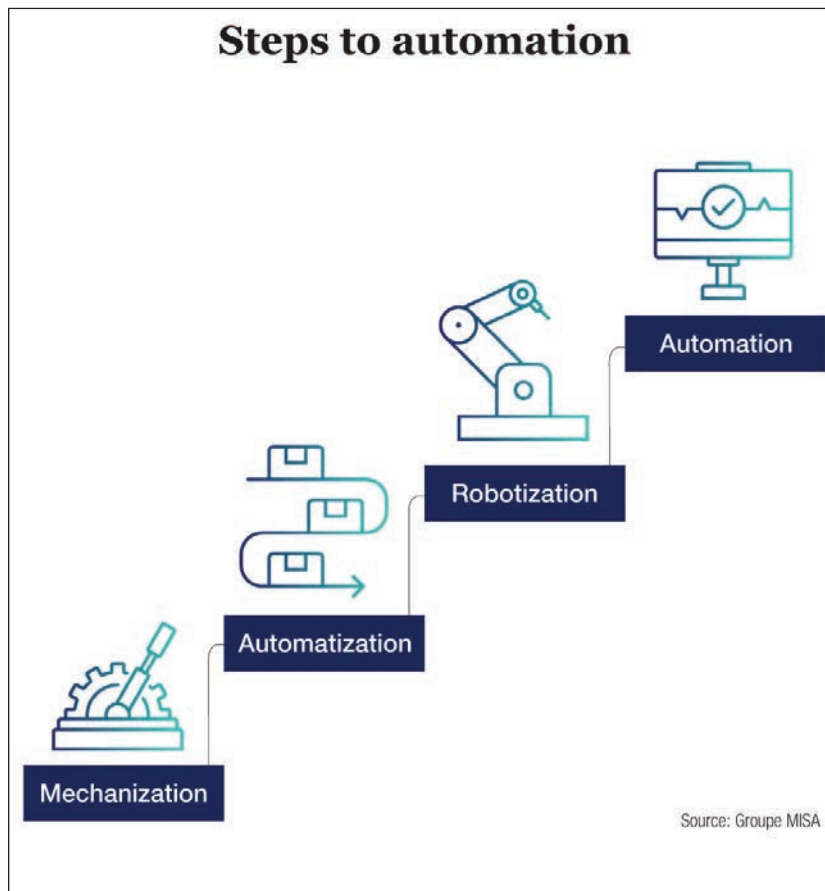
Metso Outotec, a global provider of sustainable technologies for mining, aggregates and metals refining industries, created Geminex, a metallurgical digital twin tool, to help companies respond to operational

changes more quickly. According to Giuseppe Campanelli, president of Metso Outotec's North and Central America branch, Geminex combines operational data from both internal and external data sources in order to efficiently test alternative operational scenarios and parameters. It does so by using the company's HSC process models that already have over 20,000 users worldwide. "The tool provides invaluable information for short- and long-term decision-making," said Campanelli. "It can operate as a high-level model predictive control or as a backstage planning tool."

Machine learning tools are being used within operational mine sites to save valuable time. Maptek has been providing innovative software, hardware and services for the mining industry for decades, and its launch of DomainMCF marked the company's foray into the cloud processing space. DomainMCF is a cloud-based machine learning engine that helps quickly transform input drillhole data into a predicted domain model. "This process typically takes weeks to months with traditional methods, but our solution significantly shortens the time to minutes or hours," said Jesse Oldham, the company's global product strategy manager.

In addition to saving time, innovative solutions are helping mining companies hit their ESG targets. TOMRA, a manufacturer of automation machinery, has introduced to the mining industry a sensor-based sorting technology that helps reduce waste and increase recovery, meaning companies process less material and therefore use less energy and water. The company has a digital platform that can connect to its machines and use deep learning and AI to improve accuracy. Though TOMRA has not yet launched its deep learning tools within the mining sector, it plans to do so in the future with the belief that mining operators must take their role within the energy tran-

### Steps to automation



Source: Groupe MISA





## Kevin Urbanski

Co-Founder and COO  
RITHMIK SOLUTIONS



**I see the company having significantly more partners, all collaborating in optimizing the entire value chain through technology and AI.**



**What need did Rithmik Solutions (Rithmik) see in the market for its Asset Health Analyzer (AHA)?**

My co-founder Kris Isfeld and I both used to work at Matrikon, which had a product that collected data from mobile mining equipment. In the 10+ years each of us worked with that data, the value in it was clear, but companies never seemed able to fully unlock that value. After leaving Matrikon and studying AI and machine learning, we realized that these technologies were the ticket to unlocking the potential of this data to drive better maintenance-related decision-making. And of course, this had to be done in a way that handled the complexity and extremes of mines. We didn't see any other solutions out there doing that, and that's why we started Rithmik.

Five years later, we've worked with mines in four commodities on three continents and validated with our customers that our product can save upwards of US\$10 million per year for an average-sized fleet of haul trucks. At a mine in Zambia, for example, we showed that some of the trucks had brake issues that significantly impacted the handling of the trucks and were creating wear on the powertrains. They'd had no idea what was causing them until they worked with us.

**How does AHA utilize AI to predict what might go wrong with machinery before it happens?**

We build an optimal replication model using AI that captures the characteristics of a piece of equipment running at its best. We then run the model at the same time as the actual assets, enabling us to see which sensors are deviating – for instance low oil pressure with high exhaust temperatures – essentially capturing the failure mode signatures from the equipment. We tailor those models to the mine environment using our proprietary infrastructure, which is how we can continue to provide highly-accurate results even in very different environments. So far, we've worked with various haul trucks and dozers and

have had significant interest in running the system on shovels.

**What are the main benefits of AHA's implementation?**

One major benefit is the early prediction of problems down the line. The system can also identify operator behaviors that are causing issues to the equipment as well as instances in which mechanics are not addressing the root causes of broken equipment. AHA also identifies inefficiencies, thereby allowing an operator to improve fuel burn and ultimately decrease greenhouse gas emissions. So far, we've measured opportunities to save almost 8,000 t/y of CO2 at the site level, and that's just the beginning.

**How has the market been responding to AHA?**

We are receiving more requests today as people are increasingly looking for predictive maintenance solutions. Customers still want to see proof that what we're doing works because a lot of companies have tried things in the past that haven't worked. The good news is that we've always been able to deliver that proof.

**Looking into the future, are there any other applications of AI in mining that excite you?**

Rithmik is covering a piece of the mining value chain. Fully integrating the information we're providing with the processes around it will amplify the benefits even more. A future where full automation is possible is very exciting.

**What would Rithmik like to achieve in the next two years?**

I see the company having significantly more partners, all collaborating in optimizing the entire value chain through technology and AI. It is important for us to have a focus and to do what we do extremely well, rather than trying to do everything ourselves. We're already making our insights more explicitly prescriptive, and we'll also be covering more equipment types. ■



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**Mining activity in Canada contributes to Howden's product road map and acts as a compass for its future developments.**



## Raphaël Pelletier

Account Executive – Americas  
**HOWDEN**

### What services does Howden provide the mining sector?

Howden specializes in the air handling business. We provide engineered turn-key solutions from conceptual designs to equipment manufacturing, commissioning, and ultimately maintenance of the assets. With regards to the mining sector, Howden built a name for itself as a fan manufacturer through its legacy brands and various acquisitions. Over the past decade, Howden has developed its Total Mine Ventilation Solutions (TMVS) offering end-to-end solutions. Through our TMVS offering, we can supply fans in addition to mine cooling systems, mine air heaters, ventilation control systems and engineering services.

### How important is Canada to Howden's overall operations?

20% of Howden's total mining business comes from Canada. Mining activity in Canada contributes to Howden's product road map and acts as a compass for its future developments. It helps us develop strategies locally that can then be implemented at a global scale. Sudbury, for example, is considered to be the mining technology capital of the world, with developments in BEVs, communication technologies, amongst many other innovative products.

### What are the benefits to 3D modeling in ventilation design?

3D modeling has enabled Howden to engage at an early stage customers with conceptual mine designs and help them move their project from a pre-feasibility, to feasibility, and into project execution. 3D modelling helps determine and visualize numerous factors such as tunnel size, ventilation raises and overall ventilation strategies.

### How can proper ventilation systems assist mining operators in lowering their carbon footprint?

In recent years, a Howden customer and newer mine in the Québec area, implemented our ventilation control system. It is a ventilation on demand solution that allows the mine to adjust ventilation needs in real time based on the number of personnel underground and the machinery being operated. With the total amount of toxic gasses generated by the machinery and blasting activity, controlling the ventilation is extremely important to miner safety. The VOD system helps increase production while reducing carbon footprint.

### What adoption trends has Howden seen in the ventilation on demand space?

Ventilation on demand is part of the solution that miners are implementing to achieve carbon emission reduction goals. Since this is an area of opportunity, more

competitors are entering the space, which promotes a healthy competitive environment.

### How does heating air improve ventilation and safety?

Heating is important in Northern mining environments due to ice build ups in ramps, shaft collars and ventilation raises. Heating requirements are proportional to the amount of fresh air that is required underground. If the requirement of fresh air is optimized and distributed more efficiently, you reduce the required amount of heated air, which reduces carbon emissions as air is heated using fuels such as propane, natural gas or diesel in more remote locations.

### Are there any unique considerations Howden considers when working in Québec?

Québec is one of the world's biggest untapped mineral resources and situated in very attractive mining jurisdiction. Québec has distinct mining regulations that vary from other Canadian provinces. We also need to be mindful of the culture in Québec. The official language spoken is French. New companies entering the Québec market need to understand the culture to ensure the success of their project. There are also environmental challenges that must be taken into consideration. For half the year, temperatures fall below zero degrees Celsius, which contributes to added risk, costs, and planning when it comes to mining. With that comes added supply and logistics challenges when working in remote areas.

### Do you have a final message for GBR's readers?

Howden aims to maintain its leading position in mine ventilation solutions through organic growth and acquisitions. We have our own ESG targets, such as making a commitment to reduce our carbon footprint by 50% by 2030 and reach net zero by 2035. Howden is also promoting women employment in the sector to reach a more gender equal work environment. Additionally, we make safety a priority in our plants and construction sites. Finally, since 2021, 100% of Howden employees have received anti-bribery and anti-corruption training, and we aim to maintain this record going forward throughout the organization. industry. ■

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sition seriously by adopting technologies that decrease their environmental impact. "It is crucial that the mining industry not be complacent," said CEO Tove Andersen. "The sector is under a lot of pressure, and it is the responsibility of mining companies to take control and prove how serious they are about contributing to a net zero society."

Within a brief timespan, machine learning and AI have opened up new possibilities for planning and optimization that would have been unimaginable even a decade prior. Not everybody is so quick to sing the praises of these technologies, however. "People hear AI and fear we are removing human jobs," admitted Ben Sharpe of Rockwell Automation, yet he encourages people to compare the dynamics of the market for mining against most other manufacturing industries. "The important question to ask is whether you are removing jobs that can be filled in the mining sector, or whether you are simply replacing jobs that nobody is willing to travel to do. I have worked in the business for long enough that I am confident it is the latter."

### Unleash the robots

According to Sharpe, the metals industry, just one stream down from mining, had the largest robotics growth market in 2021. He believes it is inevitable that the trend heads upstream to the mining sector; the momentum is already building.

Newtrax Technologies is one of the companies at the forefront of this shift. The company was acquired by Sandvik three years ago, and a primary reason being its interest in evolving its OptiMine collision avoidance systems for automated mining equipment. Currently, automated machinery cannot co-exist alongside pedestrians and other vehicles, which serves as the main constraint to their growth within the mining sector. "As technologies and robotics progress at significant speed, the main obstacle remains that robotics are isolated, and no humans or other vehicles can operate nearby," said CEO Alexandre Cervinka. "We want to unleash the robots."

Cervinka sees immense potential in applying digitalization and process optimization to underground mining. His company has found that in certain operations, there is an opportunity to reduce waste by up to 40%. When Newtrax started selling underground mining technologies a decade ago, it had to convince its clients of the benefits to these solutions. Now, the company sees more demand than it can supply.

### Electrification

Mining plays a vital role in the electrification of other industries, yet given the magnitude of mining equipment fleets and the types of equipment they include, the sec-

tor itself is still at the early stages of transitioning. When Kirkland Lake Gold first used battery-powered equipment back in 2012, many onlookers were doubtful. Others remained skeptical and wanted to watch the technology become more field proven before adopting it into their own operations. Today, battification of equipment repeatedly makes news in the mining world. At Glenore's Onaping Depth mine in Ontario, set to begin production in 2024, plans are being made for an entire EV fleet – from scoop trams to personal vehicles.

When it comes to charging large equipment in a dynamic environment like a mine, it is not a simple matter of plugging in and waiting. The concept of 'opportunity charging' has become increasingly popular as a means of charging industrial battery-powered equipment for short periods throughout the day rather than all at once. "The goal is not always to have a vehicle charged to 100%," explained Eric Dessureault, vice president of operations at Meglab. "It depends on what must get done before the end of the shift. A vehicle might be at 60%, for example, when it is the optimal time to charge because the operator has the time, and the charger is available."

Meglab has introduced MegaCharge to the market as a scalable charging solution that can charge from two to 18 vehicles.

Adria Power Solutions has been working on its own battery charging technology for mining equipment for a decade, taking the time to watch the market evolve in order to best identify potential needs of the future. The company observed that, given the multiple ways to accumulate energy at a high rate, it can be difficult for manufacturers to decide which chemistry to use when building the battery for a 400-ton mining truck, for example.

As a result, the company decided to create OEM agnostic chargers that spare customers looking to invest into electrification from making a costly gamble on their charging infrastructure. "We know batteries are the future, but which batteries?" posited Jean-Francois Couillard, the company's president and CEO. "That remains the question that will define the way the electrification movement unfolds beyond this first iteration."

Their solution was to design a high-power system with multiple outlets of low power. In this way, lower-powered outputs can be bridged together to generate a single output of high power. Jean-Francois Couillard, the company's president and CEO, believes this design of charger to be future-proof. "Charging infrastructure is expensive," said Couillard. "If there is a new battery technology in five years with significantly better performance that requires higher power to charge, you will not need to change your preexisting infrastructure if you have an Adria charger."

Given the pace at which the industry is evolving, built-in flexibility within product designs will be a safe way for manufacturers to offer scalable, adaptable solutions. ■





KV



ED

## Kim Valade & Eric Dessureault,

KV: General Manager  
ED: VP Operations  
**MEGLAB**

### What is Meglab's role within the mining industry?

KV: Meglab started with a focus on underground communication and electronics equipment, and has since broadened to include electric, automation, and digital solutions. Today, we work with our clients from the feasibility stage to understand exactly what is required for a project's success. Getting involved early is more important than ever, as the increased electrification of mining requires a re-thinking of how mines will be designed. From there, Meglab conceptualizes, designs, and builds its own strategies and equipment.

### Can you share any benefits that have arisen as a result of being acquired by Epiroc?

ED: From its family of companies, Epiroc assembled a group of people from around the world to brainstorm technologies that will change the future of mining. If the technology is particularly interesting, we allocate resources to do further research and contact its manufacturers. This is an exciting group to be part of because we feel we are leading the path to electrifying the mining industry on a global scale.

### How will MegaCharge reshape the usability of electric-powered equipment?

KV: MegaCharge is a multi-channel charging solution for underground and surface charging of battery vehicles.

ED: It is especially beneficial for opportunity charging, in which industrial batteries are charged for short periods throughout the day rather than all at once. The goal is not always to have a vehicle charged 100%. It depends on what must get done before the end of the shift. A vehicle might be at 60%, for example, when it is the optimal time to charge because the operator has the time, and the charger is available. This is also why Meglab works so hard to simplify its technology and make it more available to operators. We want the person running the machine to know when and for how long they should charge their equipment, and we want them to be comfortable with the new technology without it impacting their workflow or safety.

### What are the main features of the IMAGINE system, and can you share examples of it in action?

KV: IMAGINE offers a set of modular applications with a variety of functions. We can identify some features such as

tracking, ventilation on demand, mine evacuation, traffic control, and access control. The integrated technology provides significant cost savings and safety improvements. Today, the reliability of the data collected makes a difference when it comes to automating tasks and making correct decisions.

ED: Eldorado Gold Lamaque uses 100% of the IMAGINE system. What drew them to the platform was the reduction of waiting times. Agnico Eagle implemented IMAGINE in their Nunavut operations to assist with ventilation, and we are now helping them introduce additional features into their workflow. At the Odyssey mine, IMAGINE hardware is being used for collision awareness. As a modular system, the mine can start with a few prioritized features and add more over time.

### How important are telecommunication tools in underground mining?

KV: Telecommunication tools are critical in underground settings, and this is an area of deep expertise within Meglab. Recent progress allows us to work towards the vision of an autonomous and accessible mine.

### What inspires you when you see the way the mining industry is evolving?

KV: I love talking to young people who are determined to make a real difference in the sustainable development. The industry is ready to be challenged and they all have the opportunity to create a real impact by getting involved. The electrification tools Meglab is working on can have that real global impact. When I look at this younger generation, I am encouraged to see that mining embraces diversity, as there is a place for everyone. I am involved in Women in Mining Abitibi, and we have introduced initiatives at Meglab such as the construction of pink equipment in support of breast cancer awareness, to help open the door for people regardless of gender. With new people come new ideas. When it comes to finding innovative solutions to environmental challenges, we need more diversity at the table. ■

## Expert Insights:

### How are AI and machine learning tools reshaping the mining landscape?



*"We are not here to sell machines, but rather electrical infrastructure. Adria has spent the past decade preparing to assist in this inevitable push for standardization."*

**Jean-Francois Couillard, President and CEO, Adria Power Systems**



*"The principles of machine learning, AI, and simulations can be applied with great effect in mining."*

**Ben Sharpe, Senior Industry Consultant, Rockwell Automation**



*"Optimization and safety are two frontiers of new technologies that our clients are looking for."*

**Chris Blair, SVP of Mine Solutions, Maptek**



*"100% of our research and development budget goes towards solutions that have a sustainability improvement target related to energy, emissions, water, circularity, or safety."*

**Giuseppe Campanelli, President - North and Central America, Metso Outotec**



*"Our vision is to optimize the underground extraction process by digitalizing the equipment, people, and environment, and to capture this data in a way that can be used to train AI."*

**Alexandre Cervinka, CEO, Newtrax Technologies**





# SERVICES

“The environmental aspect of mining is now at the forefront of project development, and projects can be shelved if an environmental review is not approved by key stakeholders including First Nations, local communities, and provincial and federal governments.”

**David Oliphant,**  
Vice President Business Development,  
Veolia Water Technologies Canada



# Environment and water management

## ESG triumphs

Many mining companies are working overtime on their commitments to uphold high ESG standards, fighting the shackles of an industrial legacy of waste and destruction. In this battle, engineering and consulting firms play a crucial role in equipping their mining clients with innovative tools that cut carbon consumption, minimize noise and dust pollution, and increase resource management. Decisions have to be made between higher prices for materials in alignment with certain ESG standards and the perennial urge to lower development and operating costs. The extent to which this tradeoff will happen, and who is footing the bill, are two important conversations to be had.

In certain cases, the tradeoff between cost and innovation has no easy answer. Procon, a mine development contractor that opened its regional hub in Val-d'Or four years ago, plans to switch its fleet to battery electric equipment. Yet the transition will take time, and it will be costly. In the current economy, Christian Bourcier, vice president of Procon Canada East, finds it difficult to justify the investment when his clients continue to ask for the lowest cost possible. "Right now, working with diesel equipment is the cheapest. We find ourselves in a Catch-22: Go the more expensive route and lose contracts, or do things the current way," explained Bourcier.

At other times, investments into innovation become shared burdens amongst various stakeholders within the industry. Fournier & Fils, a Val-d'Or-based construction company, believes the future of mining is electric, which is why Fournier decided to supply a truck to Nouveau Monde Graphite in support of the vision to have a fully electric mine. "We know there is still a lot of ground to cover before there can be a full fleet of electric trucks at a mine site in a way that is efficient and profitable, and we also recognize that as a key player in the industry it is our role to step up," explained president Jérémi Fournier. "If nobody tries, nothing will happen."

Fournier & Fils also creates project specific ESG reports based on its operations for clients to incorporate the information into their own metrics of reporting, at the forefront of what they believe may become a standard industry practice. For its part, SNC-Lavalin has been assisting its clients in calculating and assessing their carbon performance since the early 1990s. Most recently, the company launched its Decarbonomics platform to accelerate the mining industry's shift to net zero. "Decarbonomics is a data-driven end-to-end services platform solution where we identify all carbon emis-

sions from the built environment onsite and design a roadmap for cost effective carbon reduction," explained Dominic Tremblay, vice president of the company's mining and metallurgy segment in Québec.

Having access to clear metrics enables companies seeking to minimize their environmental footprint to identify areas for improvement. Such tools fit into a trend towards taking a more individualized approach in measuring and mitigating one's environmental impact. ESG targets should not and cannot be treated as one-size-fits-all objectives.

In this regard, while larger construction firms are making significant headway into the Québec market, such as SNC-Lavalin's establishment of a business segment in the province and BBA Consultants' decision to take advantage of the flourishing of activity by opening offices in Val-d'Or and Rouyn-Noranda, the civil engineering firm Norinfra believes one of its most pronounced competitive advantages in the region is the deep understanding its talent has of the regional environment. "Our employees have more than 30 years of experience in doing civil engineering work for the regional mining sector," said Martin Drouin, a project manager and associate at the company. "Because of this, we are familiar with the climate, soil, and permitting specifications. This is important, as civil engineers should be experts on their region."

Additionally, companies operating within the province enjoy access to more environmentally friendly sources of fuel. While many are familiar with Hydro-Québec, DGSC (Distrib-

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PT



MS

## Pierre Thiffault & Marie-Claude St-Pierre

PT: VP Mining and Metals  
MS: Environmental Director  
**GCM CONSULTANTS**

### How has GCM Consultants evolved to service the mining sector?

PT: Since 1994, GCM Consultants has been serving clients in heavy industries. Historically, most of our clients were in the oil and gas industries, but we have been seeing growth recently in mining and manufacturing. We now have over 400 employees in nine offices across Canada, with headquarters in Montreal. Throughout the years, we have added specialty services to our portfolio, including construction and procurement management, process safety management, and machine safety. Our construction subsidiary, Volo Construction, can act as a general contractor. Through acquisitions we have also expanded our environmental and sustainable development consulting services, which focuses on renewable energies, energy efficiency, operational excellence, industry 4.0, and industrial IT.

### In what ways can GCM assist its clients in achieving their ESG targets?

MS: The reality is that if a mine wants to be sustainable, it needs to make sure the community is on board and that it is cost effective to allow for the success of the company in the long term. We are finding innovative ways to reduce tail-

ings footprints, including using waste material in other industries. We are also involved in water treatment solutions where we reduce the production of sludge by reducing the need to treat water. Our team will approach water use differently to reduce at the source and recycle water at different points in the plant, even underground.

Additionally, GCM has a great team of biologists that work on evaluations of flora and fauna. With any project, the environment needs to be characterized, and our biologists will go onsite and set up a baseline inventory of the fauna and flora in the area. Inventory reports are sent to the relevant ministries, after which we evaluate the impact of the project on the local environment and how the client can mitigate these impacts.

### Can you elaborate on the work GCM does regarding water management and water treatment?

MS: Reducing consumption is the first step for mining businesses to ensure sustainability. We are also involved in the progressive restoration space, where we are looking at how water consumption can be reduced and recycled during the tailings treatment process. We do many

pre-feasibility and feasibility studies prior to recommending water treatment systems, and we currently have a focus on maintaining the quality of water within treatment systems to eliminate the need for refurbishment every few years alongside changes in regulation.

### Besides financial investment, what support does GCM receive from Fonds de solidarité FTQ?

PT: Fonds de solidarité FTQ became a partner of GCM in early 2022, but we are still an employee-owned company. This partnership allows leverage and quick response to business opportunities. Our development plan is based on acquisitions, and our partnership with Fonds de solidarité FTQ will certainly be helpful, as they are also in partnership with 3,400 other businesses in Québec.

### How has GCM tackled the industry-wide labor shortage?

PT: Historically, GCM has had a very low turnaround rate. We also recently established a subsidiary, Strana Talent, that is focused on finding qualified human resources for both our company and our clients. We strive to create a favorable working environment for our employees and offer flexibility such as remote working. Our business is quite diverse, guaranteeing stability to our employees. For example, if there is a slowdown in the mining sector, we can leverage from the manufacturing or oil and gas sectors.

### What are GCM's priorities for the next few years?

PT: We have seen good business performance over the past several years and want to continue working in this direction, keeping our core values in mind. The world is changing quickly, and we want to be on the frontline together with our clients in taking on energy efficiencies issues, environmental issues, and manpower issues. GCM will continue to expand its service offerings through acquisitions to stay ahead of the game as the market comes up with new needs and challenges. We also aim to streamline our internal processes to continue boosting our efficiency. ■





## David Oliphant

VP Business Development  
VEOLIA WATER TECHNOLOGIES  
CANADA

### Can you provide an overview of Veolia's work within the mining sector in Québec?

We have a major focus on wastewater applications and issues related to toxicity to aquatic life. This typically involves removal of heavy metals and other contaminants such as ammonia. We may also design processes to remove cyanide species from wastewater. It all comes down to supplying systems that allow our clients to meet their regulatory compliance. By bundling our wide ranges of digital services for our mining clients, we can oversee their water treatment activities, provide them with preventative maintenance, advisories, and offer the full suite of technologies including mobile water services and chemicals.

There is a clear trend in companies turning towards digitalization to optimize their water systems. This

is where our Hubgrade smart digital solutions platform is becoming a value add for our clients. Hubgrade allows us to share data points with clients, giving preventative maintenance foresight for their plant.

The increase in demand on mobile assets, or temporary treatment, seen in the past years is unlikely to wane anytime soon.

### What will make Veolia stand out in the water treatment space in the years to come?

We are going to continue investing in new technologies for the good of the environment, being driven by Veolia's commitment to ecological transformation. Veolia is constantly looking to evolve and bring new innovation to its clients. Being a trusted adviser is something we take seriously, and Veolia fosters that image not just in Canada but abroad as well. ■



## Marie-Chantal Savoy

VP Strategy and Communications  
LOGISTEC

### Can you provide our readers with an overview of SANEXEN's work within the mining industry?

We specialize in tailings and water treatment, including de-watering, dredging, and sludge management.

In June 2021, we purchased an Alberta-based organization called APG that specializes in dredging and sludge management, further deepening our expertise in this sector. We work on the ground with our clients, utilizing our team of scientists, engineers, and field experts to create unique solutions.

Never before has our suite of environmental services and technologies been more necessary to deliver innovative, safe and sustainable solutions to communities facing a growing number of critical environmental challenges.

### Could you share an example of an innovative product SANEXEN has recently launched?

Last April, we launched ALTRA 3D, a brand new technology for transporting minerals, water, slurry, chemicals and other fluids in mining environments. Due to the flexibility of ALTRA 3D, our woven lay flat hose can

easily cope with the drastic environmental and climate-related changes and challenges typically found in difficult mining applications.

### Does SANEXEN ever work directly with First Nations?

SANEXEN is proud to support and strengthen the Indigenous communities we are privileged to work with. We responsibly deliver a wide variety of projects, while fostering opportunities for training, involvement and local initiatives that create a future for Indigenous youth. We recognize that success depends on building long-term partnerships and reinforcing a culture of sharing alongside Indigenous people. We are also proud to partner with two Inuit companies (Qikiqtaaluk Environmental Inc. in Nunavut and Avataani Environmental Services Inc. in Nunavik). Both Indigenous partners actively participate in strategic decisions, business development, and day-to-day operations. ■

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uted Gas Solutions Canada) provides a different type of energy. The company specializes in turnkey compressed natural gas (CNG) and liquefied natural gas (LNG) supply solutions for industrials not connected to the pipeline or for transportation end users. "Natural gas is the cleanest burning fossil fuel. At the point of combustion, it reduces greenhouse gas emissions by approximately 18% compared with propane, in addition to air pollutant reductions," explained the company's vice president of business development and marketing, Andrew Wilkins. "DGSC has been at the forefront of introducing the concept of a virtual pipeline supply of natural gas in Québec."

### Water management

In mining jurisdictions like Chile and Peru, the natural environment presents operators with a challenge when it comes to accessing water. In 2021, Arizona-based exploration company Resolution Copper faced backlash for its proposed use of 250 billion gallons of water in a region in crisis, with concerns mounting until the issue reached the attention of the US Congress. In several parts of Québec, however, an opposite challenge arises. The province has a positive water balance, meaning mining companies must look for various reuse applications to deal with the volume of water they need to remove from site. As mines become more remote in the far northern reaches of the province, transporting this water becomes all the more difficult.

In April 2022, SANEXEN launched its ALTRA 3D high-performance hose that is designed to transport minerals, water, and other fluids in mining environments in a flexible design that can withstand harsh environmental conditions and climate-related challenges. A subsidiary of LOGISTEC, SANEXEN specializes in contaminated site remediation and water main rehabilitation, and the company is confident its new product will be a value add to the sector. "I believe the ALTRA 3D hose will be a game changer for the mining industry, as water-related challenges will only intensify over the next few years," commented Marie-Chantal Savoy, vice president of strategy and communications.

Climate-related challenges are a top concern for mining companies and the engineering firms that assist them in the province. Seasons are pronounced, and winters are particularly harsh. Having the right tools to work through these changes in conditions can drastically impact the amount of work a company is able to accomplish in a year. In addition to collaborating with Eldorado Gold to develop and commercialize ECOMUD, a solution to treat the sludge and water generated from mining drilling and construction-related activities, the Canadian engineering and project management firm ASDR announced the acquisition of ECO Technologies in May 2022 as part of a broader effort to expand its water treatment and management services. Importantly, the acquisition will allow ASDR to provide these services even in harsh winter conditions. "The acquisition will stabilize our dredging service by allowing icebreaking activities and the environmental services to happen further into the winter," pres-

ident Stephen Authier explained. "In Québec, winters can be harsh enough to temporarily halt operations, so extending the seasonality of our work is a huge plus."

As the technology being adopted by the mining industry rapidly evolves, water technology is no exception. Of the various services Veolia offers its mining clients, the company is seeing a strong shift in interest towards digitalization to optimize their water systems. David Oliphant, vice president of business development for the company's water technologies segment in Canada, sees his company's Hubgrade smart digital solutions platform as a way for companies to more easily navigate legal requirements and to receive direct access to Veolia's experts, which is particularly important in more remote applications where in-person advisory can be near impossible. Oliphant believes the solution can help clients get in front of problems with their facilities before these issues occur: "Hubgrade allows us to share data points with

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## G Mining Services

### Building Together

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## Michael Gignac

VP Finance  
G MINING SERVICES

### Can you provide an overview of the past year for G Mining Services?

G Mining Services has seen significant growth in demand and personnel over the past year. We now have 180 employees and have expanded our geographic footprint with a new office in Quito, Ecuador. We have also brought on new clients, such as Allkem, who partnered with us for detailed engineering for their James Bay lithium project. G Mining Services is assisting another client on the construction of the Greenstone gold mine in Ontario, a joint venture between Equinox Gold and Orion Mine Finance. We have completed the detailed engineering work and are now focused on the construction phase. Equinox recently stated that construction is 35% complete and remains on budget and on schedule. One last highlight for 2022 is the ongoing detail engineering work we are doing with G Mining Ventures for their Tocantinzinho project. Outside of Canada and Brazil, we are involved in projects in Mexico, Ecuador, US and Botswana.

### How important are its regional operations?

G Mining Services is very active in Québec, and the Allkem project is a good example of our work in the province. We are also active throughout Canada and have clients with interesting projects in Ontario and British Columbia. The majority of our operations are focused in Canada and Latin America.

### What emphasis does G Mining Services place on delivering on projected timelines and budgets?

G Mining Services works hand in hand with its clients to ensure project success. The original EPCM/ Owner model does not help with aligning incentives, as that model is heavily focused on contract management where legal teams are often involved. Conversely, our incentive model is focused on our clients' successes, which means we emphasize delivering on time and within budget. G Mining Services has delivered 100% of its projects on budget and 66% below budget. Additionally, all our projects have been delivered on schedule or earlier. The commitment to maintaining these impressive figures helps distin-

guish us from a lot of other players in the market, and I attribute much of the company's growth to this difference in mindset.

### How can G Mining Services help its clients deliver on ESG goals?

Even though we are not an environmental firm, we adhere to ESG principles and focus on making sure our interventions fall within or exceed industry standards and practices and that they contribute towards positive outcomes. From an environmental standpoint, we try to limit the footprint of the mines we design and build. Looking at social themes, we work on fostering positive and collaborative relationships with the people in the communities we operate in. Education is also a very important aspect of the work we do, and all our projects have a very intentional skill transfer component.

### What has enabled G Mining Services to grow during a time in which it is increasingly difficult to attract and retain skilled labor?

G Mining Services has a great corporate culture, and this goes a long way in making us an attractive employer. We offer competitive salaries, growth opportunities, and more hands-on field work. It is a family-owned business, and that really shows in our culture and priorities. We also see the importance in hiring locally. For our Ecuador office, for example, we leveraged our experience to hire 100% local staff. We are very proud of this, and it helped us stand out in that market.

### What will continue to drive growth for G Mining Services?

Detailed engineering and construction support work account for the bulk of our services. We cover geology, mining, engineering, construction, as well as studies, making us essentially a one stop shop for the industry. With that in mind, our reputation has played a key role in the growth we have experienced over the last few years. Our culture, our people, our leadership, and our methods of operating are the driving force behind our growth. Our ability to consistently deliver on time and on budget are unparalleled and will continue to serve our clients across the globe. ■

↘↘  
Our incentive model is focused on our clients' successes, which means we emphasize delivering on time and within budget.  
↙↙



## Andrew Wilkins

VP Business Development and Marketing  
DGSC

### Does DGSC service mining operations in remote locations?

DGSC has been at the forefront of introducing the concept of a virtual pipeline supply of natural gas in Québec. We fill trailers with CNG to deliver to industrial and mining plants that are not connected to the gas pipeline or want to reduce their carbon footprint and fuel prices. These solutions have been deployed extensively in other parts of North America, but are in their infancy in Québec. The CNG station constructed by Energie Tergasa, a DGSC-Group Alfred Boivin-RL Energies partnership, in Chicoutimi enables the delivery of CNG by truck (aka virtual pipeline) to serve industries in the Saguenay Lac-Saint-Jean region, parts of the North Shore, and other areas in Northern Québec. The CNG station has been commissioned and the

official opening of the adjoining Public Fueling Station is scheduled for September. Energie Tergasa has been in discussions with several mines in the region for CNG supply beginning in 2023.

### Where do you anticipate demand for natural gas to come from in the near future?

The federal carbon tax and upcoming clean fuel regulation will provide economic incentives for end users to move towards lower carbon fuels. The result will be decreased distribution of heavy fuel oil, diesel and propane, and an increase in demand for natural gas in the transportation, industrial, mining and other sectors. The ability to mix some RNG in the input natural gas commodity offers customers a pathway towards fuel carbon neutrality. ■



## Stephen Authier

President  
ASDR

### Can you introduce our readers to ASDR?

ASDR was founded in 2006 with four employees and has managed to grow to more than 300. Our water treatment group, specialized in modular and permanent water treatment plants, as well as our industrial services group, specialized in maintenance work during shutdowns, have more than doubled their revenues in the last few years. The engineering and project management group provides critical multidisciplinary engineering services and senior project managers to deliver our projects. With manufacturing completing the mix, ASDR is vertically integrated from design to delivery, which allows us to simplify procurement cycles and reduce project execution times for clients while maintaining high standards for health and safety and quality thanks to our shop fabrication and modularization methodology.

management expertise. This acquisition not only expands our geographic footprint into the New Brunswick and western Canadian markets, but it also augments our end-to-end water treatment services. For example, it will stabilize our dredging service by allowing icebreaking activities and the environmental services to happen further into the winter.

### ASDR announced the acquisition of ECO Technologies in May 2022. What was the motivation driving this decision?

ASDR acquired ECO Technologies to help expand its water treatment and

### What are the unique benefits to ECOMUD as a water treatment technology?

ASDR collaborated with Eldorado Gold to develop and commercialize ECOMUD, an innovative solution for the treatment of sludge and water generated from mining drilling and construction-related activities. ECOMUD is a key step for sustainable drilling, as it can reduce water consumption by 90% thanks to its ability to recirculate water back to the drill. Furthermore, ECOMUD is unique in its ability to treat water in accordance to stringent government regulations prior to discharge. To date, we have implemented this technology at several large operations with great success. ■



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clients giving preventative maintenance foresight for their plant."

Québec-based Nordikeau has offered services for all stages of the water cycle since 1994, working on several active mines in the province including for ArcelorMittal and Rio Tinto. To stay relevant in the increasingly competitive environmental services space, the company continues to expand its offerings, such as its development of a marine drone that will be used in sedimentation basins to assess the quantities of sediment. In May 2022, Nordikeau announced the launch of its Nordicity platform, a digital solution that optimizes data gathering throughout different stages of the water cycle by using artificial intelligence. "This data provides us a global view that helps us go further in our diagnosis and operations optimization in order to be more efficient when urgent situations arise," said Jean-François Bergeron, the company's president.

As the regulatory framework for mining evolves and investors and the general public alike place greater demands

on mining companies to operate in an environmentally sound manner, water management and water treatment processes can no longer be treated as an afterthought. "As regulations change, companies have to think differently about water treatment, and investments into water management must be made from the beginning," commented Marie-Claude St-Pierre, environmental director of GCM Consultants, an engineering and construction company headquartered in Montreal.

For this reason, her company takes a progressive restoration approach, in which they conduct various studies to evaluate how water can be reduced and recycled during the tailings treatment process prior to recommending the appropriate system. In this way, they hope to eliminate the need for refurbishment of facilities every few years alongside changes in regulation.

In many ways, mining companies operating in Québec have the opportunity to stay ahead of water treatment requirements thanks to the progressive technol-

ogies of service providers. H2O Innovation's president Frederic Dugre believes this is one of the province's assets. "In environmentally advanced mining provinces like Québec, being able to provide membrane filtration that results in better quality of water output and does not negatively impact the surrounding environment is a huge advantage," he said.

**Exporting quality**

While Québec boasts several regions that draw the attention of exploration companies and investors worldwide, the province does its fair share of exporting as well. This is true not only of the materials it produces but also of the culture, experience, and expertise of its service providers. Régis Côté of Fordia recalls a moment in which he recognized the extent to which his hometown made a difference on a global scale: "I remember being in the DRC when a driller recognized the Fordia logo on my suit. There, in a very remote place, they had been trained to drill by people from Val-d'Or."

G Mining Services is a mining consultancy firm that has cast a global shadow from its headquarters in Brossard. The company, whose services cover underground and open pit projects from greenfield to operating mines, recently opened an office in Quito, Ecuador, and hired a 100% local staff to help meet the needs of the market, including the work it is doing to lead construction efforts at the Fruta del Norte project for Lundin Gold. In addition to other projects the company has taken on in Latin America and Africa, G Mining Services is working on detail engineering work with partner company G Mining Ventures for their Tocantinzinho project.

"Our work in different countries has granted us the ability to compare what it is like to operate in different mining jurisdictions," commented Michael Gignac, VP finance, noting the main differences he has seen deal with regulations, bureaucracy, and taxation. "There are a lot of unforeseen, special rules that can come up and catch you off guard. You need to be flexible, open minded, and creative in how to work through these challenges."

For a province with a population of 8.5 million people, Québec's mining industry plays an outsized role on an international scale. ■



**Marco Prud'Homme**

President  
NOLINOR AVIATION

**How have the past few years been for Nolinor Aviation (Nolinor)?**

The mining industry was seen as essential throughout the pandemic, and Nolinor was lucky enough to be one of the few airlines to service the industry. This gave us the opportunity to keep most of our staff working, which is a big positive regarding safety.

For Nolinor, the past two years have been quite stable, and the company was able to add three 737-400 and one 737-800 aircraft to its fleet. 737-200 aircrafts are usually used for our mining clients given their smaller size and ability to land on gravel, but some mining companies now have access to paved runways which allows us to utilize the 737-400 aircraft that has more capacity. With our fleet, if there is a last-minute demand or a mining site has to be evacuated quickly, we have the capacity to assist customers.

**What is the range of aircraft within Nolinor's fleet?**

Nolinor offers full circle services to mining clients. We will transport fuel to the mining site during the exploration stage, and once the project reaches maturity and construction starts, we have bigger aircrafts to meet increased cargo and passenger requirements. We also purchased shares in a smaller carrier, Corpo Aviation, which has a PC-12 aircraft and two Beechcraft 1900s in their fleet that can accommodate 8 to 12 passengers. Having a smaller carrier option for clients complements the services we already offer.

**Can you provide an overview of the key regions that you service for mining companies?**

Today, we have a cargo aircraft based in Yellowknife. Our main base is in Mirabel, Montreal, from which we do mostly passenger flights. We have also expanded our services to the Wabush region and to the Meadowbank project for Agnico Eagle. The company recently decided to diversity the markets it services by launching the OWG brand, which is more passenger oriented. Nolinor has also expanded its geographic footprint

outside of Canada and now offers flights to Los Cabos in Mexico.

**How has Nolinor adapted to price increases and logistics issues?**

We have had to reinvent many of our processes and change the way we work with suppliers. For example, in the past, if an aircraft part was broken, within 24 hours we would have had that part back in inventory. Now when a part breaks, getting another part may take multiple weeks. Additionally, fuel used to account for approximately 28% of our costs, but this has increased significantly and is more than 100% higher than what we paid even a year ago. Today we are less focused on major R&D projects and are more concerned about reinventing the way we work to save costs while still offering the highest quality service to customers.

**What sets Nolinor apart from its competitors?**

Over the past two years, the aviation market has changed drastically. In the past, people would never have expected their flight to be canceled, while nowadays hundreds of flights are canceled each week. Nolinor's goal is to maintain the same level of service the company has always offered by overcoming pandemic-related challenges to ensure they have no impact on customers. Our on-time departure rate is excellent, and we have not cancelled a single flight throughout the entire pandemic. Internally, we implemented a program that provides our entire workforce the opportunity to become pilots 100% on our cost. We have turned out over 10 pilots from this program thus far.

**What is Nolinor's growth strategy for the next few years?**

Our vision to grow Nolinor has always been to wait for customers to make specific requests before finding the best type of aircraft to answer their needs. We are not buying aircrafts and then looking for customers, but rather letting customer demand lead us in the way we grow our fleet and services. Depending on the type of requests we receive, we adjust and provide. ■

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## Dominic Tremblay

VP Québec – Mining and Metalurgy  
SNC-LAVALIN

### Could you update our readers on the new Québec segment of SNC-Lavalin?

SNC-Lavalin’s mining business is growing globally; we have many ongoing projects thanks to high metal prices and an increasing demand for critical minerals for the battery market. To capture these markets, SNC-Lavalin decided to establish a business segment in Québec as the province is a great location for investment because of a favorable regulatory environment and a government that supports the acceleration of new projects. We also wanted to be closer to our customers with a French-speaking team that understands the specific needs of the market.

In the Québec mining segment, we have approximately 250 professionals executing projects. With increased industry investment in strategic minerals and base and precious metals, we believe we will have to double our workforce. This might be a challenge as the availability of human capital is an industrywide problem.

### Can you elaborate on SNC-Lavalin’s tailings management services?

SNC-Lavalin’s goal is to be an integrated partner for its customers from exploration to mine closure. We have offices across Canada to be able to support our customers locally and establish lasting beneficial relationships. We have long-term service agreements in place with major companies such as Glencore and Rio Tinto and pride ourselves in helping clients manage risk throughout their project lifespan.

### How does SNC-Lavalin assist clients in calculating and assessing their carbon performance?

Since the early 1990s, SNC-Lavalin was one of the first in Québec to calculate carbon performance, and we have employed it on major industrial, mining and infrastructure projects.

One of our latest offerings is Decarbonomics, a data-driven end-to-end services platform solution where we identify all carbon emissions from the built environment onsite and design a roadmap for cost-effective carbon reduction, then we help implement the solutions towards a Net Zero target. ■



## Jérémie Fournier

President  
FOURNIER & FILS

### Why was 2021 a strategically important year for Fournier & Fils (Fournier)?

2021 has marked a significant milestone in a way that we have been able to geographically extend our footprint with our upper-class assets; the 100-tons class trucks and the 200-tons class shovels.

### How is Fournier able to attract and retain a skilled workforce that supports the company’s growth?

Five years ago, we had around 400 employees. We now have around 1,200. As a family-owned business, it is important for us to have a sense of community. To retain talent, it is all about having fun. The key to success is three-fold: earn money, be safe, and have fun doing it. We proactively ask our employees if they are comfortable and what we could be doing to make their jobs easier. As a result, Fournier’s turnover rate goes down each year. Of course, we recognize

that people will always come and go as part of a broader cycle. What we want is for our former employees to be our best ambassadors. They may go on to work at organizations that are clients or competitors of ours, and we want them to strengthen the Fournier name when they do.

### How can Fournier assist its clients in hitting their environmental targets?

Fournier creates project specific ESG reports based on its operations so that our clients can incorporate that information into their own reports. We provide information relating to safety and environmental management as well as community relations. This is not something most contractors do, although I believe it will become a trend in the future.

We also believe strongly in electrification. Fournier assists Nouveau Monde Graphite in their vision to have a fully electric mine. ■

## Expert Insights: From energy harvesting to tailings management, Québec is a hotbed of services innovation



*“The transition to battery electric underground equipment is happening faster than anyone expected, and we are seeing an increased number of mines starting to add this equipment to their underground fleets.”*

**John McVey, CEO, Procon**



*“Nordikeau is developing a remotely controlled marine drone that will be used in sedimentation basins to assess the quantities of sedimentation. This will help avoid the need for emergency intervention, enabling mining users to predict and prevent problems before they occur.”*

**Jean-François Bergeron, President, Nordikeau**



*“H2O Innovation developed special chemicals to treat water that is highly charged with inorganic matter such as high silica, which can occur in tailing ponds and cause issues within a matter of hours. This helps mining companies increase performance on water treatment plants, reduce their energy consumption, and avoid reduction in recovery of water.”*

**Frédéric Dugré, President and CEO, H2O Innovation**



*“The programming side of the business is becoming more significant as technology advances, particularly with new machines. In fact, the “greening” of the mining industry has been a major driving force in our technological evolution. Specifically, more people are talking about automation as machines become more powerful.”*

**Frédéric Bousquet, General Manager, HP Hydraulique**



*“We are involved in energy harvesting via materials needed for wind and solar production, such as rare earths for the magnets in wind turbines. In the solar industry, we work with high purity quartz for semiconductors. When it comes to energy storage, ANZAPLAN works with the lithium battery industry as well as vanadium flow batteries.”*

**Reiner Haus, Managing Director, Anzaplan**





## Walter Schmidt

Director of Project Development  
ORE+PROS



## Claude Sarrazin

President  
GROUPE SIRCO



## Éric Gamache

Vice President  
TACT

### Can you provide our readers with an overview of the role ORE+PROS plays within Québec's mining ecosystem?

ORE+PROS provides temporary staffing for the mining industry. What makes us so successful is our deep technical understanding of the different roles we help put in place, including mine and civil engineers, geologists, surveyors, lab technicians, mill operators, millwrights, electricians, welders, and site service personnel.

It is our job at ORE+PROS to know exactly what responsibilities our client is looking for in an employee and to find within our database the person who best embodies that set of skills.

### What is relationship between ORE+PROS, its clients, and its employees?

Our database is filled with salaried employees of ORE+PROS who we contract out to our clients. We do not tie our clients to any amount of contract work, and we are transparent with our pricing.

A large segment of the mining population is about to retire, and the new people who will take their place will need training. ORE+PROS works to create flexible training schedules that allow for more efficient learning processes. ■

### Where has SIRCO seen demand from the mining sector coming from over the past year?

Many mining companies are turning their operations technological by using more automated and remote-controlled machinery. In some cases, these companies lack the means to fully secure the environment. SIRCO has been providing several services to support its clients through this transition.

### Has the labor shortage led to any workplace disruptions?

Being forced to raise their threshold for acceptable risk, companies have been hiring people who are new to the industry. SIRCO has conducted background verifications on workforces in which 40% of employees have criminal records. This has created huge issues regarding the use of drugs. According to an analysis SIRCO conducted, 90% of this new workforce will be involved in a narcotics or drug-related incident in the workplace within their first year.

### How can SIRCO help companies navigate these challenges?

First prevention, then repression. For prevention, we provide facility training, training to managers for drug and alcohol detection, and investigation personnel. For repression, we conduct undercover operations with narcotics dogs. ■

### Can you introduce TACT and the services you provide?

Our ambition is to be a one-stop shop in communication offering solutions to our clients including consulting services and lobbying, along with ensuring clear lines of communication between various players within the industry and local communities. What makes us unique is the depth in understanding the region our teams have cultivated over the years, along with acute knowledge of the mining industry.

### How does the mining industry fit within TACT's growth strategy?

Mining companies are driving demand for TACT's services. It is crucial to develop new methods of communication to ensure all stakeholders understand what your goals are, what the project entails, and how it is going to impact the community.

### How easy is it to navigate the Québec government's regulatory framework for mining?

The current government is open and willing to make deals to ensure the industry remains healthy and attractive. If a company has a transparent approach to their project, ensures local communities are engaged, and that the social and economic impact is taken into, then the government will be unlikely to stand in the way of a project. ■

## Expert Insights: ESG Regulations

### How are regulatory changes impacting the mining value chain?



*"There has been an evolution in government regulations that is now affecting the mining industry, particularly regarding discussions on carbon neutrality."*

**Jean-François Bergeron, President, Nordikeau**



*"As regulations change, companies have to think differently about water treatment, and investments into water management must be made from the beginning."*

**Marie-Claude St-Pierre, Environmental Director, GCM Consultants**



*"The federal carbon tax and upcoming clean fuel regulation will provide economic incentives for end users to move towards lower carbon fuels. The result will be decreased distribution of heavy fuel oil, diesel and propane, and an increase in demand for natural gas in the transportation, industrial, mining and other sectors."*

**Mathieu Séguin, VP Corporate Development, Monarch Mining**



*"We anticipate continued demand for our water management services, permitting and civil engineering, as climate change worsens and government regulations become increasingly extensive."*

**Martin Drouin, Project Manager & Associate, Norinfra**



# Drilling

## Standing out in a saturated market



Image courtesy of Agnico Eagle.

The drilling landscape follows many of the same market cycles as the mining clients it serves. When mining is hot, the wave of entrepreneurial spirit floods into the sector; new companies spring up and new drills are purchased. When mining slows down, however, it often leads to a saturation of machines on the market, which is where Québec finds itself now. Drilling demand is limited in large part by the extent to which companies have the capital to invest in exploration, but many drilling companies in the province are finding innovative ways to attract work.

Diafor, a diamond drilling company based in Rivière-Heva that opened in 2020, has found success in taking on projects in the battery metals sector. “I know of drilling companies that were sent home halfway into 10,000m+ drilling projects because they were working on a gold project that was not fully financed, or that the companies pulled the budget from drilling in order to preserve base cashflow, since the beginning of the present crisis,” said president Mathieu Dionne.

On the other hand, when confronted with poor conditions at a target for a battery metals project, Dionne witnessed a “never-seen-before level of commitment” from the client given their strong capital backing. He attributes this project as a contributing reason towards the Val-d’Or Chamber of Commerce’s decision to distinguish Diafor as a top young company at its 2022 gala.

For Yuri Alexandre, president of Dynamitage Castonguay, a drilling and blast-

ing contractor that works with producing mines, the best way to ensure a steady workflow is to be able to offer services on demand in a strapped market. “The market has changed significantly post-pandemic,” Alexandre explained. “Cost is still a factor but no longer the main consideration, as mines must produce for an increased demand worldwide. The need in the market for over a year has been for equipment, manpower, and the ability to do a good job.”

Suppliers of drilling solutions such as MBI Global place priority on expanding their product offerings, particularly in mining ecosystems like Québec in which many contractors in the province take pride in building their own machines rather than purchasing them, making it all the more important to have a unique value-add. In addition to offering autonomous drilling and data collection solutions, MBI Global has worked on rod handling systems to increase safety in underground mining operations. Daniel Misiano, the company’s president, believes this serves as a differentiating factor in the market and allows for a more diverse labor pool: “These innovations open the workplace up for more diversity, as you no longer need to lift heavy weights, for example. It is a goal of ours to attract more women into the mining industry.”

Fordia, a subsidiary of Epiroc that offers diamond drilling tools, drilling equipment, accessories, and services, aims to differentiate itself through offering solutions that assist its drilling

clients in reducing their environmental footprint. “I began talking about the importance of reusing water and treating it effectively a decade ago. Back then, people laughed, as we have thousands of lakes in northern Québec, and water did not seem to be a problem,” recalled Régis Côté, the company’s regional director.

Back then, Fordia was working on a way to treat the water for rigs to make the process more efficient. The company sold its first unit in 2013 and continued to improve upon the system. “Now, the equipment can treat 45 gallons of water per minute with the water coming clear out of the system after 10 seconds. It operates on a closed circuit and can recover nearly 90% of the water used,” Côté acknowledged.

Looking ahead, David Bradley, co-owner of RJLL Drilling, hopes to see further environmental steps made within the mining sector. “Where I think the industry could make a real difference is in minimizing fuel usage,” he explained. “We have electric cars, so where is the first electric drill?”

These innovations have a cost, and in Québec there are drilling companies forgoing environmental or safety-related adaptations to remain cost-competitive, lowering the pricing environment for their market peers as they do. Yet over time, changes being made today – from using rod handling solutions to switching to biodegradable fuel – will likely become industry standards. ■



## Mathieu Dionne

President  
DIAFOR

### Can you provide an overview of Diafor’s history since its establishment in 2020?

Diafor is a diamond drilling company and we have factored ESG into our business model from day one, evidenced by the fact we are the third diamond drilling company in the world to achieve ECOLOGO certification. Within our first year of operations, word of mouth spread, and Diafor became recognized for its added-value drilling and excellent quality of the services offered. We currently work 100% with exploration (juniors) companies, but are working to position ourselves with producers (Majors) to diversify our work.

### What is your evaluation of the current drilling climate in Québec?

There are great ideas in Québec’s drilling ecosystem, but innovation has a cost, and the price of drilling in the region remains very low compared with other jurisdictions. Drilling companies are responsible for this. On the one hand, you have top-tier and global drilling companies continually evolving, and it is impor-

tant to them to implement environmentally conscious practices such as using biodegradable fuel and safe and efficient machinery like rod handling solutions. On the other hand, you have companies lacking of added-value and differentiators that needs to cut costs in order to drill for 10-20% less. These companies often do not work the same towards safety and environmental standards.

### How will Diafor position itself for growth in the years to come?

To avoid being impacted by another crash in the base metals and gold sector, Diafor will increasingly target battery metals and copper jobs since they are a global trend. Additionally, we are looking to expand our current fleet and will develop a crawler drill over the next year. We will also investigate offering heli-portable drilling. We are also open for considering growth by acquisition. We are also open to discuss partnerships with first nations. ■



## Daniel Misiano

President  
MBI GLOBAL

### Can you provide an overview of MBI Global?

MBI Global was created in 1992 with a focus on exploration drilling, particularly core drilling, as a distributor of various high-quality products. Over the years, we saw opportunities to enter the manufacturing segment of exploration consumables. From there, MBI Global gradually added manufactured products, and today, we are a full-fledged total solution core drilling and geotechnical drilling supplier that exports to over 30 countries.

### How saturated is the Québec market when it comes to the number of drills available?

In Québec, manufacturers like MBI Global can sell drills. The greater impact on either the purchase or fabrication of drills, however, is the fact that most contractors in the province love to build their own machines. There is an element of pride here for drilling contractors to have a hydraulic or mechanical specialist in their team who

can help them create their own recipe for success. Over time, as Québec is so attractive for drilling, when the high tide comes around there is a strong entrepreneurial spirit and new drilling companies may spring up. When it slows down, however, there can be a saturation of machines on the market. This is where Québec is now.

### Why do your clients prefer to purchase drills from MBI Global rather than build their own?

MBI Global places significant focus on safety. We are working on rod handling systems for underground applications and a separate project for open pit. These innovations also open the workplace up for more diversity, as you no longer need to lift heavy weights for example. It is a goal of ours to attract more women into the mining industry.

Additionally, MBI Global is working very diligently on automation and the ability to collect data, which is useful not only for the drilling company but also the geologist at the mine. ■





**David Bradley**  
Co-Owner  
RJLL DRILLING

**Please introduce RJLL?**

When I joined back in January 2020, we had three drills. Now, we have 20. RJLL works all throughout Québec, from projects in James Bay and the Abitibi region up to the Canadian Arctic. We also work outside the province and have been considering expanding our geographical footprint internationally.

**Can you highlight your company's partnerships with indigenous communities?**

We have our first contract now working south of Salluit and are the only drilling company they have an agreement with. RJLL also has a partnership with Assibi Industries, representing Anishnabe Nation of Lac Simon, in which we hope to promote the hiring and training of the community's members.

**Looking ahead, what technological advancements in drilling excite you the most?**

I recognize the benefits automatization will have on the industry, but I do not believe this type of technology allows for one-man operations. You still need two people to be safe. Where I think the industry could make a real difference is in minimizing its fuel usage – we have electric cars, so where is the first electric drill? ■



**Yuri Alexandre**  
President  
DYNAMITAGE CASTONGUAY

**Which commodity sectors drive the most demand for Dynamitage Castonguay's services?**

We are seeing most demand coming from iron ore and gold mines, especially given the extensive deposits and expertise in Québec. While we are seeing significant demand for more newly popular metals such as lithium and graphite, these projects are still more challenging to develop into mines.

**How has the market for production drilling evolved over the past few years?**

The market has changed significantly post-pandemic. Demand for metals has gone up, supply chains have been interrupted, and labor challenges are more pressing than ever. Cost is still a factor but no longer the main consideration, as mines must produce for an increased demand worldwide. The need in the market for over a year has been for equipment, manpower, and the ability to do a good job. If you can offer this, you will be welcomed on a project, cost considerations being secondary matters as services are in such high demand.

**What excites you about the next few years of mining in Québec?**

We try to stay aware of what is happening in the industry so we can be one step ahead. ■



**Régis Côté**  
Regional Director  
FORDIA

**How has Fordia grown since its acquisition by Epiroc?**

When we sold the company in 2019 to Epiroc, we were in 40 countries around the world. Now, we have a presence in 70 countries thanks to their reach, and we see better prices when purchasing products or raw materials. Fordia manufactures diamond tools, but we also sell all the parts that go on rigs for exploration and geotechnical drilling, which is our specialty. We are now working with Epiroc on reverse circulation drilling.

**What do you see driving growth for Fordia over the next few years?**

We see potential for the north of Québec to become more developed, as there is promise there but currently few roads and facilities. Additionally, mining is getting deeper, which has encouraged us to innovate tools that last longer and have better productivity. We have developed new wedges to be able to reach down and be easier to install and are currently focused on developments within the automation of rigs. ■



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Consortium de Recherche en Exploration Minière	<a href="http://www.consorem.ca/">http://www.consorem.ca/</a>
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DGSC	<a href="https://dgsc.ca/">https://dgsc.ca/</a>
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Eldorado Gold Corporation	<a href="https://www.eldoradogold.com/home/">https://www.eldoradogold.com/home/</a>
EMX Royalty	<a href="https://emxroyalty.com/">https://emxroyalty.com/</a>
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