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ORE MAGAZINE

SMA Saskatchewan Mining Association

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ORE MAGAZINE

The Official Publication of The Saskatchewan Mining Association

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Cover
This issue of Ore Magazine focuses on Saskatchewan's critical minerals essential to supplying the global supply chain with low carbon energy, fertilizer and clean technology.

SMA
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Producing the Critical Minerals that the world needs

> Saskatchewan is well positioned to develop and grow its economy through the production of critical minerals.
>
> – PAM SCHWANN

Last year as the world grappled with the onset of the COVID-19 pandemic, Saskatchewan's mining industry was recognized as providing an essential service. This is no surprise given the type of products that we mine, process and deliver to help feed a growing population and to provide energy around the world.

This year amidst the ongoing pandemic, like many other nations, Canada established its list of 31 critical minerals as part of the nation's Canadian Minerals and Metals Plan (CMMP). The strategy behind the CMMP is to position Canada as a global supplier of choice for these critical minerals and ensure that the country has what it needs to be competitive and strengthen its own domestic value chains.

This all bodes well for Saskatchewan as one of Canada's premiere mining jurisdictions. Our province is already a global leader in the production of two critical minerals, potash and uranium, which are part of the 21 critical minerals it has on the country's list. This means that Saskatchewan is well positioned to develop and grow its economy through the production of critical minerals.

Some of the other critical minerals listed include lithium and rare earths. These two minerals are the focus of local companies making great strides to advance their projects from exploration to development. Rare earths are also the object of the construction of a new processing facility in Saskatoon.

You may be wondering why any of this is important. Well, when you think of the environment and the road ahead to "net zero" greenhouse gases, mining definitely has a role to play. Uranium for example, is the fuel to produce low-carbon nuclear power, and rare earths and lithium are needed for technological innovations such as in electric vehicle batteries, computers and more. To feed the world's growing population, fertilizer will be needed to increase crop productivity, and Saskatchewan potash is produced with 50% fewer greenhouse gas emissions than potash produced by global competitors.

Saskatchewan's mining industry is a substantial economic driver for the province providing about 12,400 direct jobs (and twice as many indirect jobs), contributing over $1.8 billion in provincial, federal and municipal taxes, purchasing about $2.9 billion in goods and services from Saskatchewan suppliers and donating over $22 million to community organizations (2017 data). This impressive industry's support of local and global communities is also in keeping with currently accepted environmental, societal and governance (ESG) standards and best practices.

In this issue, you will learn about Saskatchewan's critical minerals and their benefits to society. You will discover what the province's mining companies are already doing and planning to reduce their carbon footprint. You will also gain a deeper understanding of ESG reporting requirements for mining companies and what they mean in the capital investment markets. You will also meet individuals who contribute to the safe growth of the exploration and mining industry in the province. And, since the pandemic is still here, you will also find out how the mining companies are handling the new reality of the COVID-19 workplace.

The Saskatchewan Mining Association, has been and remains a strong supporter and advocate for our province's exploration and mining industry. From raising public awareness to contributing to provincial and federal industry-related policy making and reviewing, we proudly represent the industry. This issue of Ore Magazine reflects our vision and commitment of Saskatchewan as a global mining leader in the emerging lower carbon economy. The following pages demonstrate how our province's exploration and mining companies have and continue to meaningfully contribute to Saskatchewan's innovative spirit, socio-economic well-being and future growth.

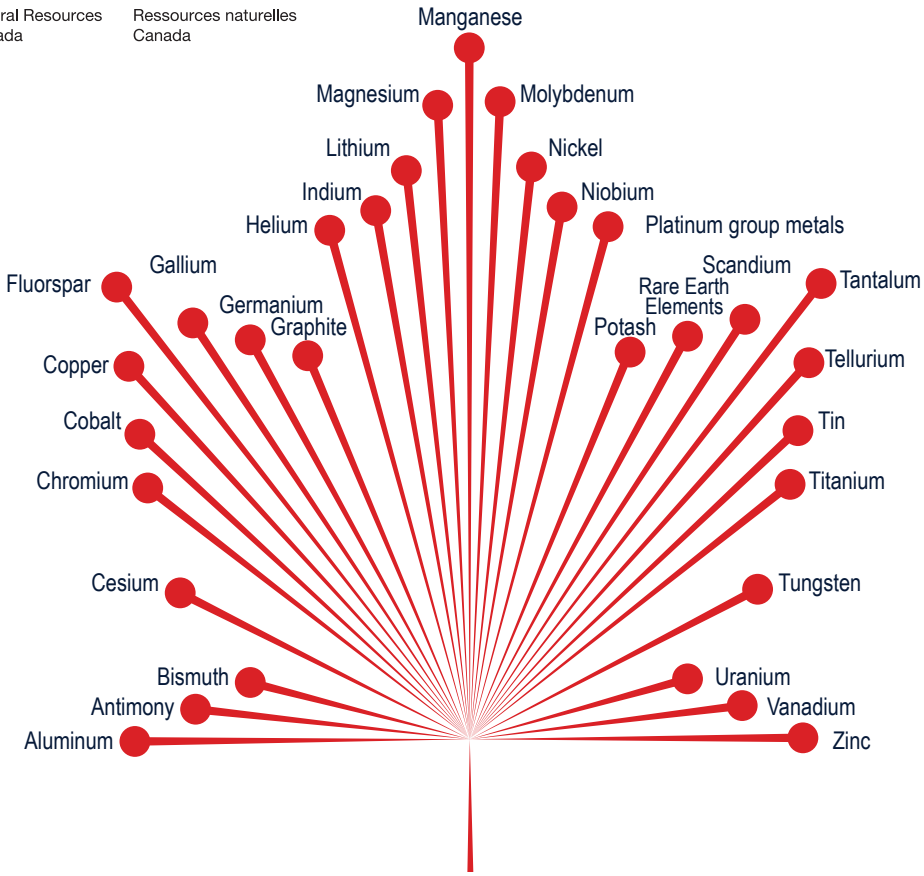
SASKATCHEWAN'S CRITICAL MINERALS ESSENTIAL TO GLOBAL SUPPLY CHAINS

The COVID-19 pandemic has highlighted the essential nature of Saskatchewan's minerals sector and the need to have a safe and reliable minerals value chain. Most Saskatchewan residents are aware of the local potash and uranium production and their role in feeding and energizing the world, but other minerals grounded in this province are also considered critical. Many of them support the world's growing technological needs and could increasingly become economic drivers of the future.

Our natural resources are key to positioning Canada as a dependable, secure and ecological supplier of key products that sustain and improve lives globally. Saskatchewan has what the world needs – critical minerals.

So, what are critical minerals? They are essentially the metals, non-metals and mineral products that are important to a region's economy and supply chain security. Many jurisdictions around the world develop a list of critical minerals for their country. The federal government has published a "list of 31 minerals considered critical for the sustainable economic success of Canada and our allies and to position Canada as the leading mining nation, as set out in the Canadian Minerals and Metals Plan." The complete list of 31 minerals is illustrated on the poster to the right.

Natural Resources Canada | Ressources naturelles Canada



CANADA'S CRITICAL MINERALS LIST 2021

ESSENTIAL TO CANADA'S ECONOMIC SECURITY

REQUIRED FOR CANADA'S TRANSITION TO A LOW-CARBON ECONOMY

A SUSTAINABLE SOURCE OF CRITICAL MINERALS FOR OUR PARTNERS

For more information, visit our website at nrcan.gc.ca/criticalminerals

Canada's list of critical minerals was prepared in consultation with the provinces, territories and industry.

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Canada

COVER

Critical minerals support clean energy by providing elements for batteries to power electronic devices and and electric vehicles.

Saskatchewan is home to 22 of the 31 critical minerals listed. Of these, three are currently being produced, helium, potash and uranium. Others, such as lithium and rare earth elements, are being considered for production. The list of Saskatchewan's 22 critical minerals compiled by the Saskatchewan Geological Survey also indicates which minerals that were previously produced [copper, nickel, platinum group metals and zinc] and have historical resources and which have defined reserves and resources [cobalt, copper, nickel, potash, rare earth elements, uranium and zinc] that could contribute to Saskatchewan and Canada's economic growth in coming years.

These critical minerals are essential to assist Saskatchewan, Canada and the world in meeting the increasing need for reliable, low-carbon energy, sustainably feeding a growing global population and continuing to improve the quality of life. Critical minerals support clean transportation by providing elements for electric vehicles and their batteries, healthcare devices, and technology advances, such as for cellular phones and computers. Producing these critical minerals is important but it's not enough.

Enhancing critical minerals value chains goes beyond just producing fertilizer, to producing agronomic products used further down the line in the agri-food supply chain. It also includes the production and processing of helium right here in Saskatchewan, which can then be sold at higher value in the fibre optics and semiconductors markets, for example.

To ensure our economic security and a timely transition to achieve a net-zero (low-carbon) economy, Canada and its provinces need to support and enhance the development of the critical minerals value chains. For Saskatchewan that means not only producing uranium ore concentrate but also having an active role in the development and deployment of Small Modular Reactors (SMRs). The signing of a recent MOU among the provinces of Saskatchewan, Ontario, New Brunswick and Alberta for the advancement of SMRs study and Natural Resources Canada's SMR roadmap demonstrate Canada's commitment to this value chain. This move is also welcomed by three northern Saskatchewan Indigenous organizations – Des Nedhe Group, Kitsaki Management and Athabasca Basin Development – which signed a Memorandum of Understanding earlier this spring in support of exploring investment opportunities to advance the development and implementation of SMR technology.

With the world's highest-grade uranium reserves located in northern Saskatchewan, uranium is a critical mineral for Saskatchewan, for Canada and for many other nations because of its strategic, national and energy security importance. Nuclear energy fueled by uranium supplies 10% of the world's electricity and constitutes 15% of Canada's power generation, including 25% of New Brunswick's electricity mix and roughly 60% of Ontario's. It is the second-leading source of carbon-free electricity on the planet, behind only hydroelectric

Canada's first rare earths producer, Cheetah Resources Saskatchewan Corp. owned by Vital Metals Ltd. joins SMA

The Nechalacho Rare Earths project, operated by Cheetah Resources Corp. and located over 100 kilometres east of Yellowknife in the Northwest Territories, started producing in early July 2021. The Nechalacho mine offers the highest-grade rare earths deposits in the world and is the first producer of these elements in Canada. After mining, crushing and sorting on site, the ore will be transported for rare earths extraction at the metallurgical processing facility in Saskatoon, Saskatchewan. As owner of the Nechalacho Rare Earth mine, Cheetah Resources is Canada's first rare earth elements producer and only the second in North America. And it is the newest member of the Saskatchewan Mining Association. Congratulations Cheetah Resources Corp. on launching the country's first rare earths production and welcome to Saskatchewan!

power. It is clear there is no viable path to net-zero emissions without nuclear energy.

Saskatchewan-based companies like Cameco and Orano have the commercial and technical expertise across the nuclear fuel supply chain to capitalize on the increasing role of nuclear power in the world's electricity supply mix. Already, uranium supplied by Cameco powers one in every nine Canadian households.

"We're seeing a clear megatrend emerge around the globe," says Tim Gitzel, Cameco's President & CEO. "That megatrend is focused on increasing electrification while simultaneously phasing out carbon-intensive sources of energy. In a world where 85% of our energy still comes from fossil fuels, and about a third of the population has little or no access to electricity, nuclear power fueled by uranium will be essential to sustainably achieve both electrification and decarbonization. We believe the net-zero emission commitments being made by countries and companies around the world will require a massive contribution from nuclear energy in order to be successful."

Today, with many countries and companies around the world setting net-zero emission targets, and with the continuing development of next-generation SMRs, nuclear energy appears poised for further growth.

Saskatchewan is also home to some of the world's largest potash reserves. There is no substitute for potash, and the world needs it to help farmers around the globe grow more food for a rising population within increasingly extreme weather conditions. Indeed, by 2050, the world population could reach almost 10 billion people, requiring more food growing capacity than ever before.

Located in northern Saskatchewan, Cigar Lake is the world's highest grade uranium mine. – Photo courtesy of Cameco Corporation.

COVER

Allan Potash Mine underground storage.
– Photo courtesy of Nutrien.

"At Nutrien, our purpose is to help grow our world from the ground up, and that is what we're doing right here in Saskatchewan starting one kilometre underground in our network of six, world-class mines. We have the people, the experience and an extensive transportation and logistics system to safely produce and supply the potash the world needs," states Ken Seitz, Executive Vice President and CEO of Potash at Nutrien.

But, as the recent "Time To Dig Deeper" multi-media advocacy campaign entitled by Saskatchewan potash producer The Mosaic Company indicates, it is not enough to have critical potash resources. The industry needs a reasonable regulatory, royalty and tax system to ensure it can compete on the global stage. Canadian potash offers many advantages - it is produced sustainably, adhering to unparalleled environmental standards that result in about 50% fewer greenhouse gas emissions compared to their foreign competitors. Our potash, however, it is significantly more costly to produce.

"Increasing costs and regulatory structures are significantly impacting our ability to compete on the global stage," says Bruce Bodine, Senior Vice President, North America for Mosaic. "Potash is a global industry with a huge national and local positive impact. There is no 'sustainability premium' added to Canadian potash nor an incentive offered to the companies who act responsibly. Deliberate and immediate action is needed to ensure Canada's potash industry moves back to the top position in production and exports by improving our overall ability to compete."

The Saskatchewan mining industry is key to the sustainability of Canada's and Saskatchewan's critical minerals supply, but governments have their parts to play too. The recent announcement of the Saskatchewan government's $31 million investment in its crown corporation SRC's Rare Earth Elements (REEs) large scale commercial processing facility is welcome news. REEs contain 17 elements essential for advanced technology products. The REEs supply market was long dominated by China before it became a net importer. Similar to uranium, REEs contain radioactive substances that have to be considered. However, Saskatchewan's expertise in uranium ore mining, processing and waste (tailings) management is an asset and will assist in making the province the hub for Canada's REEs production in the next two to three years when the SRC's facility starts operating in 2024.

Saskatchewan's Minister of Energy and Resources, the Honourable Bronwyn Eyre, highlights the importance of critical minerals, saying "to create export growth, diversify supply of critical minerals, metals and other value-added products, we want to broaden our international presence in key markets. Projects such as the REEs facility are a step in the right direction."

Beyond the government's support for mining and processing of critical minerals and the development of value-chain products derived from them, the industry also needs their support to create a reliable transportation infrastructure to move their products out to export markets.

"To create export growth, diversify supply of critical minerals, metals and other value-added products, we want to broaden our international presence in key markets. Projects such as the REEs facility are a step in the right direction."

- BRONWYN EYRE,
MINISTER OF ENERGY AND RESOURCES
GOVERNMENT OF SASKATCHEWAN

SRC's Rare Earth Elements (REEs) large scale commercial processing facility under construction (above). Rare earth element samples (right). – Photo courtesy of Saskatchewan Research Council (SRC).

Further, the world is changing and so are the markets for many of Saskatchewan's critical minerals. Global demand for these products is strongest in emerging markets like China, India, southeast Asia and the Middle East - countries where government-to-government relationships can play a major role in Saskatchewan producers' ability to get business done. A focus on commercial considerations in Canada's foreign policy and foreign affairs, including strategic, targeted support from the Government of Canada as companies look to expand existing markets and seek out new ones, is essential.

Saskatchewan's critical minerals and their value chains provide the province with an unprecedented opportunity to position itself as the premier reliable, safe and sustainable producer in the world. We have a key role to play in addressing some of the world's most pressing challenges, including transitioning to a net-zero emissions economy, feeding the growing global population, electrifying the world's energy systems and developing new technologies to improve the quality of life around the globe.

ESG:

Beyond Environmental, Social and Governance Disclosure in Mining

Water samples are collected at the Key Lake uranium mine and mill in northern Saskatchewan, as part of the operation's environmental management system. – Photo courtesy of Cameco Corporation.

The past decade has seen the rise of environmental, social and governance (ESG) disclosure and regulations in securities around the world. For the mining industry globally and right here in Saskatchewan, it has meant increased focus on ESG factors, their inherent risks and the application of best practices.

Indeed, today's investors, and the general public, expect mining companies to not only operate ethically and sustainably, but also to ensure they do everything in their power to mitigate potential environmental impacts on water, soil, land and greenhouse gas emissions. They also expect companies to protect the safety of employees, contractors and the broader community, while emphasizing local employment and procurement, and respecting Indigenous rights through a reconciliation approach. All of this has led to the development of ESG disclosure in the mining sector.

"Good ESG risk management starts with strong governance. Investors are looking for companies that have established robust policies, procedures and practices related to material environmental, social and governance risks," says Aaron White, Vice President, Sustainable Investments for CIBC Asset Management.

In securities markets, ESG analysis is rapidly becoming a substantial decision factor for investors. "This increasingly pressures investment firms to develop more robust analysis of ESG factors and will further pressure companies that are laggards in ESG risk management and reporting. The evolution of ESG analysis has also led to an increase in investment products that are catered towards sustainable outcomes. This has real implications for the cost of capital for mining companies as ESG performance will have a direct impact versus their peers," adds White.

In Saskatchewan, many mining companies were early adopters of ESG risk management and reporting. Uranium miner Cameco, for example, issued its first "sustainability report" in 2012. Cameco used the Global Reporting Initiative's Sustainability Framework (GRI) to incorporate globally recognized key indicators, in addition to some unique corporate indicators, to measure and report their performance on environmental, social and economic impacts.

"Cameco's commitment to sustainability starts at the top," says Jeff Hryhoriw, Director Government Relations & Communications at Cameco. "Our board of directors is responsible for overseeing management, strategy and the integration of sustainability and ESG principles throughout the company. ESG governance, risk oversight and disclosure are therefore regular topics of discussion at board and committee meetings. The board oversees annual corporate objective setting and approves incentive compensation for senior executives – all of which are based on performance against our four measures of success: a safe, healthy and rewarding workplace, a clean environment, supportive communities and outstanding financial performance."

Similarly, potash giant Nutrien has integrated ESG from the board of directors level all the way through to business unit operations at the employees' level. This year, Nutrien released its Feeding the Future Plan, which outlines its strategic sustainability commitments for the next ten years, with a focus on its ESG integration and targets. The company also released its second ESG report using several reporting frameworks, including the Sustainability Accounting Standards Board (SASB), the Task Force for Climate-Related Financial Disclosure (TCFD) and the GRI. These frameworks offer points of comparison with their peers and key performance metrics, some of which are geared specifically to the mining industry (e.g., tailings and waste management, employee safety, and engagement with Indigenous partners).

FEATURE

"ESG has become fully integrated into our daily operations and corporate decisions"

– TODD COAKWELL, SENIOR DIRECTOR, SUSTAINABILITY AND ESG, NUTRIEN

"We are seeing about three or four times more questions from shareholders related to ESG compared to typical shareholder questions. We have had to incorporate new information into our annual reports, presentations, press releases and quarterly conference calls to address ESG matters. It has been an opportunity to shine a light on many of our company's positive actions in this area," notes Todd Coakwell, Senior Director, Sustainability and ESG at Nutrien.

"ESG has become fully integrated into our daily operations and corporate decisions, and it is now part of our capital allocation strategy. We aim to improve upon our ESG targets and performance reporting going forward," adds Coakwell.

Climate change is among the ESG hot topics. "Climate is increasingly becoming a concern for investors, with increased scrutiny from stakeholders and policy makers," White says. "Mining companies are now working on and publishing climate & sustainability targets to reduce their carbon footprint and environmental impacts, with a clear focus on reducing absolute greenhouse gas emissions and intensity and achieving a net zero carbon within the next 20 to 30 years."

In addition to the focus on climate, White indicates that "a strong social license is required for any mining operation in any jurisdiction of the world, and this includes prioritizing local employment at all levels of the organization, ensuring robust local procurement processes, and establishing protocols for effective community investment programs."

For Saskatchewan's publicly traded mining companies, the importance of a strong social licence can be demonstrated by benefit agreements with local communities. Cameco, for example, has four collaboration agreements and one participation agreement encompassing 13 First Nations, in municipalities and Métis locals across northern Saskatchewan. It also has a memorandum of understanding with the Mississauga First Nation near its Blind River Refinery in Ontario. In these agreements, Cameco focuses on five key areas that reflect the stated needs of Indigenous and local communities – workforce development, business development, community engagement, community investment and environmental stewardship.

"Strengthening longstanding relationships and shaping them into mutually beneficial partnerships is the goal of these agreements. Working together for the benefit of all, while considering the communities' unique needs and being accountable, that's really the ultimate goal of today's ESG focus," concludes Hryhoriw.

FEATURE

Rare Earth **Elements**

WHAT ARE RARE EARTH ELEMENTS?

Rare Earth Elements (REE) comprise 17 chemical elements in the periodic table that include scandium, yttrium, and the lanthanides series (Figure 1). Despite their name, REE are not particularly rare and occur throughout the earth's crust. Unlike other common metals, however, REE are usually more dispersed, often occurring in concentrations of just tens to a few hundred parts per million. They are commonly subdivided based on their atomic weights into light rare earths, which comprise lanthanum to samarium, and heavy rare earths that include europium to lutetium plus yttrium. The heavy REE are scarcer than light REE and are therefore of higher value.

REE are a unique group of metallic elements that exhibit a range of special magnetic, electromagnetic, optical and catalytic properties. Specialized geological processes are required to define viable ore deposits of rare earths. They are also hosted in a wide variety of accessory minerals, making it more difficult to find economic concentrations.

These rare-earth oxides are used as tracers to determine which parts of a watershed are eroding. Clockwise from top center: praseodymium, cerium, lanthanum, neodymium, samarium, and gadolinium. Credit: Peggy Greb, US Department of Agriculture

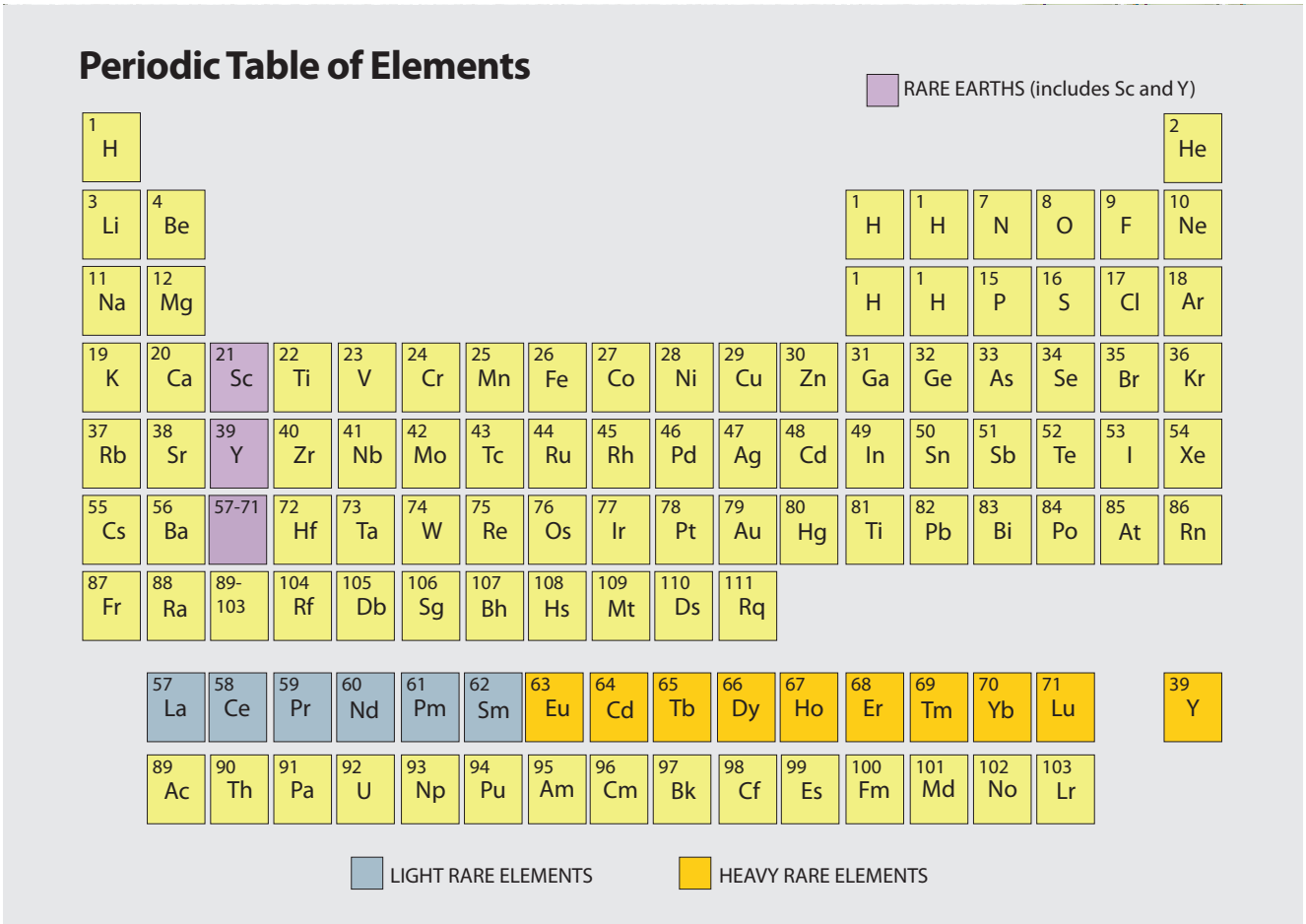


Figure 1.

WHERE ARE REE PRODUCED?

China has dominated the REE market over the past 25 years, accounting for over 90% of global production by the late 2000s. China's decision to curtail exports in 2010 caused a surge in commodity pricing and motivated new production in other parts of the world (Figure 2). China's share of global production has fallen to about 57.6%, with the USA, Russia, Burma, Australia and Madagascar contributing together 35% to the global supply. It's estimated that approximately 210,000 tonnes of rare earth oxide were mined globally in 2019.

REES AND SASKATCHEWAN

Although Saskatchewan has no current REE production, there are several deposits with promising early results and numerous occurrences that warrant further investigations.

In Saskatchewan, four main types of REE deposit types are recognized:

- monazite (light REE)-rich metamorphosed granitic pegmatites to the north and east of the Athabasca Basin;
- allanite ±apatite (light REE)-bearing veins to the north and east of the Athabasca Basin;
- mixed light and heavy REE associated with the uranium deposits in the Athabasca Basin; and
- heavy REE occurrences associated with diagenetic-hydrothermal, unconformity-related deposits of the mineral xenotime in the Athabasca Basin.

For more deposit specific information please see: https://publications.saskatchewan.ca/#/products/113933

The complex mineral assemblages hosting these deposits can make it difficult to extract the REE from the ore. In Saskatchewan, uranium and thorium often accompany REE, adding additional metallurgical processing challenges. Delivering on a key element of its 2030 Growth Plan, the Government of Saskatchewan announced $31M in funding for the establishment of a REE processing facility, which will be owned and operated by the Saskatchewan Research Council (SRC). This facility will be the first of its kind in Canada and demonstrates the province's commitment to growing the sector.

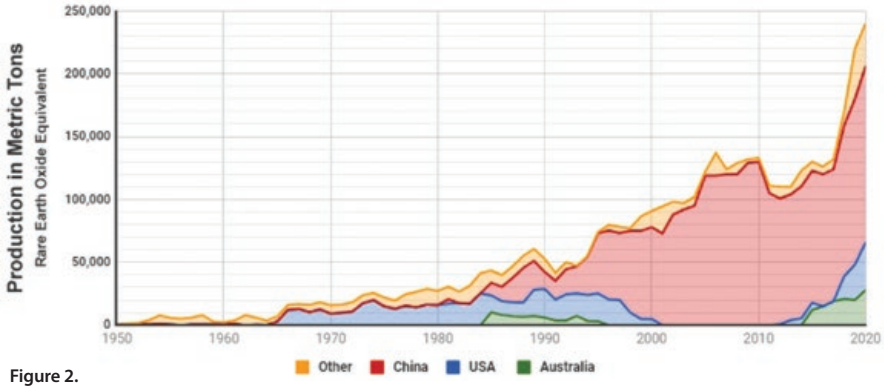


Figure 2.

VR training equipment comprised of four Quest 2 headsets with quad controllers and a Cleanbox for sanitization.

Virtual Reality Expands Safety Training Toolbox

When Saskatchewan's mining industry was declared an "essential service" early in the COVID pandemic, mining companies moved to ensure the safety of their workforce. But it wasn't only pandemic protocols being put in the place.

The Saskatchewan Mining Association (SMA)'s Safety Committee spearheaded the development of a virtual reality (VR) app to train mining industry employees on the correct use of fire extinguishers.

"As with many things during the pandemic, safety training also had to be done in a modified manner. While this was a challenge, it also provided an opportunity," says Brad Sigurdson, VP Environment, Safety and Regulatory Affairs for the SMA. "One way SMA members could capitalize on this opportunity was by recognizing that fire extinguisher training could be done in a physically distanced manner using VR technology."

The VR training project was a five-month collaboration made possible by funding from Western Economic Diversification Canada, now Prairies Economic Development Canada (PrairiesCan).

White Rabbit VR, a local Regina company, was recruited to develop the virtual reality app, with Sean Linton, Senior District Manager at Industrial Scientific, providing expert assistance as a fire extinguisher training specialist. A generous donation from the Industrial Fire and Rescue Competition (IFRC) committee provided funding for the VR equipment.

SMA Safety Committee member Katie Breeze understood that member engagement was essential to ensure the final VR training app was both realistic and relevant. According to Breeze, who is Nutrien's Senior Manager for Safety and Health, Potash, SMA member companies were enlisted to provide input in the development phase.

"Having subject matter experts provide input helped the developers with the physics of the fire in each scenario to ensure the experience is as real as it can be," Breeze says.

James Ferstl, a SMA Safety Committee member and Senior Manager of Health and Safety Services at Mosaic, North America, outlined Mosaic's participation during the development process. "We provided input on the type of fire scenarios developed, how the scenarios functioned in virtual reality and where improvements could be made. We also provided input on the instructional script to help users navigate their way through the scenarios using the VR controllers, and we tested the system on several occasions to ensure it was progressing well."

VR training welcome screen.

SAFETY

Nutrien employee participating in the VR fire extinguisher training.

> **"VR can be used as an additional tool to enhance our current training protocols and better prepare for emergency situations in a safe physical environment."**
>
> – KATIE BREEZE, SMA SAFETY COMMITTEE MEMBER AND SENIOR MANAGER, SAFETY AND HEALTH, POTASH, NUTRIEN

The final app presents users with three virtual reality scenarios—a fire in an electrical room, fire in a warehouse and fire on a construction site. Wearing VR goggles, users must react to each situation and are scored on their responses, including sounding an alarm, choosing the correct fire extinguisher, using the equipment correctly and responding to each situation appropriately.

The VR training app was completed in March 2021, a remarkable turnaround from concept to product delivery. In a random draw, Nutrien's Allan Potash Mine was chosen as the first site to receive the VR app and equipment—and Breeze was eager to see it in action.

"VR safety training is interactive, hands-on and engaging," Breeze says. "With the VR fire extinguisher training, you really feel like you're fighting a real fire."

Although the fire extinguisher training app got a kickstart because of the pandemic, the interactive element of virtual reality has many safety professionals excited about its potential in safety training.

"VR can be used as an additional tool to enhance our current training protocols and better prepare for emergency situations in a safe physical environment," says Breeze.

"It's another tool training groups c an use to build engaging training," Ferstl agrees, adding, "it's fun and different, and I think our employees will embrace it with enthusiasm."

SAFETY

Rethinking the Post-COVID Workplace

SASKATCHEWAN'S MINING COMPANIES ARE RETHINKING THEIR POST-COVID WORKPLACES BASED ON SUCCESSFUL INNOVATIONS AND LESSONS LEARNED DURING THE PANDEMIC.

Nutrien, for example, is looking to build on recent successes with virtual labour negotiations, while Orano is introducing a telework policy and K+S Potash Canada (KSPC) is exploring a return to work program.

"Working from home has made us reimagine how we've always done things, which is why we're exploring a flexible remote work program that balances employee preferences with business needs," says Chelsea Iatridis, KSPC HR Business Partner.

Developing a post-COVID return to work program requires input from all levels, and committees have been formed to consult with employees and leaders. "Our committees are exercising some creative thinking," Iatridis says. "First and foremost, returning to work needs to be as safe as reasonably possible during this pandemic. We want to ensure KSPC continues to be a supportive, healthy workplace where employees are able to thrive, whether at the worksite, a remote location or a hybrid of both."

> **"One thing the pandemic has taught us is that change can be both challenging and successful."**
>
> **– CHELSEA IATRIDIS, KSPC HR BUSINESS PARTNER**

K+S Potash employee, Shawn Maloney, at work in his office.

WORKFORCE

"One thing the pandemic has taught us is that change can be both challenging and successful," says Iatridis, who cites "agility" as one of the company's most exercised corporate values over the last year and a half. "We've had to adopt new ways to collaborate and connect with one another, which led to expanding our use of technology for things like town hall meetings and virtual workshops. Above all, we've learned how important trust and accountability are when your workforce's regular way of doing business is turned on its head, and we're thankful for having a dedicated and resilient team."

Orano Canada had a telework policy in development prior to the COVID-19 pandemic. "With the lifting of provincial restrictions this summer, this was the right time to launch it," says Carey Hyndman, Manager, Communications and Stakeholder Engagement at Orano Canada. "The policy balances flexibility for employees while maintaining the priority of in-person collaboration."

Orano has been easing employees back to the office in Saskatoon, while maintaining safety measures at McClean Lake. "Because it is a remote site, isolations and illnesses at the mill are something we want to avoid, so we have continued with our distancing and cleaning protocols, and we continue to work closely with Population Health," Hyndman says.

Despite the challenges of bringing people to the remote McClean workplace during the pandemic, Hyndman credits good communication and respect for the protocols with maintaining a safe and healthy workplace. "We're proud of our workforce," she says, "for their adherence to safety protocols and ability to remain flexible during such an extended period of change."

Trust was front and centre at Nutrien when public health regulations meant labour negotiations had to be held virtually.

"We had four different potash contracts to negotiate," says Gavin Rans, Nutrien's Senior Manager of Labour Relations. "Initially, we used a hybrid model of in-person and virtual meetings. More recently, we were negotiating in a fully virtual format, with each of us in our own home or mine site office."

The full virtual model worked well for most things but did have limitations. It was difficult for remote participants to hear at times, and the virtual platform, while stable, started to glitch at a pivotal moment.

"It's also harder to build rapport and trust virtually," Rans says. "We were fortunate that we had existing relationships, but you can't monitor body language in a virtual session, and you miss out on social aspects of the process, which help build that rapport and trust."

While it was important for participants to meet in person as negotiations got down to the wire, Rans thinks virtual negotiations would work for 95% of the items discussed. "It depends on the context, but this was an eye opener in terms of the potential benefits of using virtual technology for negotiations," Rans says, adding, "I envision us continuing to use the technology in some manner going forward."

Indigenous Business Development:

From mining suppliers to SMR investors

Sean Willy, CEO, Des Nedhe Group.

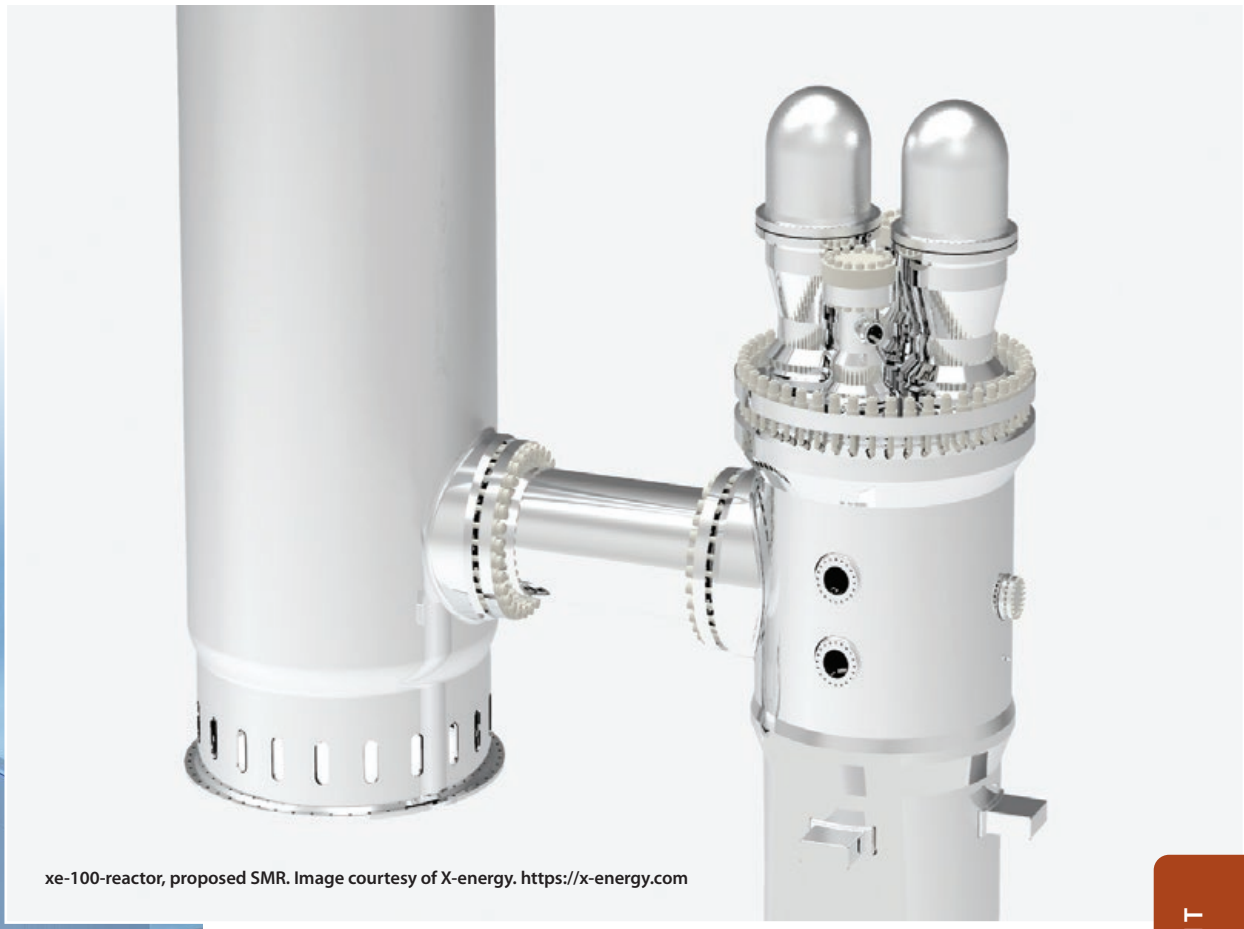
For 40 years, Indigenous organizations have been supplying goods and services to the mining industry, particularly to northern Saskatchewan uranium mines. More recently, some of them have been involved further in the nuclear fuel cycle through their work with Ontario nuclear utilities. Prompted by this long-standing experience in the nuclear industry that this past spring, Des Nedhe Group, Kitsaki Management and Athabasca Basin Development, three Indigenous business development corporations with their traditional territories in Saskatchewan's North, signed a Memorandum of Understanding (MOU) to explore investment opportunities in the field of Small Modular Reactor (SMR) advanced nuclear technology.

"All of Canada's uranium comes from our three traditional territories and, since we have supported the uranium and nuclear industry for decades, it only makes good business sense that we would work together to support and be directly invested in the next generation technology for that industry," says Sean Willy, CEO of Des Nedhe Group.

Des Nedhe's interest stems from its Indigenous roots and the importance of protecting the environment, contributing to the economic fabric of the province and the country. "We want to be involved in practical solutions to mitigate carbon in the atmosphere. SMRs are a viable option; we need to be part of the solution," states

Site rendering of the BWRX-300 SMR proposed by GEH SMR Technologies Canada Ltd. For deployment in Canada. – Photo courtesy of GE Hitachi Nuclear Energy.

> **"All of Canada's uranium comes from our three traditional territories and, since we have supported the uranium and nuclear industry for decades, it only makes good business sense that we would work together to support and be directly invested in the next generation technology for that industry."**
>
> – SEAN WILLY, CEO, DES NEDHE GROUP



xe-100-reactor, proposed SMR. Image courtesy of X-energy. https://x-energy.com

Willy. "We also want to create stable training and employment opportunities within our communities, and generate a strong revenue base for our company to provide steady dividends to our communities. A long-term power producing agreement can achieve this."

SMR advanced technology is an opportunity not only to provide electricity in highly populated areas and to power specific industries, but also to sustainably electrify remote or off-grid regions, such as rural and northern Saskatchewan. The potential SMRs offer for future business development in their region is not lost on the MOU partners.

"When you look at large energy projects, far too often First Nation, Métis and Inuit people are thought of last, when we all know that without Indigenous participation projects can no longer move forward. With this MOU, we are being proactive and progressive," Willy says.

"We want to ensure that people in industry see us as a potential partner and ally. We saw some Indigenous groups position themselves against SMRs development but as the three main entities already involved in the nuclear industry, we want to make sure people know we are supportive of this industry. We are proud of our companies and the services we provide to the uranium industry, and we want to ensure we are partners of industry as we continue on this journey," concludes Willy.

THE ROAD TO

Net Zero

Canada has set its sights on net-zero greenhouse gas (GHGs) emissions by 2050. To reach that goal, every sector of the economy needs to find more ways to reduce emissions. Although heavy industry and mining account for only four per cent of overall GHG emissions in Saskatchewan, mining companies are exploring innovative ways to further reduce emissions.

Energy generation

- 6 C — Carbon (Coal)
- 92 U — Uranium

Fluorescent lighting

- 57 La — Lanthanum
- 39 Y — Yttrium
- 65 Tb — Terbium

Production and transmission

- 26 Fe — Iron
- 29 Cu — Copper
- 13 Al — Aluminium

LED

- 31 Ga — Gallium
- 58 Ce — Cerium
- 63 Eu — Europium
- 65 Tb — Terbium

Halogen

- 26 Fe — Iron
- 74 W — Tungsten
- 24 Cr — Chromium

Canadian Mining

ENVIRONMENT

01 Electricity

Electricity travels at around 90 per cent of the speed of light.

Canada is an energy powerhouse

Electricity relies on minerals and metals to be realized. Copper is essential in both conducting electricity, and in the makeup of wind turbines which provide a greener alternative to generate the electricity used by Canadians across the country.

SaskPower's Carbon Capture and Storage (CCS) facility at the Boundary Dam Power Station. – Photo courtesy of SaskPower.

Saskatchewan's potash mining sector already stands out among global competitors for its low GHG emissions—a remarkable 50 per cent lower than other producers. The province's leading producers, Nutrien, The Mosaic Company and K+S Potash Canada (KSPC), have all announced new targets for reducing GHG emissions.

Earlier this year, Nutrien announced ambitious commitments to reduce greenhouse gas (GHG) emissions as one of the six 2030 commitments in its Feeding the Future Plan, setting a target to achieve a 30 per cent reduction in GHG emissions per tonne of products produced by 2030, using 2018 as the baseline year. Since off-site generation of purchased electricity, steam and heat is the potash division's biggest GHG emissions source, the company is exploring low-carbon power options. For example, Nutrien is set to deploy self-generated wind and solar energy at four of its potash facilities by the end of 2025.

KSPC, which has built sustainability into its greenfield Bethune mine from day one, has set a target of reducing emissions intensity from electricity generation, in partnership with its parent K+S Group, by 20 per cent by 2030.

Mosaic's 2025 ESG performance targets include reducing GHG emissions by 20 per cent per tonne of potash product produced. The company describes its proactive approach to reducing emissions as emphasizing technology and improving energy efficiency through behavioral changes, process improvements, equipment upgrades and bold solutions. For example, Mosaic has already reduced the full lifecycle GHG intensity at its Belle Plaine solution mine by self-generating the majority of on-site electricity from purchased natural gas.

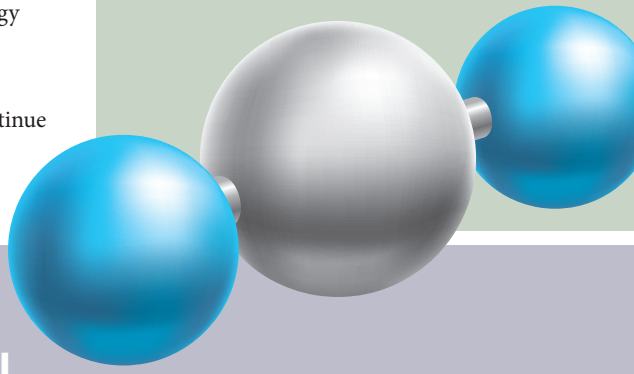
In northern Saskatchewan, Canada's leading uranium producers, Cameco and Orano, are playing a key role in reducing global GHG emissions from electricity production. That's because the energy dense uranium mined and milled in Saskatchewan fuels clean nuclear electricity around the world, preventing millions of tonnes of GHG emissions every year.

The development of small modular reactor (SMR) technology could provide carbon-free electricity with a much smaller land footprint than current reactors, a promising innovation that could help reduce GHG emissions from electrical generation, as well as generate heat thereby reducing gas consumption faster. In 2021, Alberta joined Saskatchewan, Ontario and New Brunswick in signing a Memorandum of Understanding that aims to advance the development and deployment of SMRs to address climate change, regional energy demand and economic development.

From emission reduction targets to fueling future SMR technology, Saskatchewan mining companies continue to use innovation to reduce GHG emissions and enhance their long-term sustainability.

4 Million Tonnes of CO_2 Captured

SaskPower's Carbon Capture and Storage (CCS) facility at the Boundary Dam Power Station has achieved a remarkable milestone—more than four million tonnes of carbon dioxide (CO2) captured since operations began in 2014. This is the equivalent of taking one million passenger vehicles off the road for one year. The first of its kind in the world, the Boundary Dam CCS facility is capable of reducing sulfur dioxide (SO2) emissions from the coal process by up to 100 per cent and CO2 emissions by up to 90 per cent.



World's First Carbon-Neutral Copper Project

Foran Mining's McIlvenna Bay project in east central Saskatchewan became the world's first carbon-neutral copper development project in 2021. The achievement followed the company's completion of offset purchases, which offset total project emissions for 2011-2020, including land-use changes, fuel use for exploration and travel-related emissions. Foran plans to build McIlvenna Bay, now in the feasibility stage of development, into the first mine in Canada designed to be carbon neutral from day one.

In each edition of ORE, we go beyond the official bios to give our readers insight into the leaders of Saskatchewan's mining and exploration companies.

Roger Lemaitre:

THE ART OF EMBRACING OUTDOOR LIFE

Roger Lemaitre, President and CEO of UEX Corporation

When Roger Lemaitre started university, he expected to finish with a mechanical engineering degree, but a passionate professor steered him in a whole different direction. He graduated with a geological engineering degree.

"I loved the outdoors. It was a good fit," says Lemaitre, now president and CEO of UEX Corporation. "After my degree I tried to find work in my field but the markets were depressed and exploration companies weren't hiring. So, I went back to school and did a master's degree. That's the first introduction I had to the cyclical nature of mining and exploration; no one teaches you that in university."

Before joining UEX as CEO in 2014, Lemaitre's career was marked by his love for being in the field as a geologist. He moved between major and junior exploration and mining companies, whether working for Slam Exploration Ltd., M'Ore Exploration Services, Noranda, Falconbridge, Placer Dome and Cominco. "I've outlived many of these companies," he jokes.

Saskatoon became home for Lemaitre, his wife and three children, now adults, when he first joined Cameco Corporation in 2001. It was while working for Cameco that he transitioned from technical roles to management. It was a hard transition.

"You really have to get a good grasp of the big picture and the functions and language of other areas in the organization. And managing people is harder than it seems. I enrolled in an MBA and leadership training courses. And I held on to the words of one of my mentors: 'mistakes are learning opportunities.' With that in mind, I try to empower people I work with," Lemaitre says.

"I let people make their own mistakes. I also try to mentor and encourage technical teams to own the technical decisions. After all, they're the ones in the field, and with the understanding of ground conditions. I bring the big picture to the decision-making process."

As CEO of a junior exploration company, Lemaitre raises finances from investors around the world to spend in northern Saskatchewan, exploring for critical minerals like uranium, cobalt and nickel.

> "Honour, integrity, innovation. We can live by that in the field, in the office and at home."

BEYOND THE BIO

The COVID-19 pandemic brought a new set of challenges. With his wife being a neonatal intensive care unit nurse, Lemaitre's bubble became very small very quickly, but he took it in stride.

"Many of us in the industry are used to working remotely, so adjusting to working from home was okay. The teams could still do a lot of their work in the field and I could still communicate with stakeholders. What was lost over Zoom was some creativity. For some reason, many ideas get lost over video conferencing," explains Lemaitre. "But no matter the circumstances, the key is to remain true to our personal and company core values. Honour, integrity, innovation. We can live by that in the field, in the office and at home."

When he's not living and breathing exploration and discovering ore deposits, like he has with his UEX team these past two years, Lemaitre enjoys spending time with his first grandson, Harrison. And of course, he still spends plenty of time outside.

"When I was young, I was an avid curler. Today, I do mostly outdoor activities, like kayaking, paddle boarding, mountain biking, golfing, backpacking and camping," Lemaitre says. "And as a 'do-it-yourselfer,' I even took on landscaping! I like to unplug entirely whenever I can; being outdoors I can do that."

Roger Lemaitre enjoying the outdoors in winter."

STEPHEN KITCHEN:

FROM GEOLOGY TO PROJECT MANAGEMENT TO EMERGENCY TRAINING, IT'S ALL IN A DAY'S WORK.

To say that Stephen Kitchen wears many hats is an understatement. His title is Mine Geologist, Continuous Improvement Specialist and Emergency Response Team Coordinator at Westmoreland Mining LLC coal mine in Estevan, Saskatchewan. Kitchen makes it clear that no two days are exactly the same.

"My roles and responsibilities get mixed and matched throughout the day. For example, between the May long-weekend and Labour Day, I spend a lot more time on mine exploration and development. It's the main field season," Kitchen says. "I oversee a junior mine geologist and a student, and drilling contractors at the Estevan mine and also at the Poplar River mine, located over two hours away near Coronach."

Stephen Kitchen with his girlfriend Mariah and his Australian shepherd.

When he wears his geologist hat, Kitchen's main goal is to update the mines' geological models, mapping, and the stated reserves and resources estimates. But that's only a small portion of the day. He is also part of the project management team. As a continuous improvement specialist, he helps both Estevan and Poplar River mines be more efficient and make coal mining more sustainable. "I look at ways to improve operational, maintenance, IT and financial aspects, without of course compromising safety," says Kitchen.

Westmoreland supplies the coal used to generate power at SaskPower's Boundary Dam Power Station, home to the world's first commercial carbon capture operation.

"With today's climate change discussions and decarbonization, we have to find ways to use this resource sustainably. We optimize coal quality, to reduce its ash, sulfur and moisture content," states Kitchen. "At our Estevan operation we also produce activated carbon and charcoal products, like barbecue briquets, and we look for ways to increase yields so that our stakeholders have a sustainable supply."

Kitchen doesn't end his day looking at improvement opportunities.

Since 2017, Kitchen has also been leading the Estevan mine Emergency Response Team. Although this is a volunteer position, it is quite demanding of his time.

"This is a really rewarding leadership opportunity. I get to learn very practical skills in emergency response with my colleagues. I help the team with the day-to-day of training and making sure our team is prepared in case of an emergency and also to compete at the annual Saskatchewan Mining Emergency Response and Mine Rescue Skills Competition," he says.

You would think that after those long days of moving from one project to the next, Kitchen would say that's enough. But no, the Estevan native, stays on after hours in the summer to help organize the site's annual golf tournament. "When I'm not at work, I'm either spending time with my girlfriend Mariah, and my Australian shepherd, or on the golf course," he says. "I love sharing my passion for golf."

"With today's climate change discussions and decarbonization, we have to find ways to use this resource sustainably.

Since graduating from the University of Regina, Kitchen has spent all nine years of his young career at the Estevan mine. Although he spends the majority of his workday in front of the computer, Kitchen appreciates his extra-curricular activities and the ability to go in the field to work alongside and mentor young geologists and also learn from his colleagues.

"I'm not sure what the future will bring," Kitchen says. "My career could go in so many directions with my current experience as a geologist and continuous improvements project manager. Being in the resources and energy sectors is important to me. It's important for Canada. It's exciting for our collective future. I want to keep learning and moving forward in this industry."

Saskatchewan **and the EV Battery Supply Chain**

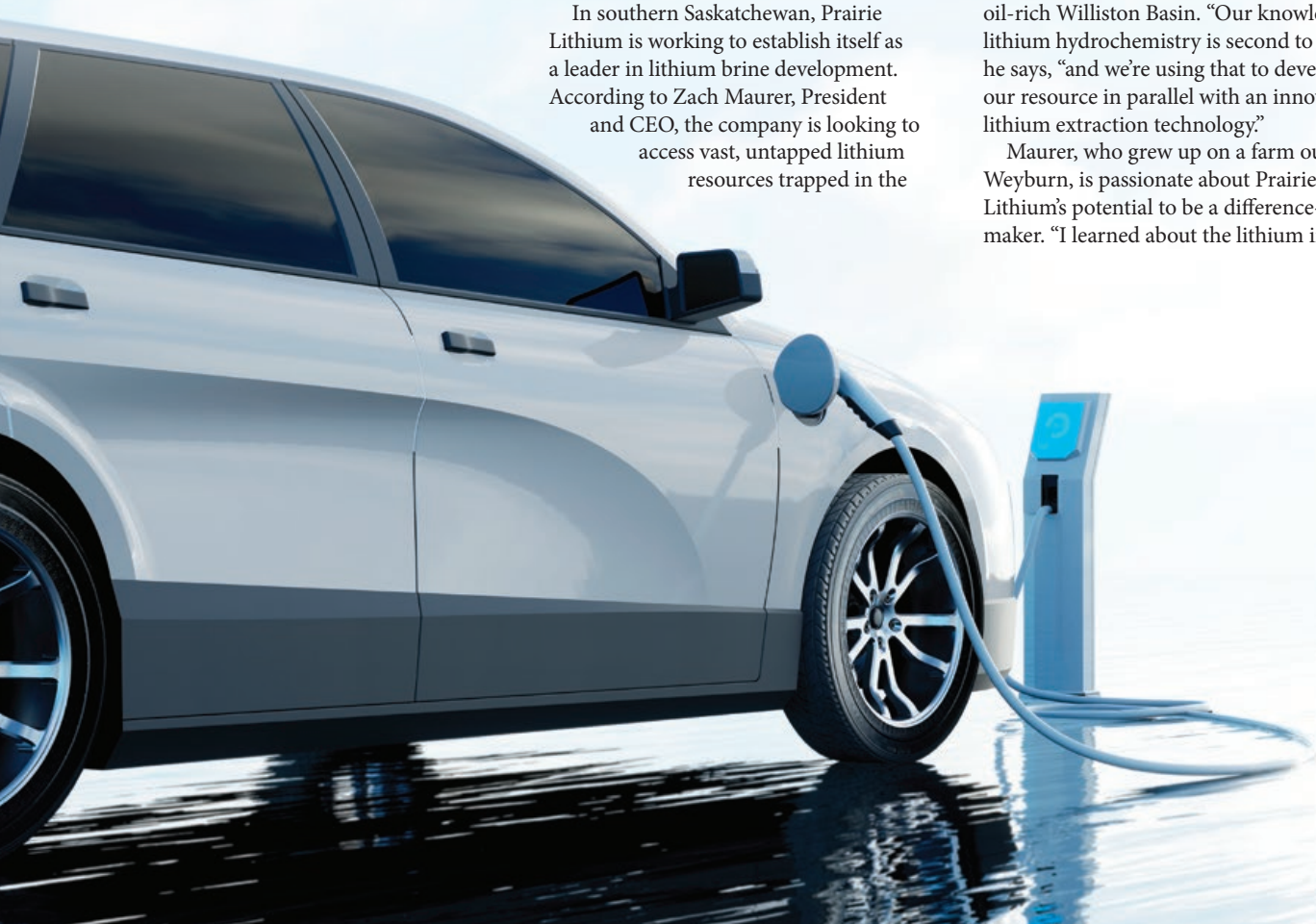
As part of its 2050 goal of net zero carbon emissions, Canada has mandated that all new light-duty cars and passenger trucks be zero-emission by 2035. In addition to being an early adopter of electric vehicles (EVs) for its operations a few years ago, Saskatchewan's mining sector could play a pivotal role in the transition to EVs by supplying two of the critical minerals used in the manufacture of EV batteries—cobalt and lithium.

Right now, North America imports the large majority of its lithium from producers in South America, Australia and China, while most of its cobalt comes from a single source: the Democratic Republic of the Congo in Africa. Canada and the U.S. are both intent on building a North American supply chain for the lithium-ion batteries used in EVs—and it begins by developing home-grown mineral resources.

Zach Maurer, President and CEO of Prairie Lithium

In southern Saskatchewan, Prairie Lithium is working to establish itself as a leader in lithium brine development. According to Zach Maurer, President and CEO, the company is looking to access vast, untapped lithium resources trapped in the oil-rich Williston Basin. "Our knowledge of lithium hydrochemistry is second to none," he says, "and we're using that to develop our resource in parallel with an innovative lithium extraction technology."

Maurer, who grew up on a farm outside Weyburn, is passionate about Prairie Lithium's potential to be a difference-maker. "I learned about the lithium in



Saskatchewan's oil and gas brine, then proposed a master's degree to the University of Regina focused on understanding the origin and evolution of lithium in the brines in Saskatchewan. I put that knowledge to work at the right time, together with the growing demand for lithium in EV batteries, and established Prairie Lithium," he says.

The company has developed a proprietary extraction process that has dramatically reduced the time it takes to extract lithium from the brine. "Traditional methods pump the brine to the surface and let the salt water evaporate in the sun, leaving the lithium in solution while the other salts precipitate out over 18–24 months. Our technology directly extracts the lithium from the brine and puts the brine back underground in hours."

According to Maurer, interest in Prairie Lithium, both its resource and its technology, has been growing over the past 12 months. "Lithium is one of 31 minerals the federal government has identified as critical for sustainable economic success, and I think it's important for Canada to develop our critical resources."

Roger Lemaitre, President and CEO of UEX Corporation, couldn't agree more, although his focus is the uranium and cobalt-nickel deposits in northern Saskatchewan's Athabasca Basin. "I'm a big fan of uranium and cobalt because they fuel clean air energy," he says.

Lemaitre was a Cameco geologist on loan to UEX when the West Bear Cobalt-Nickel deposit was first discovered in 2002. Although he's seen a lot of industry ups and downs over the years, he's optimistic about proving the potential of the West Bear project.

"For me, this is the fun part of any project," Lemaitre says. "West Bear is developable but it's not big enough on its own. We need to continue exploring. We've got a head start, because for a long time, we were the only ones actively looking for cobalt deposits in the Athabasca."

While cobalt has been the driving commodity, nickel is also important. It is used in EV batteries, and global demand is expected to increase. It is on Canada's list of critical minerals, and while it is currently mined in Ontario, Quebec, Newfoundland and Manitoba, Lemaitre thinks Saskatchewan could be the next viable producer.

Ready or not, the world is moving to EVs. Prairie Lithium and UEX are joining a growing chorus who want to see Saskatchewan step up to play an active role in North America's EV battery supply chain.


West Bear Camp. – Photo courtesy of UEX Corporation

Criss-Cross Rock

SMA Saskatchewan Mining Association

Pegmatite dyke cutting a layered metamorphic rock near Colin Lake Photographer: Svieda Ma Other Credits: Saskatchewan Geoscience Calendar 2021, Saskatchewan Geological Society

X Marks the Spot:

The layering in the grey rock developed when it was metamorphosed deep in the Earth's crust, and before the rock was intruded by the ten-centimetre-wide igneous intrusion with large crystals.

Digging Deeper:

The original grey rock was probably a sedimentary rock that was buried to a depth of about 20 km during a Himalayan-scale mountain building event about 1.8 billion years ago. The igneous intrusion, called a pegmatite, which contains large crystals of quartz (white), feldspar (pink) and biotite (black), was later intruded into the layered metamorphic rock.

Fun Fact:

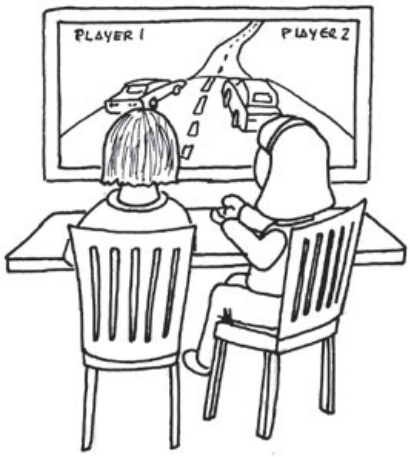
The largest crystals in the world are usually found in pegmatites. One unbelievable example is a crystal of beryl from Malakialina in Madagascar that is 18 metres long and 3.5 metres in diameter!

Did You Know?

Most pegmatites are made up of minerals that you would normally find in granites, like quartz and feldspar, but they can also contain rare and exotic minerals derived from elements like lithium, beryllium, rare earth elements and niobium. Gem-quality crystals of emerald, topaz, tourmaline and many others can also be found in pegmatites.

What's in your Computer?

Did you know we use minerals every day? The products of mining provide many essential items, including highways, electrical and communications networks and housing.



In the puzzle below, can you find the metals and minerals that make up computers, cell phones and most other high-tech gadgets?

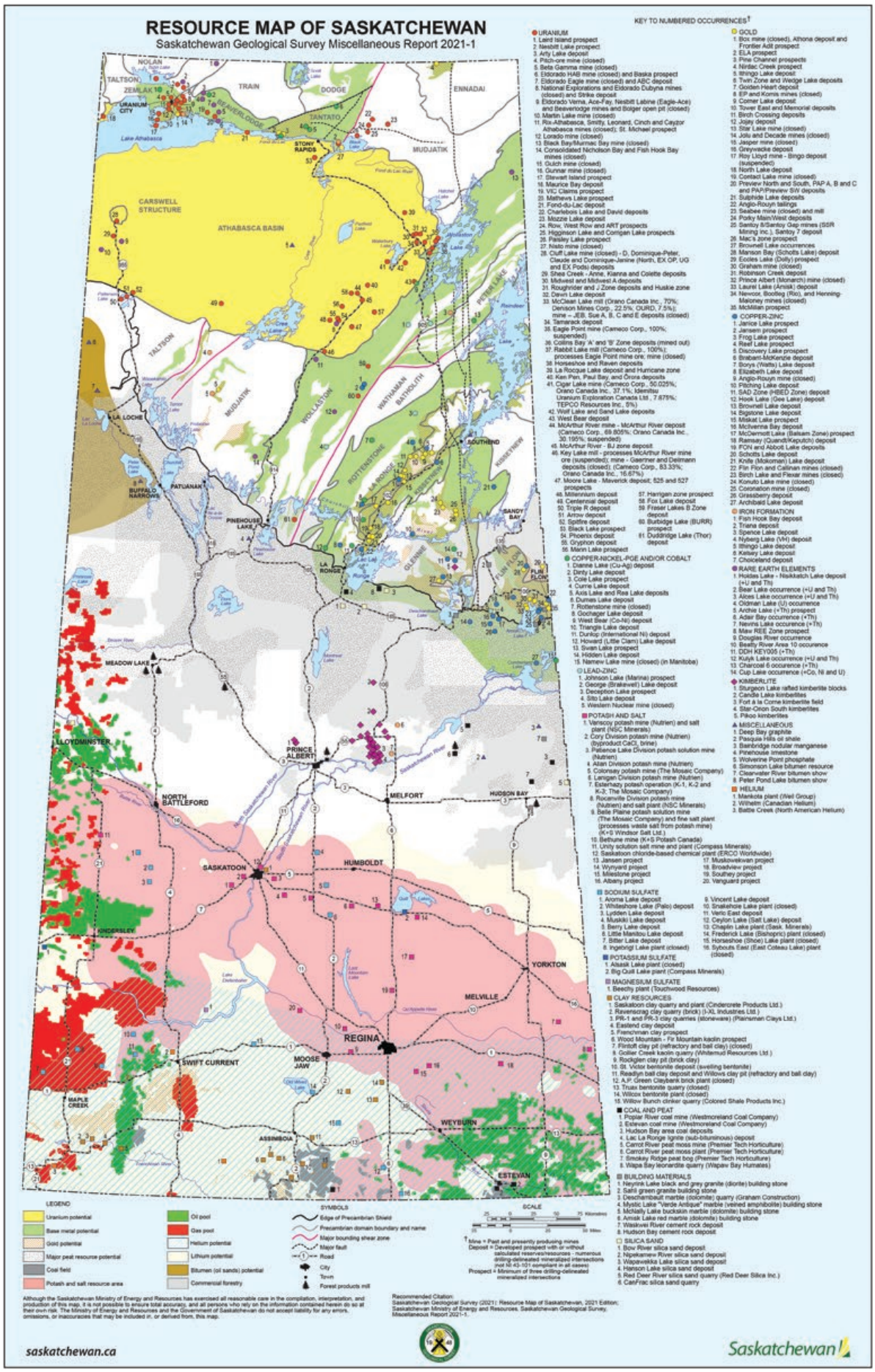
WORD BANK

ALUMINUM	COPPER	GOLD	NICKEL	TIN	ZINC
CHROMIUM	GALLIUM	LEAD	SILVER	TITANIUM	
COBALT	GERMANIUM	LITHIUM	TANTALUM	TUNGSTEN	

J	Z	D	W	P	J	M	C	S	I	L	V	E	R	D	B	T	B
L	O	C	R	I	U	S	R	T	T	U	O	N	N	S	I	U	J
Q	Z	C	H	I	J	E	B	J	I	L	M	D	S	T	B	N	R
D	X	B	L	R	C	A	R	G	E	T	V	F	L	X	T	G	U
N	T	L	X	O	O	O	G	E	R	M	A	N	I	U	M	S	X
I	A	G	I	P	B	M	F	A	T	D	V	N	D	S	P	T	B
G	N	M	O	W	R	M	I	H	M	J	U	R	I	M	B	E	C
M	T	X	X	L	M	E	M	U	Q	L	D	W	O	U	Z	N	O
U	A	D	O	D	D	B	P	U	M	V	K	V	R	K	M	F	B
N	L	T	L	L	O	Y	X	P	I	N	I	C	K	E	L	H	A
I	U	L	E	A	D	W	V	J	O	C	C	J	P	U	J	N	L
M	M	G	Z	X	K	G	C	P	H	C	G	P	C	S	I	L	T
U	O	L	E	U	S	N	D	Y	N	H	F	P	C	T	H	E	D
L	B	Q	F	B	I	H	L	A	Q	I	N	S	T	B	E	L	X
A	K	T	G	Z	O	J	V	L	I	T	H	I	U	M	I	R	V

MiningMatters.ca

BUILDING BLOCKS


RESOURCE MAP OF SASKATCHEWAN
Saskatchewan Geological Survey Miscellaneous Report 2021-1
KEY TO NUMBERED OCCURRENCES†
URANIUM
1. Laird Island prospect
2. Nesbitt Lake prospect
3. Arty Lake deposit
4. Pitch-ore mine (closed)
5. Beta Gamma mine (closed)
6. Eldorado HAB mine (closed) and Baska prospect
7. Eldorado Eagle mine (closed) and ABC deposit
8. National Explorations and Eldorado Dubyna mines (closed) and Strike deposit
9. Eldorado Verna, Ace-Fay, Nesbitt Labine (Eagle-Ace) and Beaverlodge mines and Bolger open pit (closed)
10. Martin Lake mine (closed)
11. Rio-Athabasca, Smith, Gunnard, Cinch and Cayzor Athabasca mines (closed); St. Michael prospect
12. Lorado mine (closed)
13. Black Bay/Murmac Bay mine (closed)
14. Consolidated Nicholson Bay and Fish Hook Bay mines (closed)
15. Gulch mine (closed)
16. Gunnar mine (closed)
17. Stewart Island prospect
18. Maurice Bay deposit
19. VIC Claims prospect
20. Mathews Lake prospect
21. Fond-du-Lac deposit
22. Charlebois Lake and David deposits
23. Mozzie Lake deposit
24. Row, West Row and ART prospects
25. Higginson Lake and Corrigan Lake prospects
26. Paisley Lake prospect
27. Niato mine (closed)
28. Cluff Lake mine (closed) - D, Dominique-Peter, Claude and Dominique-Janine (North, EX OP, UG and EX Pods) deposits
29. Shea Creek - Anne, Kianna and Colette deposits
30. Midwest and Midwest A deposits
31. Roughrider and J Zone deposits and Huskie zone
32. Dawn Lake deposit
33. McClean Lake mill (Orano Canada Inc., 70%; Denison Mines Corp., 22.5%; OURD, 7.5%); mine – JEB, Sue A, B, C and E deposits (closed)
34. Tamarack deposit
35. Eagle Point mine (Cameco Corp., 100%; suspended)
36. Collins Bay 'A' and 'B' Zone deposits (mined out)
37. Rabbit Lake mill (Cameco Corp., 100%); processes Eagle Point mine ore; mine (closed)
38. Horseshoe and Raven deposits
39. La Rocque Lake deposit and Hurricane zone
40. Ken Pen, Paul Bay, and Orora deposits
41. Cigar Lake mine (Cameco Corp., 50.025%; Orano Canada Inc., 37.1%; Idemitsu Uranium Exploration Canada Ltd., 7.875%; TEPCO Resources Inc., 5%)
42. Wolf Lake and Sand Lake deposits
43. West Bear deposit
44. McArthur River mine - McArthur River deposit (Cameco Corp., 69.805%; Orano Canada Inc., 30.195%; suspended)
45. McArthur River - BJ zone deposit
46. Key Lake mill - processes McArthur River mine ore (suspended); mine - Gaertner and Deilmann deposits (closed) (Cameco Corp., 83.33%; Orano Canada Inc., 16.67%)
47. Moore Lake - Maverick deposit; 525 and 527 prospects
48. Millennium deposit
49. Centennial deposit
50. Triple R deposit
51. Arrow deposit
52. Spitfire deposit
53. Black Lake prospect
54. Phoenix deposit
55. Gryphon deposit
56. Marin Lake prospect
57. Harrigan zone prospect
58. Fox Lake deposit
59. Fraser Lakes B Zone deposit
60. Burbidge Lake (BURR) prospect
61. Dudbridge Lake (Thor) deposit
COPPER-NICKEL-PGE AND/OR COBALT
1. Dianne Lake (Cu-Ag) deposit
2. Dirty Lake deposit
3. Cole Lake prospect
4. Currie Lake deposit
5. Axis Lake and Rea Lake deposits
6. Dumas Lake deposit
7. Rottenstone mine (closed)
8. Gochager Lake deposit
9. West Bear (Co-Ni) deposit
10. Triangle Lake deposit
11. Dunlop (International Ni) deposit
12. Howard (Little Clam) Lake deposit
13. Swan Lake prospect
14. Hidden Lake deposit
15. Namew Lake mine (closed) (in Manitoba)
LEAD-ZINC
1. Johnson Lake (Marina) prospect
2. George (Brakewell) Lake deposit
3. Deception Lake prospect
4. Sito Lake deposit
5. Western Nuclear mine (closed)
POTASH AND SALT
1. Vanscoy potash mine (Nutrien) and salt plant (NSC Minerals)
2. Cory Division potash mine (Nutrien) (byproduct CaCl2 brine)
3. Patience Lake Division potash solution mine (Nutrien)
4. Allan Division potash mine (Nutrien)
5. Colonsay potash mine (The Mosaic Company)
6. Lanigan Division potash mine (Nutrien)
7. Esterhazy potash operation (K-1, K-2 and K-3; The Mosaic Company)
8. Rocanville Division potash mine (Nutrien) and salt plant (NSC Minerals)
9. Belle Plaine potash solution mine (The Mosaic Company) and fine salt plant (processes waste salt from potash mine) (K+S Windsor Salt Ltd.)
10. Bethune mine (K+S Potash Canada)
11. Unity solution salt mine and plant (Compass Minerals)
12. Saskatoon chloride-based chemical plant (ERCO Worldwide)
13. Janssen project
14. Wynyard project
15. Milestone project
16. Albany project
17. Muskowekwan project
18. Broadview project
19. Southey project
20. Vanguard project
SODIUM SULFATE
1. Aroma Lake deposit
2. Whiteshore Lake (Palo) deposit
3. Lydden Lake deposit
4. Muskiki Lake deposit
5. Berry Lake deposit
6. Little Manitou Lake deposit
7. Bitter Lake deposit
8. Ingebrigt Lake plant (closed)
9. Vincent Lake deposit
10. Snakehole Lake plant (closed)
11. Verlo East deposit
12. Ceylon Lake (Salt Lake) deposit
13. Chaplin Lake plant (Sask. Minerals)
14. Frederick Lake (Bishopric) plant (closed)
15. Horseshoe (Shoe) Lake plant (closed)
16. Sybouts East (East Coteau Lake) plant (closed)
POTASSIUM SULFATE
1. Alsask Lake plant (closed)
2. Big Quill Lake plant (Compass Minerals)
MAGNESIUM SULFATE
1. Beechy plant (Touchwood Resources)
CLAY RESOURCES
1. Saskatoon clay quarry and plant (Cindercrete Products Ltd.)
2. Ravenscrag clay quarry (brick) (I-XL Industries Ltd.)
3. PR-1 and PR-3 clay quarries (stoneware) (Plainsman Clays Ltd.)
4. Eastend clay deposit
5. Frenchman clay prospect
6. Wood Mountain - Fir Mountain kaolin prospect
7. Flinoff clay pit (refractory and ball clay) (closed)
8. Gollier Creek kaolin quarry (Whitemud Resources Ltd.)
9. Rockglen clay pit (brick clay)
10. St. Victor bentonite deposit (swelling bentonite)
11. Readlyn ball clay deposit and Willows clay pit (refractory and ball clay)
12. A.P. Green Claybank brick plant (closed)
13. Truax bentonite quarry (closed)
14. Wilcox bentonite plant (closed)
15. Willow Bunch clinker quarry (Colored Shale Products Inc.)
COAL AND PEAT
1. Poplar River coal mine (Westmoreland Coal Company)
2. Estevan coal mine (Westmoreland Coal Company)
3. Hudson Bay area coal deposits
4. Lac La Ronge lignite (sub-bituminous) deposit
5. Carrot River peat moss mine (Premier Tech Horticulture)
6. Carrot River peat moss plant (Premier Tech Horticulture)
7. Smoky Ridge peat bog (Premier Tech Horticulture)
8. Wapa Bay leonardite quarry (Wapaw Bay Humates)
BUILDING MATERIALS
1. Neyinik Lake black and grey granite (diorite) building stone
2. Sahli green granite building stone
3. Deschambault marble (dolomite) quarry (Graham Construction)
4. Mystic Lake "Verde Antique" marble (veined amphibolite) building stone
5. McNally Lake buckskin marble (dolomite) building stone
6. Amisk Lake red marble (dolomite) building stone
7. Waskwei River cement rock deposit
8. Hudson Bay cement rock deposit
SILICA SAND
1. Bow River silica sand deposit
2. Nipekamew River silica sand deposit
3. Wapawekka Lake silica sand deposit
4. Hanson Lake silica sand deposit
5. Red Deer River silica sand quarry (Red Deer Silica Inc.)
6. CanFrac silica sand quarry
GOLD
1. Box mine (closed), Athona deposit and Frontier Adit prospect
2. ELA prospect
3. Pine Channel prospects
4. Nirdac Creek prospect
5. Ittinger Lake deposit
6. Twin Zone and Wedge Lake deposits
7. Golden Heart deposit
8. EP and Komis mines (closed)
9. Comer Lake deposit
10. Tower East and Memorial deposits
11. Birch Crossing deposits
12. Jojay deposit
13. Star Lake mine (closed)
14. Jolu and Decade mines (closed)
15. Jasper mine (closed)
16. Greywacke deposit
17. Roy Lloyd mine - Bingo deposit (suspended)
18. North Lake deposit
19. Contact Lake mine (closed)
20. Preview North and South, PAP A, B and C and PAP/Preview SW deposits
21. Sulphide Lake deposits
22. Anglo-Rosyln tailings
23. Seabee mine (closed) and mill
24. Porky Main/West deposits
25. Santoy 8/Santoy Gap mines (SSR Mining Inc.), Santoy 7 deposit
26. Mac's zone prospect
27. Brownell Lake occurrences
28. Manson Bay (Schotts Lake) deposit
29. Eccles Lake (Dolly) prospect
30. Graham mine (closed)
31. Robinson Creek deposit
32. Prince Albert (Monarch) mine (closed)
33. Laurel Lake (Amisk) deposit
34. Newcor, Bootleg (Rio), and Henning-Maloney mines (closed)
35. McMillan prospect
COPPER-ZINC
1. Janice Lake prospect
2. Jansen prospect
3. Frog Lake prospect
4. Reef Lake prospect
5. Discovery Lake prospect
6. Brabant-McKenzie deposit
7. Boys (Watts) Lake deposit
8. Elizabeth Lake deposit
9. Anglo-Rosyln mine (closed)
10. Pitching Lake deposit
11. SAD Zone (HBED Zone) deposit
12. Hook Lake (Gee Lake) deposit
13. Brownell Lake deposit
14. Bigstone Lake deposit
15. Miskatl Lake prospect
16. McIlvenna Bay deposit
17. McDermott Lake (Balsam Zone) prospect
18. Ramsay (Quandt/Kaputch) deposit
19. FON and Abbott Lake deposits
20. Schotts Lake deposit
21. Knife (Mokoman) Lake deposit
22. Flin Flon and Callinan mines (closed)
23. Birch Lake and Flexar mines (closed)
24. Konuto Lake mine (closed)
25. Coronation mine (closed)
26. Grassberry deposit
27. Archibald Lake deposit
IRON FORMATION
1. Fish Hook Bay deposit
2. Triana deposit
3. Spence Lake deposit
4. Nyberg Lake (VH) deposit
5. Ittinger Lake deposit
6. Kelsey Lake deposit
7. Choiceland deposit
RARE EARTH ELEMENTS
1. Holden Lake - Nisikkatch Lake deposit (+U and Th)
2. Bear Lake occurrence (+U and Th)
3. Aices Lake occurrence (+U and Th)
4. Oldman Lake (U) occurrence
5. Archie Lake (+Th) prospect
6. Adair Bay occurrence (+Th)
7. Nevins Lake occurrence (+Th)
8. Maw REE Zone prospect
9. Douglas River occurrence
10. Beatty River Area 10 occurrence
11. DDH KEY005 (+Th)
12. Kulyk Lake occurrence (+U and Th)
13. Charcoal 6 occurrence (+Th)
14. Cup Lake occurrence (+Co, Ni and U)
KIMBERLITE
1. Sturgeon Lake rafted kimberlite blocks
2. Candle Lake kimberlites
3. Fort à la Corne kimberlite field
4. Star-Orion South kimberlites
5. Pikoo kimberlites
MISCELLANEOUS
1. Deep Bay graphite
2. Pasquia Hills oil shale
3. Bambridge nodular manganese
4. Pinehouse limestone
5. Wolverine Point phosphate
6. Simonson Lake bitumen resource
7. Clearwater River bitumen show
8. Peter Pond Lake bitumen show
HELIUM
1. Mankota plant (Weil Group)
2. Wilhelm (Canadian Helium)
3. Battle Creek (North American Helium)
† Mine = Past and presently producing mines
Deposit = Developed prospect with or without calculated reserves/resources - numerous drilling-delineated mineralized intersections (not NI 43-101 compliant in all cases)
Prospect = Minimum of three drilling-delineated mineralized intersections
NOLAN
TALTSON
ZEMLAK
URANIUM CITY
Lake Athabasca
TRAIN
DODGE
ENNADAI
TANTATO
STONY RAPIDS
MUDJATIK
CARSWELL STRUCTURE
ATHABASCA BASIN
TALTSON
MUDJATIK
WOLLASTON
WATHAMAN BATHOLITH
PETERSLAKE
ROTTENSTONE
LA ROCHE
KISSEYNEW
GLENNIE
LIN FLON
LA LOCHE
BUFFALO NARROWS
PATUANAK
PINEHOUSE LAKE
SOUTHEND
SANDY BAY
LA RONGE
FLIN FLON
MEADOW LAKE
LLOYDMINSTER
PRINCE ALBERT
NORTH BATTLEFORD
MELFORT
HUDSON BAY
SASKATOON
HUMBOLDT
KINDERSLEY
YORKTON
MELVILLE
REGINA
SWIFT CURRENT
MOOSE JAW
MAPLE CREEK
WEYBURN
ASSINIBOIA
ESTEVAN
LEGEND
Uranium potential
Base metal potential
Gold potential
Major peat resource potential
Coal field
Potash and salt resource area
Oil pool
Gas pool
Helium potential
Lithium potential
Bitumen (oil sands) potential
Commercial forestry
SYMBOLS
Edge of Precambrian Shield
Precambrian domain boundary and name
Major bounding shear zone
Major fault
Road
City
Town
Forest products mill
SCALE
Kilometres
Miles
Although the Saskatchewan Ministry of Energy and Resources has exercised all reasonable care in the compilation, interpretation, and production of this map, it is not possible to ensure total accuracy, and all persons who rely on the information contained herein do so at their own risk. The Ministry of Energy and Resources and the Government of Saskatchewan do not accept liability for any errors, omissions, or inaccuracies that may be included in, or derived from, this map.
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