RING OF FIRE

puts spotlight on northern Ontario's mining industry

By Nicole Axworthy

It was a search for diamonds that first sparked a flurry of excitement in this Canadian mining story. De Beers, a world-leading diamond mining company, ventured up to a remote and inhospitable region of the Hudson Bay Lowlands in northern Ontario in 2002 in search of the precious stones. What De Beers found instead was perhaps even more valuable: strong indicators for minerals and metals like copper and zinc.

This sparked interest in the area by other companies, and one potentially commercial find led to another. The most promising of all? The first commercial quantities of chromite in North America. So massive is the opportunity that Ontario engineers and others speak of a multi-billion-dollar potential that can be mined over many decades and could conceivably supply North American needs for over 200 years.

According to a recent report by the Ontario Chamber of Commerce (OCC), this 5000-square-kilometre, crescent moon-shaped area now known as the Ring of Fire (named by Noront Resources founder Richard Nemis, a life-long Johnny Cash fan) is one of the most promising mineral development opportunities in Ontario in almost a century. The OCC report projects the Ring of Fire will create 5500 potential new jobs in the area and an economic boost of more than $25 billion across several sectors in Ontario by 2047, including $600 million within the manufacturing sector alone.

The existence of only two mining exploration camps in the Ring of Fire, including Noront Resources' Camp Esker, above, demonstrates the current lack of adequate infrastructure to support mining operations.
Photo: Noront Resources

"The development of this area of Ontario has the potential to have significant impact on the future of our province," says Sue Tessier, P.Eng., chair of the Ontario Society of Professional Engineers' (OSPE) Ring of Fire Working Group. However, she believes, as does the OSPE working group, there are many important issues that should be highlighted, particularly labour market needs and the opportunities for engineers–not only in mining but in infrastructure, energy and innovation.

"Engineers will be involved in almost every facet of the Ring of Fire, from extracting the chromite to constructing the roads and rail lines that will carry minerals to the destinations where the processing will take place," Tessier explains. "The electricity needs of the region will be harnessed by power engineers. And the environmental sustainability of the whole project will demand innovation on the part of Ontario's green industry and clean tech sectors."

WHAT IS CHROMITE?

While the project involves the potential to mine a number of rich mineral resources, the amount of chromite available has gained the most attention. Chromite is the key mined mineral in the production of stainless steel, among other products. Converted into ferrochrome using an energy-intensive smelting process, the material is subsequently used to make things like refrigerator covers, pots and pans, cell phones and surgical tools. It is highly valued for its ability to improve the properties of stainless steel–to increase hardness, toughness and resistance to corrosion. Currently, worldwide resources with the quality and quantity of chromite comparable to the Ring of Fire are limited. It is estimated the area holds at least 220 million tonnes of chromite–so completion of the project has the potential to position Ontario as a key supplier of this relatively scarce commodity.

To compare, about 22 million tonnes of chromite is mined a year around the globe. The majority of production is limited to a handful of countries: South Africa accounts for 45 per cent of global production, with production also occurring in India, Kazakhstan and Turkey. China is the global leader in the production of stainless steel and thus is the biggest importer of chromite, making up 85 per cent of global demand.

ENGINEERING CHALLENGES

Despite the economic potential, the engineering challenges arising from the project are staggering. First, the distance to get to the area is great and the terrain difficult. Transportation is by air, over water and ice. If not traveling by float plane, the area is serviced by only three small airstrips. The nearest roads are 300 km to the southwest in Pickle Lake, or 340 km to the south in Nakina. The nearest railways are about 400 km away, and major power lines are also hundreds of kilometres away. These issues, which are top of mind for engineers, government and First Nation communities, include concerns about who will pay for the necessary infrastructure and how it will be organized, planned, managed and implemented.

It has been estimated that up to $2 billion will need to be spent on roads, rail and power lines to serve Ring of Fire mines. Yet there is no consensus on where and exactly which types of infrastructure should be built to serve the region, transport materials to market or link the mines to processing plants farther south. Development of the mines and roads will also have to rely on the availability of all-weather access to deploy fuel, supplies and equipment in advance of construction.

Sorting through competing infrastructure transportation proposals–which route and whether it should be an all-weather road or rail line–is one of the many obstacles confronting the Ring of Fire project. Another consideration is the cost of bringing electricity transmission lines to the region for mines and their camps, as well as to the remote Aboriginal communities. Provincial electricity prices act as a development challenge, too.

"The problem with all those deposits is that we simply can't go up there as a private corporation and start building roads on Crown land," said Moe Lavigne, vice president, exploration and development, KWG Resources, at a recent Sudbury Chamber of Commerce event. "It's the government that needs to take the lead on having a vision on how that should take place. Individual mining companies can do all the studies on individual deposits and do the engineering and financial analysis but they can't sit down and negotiate, for example, with the First Nations on where the infrastructure might be."

"THE PROBLEM WITH ALL THOSE DEPOSITS IS THAT WE SIMPLY CAN'T GO UP THERE AS A PRIVATE CORPORATION AND START BUILDING ROADS ON CROWN LAND."
Moe Lavigne, KWG Resources

The Ontario government has taken the first step by creating a Ring of Fire Development Corporation to support infrastructure development. It is mandated to "develop, construct, finance, operate and maintain infrastructure supporting access to strategic resources in the Ring of Fire." In July, Premier Kathleen Wynne pledged $1 billion for transportation infrastructure and is calling on the federal government to match this funding.

While the mining companies are eager to clear the infrastructure hurdles, Vic Pakalnis, P.Eng., president and CEO, MIRARCO Mining Innovation, a not-for-profit research firm for the natural resources industry, says we need to look beyond a single-road solution. "Don't look at this as just an infrastructure issue," he says. "Engineers are interested in a larger vision than just roads and railways… It's a new opportunity to create a community up there that could survive the next two to three hundred years."

Marilyn Spink, P.Eng., an independent consultant to the global mining industry and lieutenant governor appointed PEO councillor, believes the key to success is good governance. With a project like this, you have only one chance to do it right, she says: "Once you've started, you can't stop and do it over again. It's similar to landing a plane–there is a point of no return, therefore you need to execute a perfect landing. Throughout the project there needs to be gating points for 'sanity checks' as the engineering progresses, that is, oversight by experienced, qualified individuals. Good engineering builds wealth. Good project governance and engineering management will ensure a successful project outcome."

"Canada, and particularly Ontario, has a depth of engineering expertise, and we will need to replace the knowledge gap created by the aging engineering workforce," Spink continues. "We need to start developing it now. We have to look at the human capital–are we preparing our youth to be tech-

The Ring of Fire belt is located about 400 km northeast of Thunder Bay in the James Bay Lowlands of northern Ontario and covers roughly 5000 square km.

nical, to be the good engineers in the right disciplines? Do we have the political will to invest long term? We're talking about billions of dollars in economic benefit to the province."

OTHER CONCERNS

Environmental concerns must be considered, too, alongside economic benefits. Impact on communities might be thought of as positive or negative, depending on the view. In northern Ontario, the Matawa First Nations, the group of Aboriginal communities closest to the Ring of Fire, have a strong voice among those who weigh in on the pros and cons of developing the mines, particularly in respect of exploration and mineral development undertaken on or near their traditional communities.

While more than 30 prospecting companies are involved with the Ring of Fire, and there are tens of thousands of claims, Toronto's Noront Resources is one of only two companies, and the only Canadian one, with a major development proposal. In 2007, Noront discovered a high-grade, nickel-copper-platinum group element deposit in the area now known as Eagle's Nest. To minimize the environmental impact from mining, the company has designed a fully underground project for Eagle's Nest. Road aggregates are planned to be sourced from underground and the voids from extracting these aggregates along with the mined-out deposit will be used to capture the mine's tailings. The result of this approach is a greatly diminished surface footprint.

"Because of the lack of bedrock, we've chosen to put a lot of our major facilities underground and we're managing our process plant so there will be no water discharge from our processing," explains Paul Semple, P.Eng., Noront's chief operating officer.

Although Noront also owns a chromite deposit, it is not developing it at the moment, focusing instead on developing Eagle's Nest.

Semple points out that one of the main challenges of the mining project is going through the environmental assessment and permitting process while concurrently negotiating with the province and First Nations. Proposed mining and infrastructure projects in the Ring of Fire require approvals under federal and provincial legislation. According to the Ontario Ministry of Northern Development and Mines, environmental assessments are rigorous undertakings intended to "identify, predict and mitigate" any effects the projects may have on the environment, and ensure potential economic, social and cultural impacts are taken into account.

Noront has volunteered to make its projects subject to a harmonized environmental assessment under the *Ontario Environmental Assessment Act* and *Canadian Environmental Assessment Act*–this means both provincial and federal agencies will work with the company to make sure its technical studies meet the requirements of both the federal and provincial legislation. If the proposal is approved, Noront can proceed with its environmental assessment report.

Noront is also required to engage potentially affected Aboriginal groups at various times during the process to allow them to identify and consider potential concerns and issues, and to provide the communities with an opportunity to get information about, and have input into, the development of the environmental assessment. Since the discovery of Eagle's Nest, Noront has spent more than $200 million on exploration, development and community engagement, including holding community open houses, where the mining projects are discussed with the chiefs of councils and the community. "We've been doing youth camps in various communities, career fairs–all kinds of activities," says Semple.

For their part, the Ontario government recently announced a framework agreement with the Matawa First Nations in an effort to move forward with mineral and community development in the remote region. The agreement sets out the principles and guidelines for more formal discussions on these issues. The province appointed former Supreme Court of Canada justice Frank Iacobussi as lead negotiator on its behalf in discussions with the chiefs of the Matawa First Nations Tribal Council. The chiefs have, in turn, appointed former premier Bob Rae as their lead negotiator.

"To be genuinely sustainable, communities need an economy," said Rae during a lecture on sustainable northern economic development at Laurentian University in March. "So we have to deal with how to ensure the development that happens will actually create work and opportunities for the people who are living there. That needs to happen. That's how you create the sustainability of communities."

ONE OF THE MAIN CHALLENGES OF THE MINING PROJECT IS GOING THROUGH THE ENVIRONMENTAL ASSESSMENT AND PERMITTING PROCESS WHILE CONCURRENTLY NEGOTIATING WITH THE PROVINCE AND FIRST NATIONS.

Spink agrees every mining project must benefit society, not just the company doing the engineering or supplying the equipment, for it to be truly successful. "The recent [OCC] report showed a really interesting graphic–a little coal cart you would think of in the 1800s. The message this coal cart conveyed is that mining isn't clean [and] the Ring of Fire is about coal. Nothing could be further from the truth," she says. "The Ring of Fire project is so much more than just a mining project; it's about mechanical engineers and electrical engineers producing the products and equipment that are going to be needed for the life of the mine, the civil and high-power electrical engineers whose designs are needed to build the critical support infrastructure, the environmental engineering required to meet permitting requirements… I don't think I will see it actually develop in my lifetime but it will be for your children and my children, possibly, who will reap the benefits. We just need good project leadership to set it off on the right course."Σ

PEO PROVIDES GUIDANCE FOR ACCEPTABLE REPORTING ON MINERAL PROPERTIES

Mining projects like those contemplated in the Ring of Fire go through several lifecycle stages, each requiring various reports, often prepared by professional engineers. PEO's guideline, *Professional Engineers Providing Reports on Mineral Properties*, focuses on what it considers to be acceptable standards of diligence, methodology and reporting for engineers providing exploration reports, scoping studies, pre-feasibility studies, final feasibility studies, due diligence reports and valuation reports–the reports typically required during a mining property's pre-development stages. It is to be used in conjunction with *National Instrument 43-101, Standards of Disclosure for Mineral Projects* and its companion documents. The guideline is available from PEO's website at www.peo.on.ca/index.php/ci_id/22096/la_id/1.htm.