



Centre of Excellence for Sustainable Mining and Exploration (CESME)

Annual Report to the Office of Research Services

June 2016

Executive Summary

In the past year CESME has achieved the following:

- Post Doctoral fellow Karl Skogstad published a report on “The Mining Industry in Northwestern Ontario: An Analysis of Recent Developments and the Strategy for Success”.
- Co-sponsored a conference on the Ring of Fire with the Bora Laskin Faculty of Law
- Supported the research of one PDF and one PhD student
- Provided two scholarships to support graduate research
- Hosted three guest speakers
- Established an Advisory Board

CESME goals & objectives

As outlined in the original proposal to the Senate Research Committee the purpose, rationale, mission and goals of the Centre of Excellence in Sustainable Mining and Exploration (CESME) are as follows:

Purpose

CESME will encourage and support research, education and outreach activities regarding the nature and impacts of mineral resource exploration and extraction particularly in Northern Ontario.

Rationale

Northern Ontario’s dynamic mining sector is booming, creating challenges regarding how best to undertake sustainable economic development while ensuring environmental protection and respecting constitutionally protected Aboriginal and Treaty rights. CESME will help address these challenges by linking Lakehead University researchers with partners from First Nation, Métis and local communities, government, and industry. This collaborative approach recognizes that Canadian natural resource development requires sophisticated planning, collaboration, assessment, implementation, and remediation strategies that are calculated to minimize negative environmental, socio-economic, and cultural impacts. CESME uses the term “sustainable” to imply reconciliation of the three pillars of environmental, social equity, and economic demands (2005 World Summit on Social Development) that is now widely recognised by the mining industry. To this end, CESME is structured under three pillars: 1) Mining, Exploration and Mineral Processing; 2) Environmental Impacts; and 3) First Nation, Métis and Local Community Engagement.

Through the Centre academic, community, government, and industry partners will carry out cutting-edge research in discovery, advanced exploration, and development, and address the environmental, social and cultural aspects of mineral extraction.

Mission

CESME will:

- Support the development of community-based research and outreach activities in both the Lakehead University community and the region as a whole;
- Generate research projects that facilitate sustainable resource development in Northern Ontario and evaluate the current and future ecological, social, cultural and economic impacts of development; and
- Apply research outcomes from Northern Ontario projects to broader sustainable development issues in other northern Canadian and international jurisdictions and apply the lessons learned in other jurisdictions to Northern Ontario.

Goals

CESME will:

- Increase the capacity for mineral deposit research at Lakehead University and enhance the reputation of the institution in the region, nationally and internationally;
- Increase the capacity for research into the environmental impacts of mining and the sustainability of this activity in Northern Ontario;
- Increase the capacity for research into the social and cultural impacts of mining, especially the involvement of local and First Nation and Métis communities and the recognition of Aboriginal and treaty rights;
- Increase the capacity for research into mining and mineral processing;
- Initiate interdisciplinary research into these fields and develop multidisciplinary research proposals for funding agencies and research partners;
- Bring together a diverse range of researchers at Lakehead University working in fields related to mining exploration, sustainable mining, and environmental and community impacts; and
- Make Lakehead University the hub for sustainable resource extraction research in Northern Ontario.

Progress towards the Centre's goals

In our original proposal to the Senate Research Committee we indicated that we would achieve the goals of the Centre by undertaking a number of activities. This section lists those activities and highlights progress made.

1. Initiate discussions with the wider community to shape the research activities of the Centre.

We have participated in meetings with a number of groups on and off campus in order to address this point. These include meetings with representatives of the mining industry (Goldcorp, Noront, SNC Lavalin), with First Nations and Métis communities (Matawa First Nations), politicians (provincial Minister of Northern Development and Mines,

Michael Gravelle) and alumni. On July 23, 2015 we held an internal strategic planning session for CESME to which all members were invited. In addition, we have co-published with the Northern Policy Institute.

2. *Generate multidisciplinary research proposals and apply for external funding*

We continue to seek additional funding to support research projects both through philanthropy and research councils. Unfortunately CESME Pillar Leader, Dr. Peggy Smith's application for an NSERC CREATE grant entitled "*Indigenous Rights and Resource Governance: Canada and Extractive Industries in the Global Perspective*" from the Pan American Indigenous Rights and Governance Network (PAIR-GN) based out of Wilfrid Laurier with research partners across Canada was unsuccessful. We have established an active collaboration with Dr. Dawn Mills from British Columbia to look at the environmental impacts of mining. This has led to a DFO funded project that will support a MSc student at Lakehead University.

3. *Invite and fund proposals for research and outreach activities*

Thanks to an excellent ongoing partnership with staff of the External Relations office, particularly Jennifer Childs and Deb Comuzzi, we have been able to secure funding for a new scholarship from SNC Lavalin that will support a PhD student working on a topic related to First Nations communities and mining. The first John R. Craig Memorial CESME Awards intended to support graduate students undertaking research related to First Nations and Métis issues were awarded to PhD student Dan Duckert (NRM) and MSc student Kristi Dysievick (Biology). We are in discussions with local partners to secure additional funding.

4. *Recruit and foster faculty, postdoctoral fellows, postgraduate, graduate, and undergraduate student participation*

As additional funding becomes available we hope to increase student participation in CESME. We successfully recruited our first PDF, Dr. Karl Skogstad, to investigate the economic impacts of mining. We have been able to support two graduate students through the John R. Craig Memorial scholarship and will soon be able to support other graduate students through the Bartley Award and the new scholarship from SNC Lavalin. As mentioned above we hope to soon have another MSc student in place working with Dr. Peter Lee and Dr. Dawn Mills.

5. *Establish working relationships with similar national and international centres (e.g., Mineral Deposit Research Unit (MDRU) at the University of British Columbia, Mineral Exploration Research Centre (MERC) at Laurentian, CODES – ARC Centre of Excellence in Ore Deposits at the University of Tasmania, Centre for Exploration Targeting (CET) at the University of Western Australia)*

We have established excellent working relationships with CET and CODES with CESME members currently co-supervising students at both institutions. In addition we are building relationships with the Centre for Excellence in Mining Innovation (CEMI) based out of Sudbury and the Pan American Indigenous Rights and Governance Network (PAIR-GN)

6. *Develop and maintain a website for the Centre*

We have established a website that highlights CESME activities and acts as a repository for our publications and videos of our guest speakers.

Members of CESME

We are thrilled to announce that we have established the first Advisory Board for CESME. The initial membership comprises:

- Mr. Peter Moses, Matawa
- Mr Glenn Nolan, Noront
- Dr. James Franklin, Consultant
- Dr. Scott Jobin-Bevans, Consultant

The service of these individuals is greatly appreciated and we look forward to working with them to strengthen CESME in the coming years.

The following faculty members have agreed to lead the three research pillars of CESME:

- Dr. Peggy Smith continues as leader of the First Nations Pillar
- Dr. Pedram Fatehi has accepted the role of leader of the Mining, Exploration and Mineral Processing pillar
- Dr. Peter Lee has accepted the role of leader of the Environmental pillar.

The following faculty members have signed up as CESME members:

Dr	Ehsan Rezazadeh	Azar	Civil Engineering
Dr	Amir	Azimi	Civil Engineering
Dr.	Matthew	Boyd	Anthropology
Dr.	Lionel	Catalan	Chemical Engineering
Dr.	Aicheng	Chen	Chemistry
Dr.	Han	Chen	Natural Resources Management
Dr.	Andrew	Conly	Geology
Dr.	Bahram	Dadgostar	Business Administration
Dr.	Jian	Deng	Civil Engineering
Dr.	Amanda	Diochon	Geology
Dr.	Martha	Dowsley	Anthropology
Dr	Karen	Drake	Faculty of Law
Dr.	A. Ernest	Epp	History
Dr.	Pedram	Fatehi	Chemical Engineering
Dr.	Philip	Fralick	Geology
Dr.	Tony	Gillies	Civil Engineering
Dr.	Scott	Hamilton	Anthropology
Dr.	Mary Louise	Hill	Geology
Dr.	Mary Lou	Kelley	Social Work
Dr.	Rhonda	Koster	Outdoor Recreation
Dr.	Thamara	Laredo	Sustainability Sciences
Dr.	Peter	Lee	Biology
Dr.	R. Harvey	Lemelin	Outdoor Recreation
Dr.	Baoqiang	Liao	Chemical Engineering
Dr.	Nancy	Luckai	Natural Resources Management
Dr	Jason	MacLean	Faculty of Law
Dr.	Douglas	Morris	Biology



Dr. Rob	Petrunia	Economics
Dr. Wensheng	Qin	Biorefining Research Institute
Dr. Chander	Shahi	Natural Resources Management
Dr. Peggy	Smith	Natural Resources Management
Dr. Darlene	Steven	Nursing
Dr. Robert	Stewart	Geography
Dr. Shannon	Zurevinski	Geology

The following adjunct faculty are also members of CESME:

Dr. Greg	Ross	NOSM
Dr. Robert	Mackereth	Centre for Northern Forest Ecosysteme Research

In addition there is one Post Doctoral Fellow (Kark Skogstad, Economics) and one PhD student (Dan Duckert, NRM) affiliated with CESME.

Research Projects & Scholarly Activities

One of the key achievements of CESME in the past year was the publication of the report on “The Mining Industry in Northwestern Ontario: An Analysis of Recent Developments and the Strategy for Success” co-authored by Dr. Karl Skogstad and Dr. Ayman Alahmar, and published by the Northern Policy Institute. The report investigated the fate of a number of mining developments in Northern Ontario in order to identify the key factors that influenced success or failure. The report received extensive coverage by regional media outlets raising CESME’s profile considerably. Copies of the report were provided to local, provincial and federal politicians and can be downloaded from <http://cesme.lakeheadu.ca>. Dr Skogstad presented the results of the report during the Annual Alumni and Friends Breakfast at PDAC

Dr. Skogstad’s activities

Derek and Joan Burney Post Doctoral Fellow Dr. Karl Skogstad is very pleased with the progress of my work during the past year. He published a report on the current state of mining in Northwestern Ontario entitled “The Mining Industry in Northwestern Ontario: An Analysis of Recent Developments and the Strategy for Success” through the Northern Policy Institute. In this report Skogstad and hi co-author, using a case study approach, were able to identify the major obstacles that mine developers are facing in the region and what steps could be taken to overcome them. These recommendations included investments in infrastructure and training to lower mine operating costs, streamlining the environmental review process in order to shorten the development stage, and clarify the rights and responsibilities of aboriginal and non-aboriginal stakeholders in order to decrease uncertainty in the industry. Skogstad presented this paper at the Nishnawbe Aski Development Fund Mining Summit in Thunder Bay and at the Prospectors & Developers Association of Canada meeting in Toronto. Additionally, the report received a good deal of media attention in Northern Ontario including interviews with CBC Radio, TBT news, and Northern Ontario Business, amongst others.

The rest of Skogstad’s time this year was devoted to the analysis of a historic dataset on Ontario gold mines from 1920 through to 1965. The Ontario Department of Mines published

mine level financial and operational data on all Ontario gold mines during this period. In general, this refinement of data is difficult to obtain and allows economists to answer some interesting questions. The first pass at the data has resulted in the writing of the paper “The Reaction of Ontario Gold Mines to World War II”. In this paper, Karl and his co-author examine how the industry reacted to changing labour market conditions throughout the war. By doing so, they are able to identify the most efficient gold mines in the province at the time and try to understand what conditions allowed these mines to become so cost-effective. They also examine how country-wide labour market restrictions implemented in the latter half of the war led to inefficiencies. Their current estimates suggest that, because of these policies, the industry as a whole lost the equivalent of one billion dollars in profit (measured in 2016 Canadian dollars).

Looking ahead, Skogstad’s research will largely consist of making further use of this historical dataset. Having looked at only the World War II years so far, he plans to extend the analysis to the entire 1920 to 1965 time period. There are two interesting policies that occurred during this period that he wishes to examine. In 1934, the price of gold suddenly increased by 70% overnight. Examining how the industry reacted to this change will provide insights as to how mines expand their operations in the face of increasing output price. A second policy was implemented in the post-war period during a time when higher production costs was leading to the closure of many mines. To stem the tide of closures the government began to subsidize gold production. Karl plans to examine the impact that this policy had on the industry, to see whether such policies have net benefits to the economy. Finally, Karl is in discussions with his co-author from “The Mining Industry in Northwestern Ontario: An Analysis of Recent Developments and the Strategy for Success” about writing another policy paper. They wish to measure empirically which mining jurisdictions in the world are most competitive when it comes to cost of operations, cost of environmental regulations, and other idiosyncratic costs. This work is still in its formative stages, and the scope of the project may change based on the availability of data.

Mr. Dan Duckert’s activities

A project titled “Going Beyond Values Mapping: Giving voice to communities about their relationships in the land and their well-being needs” is being implemented on the premise that sustainable development and sustainable mineral exploration must have a foundation of respectful and equal relationships between First Nations, Ontario and project proponents. The work is being done by North Spirit Lake First Nation and Dan Duckert, a PhD Candidate in the Faculty of Natural Resources Management and associated with CESME. The purpose of the work is to develop strategic directions in the land use planning process in order to provide an effective and respected voice of the community of North Spirit Lake in development initiatives on their territory. North Spirit Lake First Nation has initiated community based land use planning under the Far North Act and therefore all planning stages will be jointly endorsed by the Province of Ontario and North Spirit Lake First Nation. North Spirit Lake First Nation saw this as an opportunity to assert the First Nation’s claim on the shared territory and demand that not only are they equal partners in land based decision making, but that their worldview and cultural ethics will be part of the development process.

Prior to this project’s onset, land use planning initiatives included the collection of Traditional Knowledge (TK) through mapping interviews. Many areas of cultural significance were identified on maps and entered into a GIS database. This information was seen as valuable

in the creation of go / no-go zones for developers; but development from North Spirit Lake's perspective was more complex than simple zonation on a map. For one thing, there was already some mineral exploration taking place in their territory. This exploration, although confined to a relatively small area, was in close proximity to a very significant site of cultural importance. Furthermore, the targeted pegmatite bedrock that appears to contain high value lithium deposits runs in a band through the territory and underneath, and adjacent to, the community's most used waterway. As such, there are many other sites of cultural importance in direct proximity to or laying within new mining claims. The community is concerned that they will have little say over Ontario's agenda of development. Not surprisingly, speculation, cynicism, scepticism and insinuations ensued. In the end, mapping has brought to light more conflict than solutions.

Although there are conflicts and intrusions on North Spirit Lake First Nation's traditional territory, it doesn't mean they are against development. On the contrary, they want to be part of development and lead the planning of development projects through the contribution of their knowledge and ethics. They feel they can contribute to innovations in environmental stewardship and social responsibility. Considering the dominance of the western development agenda, it is unlikely that Ontario or project proponents would request the assistance of North Spirit Lake First Nation in creating innovative solutions to development projects based on their traditional knowledge and alternative worldview. North Spirit Lake First Nation's desire to co-lead must be initiated, through action, by the people of North Spirit Lake First Nation. This is the purpose behind the work of the Beyond Mapping Values project. We are engaging in community meetings, interviews and conversations to understand the type of relationships people need with the land (or within the land system) in order for them to live a life they value. With this understanding, we are creating a strategic direction for a land use plan through the development of a 'terms of reference' document that accentuates North Spirit Lake First Nation's world view and provides mechanisms for balancing the power relationships between the community and other development interest groups.

This project has been funded through support of Dr. Peggy Smith and her Giving Voice SSHRC grant and the Keewatinook Okimakanak Research Institute. Dan Duckert is the recipient of a SSHRC doctoral fellowship grant and the John R Craig Memorial CESME scholarship.

Other activities

CESME is a partner on the application "E.TROUGH – Thinking rough towards sustainability" for a collaborative project in response to the call H2020-MSCA-RISE-2016: Marie Skłodowska-Curie Research and Innovation Staff Exchange under the Horizon 2020 Programme. This project will develop a cross cutting approach going from mining (primary and secondary RM) to market. The impact of this research will be to foster collaboration and innovation both in the scientific community and in society, and promoting environmental and socially conscious behaviour in public and private domains.

CESME is a partner on Lakehead's submission to the AANDC Post-Secondary Partnerships Program. If successful this will provide funding for a coordinator to develop undergraduate programming targeted at increasing First Nations enrolment and retention.



Educational Activities

On November 13, 2015 CESME sponsored a talk by Dr. Rachel Ariss & John Cutfeet on "Kitchenuhmaykoosib Inninuwug: The Right to Self Determination, Mining and Canadian Law". The talk was attended by ~15 people.

On February 10, 2016 CESME sponsored two talks by Dr. Thomas Morris on "Northern Superior Resources Litigation vs. the Ontario Government: Are we really "Open for Business" in the Mineral Sector?" and "Northern Superior Resources TPK Project: Evidence suggesting a New Gold Camp for Ontario" (Co-hosted with CIM Thunder Bay Branch). Over 40 people attended the first talk and 15 the second.

On February 24, 2016 CESME sponsored a talk by DR. Terry Mitchell on "Self-determined development: Indigenous Rights and Resource Extraction in the Global Economy" which was attended by ~15 people.

On October 30, 2015 CESME partnered with the Bora Laskin Faculty of Law at Lakehead University to organize a conference on the Ring of Fire, a major chromite and Cu-Ni-PGE deposit in Northern Ontario. The conference featured three panels on "Sustainable Resource Development: Possibility or Pipe Dream?", "Duty to Consult: A Regional Approach?" and "Community Impact". Over 180 people registered for the conference.

Videos of these talks and copies of the presentations can be found on the CESME web site.

In March 2016 Hollings was invited to give a presentation about CESME in the Ontario Pavilion at PDAC.

In December, 2015 CESME hosted a press conference for the Ministry of Northern Development and Mines where Ministers Gravelle and Mauro announced Ontario's Mineral Development Strategy 2015.



CESME Director Dr. P. Hollings hosts a MNDM press conference



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PDF Karl Skogstad gave a number of presentations this year:

- 2015 Nishnawbe Aski Development Fund Mining Summit – Thunder Bay. Presented “The Mining Industry in Northwestern Ontario”
- 2016 Prospectors & Developers Association of Canada (Lakehead University Alumni Reception) – Toronto. Presented “The Mining Industry in Northwestern Ontario”
- 2016 Canadian Economic Association Annual Meeting – Ottawa. Presented “The Reaction of Ontario Gold Mines to World War II”
- 2016 North American Productivity Workshop IX – Quebec City. Presented “The Reaction of Ontario Gold Mines to World War II”

Undergraduate and graduate training

As discussed above we currently have one PhD student undertaking research related to CESME. We have supported two graduate students through the John R. Craig Memorial Scholarship and we have been successful in seeking funding to support CESME-related scholarships that will be used to support undergraduate and graduate research in the coming years.

We are currently in discussions with CESME faculty about the possibility of establishing a 0.5 FCE course with the theme of Aboriginal Engagement.

Financial statement

CESME is in reasonable financial health. The statement provided below covers the 2015-2016 financial year.

Item	Credit	Debit
Carry Forward	\$34,200.00	
Donations	\$8,250.00	
Intrafund transfer	\$10,431.91	
Travel & Conferences (PDAC, Roundup)		\$6,202.18
Travel (Skogstad – PDAC)		\$1,192.25
Telecommunications		\$768.60
Sessional coverage for Director		\$7,734.00
Guest speaker (Mitchell, Ariss & Morris)		\$1,515.59
Ring of Fire Conference Sponsorship		\$1,000.00
Catering		\$521.79
Subtotal	\$52,881.91	\$18,934.51
Balance	\$33,947.40	

In addition to the items listed above CESME received a \$150,000 donation from Derek and Joan Burney to support a Postdoctoral Fellow for a period of three years.

One-year and five-year plans

The immediate goals of CESME are as follows:

- Work with the initial Advisory Board to identify additional members and provide guidance for CESME
- We are in discussions to develop a 0.5 FCE undergraduate course on First Nations engagement that would be taught by members of CESME.
- We are seeking funding both from research councils and donors to support graduate and undergraduate research.
- We are considering the possibility of hosting another conference at Lakehead or alternatively providing support to other related events on campus. Specifically we are planning two workshops. One will be for CESME members to share research plans and discuss our strategic vision whereas the second will bring together representatives of the mining industry and local communities with CESME members to discuss research needs and highlight the work of Lakehead faculty.
- We continue to engage with faculty across campus to encourage them to participate in and identify CESME activities.

In the medium term we are seeking to establish three research chairs, one related to each of the CESME pillars (Mining and Exploration, Environmental Impacts and First Nation, Métis and Local Community Engagement). These chairs are critical to the long-term success of CESME as they will provide the core researchers around which Centre activities can be developed. In addition to funding the Chair we are seeking ways to support graduate students and Post-Graduate Fellows who will undertake much of the research. We are investigating a number of mechanisms to fund these chairs, including:

- The NOHFC Industrial Research Chairs program;
- Corporate donations;
- Philanthropy; and
- NSERC Industrial Research Chairs program

We are working closely with the Office of Research Services and External Relations to achieve this goal.

2016-2017 Budget*

Item	Cost
Attend PDAC meeting to promote CESME (1 x \$2,000 people)	\$4,000
Attend Roundup meeting to promote CESME (1 x \$2,000 people)	\$4,000
Conferences for CESME members	\$4,000
Teaching relief for Director (1 x \$7,800)	\$7,800
Promotional materials	\$1,000
Invited speakers	\$3,500

* Scholarships provided by CESME are not included here.

Emerging Trends

CESME activities are more important than ever in the face of changing developments and conditions in the mining sector in northern Ontario. The provincial government has made commitments to develop infrastructure to support the development of the Ring of Fire. Market conditions have contributed to Cliffs Natural Resources suspending its operations in the Ring of Fire. A breakthrough in relations with First Nation communities has been achieved through a Framework Agreement negotiated with Matawa First Nations. Environmental assessments are in process for several mining developments across northern Ontario.

Appendix

Media reports, posters and publications

Media coverage from Skogstad report

NPI Releases Mine Report

Magic FM News
Tuesday, January 26, 2016

A think tank says Ontario is missing out on billions of dollars in tax revenue with delays in proposed mining projects.

According to a new Northern Policy Institute research report, nine potential mining projects have been proposed in the North since 2010 but none have begun commercial production.

The report suggests the province make it less costly to operate a mine in the region, shorten the development period and reduce the uncertainty in the process.

The province is getting in the way of new mines: Study

By: Jonathan Migneault
Sudbury Northern Life
Jan 27, 2016

Exorbitant hydro rates, a myopic First Nations consultation process and an onerous environmental review system — a familiar trio of regulatory barriers — are hampering the development of new mines in northwestern Ontario, a new report says.

Regulatory barriers have halted the development of nine mines in northwestern Ontario since 2010, say the authors of a new report from the Northern Policy Institute.

Those nine proposed mining projects, which include Noront Resources' Eagle's Nest and Black Thor projects in the Ring of Fire, and Treasury Metals' Goliath Gold project, had the potential to create 23,000 jobs and generate an estimated

\$135.4 billion in wealth, says the mining industry report.

“As of today, none of them have started production,” said Karl Skogstad, an economics professor at **Lakehead University**, and one of the report's authors.

Rubicon Minerals Corporation's Phoenix Gold project made the list of nine mining projects, and while it was completed, turned out to be disastrous for the company.

In 2013, Rubicon estimated the deposit contained around 3.3 million ounces of gold, but it turned out to be closer to 413,000 ounces in more recent estimates.

The company suspended underground work on the project in November 2015.

Construction has started on two other projects in the list – Goldcorp's Cochenour/Bruce Channel Mine and New Gold's Rainy River Gold Project – but both have not yet started production.

Skogstad acknowledged a slump in commodity prices has impacted the current economic viability of many of the projects, but added other factors prevented their development when mineral prices were higher.

“What stopped them from developing when times were good?” he asked.

The answer, according to his report, is that high costs – especially for hydro and infrastructure – an onerous environmental review process, and a lack of clarity around Aboriginal consultations have all made it difficult for mines in Ontario to reach production.

Skogstad commended the provincial government's commitment to invest \$1 billion to build infrastructure that would connect the remote Ring of Fire mineral deposits to the rest of the province, but said the province has lagged in other areas.

Hydro rates, in particular, are higher in Ontario than in the neighboring province of Manitoba and Quebec.

“Mining is a very energy intensive industry,” Skogstad said. And without competitive hydro rates, it is difficult for Ontario operations to compete with their neighbours to the east and west of the provincial border.

Skogstad said Ontario environmental review process has not only slowed some mines from going into production, but made them unviable. When mines in Ontario compete with mines around the world, there is a big advantage to being the first to market, said Skogstad.

When a mine starts producing before a competitor, he said, it can often sell its minerals at a higher price, before the market is flooded and prices go down.

“The fact we have high environmental standards, I think is limiting the number of mines constructed in the region,” he said. “What do we value more, the construction of mines or protection of the environment?”

As for Aboriginal consultations, Skogstad said many First Nations lack the expertise and experience to properly negotiate with mining companies. The province could supply funds, he said, to help them hire consultants and make the process easier.

A landmark Supreme Court of Canada decision in 2014 has also made the consultation process more complicated, Skogstad said.

In a unanimous decision, the court said Indigenous Canadians own their ancestral lands, unless that ownership was signed away in treaties with the government.

Skogstad said the government needs to provide more clarity as to what those rights entail.

If all levels of government make efforts to remove the barriers outlined in his report, Skogstad said Ontario's mining companies could be more well prepared to go into production when commodity prices inevitably bounce back.

Please scroll 11:05 for the TBTv news story from Tuesday, Jan. 26:

<https://www.youtube.com/watch?v=Yz9BPN3dWAw>



**Canadian Institute of Mining and
Metallurgy
Thunder Bay Branch**

and



are pleased to present:



CIM Guest Lecturer

Dr. Tom Morris, *P.Geo.*

(President and CEO, Northern Superior Resources Inc.)

7:00 p.m., Wednesday, February 10, 2016

Tony & Adams, 45 South Court Street

Northern Superior Resources TPK Project: Evidence Suggesting a New Gold Camp for Ontario

The TPK gold-silver- copper property is a unique exploration project in northwestern Ontario, located just 150 km due west of the “Ring of Fire”. Within this large property (30 km by 20 km) there exist two large and independent mineral systems: 1) a gold-bearing shear system (at least 24 km long) extending from which is thought to be the second-largest gold grain-in-till dispersal apron in North America; and 2) a newly discovered greenstone belt, from which mineralized boulders were glacially dispersed, returning as high as 727 g/t gold, 111 g/t silver and 4.05% copper.

Free Admission

Cash Bar

All are welcome!

***For further information, please contact:
Mark Smyk 475-1107***



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Free Public Lecture



Presents Guest Speaker

DR. TOM MORRIS

President and CEO

Northern Superior Resources (NSR)

Northern Superior Resources Litigation vs. the Ontario Government: Are we really “Open for Business” in the Mineral Sector?

Northern Superior Resources (NSR) has a long and successful history of First Nation engagement in Ontario, Québec, Nunavut and Saskatchewan. This effort has in part lead to NSR receiving several prestigious awards, including the TSX-V's Top 50 Company Award (2011), an Ontario Business Achievement Award for Corporate Governance (2011); the Prospector of the Year Award in Québec (2012); and the Canadian Council for Aboriginal Business, Progressive Aboriginal Relations Award (2013 and 2014).

Despite best efforts, and having been led to believe that Ontario was truly “Open for Business” as advertised by the Ontario Government, NSR lost access to three key mineral properties in the Sachigo Lake area of Northwestern Ontario. This after not one, but three, First Nations informed NSR in writing that the Company was no longer welcome to explore in the area despite the Company's stellar efforts to accommodate First Nation interests. After careful consideration over a 12 month period regarding the events leading to the expulsion of NSR from the Sachigo Lake area, the Company felt it had no option but commence litigation against the Ontario Government.

This presentation will: 1) summarize events leading up to the expulsion of NSR from the Sachigo Lake area; 2) summarize NSR's claims against the Ontario Government and the messaging and potential implication(s) to industry from the Ontario Government's response to NSR claims; 3) provide a comparison of NSR's exploration engagement in other jurisdictions to NSR's experience in Ontario; and 4) provide suggestions for creating an environment to encourage and foster exploration.

BIOGRAPHY

Dr. Morris (President and CEO) is a registered, Professional Geoscientist with 30 years of experience, successfully managing and making mineral discovery on a variety of exploration programs for provincial and federal governments, private sector and publicly traded companies. Under his management, Northern Superior was recognized as one of the top 50 companies listed on the TSX-V (2011), was awarded the Ontario Business Achievement Award for Corporate Governance (2011), was awarded the Quebec Prospector of the Year Award by the Association de L'Exploration Minière du Québec (2012) and attained Progressive Aboriginal Relations “Par Committed” status from the Canadian Counsel for Aboriginal Business (2013, 2014). Dr. Morris has also obtained the Institute of Corporate Directors (ICD.D) designation.

FEBRUARY 10, 2016

AT: 1:00 pm

IN: CB 3031



Lakehead
UNIVERSITY



CENTRE OF EXCELLENCE FOR
**SUSTAINABLE MINING
& EXPLORATION**

Free Public Lecture



Presents Guest Speaker

Dr. Terry Mitchell

Associate Professor, Psychology Laurier & Balsillie School of International Affairs
Director, Indigenous Rights and Social Justice Research Group
Wilfrid Laurier University

Self-Determined Development: Indigenous Rights and Resource Extraction in the Global Economy

BIOGRAPHY

Dr. Terry Mitchell is an associate professor in the Faculty of Science at Wilfrid Laurier University and the Balsillie School of International Affairs. She is a community psychologist working within a scientist/practitioner model and a registered clinical psychologist with a private practice. She is first and foremost a mother of a 15 year old daughter - Lily.

Terry is the Director of the Laurier Indigenous Rights and Social Justice Research Group and founder of the Pan-American Indigenous Rights and Governance Network. She served as the Coordinator of Laurier's Community Psychology Program from 2007-2010 and was the Executive Director of the Laurier Centre for Community Research Learning and Action from 2008-2012. With First Nations in Prince Edward Island, she developed ASH (Aboriginal Survivors for Healing), a center for survivors of residential schools funded by the Aboriginal Healing Foundation (1998). Terry has also worked as a visiting scholar at the Institute of Indigenous Studies at the Universidad de La Frontera, in Chile. Her research focuses on the political origins of colonial trauma, Indigenous rights, intercultural dialogue and resource governance.

FEBRUARY 24, 2016 AT: 3:00 pm IN: AT 2021



Free Public Lecture

Presents Guest Speakers

DR. RACHEL ARISS
and **JOHN CUTFEET**

Kitchenuhmaykoosib Inninuwug: The Right to Self-Determination, Mining and Canadian Law

BIOGRAPHY

John Cutfeet was band councillor for Kitchenuhmaykoosib Inninuwug (KI), with responsibility for Lands and Environment from 1999 to November 2007. He is currently VP of Communications for Wataynikaneyap Power. He also works with the Wildlands League coordinating watershed work with Aboriginal communities, and as a freelance translator. John has long worked on mining issues, Indigenous rights, Development and Peace, and has been involved in solidarity work in El Salvador, Mexico (Mesoamerica) and London England. John lives in KI and continues to engage in the traditional pursuits of living off the land.



Dr. Rachel Ariss' (SJD University of Toronto) research analyzes the relationships between law, social justice and change, and how law shapes (and misshapes) community. Her research projects include Aboriginal land rights and mining; the duty to consult and accommodate Aboriginal peoples and provincial policy; and how midwives understand social change work since midwifery was regulated in Ontario. She was a member of Lakehead University's Sociology Department from 2003 to 2010 and currently teaches in the Legal Studies Program at the University of Ontario Institute of Technology in Oshawa, Ontario.

Rachel and John have written together on the issues arising from KI's legal dispute with Platinex Inc., publishing an article in the Indigenous Law Journal "Kitchenuhmaykoosib Inninuwug First Nation: Mining, Consultation, Reconciliation and Law" in 2011 as well as a book, Keeping the Land: Kitchenuhmaykoosib Inninuwug, Reconciliation and Canadian Law, with Fernwood Publications in 2012.

DATE: **NOVEMBER 13, 2015** AT: **2:00 pm** IN: **ATAC 1007**

Thank you for attending our conference. An overview of the day, as well as video recordings of the panelist presentations, will be available on our website shortly.

law.lakeheadu.ca



The Bora Laskin Faculty of Law,
along with The Centre of Excellence
for Sustainable Mining and Exploration,
are pleased to welcome you to a conference
examining the 'Ring of Fire'

October 30th, 2015

Paterson Auditorium, 3rd floor

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OVERVIEW

This conference provides an opportunity to hear from all sides affected by the Ring of Fire development in Ontario’s Far North. This development has been described as the most promising mineral development opportunity in Ontario in almost a century, with a multi-generational potential of chromite production, and a significant production of nickel, copper and platinum. While the economic development opportunity is significant, the environmental effects and impact on Aboriginal communities must be considered. The Ring of Fire development pertains to two of the Bora Laskin Faculty of Law’s mandates: environmental and natural resources law and Aboriginal law and issues.

There will be three panels. Each panelist will deliver brief remarks, followed by a Q&A period and discussion.

AGENDA

8:00am	Registration (main floor) and Coffee (third floor)
8:30am	Opening Prayer - Elder Isabelle Mercier Greetings from Fort William First Nation - Chief Peter Collins Greetings from the Métis Nation of Ontario - Bryanna Scott, President of the Thunder Bay Métis Council
9:15am	Welcome from Interim Dean Lisa Philipps, Bora Laskin Faculty of Law
9:30am	Panel 1: Sustainable Resource Development: Possibility or Pipe Dream? Moderated by Dr. Pete Hollings, Lakehead University Geology Dept., and Director of the Centre of Excellence for Sustainable Mining & Exploration (CESME) <ul style="list-style-type: none">Janet Sumner, Executive Director, Canadian Parks and Wilderness Society Wildlands League (CPAWS)Glenn Nolan, Vice President, Aboriginal Affairs, Noront ResourcesJason MacLean, Assistant Professor, Bora Laskin Faculty of Law

10:45am – 11:00am	Coffee Break
11:00am	Panel 2: Duty to Consult: A Regional Approach? Moderated by Prof. Jason MacLean, Assistant Professor, Bora Laskin Faculty of Law <ul style="list-style-type: none">Bryce Edwards, Negotiator for Matawa First Nations, Partner at OKT LLPDavid de Launay, Deputy Minister, Ministry of Northern Development and MinesDavid Good, Department of Earth Sciences, Western University
12:15pm – 1:15pm	Lunch , served in the second floor hallway
1:15pm	Panel 3: Community Impact Moderated by Ms. Leslie de Meulles, 2L Student & LSS President, Bora Laskin Faculty of Law <ul style="list-style-type: none">Anna Betty Achneepineskum, Deputy Grand Chief, Nishnawbe Aski NationStuart Kirsch, Professor of Anthropology, University of MichiganKyle Stanfield, Director of Environment & Sustainability, New Gold Inc.
2:30pm	Closing Remarks - Dr. Pete Hollings
2:40pm	Closing Prayer - Elder Isabelle Mercier
3:00pm - 4:00pm	Reception for those who wish to stay and engage in further discussion

THE VALUE OF MINERAL PRODUCTION IN ONTARIO

MINING IS AT OUR CORE

\$3.4B

in non-metallic minerals,
including diamonds, was
produced in Ontario in 2015

\$3.4B

in gold

\$1.5B

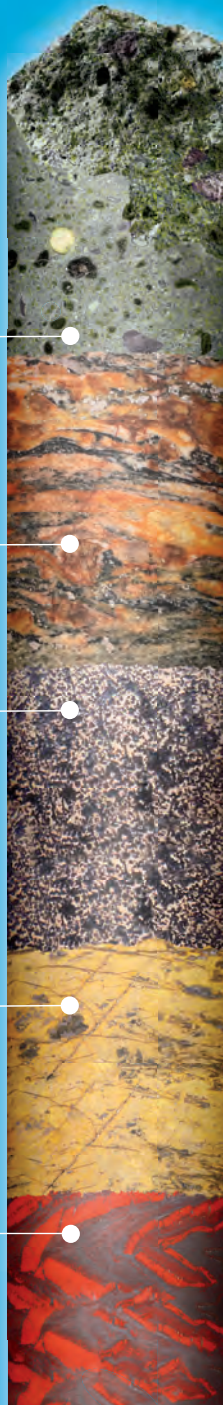
in nickel

\$1.3B

in copper

\$1.2B

in other metals such as
cobalt, platinum
and silver



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Ontario Pavilion Seminar Schedule

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PDAC ONTARIO PAVILION SEMINAR SCHEDULE

MARCH 6–9, 2016

SUNDAY, MARCH 6

Ontario's Business Climate

- 10:30 – 10:45 am Northern College –
Haileybury School of Mines
- 10:45 – 11:00 am Lakehead University
Center of Excellence for
Sustainable Mining and Exploration
- 11:00 – 11:15 am Northern Centre for
Advanced Technology

Mineral Sector Investment and Opportunity

Gold in Unconventional Settings

- 11:30 – 11:45 am Ontario Geological Survey
- 11:45 – 12:00 pm Ardiden Ltd.
- 12:00 – 12:15 pm Zenyatta Ventures Ltd.
- 12:15 – 12:30 pm Avalon Advanced Materials Inc.
- 12:30 – 12:45 pm KWG Resources Inc.
- 12:45 – 1:00 pm MDN Inc.
- 1:00 – 1:15 pm Pele Mountain Resources Inc

Gold in the Shadow of Head Frames

- 1:30 – 1:45 pm Ontario Geological Survey
- 1:45 – 2:00 pm Wesdome Gold Mines Ltd.
- 2:00 – 2:15 pm Kirkland Lake Gold Inc.
- 2:15 – 2:30 pm Detour Gold Corp.
- 2:30 – 2:45 pm Richmond Mines Inc.
- 2:45 – 3:00 pm Premier Gold Mines Ltd.

MONDAY, MARCH 7

Morning Agenda

Ontario's Business Climate

- 9:30 – 10:00 am Mining Act Modernization
- 10:00 – 10:30 am Northern Ontario
Heritage Fund Corp.
- 10:30 – 11:00 am Mineral Development Strategy
- 11:00 – 11:15 am Aboriginal Participation Fund

Mineral Sector Investment and Opportunity

Nickel-Copper-PGM's in Ontario

- 11:30 – 11:50 am Ontario Geological Survey
- 11:50 – 12:20 pm Wallbridge Mining Company Ltd.
- 12:20 – 12:40 pm Transition Metals Corp.
- 12:40 – 1:00 pm Noront Resources Ltd.

Afternoon Agenda

Ontario Pavilion Official Opening

- 1:00 pm The Honourable Michael Gravelle,
Minister of Northern Development
and Mines**

Ontario's Business Climate

- 2:00 – 2:30 pm Ontario Prospectors Association
- 2:30 – 3:00 pm Mining Act Modernization

Mineral Sector Investment and Opportunity

Gold in the Shadow of Head Frames

- 3:00 – 3:15 pm Ontario Geological Survey
- 3:15 – 3:30 pm Champagne Resources Ltd.
- 3:30 – 3:45 pm Melkior Resources Inc.
- 3:45 – 4:00 pm Red Pine Exploration Inc.
- 4:00 – 4:15 pm Pure Gold Mining Inc.

TUESDAY, MARCH 8

Ontario's Business Climate

- 9:30 – 10:00 am Mining Act Modernization
- 10:00 – 10:30 am Aboriginal Affairs Branch

Mineral Sector Investment and Opportunity

New Gold Horizons

- 10:45 – 11:00 am Ontario Geological Survey
- 11:00 – 11:15 am New Gold Inc.
- 11:15 – 11:30 am Harte Gold Corp.
- 11:30 – 11:45 am Transition Metals Corp.
- 11:45 – 12:00 pm Treasury Metals Inc.
- 12:00 – 12:15 pm Rapier Gold Inc.
- 12:15 – 12:30 pm Gowest Gold Inc.
- 12:30 – 12:45 pm Chalice Gold Mines Ltd.
- 12:45 – 1:00 pm Goldeye Explorations Ltd.

Ontario's Business Climate

- 2:30 – 3:00 pm Mining Act Modernization





NORTHERN
POLICY INSTITUTE

INSTITUT DES POLITIQUES
DU NORD

Research Paper No. 6 | January 2016

The Mining Industry in Northwestern Ontario:

An Analysis of Recent Developments and the Strategy for Success

By Karl Skogstad and Ayman Alahmar

northernpolicy.ca

Who We Are

Some of the key players in this model, and their roles, are as follows:

Board: The Board of Directors sets strategic direction for Northern Policy Institute. Directors serve on operational committees dealing with finance, fundraising and governance, and collectively the Board holds the CEO accountable for achieving our Strategic Plan goals. The Board's principal responsibility is to protect and promote the interests, reputation, and stature of Northern Policy Institute.

President & CEO: Recommends strategic direction, develops plans and processes, and secures and allocates resources to achieve it.

Advisory Council: A group of committed individuals interested in supporting, but not directing, the work of Northern Policy Institute. Leaders in their fields, they provide advice on potential researchers or points of contact in the wider community.

Research Advisory Board: A group of academic researchers who provide guidance and input on potential research directions, potential authors, and draft studies and commentaries. They are Northern Policy Institute's formal link to the academic community.

Peer Reviewers: Ensure specific papers are factual, relevant and publishable.

Authors and Research Fellows: Provide independent expertise on specific policy areas as and when needed.

Standing engagement tools (general public, government stakeholders, community stakeholders): Ensure Northern Policy Institute remains responsive to the community and reflects THEIR priorities and concerns in project selection.

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Charles Cirtwill

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This report was made possible through the support of our partners Lakehead University, Laurentian University and Northern Ontario Heritage Fund Corporation. Northern Policy Institute expresses great appreciation for their generous support but emphasizes the following: The views expressed in this commentary are those of the author and do not necessarily reflect the opinions of the Institute, its Board of Directors or its supporters. Quotation with appropriate credit is permissible.

Author's calculations are based on data available at the time of publication and are therefore subject to change.

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About the Authors

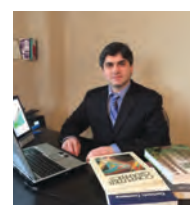
Dr. Karl Skogstad



Dr. Karl Skogstad holds the Derek and Joan Burney Postdoctoral Fellowship in the Department of Economics and the Centre of Excellence

for Sustainable Mining and Exploration (CESME) at Lakehead University. Dr. Skogstad uses empirical methods to conduct research in two broad areas: The economic impact of mining in Northern Ontario and the economics of national defence. In regards to the former, his current research focus involves examining the efficiency and productivity of Ontario's gold mining industry during World War II. With regards to the latter, his research focuses on how countries interact when setting defence budgets and the effectiveness of Canada's navy in the Second World War. He holds a PhD and Master's degree in economics from Queen's University as well as an Honours Bachelor's degree in economics from Lakehead University.

Dr. Ayman Alahmar



Dr. Ayman Alahmar is an Associate Professor of Mechanical Engineering and Information Systems with more than ten years of

university teaching and academic/ industrial research experience. He recently joined the Faculty of Business Administration at Lakehead University and received the Master of Business Administration (MBA) degree in 2015. He is currently working as a Research Assistant at Lakehead University and as an independent consultant and researcher.

Executive Summary

In the early 2010s, Northwestern Ontario seemed to be on the verge of a major mining boom, with nine projects in particular seen as having the best chance of reaching the commercial production stage. With these mines and the five already in operation, it seemed possible that a total of fourteen mines could be operating in the region by the end of 2018. So far, however, none of the nine projects — with resource wealth valued in 2012 at US\$135.4 billion, potential tax revenues exceeding C\$16 billion, and predicted to create over 23,000 direct, indirect, and induced new employment positions — has begun commercial production, and only three might be operational by 2018.

The development of these projects has faced major challenges, including labour shortages, a lack of sufficient and coordinated consultation processes with First Nations and communities, the inadequacy of infrastructure — particularly in terms of the lack of rail, roads, and electrical power — the long environmental review process, taxation, the lack of access to capital, the need to foster collaboration between communities, the low level of involvement of supply and services firms and organizations operating in the region, and, above all, the volatility of commodity markets. The unpredictability of commodity prices combined with the length of time between the exploratory stage and the commercial production stage has meant that some mines were not able to act fast enough to capitalize on commodity prices when they were high.

Little can be done to overcome the fundamental economic conditions of the commodity market. If commodity prices are low, many projects will remain economically unfeasible, and the region's mineral wealth will remain in the ground until prices make it profitable for the resource to be extracted. However, capital and operating costs — particularly the cost of electricity, which is higher

in Ontario than in other Canadian mining jurisdictions could be reduced, which would make the projects viable at lower commodity prices. With interest rates at historic lows, now is also the time to invest in energy production and transmission, as well as in other infrastructure, which would help make Northwestern Ontario's mines more internationally competitive. Another reason for high operating costs is the high cost of labour and the shortage of skilled labour in Ontario's mining sector; thus, providing incentives to students to train in this area in the region's post-secondary educational institutions should be a priority.

The mining sector could also be helped by shortening the development period of projects — particularly by reducing the time required for the environmental permitting process. For instance, funds could be made available to allow firms to hire the additional staff necessary to conduct reviews more quickly, and to allow local communities, both Aboriginal and non-Aboriginal, to hire the necessary professionals to help them quickly understand the potential environmental costs of projects. If the time it takes to open up a mine is shortened, more mines could ride the next wave of high commodity prices to the production phase.

Finally, clarity needs to be provided in dealing with Aboriginal groups. Many firms have been able to come to mutually beneficial agreements with Aboriginal stakeholders, but others have been unable to do so. This issue makes it difficult to secure investors, as any agreement ultimately could affect a mine's profitability. The rights of both parties should be made explicitly clear, so that the two sides can negotiate more easily over the project's benefits.

Ultimately, the reason for the failure of most of the nine projects to develop came down to their low expected profitability, but with improvements in infrastructure and labour supply, lower operating costs, a faster environmental permitting process, and better relations with Aboriginal groups, the next time commodity prices rise, the region might indeed experience the mining boom that was predicted three years ago.

Introduction

In the early 2010s, there was a belief that Northwestern Ontario was on the verge of a major mining boom. Exploration and development in the Ring of Fire and, indeed, in the entire region was progressing rapidly, driven by high mineral prices. Nine projects in particular were seen as having the best chance of reaching the commercial production stage. Combined with the five mines already in operation, it was believed that a total of fourteen mines could be operating in the region by the end of 2018. Various reports detailed the potential economic benefits that could arise, as well as the challenges that needed to be overcome (Dadgostar et al. 2012; S.-L. Inc. and E.H.D. Consulting 2013). At the time of writing this study, however, none of these nine projects had begun commercial production, and it appears that only three of them might be operational by 2018. The purpose of this study is to analyse recent developments in the mining industry by examining these nine projects to determine what factors ultimately will lead to their success or failure. Our hope is that, by identifying trends in the data, we will be able to recommend a strategy for success to improve the likelihood that future mining projects in the region will reach the commercial production stage.

As of 2015, five mineral mines were operating in Northwestern Ontario:

- Red Lake Gold Mines, operated by Goldcorp Inc.;
- Musselwhite Mine, operated by Goldcorp Inc.;
- Williams Mine (Hemlo), operated by Barrick Gold Corporation;
- Lac des Iles Mine, operated by North American Palladium Ltd.; and
- Victor Diamond Mine, operated by De Beers Canada.

The three gold mines — Musselwhite, Red Lake, and Williams — are all relatively old, with the youngest, Musselwhite, having opened in 1997. Lac des Iles, primarily a palladium producer, began operations in 1993, while the Victor mine is the youngest, having begun production in 2008.

Development of the region's mining sector during the late 1990s and early 2000s was relatively slow, owing mostly to low commodity prices. As prices rose, so too did mining development. As of 2012, eighty-two mining projects were at various stages of development (Dadgostar et al. 2012). Included in this number

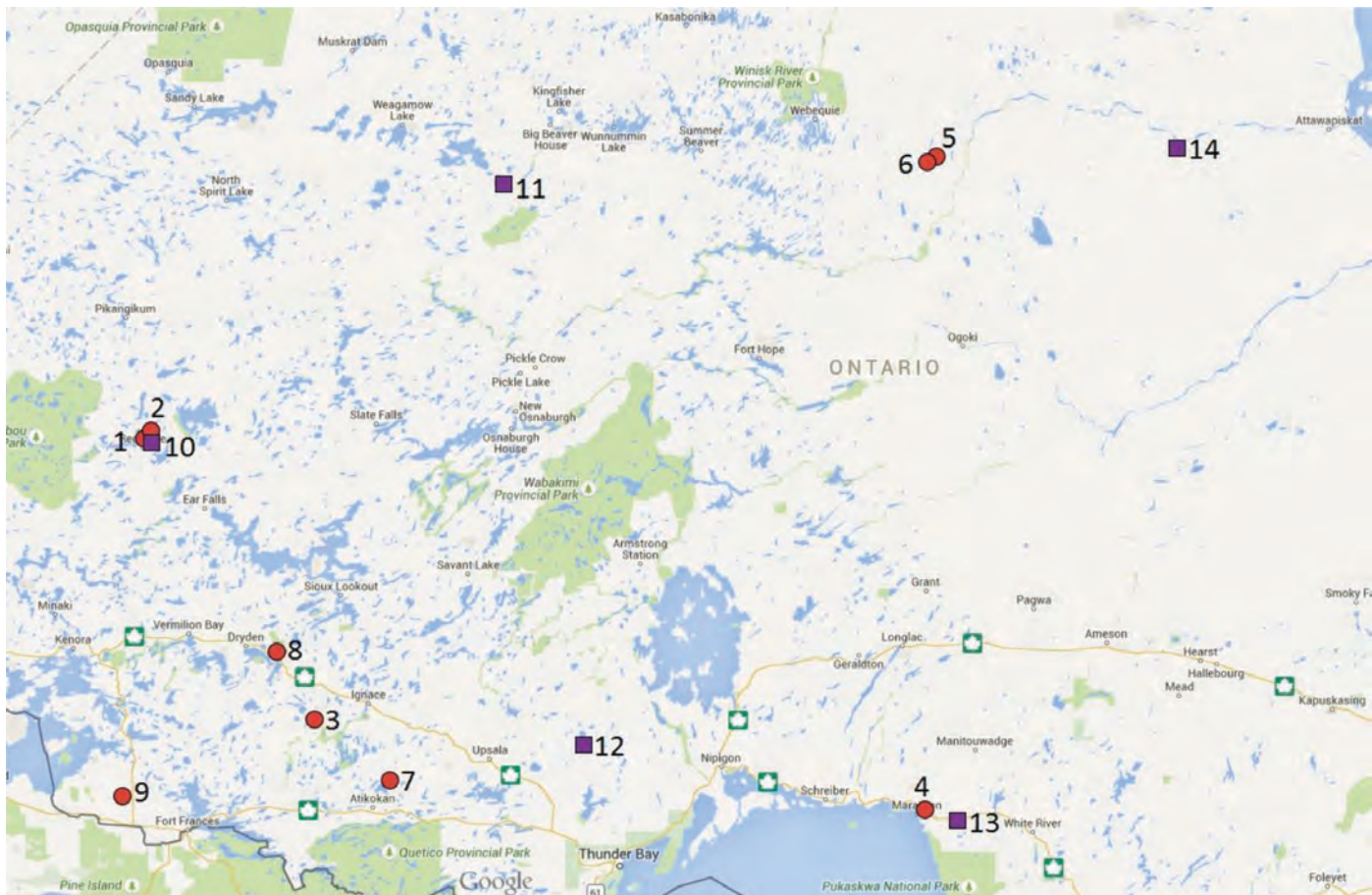
were nine projects described as “mature exploration projects” because they were expected to move from exploration to production in the near future — that is, between 2013 and 2017. These nine mature exploration projects (and their current owners) are as follows:

- Cochenour/Bruce Channel (Goldcorp Inc.);
- Phoenix Gold Project (Rubicon Minerals Corporation);
- Josephine Cone Mine (Bending Lake Iron Group Ltd.);
- Marathon Cu-PGM Deposit (Stillwater Mining Company);
- Black Thor (Noront Resources Ltd.);
- Eagle's Nest (Noront Resources Ltd.);
- Hammond Reef (Canadian Malartic Corporation);
- Goliath Gold Project (Treasury Metals Inc.); and
- Rainy River Gold Project (New Gold Inc.).

Figure 1 shows the locations of these nine projects as well as those of the five currently operating mines. Even though the nine projects were considered mature in 2012, have resource wealth valued at US\$135.4 billion, were expected to generate tax revenues exceeding \$16 billion (all dollar values are Canadian dollars unless otherwise stated), and were predicted to create over 23,000 direct, indirect, and induced new employment positions (Dadgostar et al. 2012), none had started commercial production as of November 2015. Despite these substantial benefits, previous reports showed there are challenges in developing these projects, which we consider in this study, with special attention to changing economic conditions, the availability of infrastructure, the shortage of trained workers, local Aboriginal support, and the length of the environmental permitting process. We show, however, that some of these obstacles are more easily overcome than others.

The study is organized as follows. We begin with a summary of previous studies of mining projects in Northwestern Ontario. We then provide a summary of the movement of commodity prices over the past decade, followed by analyses of the nine mature exploration projects. We then assess likely future commodity price movements, and offer conclusions and recommendations in the final two sections.

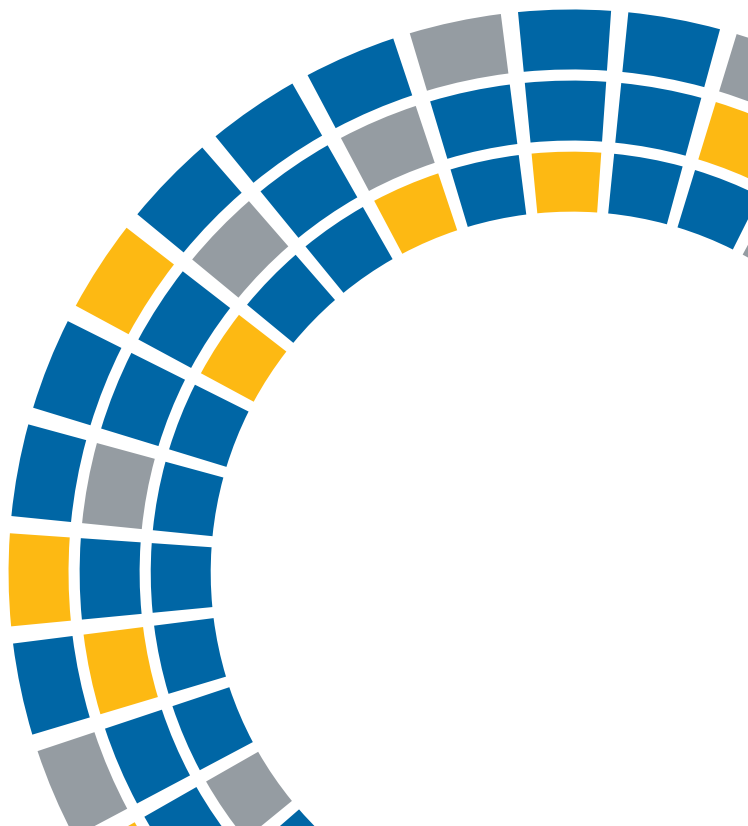
Figure 1: Operating Mines and Mature Exploration Projects, Northwestern Ontario, 2012



Circles are sites under development; squares are operating mines.

1. Cochenour/Bruce Channel (Goldcorp Inc.)
2. Phoenix Gold Project (Rubicon Minerals Corporation)
3. Josephine Cone Mine (Bending Lake Iron Group Ltd.)
4. Marathon Cu-PGM Deposit (Stillwater Mining Company)
5. Black Thor (Noront Resources Ltd.)
6. Eagle's Nest (Noront Resources Ltd.)
7. Hammond Reef (Canadian Malartic Corporation)
8. Goliath Gold Project (Treasury Metals Inc.)
9. Rainy River Gold Project (New Gold Inc.)
10. Red Lake Gold Mines (Goldcorp Inc.)
11. Musselwhite Mine (Goldcorp Inc.)
12. Lac des Iles Mine (North American Palladium Ltd.)
13. Hemlo Mine (Barrick Gold Corporation)
14. Victor Diamond Mine (De Beers Canada)

Source: Authors' compilation, from Google Earth.



Previous Studies

The most recent reports on the mature exploration projects we investigate in this study are *Mining in Northwestern Ontario: Opportunities and Challenges* (Dadgostar et al. 2012) and *Advantage Northwest: Mining Readiness Strategy* (S.-L. Inc. and E.H.D. Consulting 2013). Here we highlight the relevant results of these reports as they relate to these nine mining projects.

Mining in Northwestern Ontario found that the nine projects were well advanced through the development stage and could become active mines by 2017. It estimated the total value of the metals and minerals that could be extracted from these mines to be US\$135.4 billion (at commodity prices as of June 1, 2012). The mines were expected to generate direct, indirect, and induced employment growth of 23,588 new jobs in the province, and the potential tax revenue for all three levels of government was conservatively estimated to exceed \$16 billion. At the same time, however, the study identified three major challenges to the development of these projects: Aboriginal involvement, labour market dynamics, and the availability of infrastructure in terms of rail, roads, and electrical power.

Advantage Northwest examined ten mining projects that were anticipated to become operational by 2017 — namely, the nine mature exploration projects plus an expansion project at an existing mine (Lac des Iles). The study estimated that the growth of the mineral sector from the ten projects would create about 10,000 full-time equivalent positions per year over a ten-year period and economic revenues to Northwestern Ontario of between \$1 billion and \$1.7 billion per year. The estimated total economic impact on the Ontario economy over the ten years ranged from \$14.92 billion to \$20.89 billion, with much of the benefit remaining in Northwestern Ontario. The study also indicated that the projects faced a number of obstacles: labour shortages, the need to consult Aboriginal peoples, the inadequacy of infrastructure, mining regulation and taxation (for example, in the form of long environmental review processes), economics barriers such as lack of access to capital, the volatility of commodity markets, challenges in fostering collaboration between communities, a lack of understanding of the benefits of the mining sector, and the low level of involvement of supply and services firms and organizations operating in the region.

What both studies make clear is that, as of 2012 and 2013, there was a belief that Northwestern Ontario was about to witness a mining boom. Challenges certainly had to be overcome, but it was expected that the nine projects would bring substantial economic benefits to the region, the province, and the country. Understanding why these benefits never materialized is the focus of the rest of this study.



Commodity Price History

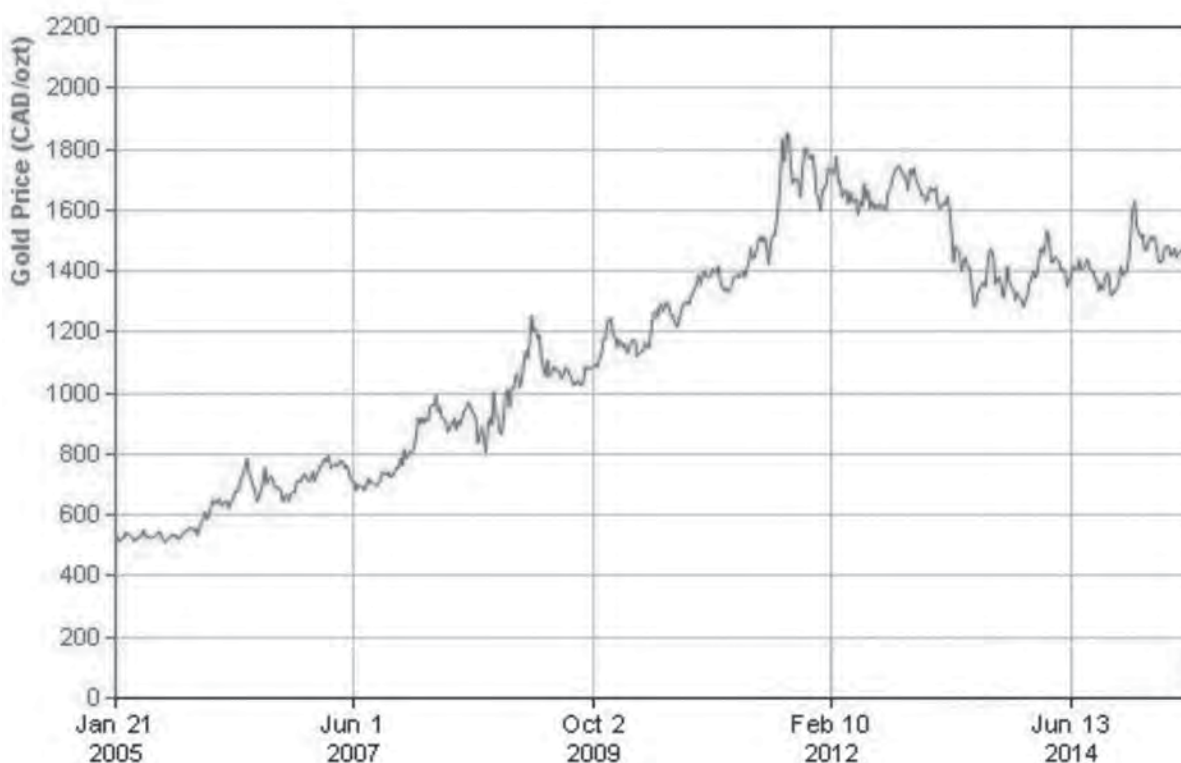
The first step in examining the mining development sector in Northwestern Ontario over the past few years is to understand how commodity prices have changed. Commodity prices have a significant influence on mining activities because the profitability of mining projects is highly dependent on market prices. Mining firms respond in direct correlation to the movement of commodity prices. As prices rise, resources that were uneconomical can now be extracted at a profit. Firms begin the environmental permitting process and conduct feasibility studies, in the hope that their project will become operational quickly enough to take advantage of higher commodity prices. As prices fall, some projects are no longer expected to return a profit, and development of these sites stop.

Figures 2 and 3 show the price of gold over the past decade in both Canadian and US dollars. From 2005 to 2012, there was a clear upward movement in the price, tripling in value over that period. As the price rose, a number of gold projects in Northwestern Ontario began to move through the development cycle. Since 2012, however, the price of gold has fallen, particularly, as Figure 3 shows, when measured in globally traded US dollars. The price has not fallen as much when valued in Canadian dollars because of the recent depreciation of that currency against the US dollar.

The role of the exchange rate is important for mines operating in Canada, since most of their production costs are valued in Canadian dollars. On the other hand, when these mines sell their output on global markets, they receive payment in US dollars. All things being equal, when the Canadian dollar depreciates in value against the US dollar, mines in Ontario profit. For instance, the sale of 100 ounces of gold at US\$1,500 per ounce at an exchange rate of 1:1 would yield revenue of \$150,000, but at an exchange rate of 0.75:1 the sale would yield \$200,000. Figure 4 shows the Canadian-US dollar exchange rate over the past ten years. Besides the short depreciation caused by the 2008 recession, the two currencies traded near parity between 2007 and 2012. Since 2013, however, the value of the Canadian dollar has fallen against the US dollar, with the result that falling commodity prices have not had as large an effect on mines in Ontario than otherwise might have been the case.

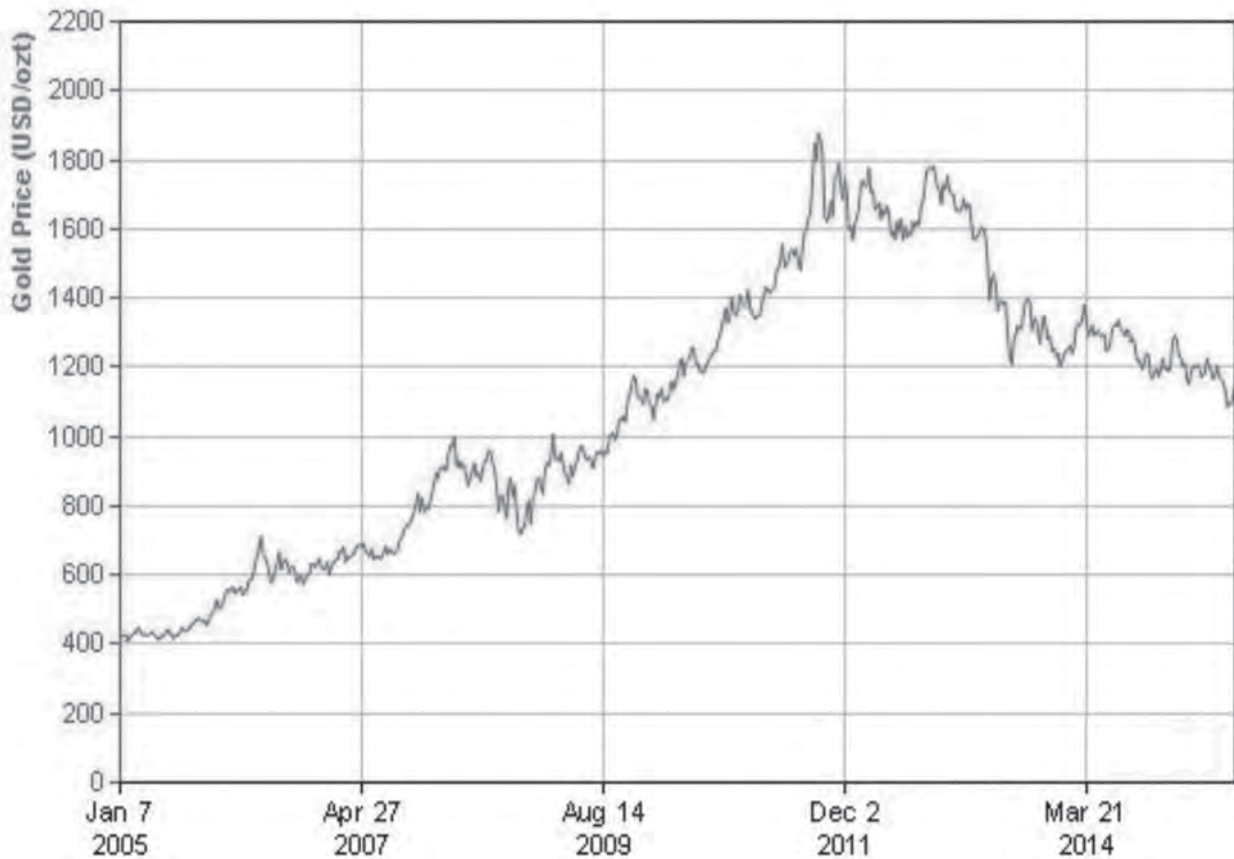
The prices of silver, copper, nickel, platinum, palladium, ferro chrome (chromite), and iron (pellets) for the past ten years can be found in the figures in the Appendix. The figures of prices in US dollars show that most of these resources have followed the same pattern as gold, with an inverted U-shaped curve indicating a

Figure 2: Gold Prices in Canadian Dollars per Troy Ounce, 2005–15



Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure 3: Gold Prices in US Dollars per Troy Ounce, 2005–15



Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

rise in commodity prices in the late 2000s, followed by a decline. The timing of the peak in price differs depending on the resource. Gold peaked in late 2011/early 2012, silver in 2011, copper also in 2011 after a serious fall during the 2008 recession, and nickel in 2007. The price of palladium appears to have peaked in 2014, but its recent fall might not be indicative of an overall downward trend. The price of platinum peaked in 2008 before the recession, fell dramatically, recovered, and then began to fall again in 2011. The price of ferro chrome, which best reflects the price of chromite, peaked in 2008 prior to the recession, fell dramatically, and has remained low ever since. The price of iron pellets peaked in 2011 and has continued downward ever since.

The recent decline in the prices of these commodities is less obvious, however, when looked at in terms of Canadian dollars because of the depreciation of that currency. That is, the falling value of the Canadian dollar has sheltered Canadian mines from the full effect of the price drops, which implies that projects that certainly would no longer be feasible had the exchange rate remained at parity might still be viable. Even in Canadian dollars, the change in these resource prices demonstrates just how volatile commodity

markets can be. Gold at one time was over \$1,800 an ounce, but at the end of August 2015 was trading at around \$1,530 an ounce. Also at the end of that month, silver was down to around \$20 an ounce from its high of over \$45, nickel was down to \$6.09 a pound from its high of around \$27 (a drop of over 75 percent), and ferro chrome was trading at \$1.25 a pound, down from its high of \$2.75.

Commodity prices are difficult to predict. For example, at the beginning of 2013, when gold prices were continuously rising, many major gold mining managers, commercial banks, and other experts predicted the price of gold would rise well above US\$2,000 per ounce (see Trustable Gold 2013). As the figures in the Appendix make clear, however, this did not happen. This unpredictability in commodity prices combined with the long time (in Canada) between the exploratory stage and the commercial production stage poses a big challenge for the mining industry. As we show in the next section, some mines were not able to deal with this challenge by acting fast enough to capitalize on commodity prices when they were high.

“The **falling** value of the Canadian dollar has sheltered **Canadian** mines from the full effect of the price **drops**. . .

Figure 4: The Canadian-US Dollar Exchange Rate, 2005–15



Source: Bank of Canada.

. . . which implies that **projects** that certainly would no longer be **feasible** had the exchange rate remained at parity might still be **viable**.”

Analysis of Individual Projects

In this section, we provide an analysis of each of the nine projects listed previously. The goal is to identify which factors were essential in helping some projects develop and which factors hindered the development of others. We pay particular attention to economic factors, the availability of infrastructure, community support, Aboriginal support, the availability of labour, and the environmental permitting process. We also include a timeline noting important events that occurred during each project's development.

To facilitate the comparison of the various projects, we present a series of tables that provide detailed information on various factors relating to each project. We should note that feasibility reports for some projects have not been made public; in such cases, we used various other sources to provide as much detail as possible. We have separated the projects into three groups, based on the minerals being extracted. Table 1 provides information on the five gold projects, Table 2 on the two platinum group metal projects, and

Table 1: Gold Projects, Northwestern Ontario, 2015

	Project				
	Phoenix	Goliath	Rainy River	Hammond Reef	Cochénour
Financial					
Revenues (LOM) (\$ millions)	3,127.00	1,143.20	4,795.00	4,742.30	N/A
Initial capital expenditure (\$ millions)	224.00	93.80	931.00	681.54	496.00
Sustaining capital expenditure (\$ millions)	426.00	106.00	366.30	175.38	N/A
Operating costs (LOM) (\$ millions)	1,378.00	579.40	2,514.00	2,568.70	N/A
Cash cost per ounce of gold milled (\$)	629.00	731.00	737.00	502.00	350.00
All-in cost per ounce of gold milled (\$)	926.00	913.00	1,080.00	658.00	N/A
Operational					
Tonnes milled per year (thousands)	689	875	7,670	17,500	548
Average gold grade (LOM) (grams per tonne)	8.06	2.87	1.12	0.71	N/A
Ounces of gold recovered (LOM) (thousands)	2,190	793	3,402	5,119	5,000
Ounces of silver recovered (LOM) (thousands)	N/A	1,892	6,004	3,808	N/A
Recovery (%)	92.50	96.85	90.60	93.00	93.60–97.50
Life of mine (years)	13.3	10.3	13.6	15.0	20.0
Workforce size (number of employees)	335	200	150–606	417–527	N/A
Return on investment					
Net present value (5%), after tax (\$ millions)	531.00	144.30	330.00	458.40	N/A
Internal rate of return after tax (%)	27.0	32.4	11.3	15.2	N/A
Payback period (years)	3.7	2.8	5.5	4.6	N/A
Assumptions					
Assumed gold price (US\$ per ounce)	1,385	1,375	1,300	825	N/A
Assumed silver price (US\$ per ounce)	N/A	26	22	13	N/A
Assumed US-Canadian dollar exchange rate	1.05	1.02	1.05	1.11	N/A
Date of report	Feb. 2014	Aug. 2012	Feb. 2014	Nov. 2009	N/A

Notes: LOM is life of mine. All dollar amounts are in Canadian dollars unless otherwise specified. Sources: Phoenix: Bernier et al. (2014); Goliath: Roy et al. (2012); Rainy River: Hardie et al. (2014); Hammond Reef: Rennie, R.J. Lambert, and H. Krutzelmann (2009); Cochenour: Goldcorp (2011a, 2015a, 2015b); Tollinsky (2015).

Table 2: Platinum Group Metals Projects, Northwestern Ontario, 2015

	Project	
	Marathon Cu-PGM	Eagle's Nest
Financial		
Revenues (LOM) (\$ millions)	2,565.30	3,509.00
Initial capital expenditure (\$ millions)	351.10	609.40
Sustaining capital expenditure (\$ millions)	144.00	160.00
Operating costs (LOM) (\$ millions)	1,224.10	1,080.00
Cash cost of nickel milled (\$ per pound)		3.47
Cash cost of copper milled (\$ per pound)	2.84	
Cash cost of ore milled (\$ per tonne)	16.64	97.01
All-in cost of nickel milled (\$ per pound)		5.94
All-in cost of copper milled (\$ per pound)	3.98	
All-in cost of ore milled (\$ per tonne)	22.05	166.15
Operational		
Tonnes milled per year (thousands)	8,030	1,095
Average gold grade (LOM) (grams per tonne)	0.085	0.179
Average silver grade (LOM) (grams per tonne)	1.442	
Average nickel grade (LOM) (%)		1.68
Average copper grade (LOM) (%)	2.47	0.87
Average palladium grade (LOM) (grams per tonne)	0.834	3.09
Average platinum grade (LOM) (grams per tonne)	0.237	0.89
Pounds of nickel payable (LOM) (thousands)		308,397
Pounds of copper payable (LOM) (thousands)	431,220	144,209
Ounces of palladium payable (LOM) (thousands)	1,812.6	675.5
Ounces of platinum payable (LOM) (thousands)	434.5	173.9
Ounces of gold payable (LOM) (thousands)	180.1	36.6
Ounces of silver payable (LOM) (thousands)	2,839.4	
Life of mine (years)	11.5	10.2
Workforce size (number of employees)	130-250	162
Return on investment		
Net present value (5%) after tax (\$ millions)	293	748
Internal rate of return after tax (%)	17.40	28.30
Payback period (years)	4.4	2
Assumptions		
Assumed nickel price (US\$ per pound)		9.43
Assumed copper price (US\$ per pound)	2.91	3.60
Assumed platinum price (US\$ per ounce)	1,346	1,601
Assumed palladium price (US\$ per ounce)	321.44	599
Assumed gold price (US\$ per ounce)	819.22	1,415
Assumed silver price (US\$ per ounce)	14.10	
Assumed US-Canadian dollar exchange rate	1.099	1.015
Date of report	Nov. 2008	Oct. 2012

Notes: LOM is life of mine. All dollar amounts are in Canadian dollars unless otherwise specified. Sources: Marathon: Fraser (2012); Murahwi et al. (2010); Stillwater (2011); Eagle's Nest: Burgess et al. (2012).

Table 3 on the single iron project. (We were unable to provide a table on the Black Thor chromite project because of insufficient data.) When examining these tables, it is important to remember that many of these values are estimates, some of which have changed as market conditions have evolved. Additionally, the assumptions made by each report vary. For instance, the Hammond Reef project report was written using an estimated price of gold of US\$825 per ounce, whereas Rubicon's Phoenix project used an estimate of US\$1,385 per ounce. These values have a direct influence on the estimated rates of returns on the project, so care must be taken when comparing values between the mines. Despite this, these variables still provide a good indication of the size of each project, and their expected profitability.

All else being equal, a fall in the price of a commodity relative to the assumed value will lead to a fall in the projected net present value and its internal rate of return. However, the fall in the value of the Canadian dollar might partially or completely offset this. Examining the five gold projects in Table 1, we can see that the estimated value of gold in Canadian dollars ranges from \$915.75 to \$1,454.25 per ounce. With the current price of gold at \$1,433.95 per ounce as of November 24, 2015, these projects should in fact be more profitable than predicted by the feasibility studies.

Turning to the two platinum group metals (PGM) projects, Table 2 reveals a different story. In both cases, the estimated prices of the commodities in Canadian dollars have changed in both directions: nickel, copper, and platinum are now worth substantially less than estimated, while palladium, gold, and silver are

worth more. Based on these changes, the value of the ore at the Marathon project has increased substantially, thanks mainly to the huge increase in the value of palladium, while the Eagle's Nest project's resources are worth substantially less, driven mainly by the fall in the prices of nickel and platinum. Finally, Table 3 shows that, although the Josephine Cone project assumed a price of iron ore pellets of US\$128.31 per tonne, the price now sits at US\$70 per tonne, so that, even with the fall in the Canadian dollar, the estimated return for this project is now well below expectations.

From Tables 4 through 6, which provide the resource estimates for these projects, it is clear that the projects vary greatly in both the amount and grade of ore

present. All else being equal, projects with higher-grade ore will be more profitable than those with lower-grade ore: the more of a commodity that can be recovered per tonne of ore milled, the more revenue will be generated for a similar cost. Also note that the terms measured, indicated, and inferred have specific definitions when discussing the amount of resources estimated to be present in an ore body, and are listed in the tables in decreasing order of certainty. Therefore, all else being equal, a project with measured resources will be less risky than one with indicated resources, which, in turn, will be less risky than one that has only an inferred amount. When analyzing each of the mines in turn, these tables will be useful to make quick comparisons of the various projects.

Table 3: Northwestern Ontario's Iron Mine Project, 2015

Josephine Cone	
Financial	
Initial capital expenditure (\$ millions)	990
Sustaining capital expenditure (\$ millions)	320
Cash cost of iron milled (\$ per tonne)	52.99
Operational	
Tonnes milled per year (millions)	14.6
Tonnes of iron pellets recovered (LOM) (millions)	116
Life of mine (years)	29
Workforce size (number of employees)	300
Return on investment	
Net present value (10%) after tax (\$ millions)	980
Internal rate of return after tax (%)	25
Payback period (years)	3.5
Assumptions	
Assumed iron pellet price (US\$ per tonne)	128.31

Notes: LOM is life of mine. All dollar amounts are in Canadian dollars unless otherwise specified. Sources: Arnold et al. (2011); Bending Lake Iron Group (2011); Chronicle Journal (2011).

Table 4: Gold Resources, Northwestern Ontario, 2015

Project	Level of Certainty	Amount of Ore (tonnes)	Gold Grade (grams per tonne)	Amount of Gold (troy ounces)	Silver Grade (grams per tonne)	Amount of Silver (troy ounces)
Cochenour	inferred	9,300,000	11.55	3,450,000		
Phoenix	indicated	4,120,000	8.52	1,129,000		
	inferred	7,452,000	9.26	2,219,000		
Goliath	indicated	9,140,000	2.60	760,000	10.40	3,070,000
	inferred	15,900,000	1.70	870,000	3.90	1,990,000
Rainy River	measured	26,665,000	1.21	1,035,000	1.79	1,531,000
	indicated	150,696,000	1.07	5,202,000	2.70	13,104,000
	inferred	20,655,000	1.16	773,000	2.58	1,717,000
Hammond Reef	measured	123,500,000	0.90	3,590,000		
	indicated	72,900,000	0.78	1,830,000		
	inferred	75,700,000	0.72	1,750,000		

Sources: Cochenour: Goldcorp (2015a); Phoenix: Bernier et al. (2014); Goliath: Roy et al. (2012); Rainy River: Hardie et al. (2014); Hammond Reef: Osisko Mining Corporation (2013).

Table 5: Platinum Group Metals Resources, Northwestern Ontario, 2015

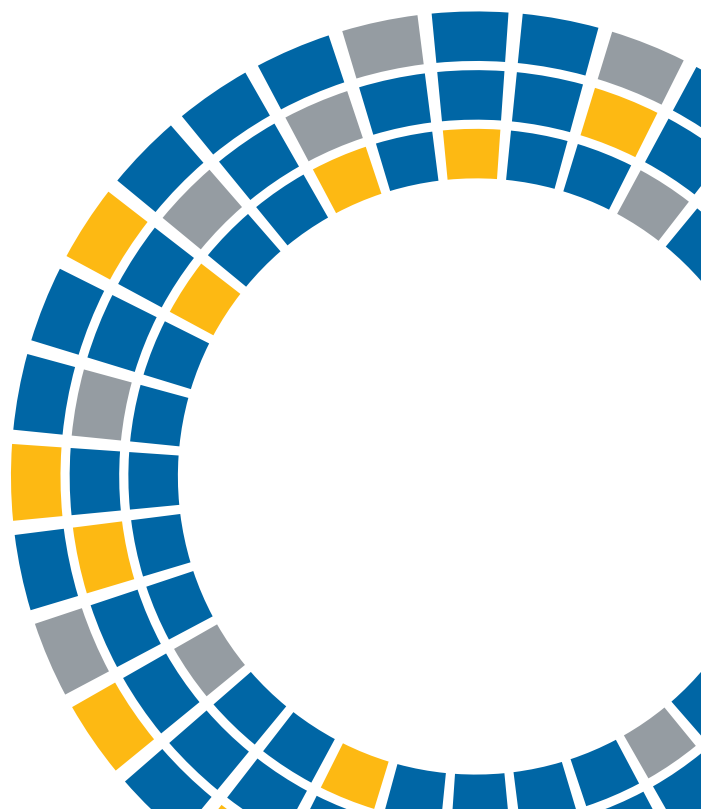
	Project					
	Eagle's Nest			Marathon Cu-PGM		
Level of certainty	measured	indicated	inferred	measured	indicated	inferred
Amount of ore (tonnes)	5,346,000	5,643,000	8,966,000	69,500,000	27,900,000	2,700,000
Nickel (%)	2.08	1.50	1.10			
Nickel (tonnes)	111,197	84,645	98,626			
Copper (%)	1.07	0.89	1.14	0.30	0.21	0.20
Copper (tonnes)	57,202	50,223	102,212	206,384	58,059	5,443
Platinum (grams per tonne)	1.04	0.94	1.16	0.23	0.24	0.16
Platinum (troy ounces)	178,753	170,541	334,386	513,000	215,000	14,000
Palladium (grams per tonne)	3.55	3.27	3.49	0.79	0.66	0.50
Palladium (troy ounces)	610,167	593,265	1,006,040	1,761,000	588,000	43,000
Gold (grams per tonne)	0.20	0.20	0.30	0.09	0.08	0.07
Gold (troy ounces)	34,376	36,285	86,479	194,000	72,000	6,000
Silver (grams per tonne)				1.70	1.60	2.10
Silver (troy ounces)				3,763,000	1,442,000	181,000

Sources: Marathon: Murahwi (2010); Eagle's Nest: Burgess et al. (2012).

Table 6: Iron Resources, Northwestern Ontario, 2015

Project	Level of Certainty	Amount of Ore (tonnes)
Josephine Cone	indicated	56,200,000
	inferred	45,700,000

Source: Arnold et al. (2011).



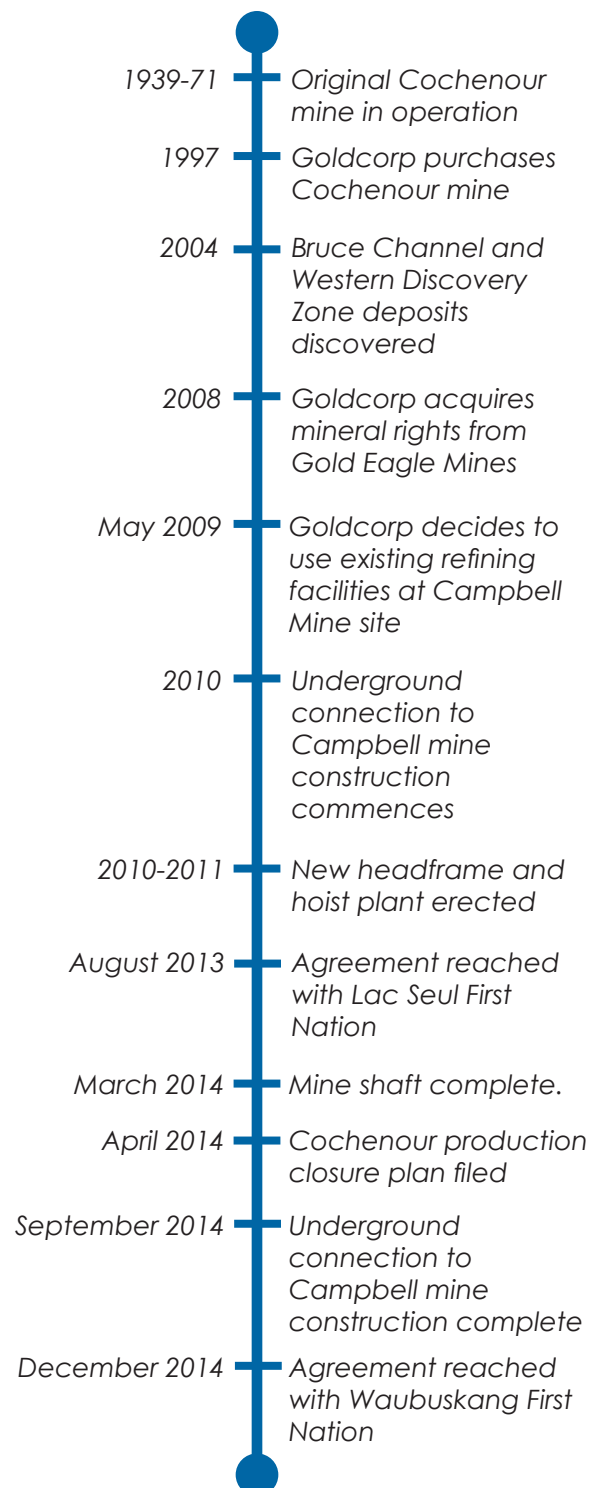
Cochenour/Bruce Channel — Goldcorp

It was originally believed that the Cochenour project, located in the Red Lake area, would begin production in 2014 (see the project timeline shown in Table 7). As of this writing, however, exploration drilling is still ongoing and no date has been made public regarding when production is expected to begin.¹ Despite this, a significant amount of development work has been done at the site, and there are still many signs that indicate that this project will begin production in the near future.

Goldcorp's operations in the area already consist of three complexes: the Campbell Complex, the Red Lake Complex, and the Balmer complex. The Bruce Channel and Western Discovery Zone ore bodies are located 5 kilometres west of the Campbell Complex, and are accessible through the old Cochenour mine site. With the mineral reserves at the Campbell Complex nearing depletion, the decision was made to use the milling facilities already present at that site instead of constructing a new mill at the Cochenour site. This decision reduced the amount of new capital investment that would be required to bring the site into production (Jenish 2014; Moore 2014). The mine workings needed to be drained and some surface construction was required, but the most time-consuming investment was the construction of a 5-kilometre underground rail link between the old Cochenour mine and the Campbell Complex (*Canadian Mining Journal* 2014). The rail link faced some engineering difficulties toward the end, when the rock became too weak to support the heavy railcars, but this was overcome (Tollinsky 2015). In the end, only \$496 million of capital investment was required to bring the project into operation (Goldcorp 2015b). The other benefit of using the underground rail link was that it would limit the number of environmental permits required (Moore 2014). On top of the reasonable construction costs, the operating costs of the mine are also expected to be low, at only \$350 per ounce of gold — much lower than the other gold mining projects examined here (Goldcorp 2011b).

Since the project is in the Red Lake area, it already has access to transportation infrastructure and to the provincial power grid (Blais, Osiowy, and Glazier 2011). (Originally, there was a lack of electrical transmission capacity in the region, but this was remedied; see CBC News 2014.) The community also has a number of suppliers set up to service the mining sector, a major factor contributing to the low operating costs. A workforce for the project is not expected to be hard

Table 7: Timeline of the Cochenour Project



¹ See the website of Goldcorp, at <http://www.goldcorp.com/English/Unrivaled-Assets/Mines-and-Projects/Canada-and-US/Development-Projects/Cochenour/Overview-and-Development-Highlights/default.aspx>; accessed May 2015.

to come by, as employees are planned to be sourced mainly internally from the other three mine complexes (SomaBull 2015).

A further factor that allowed the project to develop quickly was that Goldcorp was able to reach agreements with the two First Nations with traditional land claims in the area: Lac Seul First Nation in August 2013 and Wabauskang First Nation in December 2014 (Goldcorp 2015a).

Despite these advantages, the project still faces a few hurdles. The presence of Rubicon's Phoenix project almost surely will drive up labour and supply costs as regional demand increases. More important, Cochenour, like other gold projects, continues to suffer from the economic uncertainty regarding the fast-falling price of gold. As the price of gold falls, the project becomes less profitable, but the falling value of the Canadian dollar might partially or completely offset this.

Overall, this project's location in an established mining camp with historical and existing infrastructure on site has made development relatively easy, and has allowed the project to benefit from low capital costs, low production costs, a simplified environmental permitting process, and strong local support. Table 8 summarizes the project's advantages and disadvantages.

Table 8: Summary of the Cochenour Project

Advantages

- *Infrastructure already in place*
- *Workforce available from nearby operations*
- *Limited capital investment required*
- *Relatively low production costs*
- *First Nations support*

Disadvantages

- *Falling gold prices*
- *Engineering challenges*



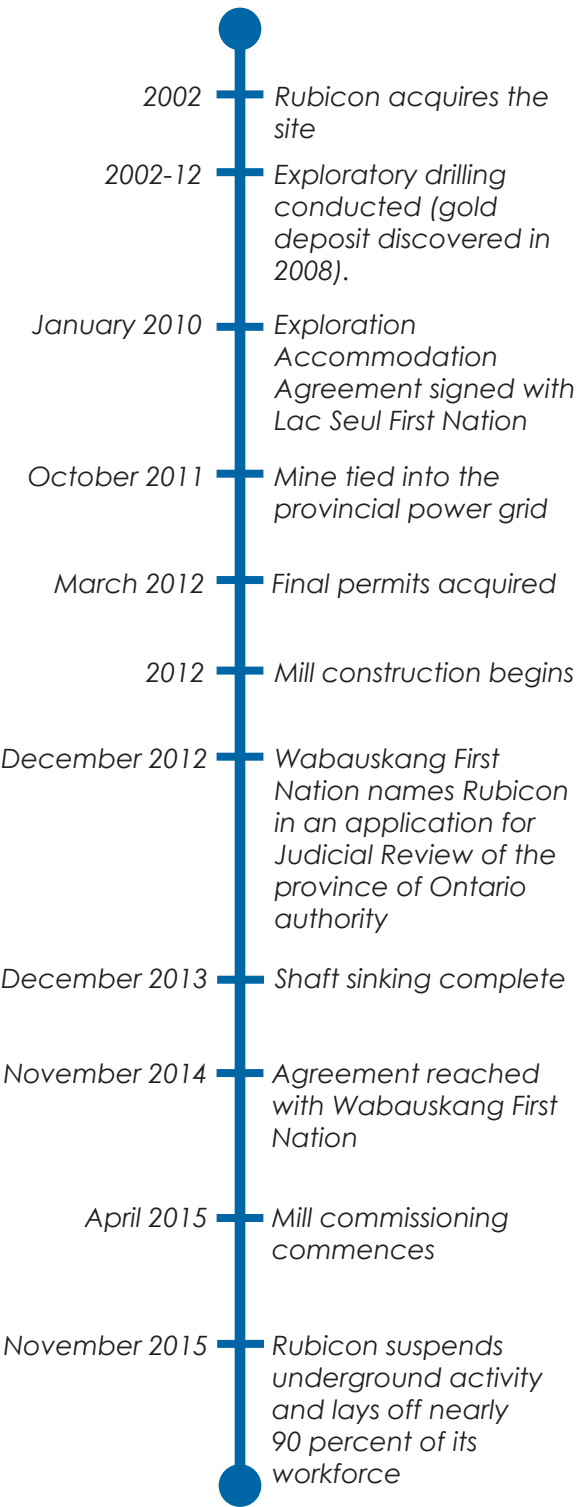
Phoenix Gold — Rubicon Minerals Corporation

The Phoenix Gold Project,² owned by Rubicon, is set to begin operations in late 2016 (CBC News 2015); see Table 9. This is later than the 2013–14 predictions made earlier (see Dadgostar et al. 2012; S.-L. Inc. and E.H.D. Consulting 2013). Despite the delay, this project is still one of only two that have successfully reached the post-construction phase. Similar to Goldcorp’s Cochenour project, the Phoenix project’s success is the result of a number of locational advantages it enjoys.

The project is located in the Red Lake area, which has an extensive history of mining operations. This gave it easy access to infrastructure, mining supply firms, and an experienced workforce that allowed the project to develop quickly. There was no major cost necessary to connect the site to the road network or the electrical grid (Bernier et al. 2014). These factors kept the required initial capital expenditure lower than it otherwise would have been. Of the nine projects we examined, Phoenix required one of the lowest investments, with an estimated initial capital cost of only \$224 million. In the end, the final cost ended up being closer to \$373 million, which still makes it one of the least expensive projects. Its estimated operating costs are on par with the other mining projects, with an all-in cost of \$926 per ounce of gold milled (Bernier et al. 2014). The fact that it was a brownfield site — that is, a historical development — allowed the environmental permitting process to proceed relatively smoothly. As well, the presence of other mines in the area meant that the community largely supported the development of the mine. Rubicon was also very proactive in engaging with local Aboriginal groups once it was determined that the project was situated on the traditional lands of Lac Seul First Nation and Wabauskang First Nation.

As with all projects, the Phoenix project has faced challenges. Despite reaching an early agreement with Lac Seul First Nation, Wabauskang First Nation named the company in a petition for judicial review of Ontario’s authority to approve its production permits. In November 2014, Wabauskang First Nation and Rubicon reached a Settlement Agreement whereby the First Nation agreed to discontinue its appeal of the court’s dismissal of the original application for judicial review (Hale 2014). In addition, although there is a trained workforce in the Red Lake community, unemployment in the area is relatively low — indeed, as of late 2013, there were no unemployed people

Table 9: Timeline of the Phoenix Gold Project



2 In January 2016 after additional exploration, it was determined that Rubicon had overestimated the gold reserves at the Phoenix project by 86%. With this information, Rubicon has determined that the project is no longer economically viable. Despite this unfortunate revelation, the project can in some sense still be considered a success as it was able to successfully complete most of the development process based on its belief of a large gold deposit being present.

with mining skills living in the area (Walters 2013). This forces the company to rely on workers from outside the community, leading to higher labour costs. There were also issues in the area regarding the availability of power, but this problem has been rectified (CBC News 2014). Finally, as with the other gold projects, the Phoenix project faces changing economic conditions. Its economic analysis was based on a gold price of US\$1,385 per ounce and a Canadian dollar nearly at par with its US counterpart. With both the price of gold and the value of the Canadian dollar having fallen, it turns out that these two factors have nearly completely offset one another, meaning the mine's expected revenue remains unchanged. Indeed, since 80 percent of its costs are denominated in Canadian dollars, costs should not rise to a large degree (Rubicon Minerals Corporation 2015).

Despite successfully making it through the construction phase, the project ran into a major obstacle while undergoing the start-up process. It was determined that the shape of the ore body was significantly different than earlier estimates had predicted. Because of this, Rubicon temporarily laid off nearly 90 percent of its workforce in November 2015 while it developed a new mining plan. Given that the mine has already been constructed, it is likely that operations will commence in late 2016 once the new plan has been developed and implemented (CBC News 2015). Overall, Phoenix's location in the Red Lake area has afforded it a number of advantages not enjoyed by other projects examined here. Its location has translated into relatively low development costs and limited objections from the local community, local Aboriginal groups, or environmental review agencies. Table 10 summarizes the project's advantages and disadvantages. For these reasons, the project was able to develop relatively quickly, and likely will be able to overcome its latest obstacle.

Table 10: Summary of the Phoenix Gold Project

Advantages

- *Good access to infrastructure*
- *Supported by the community*
- *Limited capital investment required*
- *Relatively easy environmental permitting process*

Disadvantages

- *Lack of skilled labour*
- *Limited electricity available*
- *Legal action by local First Nations*
- *Ore body discovered to be significantly different than predicted*

Josephine Cone Mine Project — Bending Lake Iron Group Ltd.

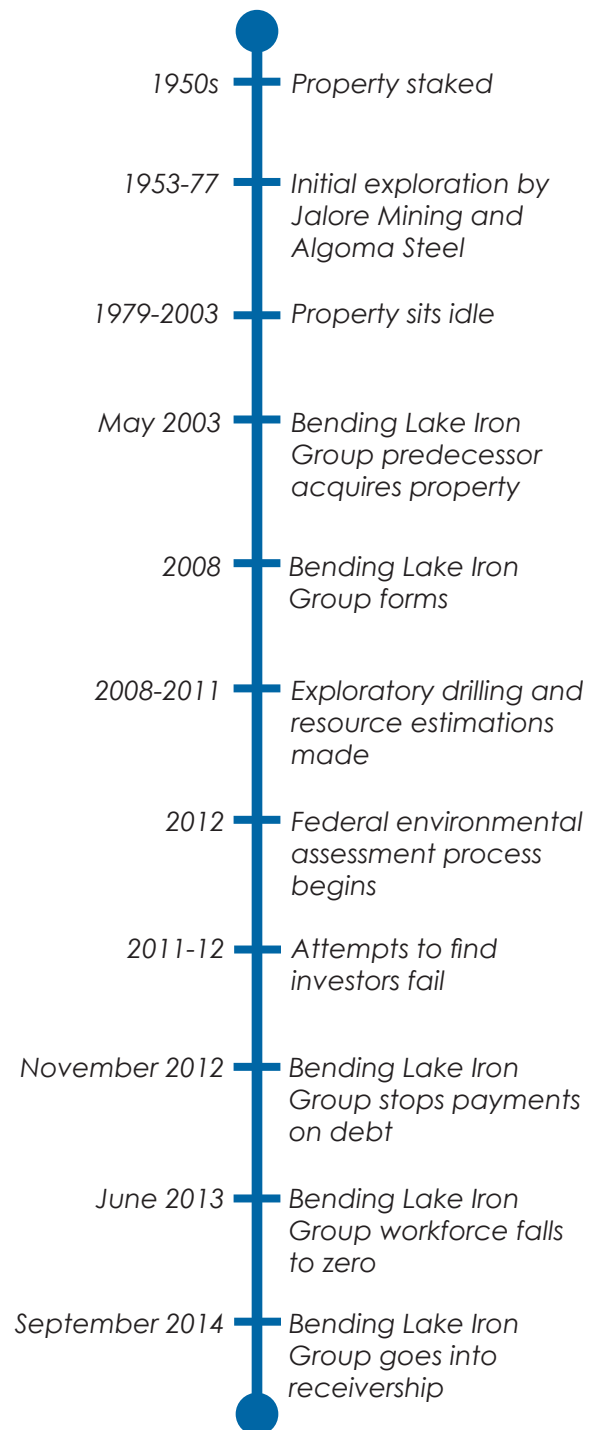
Bending Lake Iron Group's (BLIG's) Josephine Cone Mine project is unique among the mines analysed in this study in that it is the only iron project (see Table 11). Unfortunately for BLIG, the price of iron has experienced the largest relative fall of any of the resources found at other sites, which has translated into a fall in the expected return on the project, leading to BLIG's being unable to obtain the necessary investment to finance the project (Ontario Superior Court of Justice 2014). Ultimately, in September 2014, BLIG went into receivership (see Smith 2014). Although the project still might come into operation in the future, it is unlikely to do so until the price of iron rebounds to a level sufficient to entice investment in the project.

*“The largest **obstacle** was the high capital expenditures, estimated at nearly **\$1 billion**, required to get the mine operational.”*

The project did benefit from some advantages during its development. The ore body is located close to a highway, giving easy access to the site. Additionally, a workforce could be acquired from the relatively close towns of Ignace, Dryden, and Atikokan — the latter having a history of iron mining (Bending Lake Iron Group 2011; Chronicle Journal 2011). It was also likely that the project would enjoy good relations with local Aboriginal groups, for a number of reasons. First and foremost, the company is owned by Aboriginal people (Bending Lake Iron Group 2012). Second, BLIG was actively engaging local Aboriginal groups, and was beginning to write a Memorandum of Understanding and Exploration Agreement Protocols with the communities of Wabigoon Lake First Nation and the Wabigoon Métis (Arnold et al. 2011).

These few advantages, however, were not able to overcome the challenges the project faced. The largest obstacle was the high capital expenditures, estimated at nearly \$1 billion, required to get the mine operational. Part of the high capital cost was the requirements to run a rail line, hydro line, and natural gas line to the site (Summer 2013). Afterwards, production costs would be \$53 per tonne. As the site planned to produce iron pellets, the potential profits

Table 11: Timeline of the Josephine Cone Mine Project



were staggering in January 2011, when the price of pellets was over \$210 per tonne (Bending Lake Iron Group 2011). As of August 2015, however, the price had dropped to \$90. Given the high capital costs and the much smaller margins than originally forecast, the return on investment would be much smaller than the 25 percent originally predicted.

Despite these small advantages the project enjoys in terms of potential labour availability and Aboriginal participation, it was simply not possible to overcome the basic economic fact that higher-return investments are to be made elsewhere. Future improvements in the market for iron someday might make the project economically viable, but an investment in infrastructure would still be required to bring it to fruition. Table 12 summarizes the project's advantages and disadvantages.

Table 12: Summary of the Josephine Cone Mine Project

Advantages

- Accessible by road
- Good community support
- Labour force nearby

Disadvantages

- Investment in rail, power, and natural gas required
- Iron price has fallen sharply.
- Very high initial capital investment required



Marathon Cu-PGM Deposit — Stillwater Mining Company

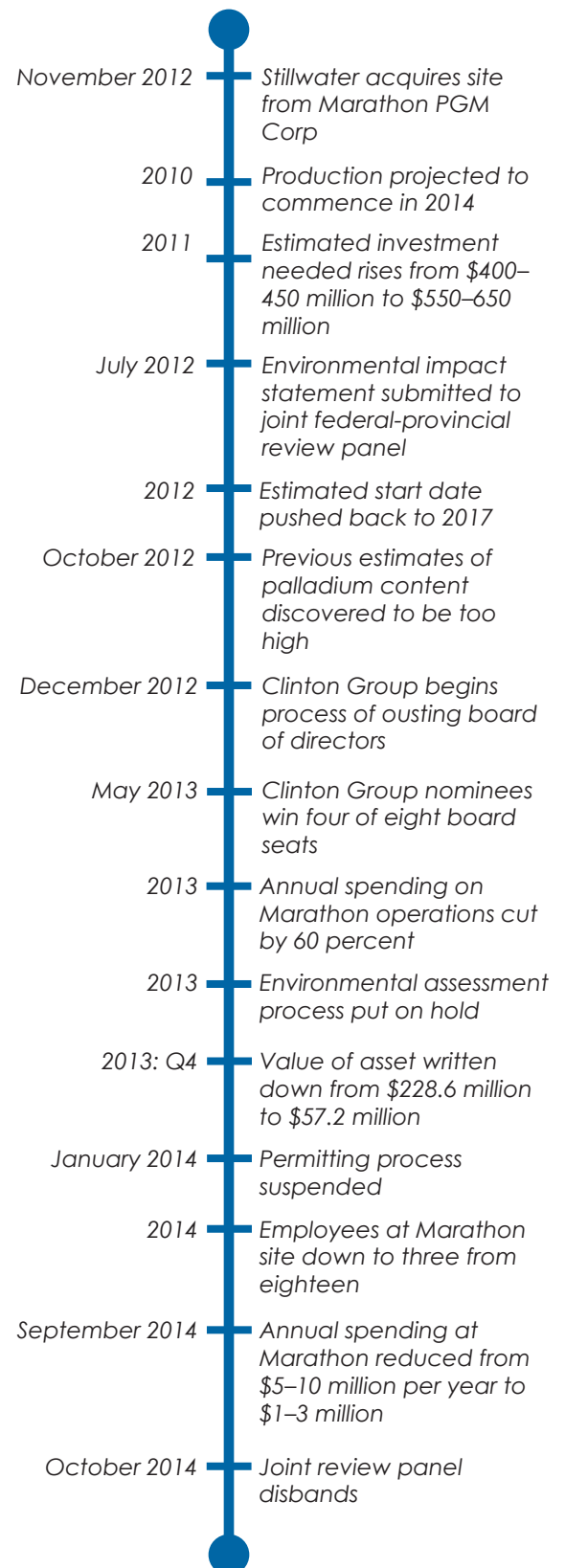
Stillwater's Marathon site initially seemed like a project that would begin operations relatively quickly, as the company poured a lot of its resources into it (Stillwater Mining Company 2014). A reorganization of the company's leadership, however, has resulted in a sharp reduction in the amount invested there.³ It was initially believed, when Stillwater acquired the site in 2010, that operations would begin by 2015 (Stillwater Mining Company 2011); see Table 13. As the company evaluated the site further and the environmental review process went forward, however, this date began to be pushed back further and further. During this time, commodity prices fell such that, ultimately, the company decide it could not recoup the investment necessary to bring the project into operation, and development of the site has ceased (Northern Ontario Business 2014a, 2014b).

Initially, the company was very aggressive in developing the project because it possessed a number of promising factors. The site was well situated in regards to infrastructure and labour force availability (Murahwi et al. 2010). It is located just off the TransCanada Highway, and has easy access to road, rail, and electricity. Its proximity to the town of Marathon meant that it would have easy access to an experienced workforce from the Barrick gold mines located there, as well as to firms in the mining sector supply chain. Local support for mining in the region is also relatively strong.

As the development moved forward, however, a number of obstacles were soon discovered. One issue was where the refinement of the resources would occur. Sudbury was one possibility, but the transportation costs were not trivial. In addition, the company discovered that the cost of refining in Ontario is quite high due to the high cost of electricity (Stillwater Mining Company 2012). Next, the environmental review process took longer than the firm had anticipated (Stillwater Mining Company 2011, 2013). When it acquired the site in 2010, the company expected the process to be complete by 2013, but it was still ongoing in 2014. Finally, in terms of coming to arrangements with local Aboriginal groups, the company initially identified fourteen communities that could have potential interest in the project, substantially more than most other projects have had to accommodate. Four of the fourteen expressed an interest in the project based on traditional and current land use (Fraser 2012).

Ultimately, though, it was the economics of the project that made it infeasible. The company initially believed it would require \$350 million to develop the project, but

Table 13: Timeline of the Marathon Cu-PGM Deposit Project



3 See the website of the Stillwater Mining Company, at <https://www.stillwatermining.com/>; accessed May 2015.

this estimate quickly rose to between \$550 and \$650 million (Stillwater Mining Company 2012). Moreover, the estimated life of the mine was only eleven and a half years, making it difficult to recoup these costs over such a short period of production (Stillwater Mining Company 2014). Later, it was determined that the palladium content of the ore body had been overestimated, making the returns on the project even lower (Ross 2014c). Finally, the company had to deal with falling commodity prices. In terms of Canadian dollars, the value of the resource is significantly more than estimated in 2008, but as Stillwater is a US firm operating primarily in that market, it is likely that more of its costs will be priced in US dollars. In late 2013, Stillwater wrote down the value of the asset in its books by US\$171.4 million (Billings Gazette 2014).

What makes it unlikely that the project will come into operation soon is the change in governance of the company. Starting in late 2012, the Clinton Group, a hedge fund and shareholder of Stillwater, became unhappy with the direction the firm had taken (Zadvydas 2013). It organized the shareholders and ultimately elected four of its candidates to the board of directors (McAfee 2013). With a former governor of Montana as the new chairman of the board, the Clinton Group plans to focus the company's efforts on its Montana operations (Johnson 2013). This has led to minimal further investment in the Marathon site, and the cessation of nearly all development activity (Canadian Environmental Assessment Agency 2014). Additionally, the Clinton Group has stated it does not plan to sell the site in the immediate future (Northern Ontario Business 2014b). Thus, it is likely that the project will remain undeveloped for the time being. Resource prices will not need to experience that large a rebound, however, as prices are still above those assumed in the initial economic assessment. Table 14 summarizes the project's advantages and disadvantages.

Table 14: Summary of the Marathon Cu-PGM Deposit Project

Advantages

- *Excellent access to infrastructure*
- *Experienced labour force available*
- *Mineral prices do not need a large rebound*
- *Good community support*

Disadvantages

- *Rising capital costs*
- *Resources overestimated*
- *Short life span*
- *Many Aboriginal groups with which to negotiate*
- *Lengthy environmental review process*



Black Thor — Noront Resources Ltd.

The Black Thor project, previously owned by Cliffs Natural Resources, faced a number of significant obstacles before the project could be put into production. Ultimately, the company was unable to overcome these challenges, and sold the site to Noront Resources, which now faces many of the same challenges, leaving the future development of the project in doubt — see Table 15 (Younglai and Marotte 2015).⁴

Cliffs entered the Ring of Fire in early 2010, when it acquired the mineral rights for the Black Thor deposit from Freewest Resources Canada. At that time, the company believed it would be able to bring the project into production by 2015, and it aggressively pursued this goal (Cliffs Natural Resources 2011). As the challenges of developing a mine in the Ring of Fire became evident, however, Cliffs steadily began to push back the expected opening date. By the end of 2013, the opening date had been pushed back to 2017 (Ross 2013a).

The two largest problems facing the Black Thor project are a complete lack of infrastructure in the region and poor economic conditions (Kuyek 2011). Additionally, the project faces environmental permitting challenges, including objections from local Aboriginal groups (Freeman 2013; Ross 2012; Scofield 2010).

In terms of the economics of the project, a huge initial investment is required. Cliffs estimated that, for the mine, infrastructure, and ferrochrome production facility, the cost would be \$3.3 billion (Ross 2012). The mine itself would require a massive \$1.45 billion investment to become operational, far above any of the other projects examined here (S.-L. Inc. and E.H.D. Consulting 2013). The estimated cost of providing transportation and energy infrastructure to the mine site was \$1.74 billion (Chong 2014). If Cliffs had been able to obtain public funding for this, it would have made the project more economically feasible. With an estimated yearly operational cost of \$900 million, a relatively high price for chromite was needed to make the project feasible (S.-L. Inc. and E.H.D. Consulting 2013). Unfortunately for Cliffs, the price of chromite remained low throughout the development period (see Figures B-11 and B-12). In 2007 and 2008, the price of ferrochrome skyrocketed from \$0.75 per pound to nearly \$3.00 per pound, but by 2009 it had fallen back to around \$1.25 per pound and has hovered around that level ever since. With supply of the material readily available from other mines, it seems unlikely that the price will rise to an economically feasible level soon (CBC News 2013a; Kuyek 2011).

Table 15: Timeline of the Black Thor Project



September 2008	Black Thor deposit discovered by Freewest Resources Canada
February 2011	Production expected to begin in 2015
May 2012	Agreement made with Ontario government to build ferrochrome processing facility near Sudbury.
June 2013	Environmental assessment activities suspended
September 2013	KWG Resources wins victory on road issue at provincial mining tribunal
November 2013	Start date pushed back to 2017
December 2013	Operations suspended indefinitely
January 2014	Casablanca Capital begins campaign to take over board of directors
July 2014	Casablanca takes control of board of directors of Cliffs; Ontario divisional court set aside previous road ruling
January 2015	Cliffs terminates federal environmental assessment
April 2015	Ring of Fire assets sold to Noront Resources

⁴ See also the website of Cliffs Natural Resources, at <http://www.cliffsnaturalresources.com/EN/Pages/default.aspx>; accessed June 2015.

The other large obstacle that Cliffs faced was the need for infrastructure in the area. The Ring of Fire is extremely remote, and requires land-based transportation links to move the chromite to a processing facility. The cost was estimated at \$600 million for a north-south road.⁵ Competing interests in the Ring of Fire advocate different routes for the road. A legal battle was also fought between Cliffs and KWG Resources regarding claims on the preferred route (Ross 2013b, 2014a). Ultimately, although the Ontario government was ready to contribute funds for the construction of an overland link, but the federal government was not willing to match the funding (Ross 2014b). Until the transportation link is in place, the project cannot begin operation (Marotte 2013). With so many interested parties, coupled with environmental and political issues, the construction of a ground transportation link is far off.

Dealing with the First Nations was difficult for Cliffs. The Matawa Tribal Council began legal proceedings over the project's development, with Chief Peter Moonias calling Cliffs "an American bully hell-bent on making a road and a mine no matter what First Nations say" (quoted in Ross 2012). There were many complaints from First Nations about insufficient consultation by Cliffs (Freeman 2013; Mulligan 2014; Ross 2012). As well, ongoing negotiations between Ontario and the Matawa Tribal Council regarding revenue sharing and land use in the Ring of Fire have been a slow process, and the pursuit of piecemeal negotiations has been nearly impossible.⁶

Many First Nations' concerns stem from the project's potential environmental impact on the region (Ross 2014b). Chromite poses significant challenges to the environment that can be difficult to manage (Schofield 2012). As well, since the area does not have the mining history that some of the other projects examined here enjoy, environmental assessments are taking a long time to conduct (Marotte 2013; Northern Ontario Business 2015a).⁷

Ultimately, all these challenges proved too much for the company to overcome. In January 2014, Casablanca Capital, an investment firm from New York that owned more than 5 percent of Cliffs' shares, began a campaign to oust the board of directors (MarketWatch 2014a). Casablanca's platform was based on Cliffs' refocusing on its US iron mines (Team 2015). Casablanca was successful, and in July 2014 took control of the board (Benoit & Miller 2014; Koven 2014). As promised, the company sold its claims in the Ring of Fire to Noront Resources in April 2015, although Noront has stated that it plans to focus on

its Eagle's Nest property for the immediate future.⁸ Although Noront enjoys better relations with local First Nations and a transportation link ultimately might be constructed to service its Eagle's Nest project, the Black Thor project still faces the economic challenges of a low chromite price and high costs as it did before. Until market conditions improve, it is unlikely that the project will be developed. Table 16 summarizes the project's advantages and disadvantages.

Table 16: Summary of the Black Thor Project

Advantages

- *Strong provincial support*
- *Large ore body*

Disadvantages

- *Complete lack of infrastructure*
- *Significant Aboriginal opposition*
- *Low commodity prices*
- *Difficult environmental review process*
- *High extraction costs*
- *Enormous capital investment required*

5 See the website of Noront Resources, at <http://norontresources.com/>; accessed June 2015.

6 Ibid.

7 See also the website of Cliffs Natural Resources, at <http://www.cliffsnaturalresources.com/EN/Pages/default.aspx>; accessed June 2015.

8 See the website of Noront Resources, at <http://norontresources.com/>; accessed June 2015.

Eagle's Nest — Noront Resources Ltd.

Noront's Eagle's Nest project in the Ring of Fire faces many challenges due to its remote location. These challenges have delayed the opening of the project beyond the initial predicted date of 2016 to at least 2018 and perhaps further (see Table 17). Despite these challenges, the company continues to invest in the project, and is optimistic that production can be achieved before the end of the decade.⁹

The project faces many of the same obstacles as Black Thor, while benefiting from certain advantages not enjoyed by Cliffs' old project. First, Eagle's Nest requires a much smaller initial capital investment of only \$609 million (Burgess et al. 2012). This is still a relatively large investment compared with mining projects outside the Ring of Fire, but the amount is not unmanageable. However, this amount does not include the full cost of building a road to the region.

Comparing this project to the Marathon Cu-PGM project, the other platinum group element development examined here, Eagle's Nest clearly is at a disadvantage. Its required capital investment is

higher, operating costs are much higher, the life of mine is shorter, and the value of the resources in the ground are worth less when evaluated at the same price. The feasibility study was conducted when commodity prices were near their peak, making the project seem particularly profitable. The return on investment is certainly lower than that reported in Table 2, and likely lower than that of the Marathon project.

Besides low commodity prices, the other major obstacle the project faces is infrastructure, mainly in terms of a land transportation link to the region. Noront hopes that a road will be built from the Pickle Lake region to the Ring of Fire, and the 2014 Ontario provincial budget announcement of \$1 billion in infrastructure spending for the Ring of Fire will help to facilitate this (Noront Resources Ltd. 2015a). In March 2015, the federal and Ontario governments provided funds to conduct a study on the road through the region, although Ottawa has not yet promised any funds for construction (Koven 2015; Northern Ontario Business 2015b). The project cannot become operational, however, until the transportation link is in place.

A major advantage Noront enjoys here is relatively good relations with local First Nations. In an effort to build up a skilled workforce in the region, Noront has begun to train local Aboriginal people through a program at Confederation College in Thunder Bay. As of the start of 2015, 340 people had already completed

Table 17: Timeline of the Eagle's Nest Project



⁹ See the website of Noront Resources, at <http://norontresources.com/>; accessed June 2015.

the program (Noront Resources Ltd. 2015b). Thanks to programs such as this and the obvious respect Noront has shown toward local communities, the project has a lot of local support (Mulligan 2015b; Sudol 2015). Noront's success in this regard was recognized by the Prospectors & Developers Association of Canada, which awarded the company an Environmental and Social Responsibility Award for its active involvement with local First Nations (Sudol 2015). Nonetheless, Noront still faces challenges in this regard. Local First Nations have little incentive to negotiate individual agreements with the company as long as negotiations between the province and the Matawa Tribal Council are ongoing (see CBC News 2013b; Mulligan 2015b). Noront also faces some criticism for not consulting with First Nations when it purchased Cliffs' claims in the area (NetNewsLedger 2015). Additionally, the Matawa Council is split over the transportation link issue, since the east-west road Noront supports would access only some of the Matawa reserves, whereas Cliffs' north-south road would have connected a separate set of Matawa reserves (Ross 2015a, 2015b).

In terms of environmental permits, the company is facing a number of challenges, as the region has been previously completely devoid of development. In June 2015, however, its Terms of References were finally accepted, with amendments, by the Ontario Ministry of the Environment after a three-year review process (Mulligan 2015a; Ross 2015b; Vis 2015).

Overall, Eagle's Nest still faces many challenges. Low commodity prices have driven down the expected return on the project, which will make acquiring investors difficult. There is still no clear plan on the construction of a transportation link to the area, although some progress is being made. Finally, no final agreement has been made with the Matawa Tribal Council regarding developing the Ring of Fire. Until all these uncertainties are resolved, it is unlikely that construction on the project will begin. Table 18 summarizes the project's advantages and disadvantages.

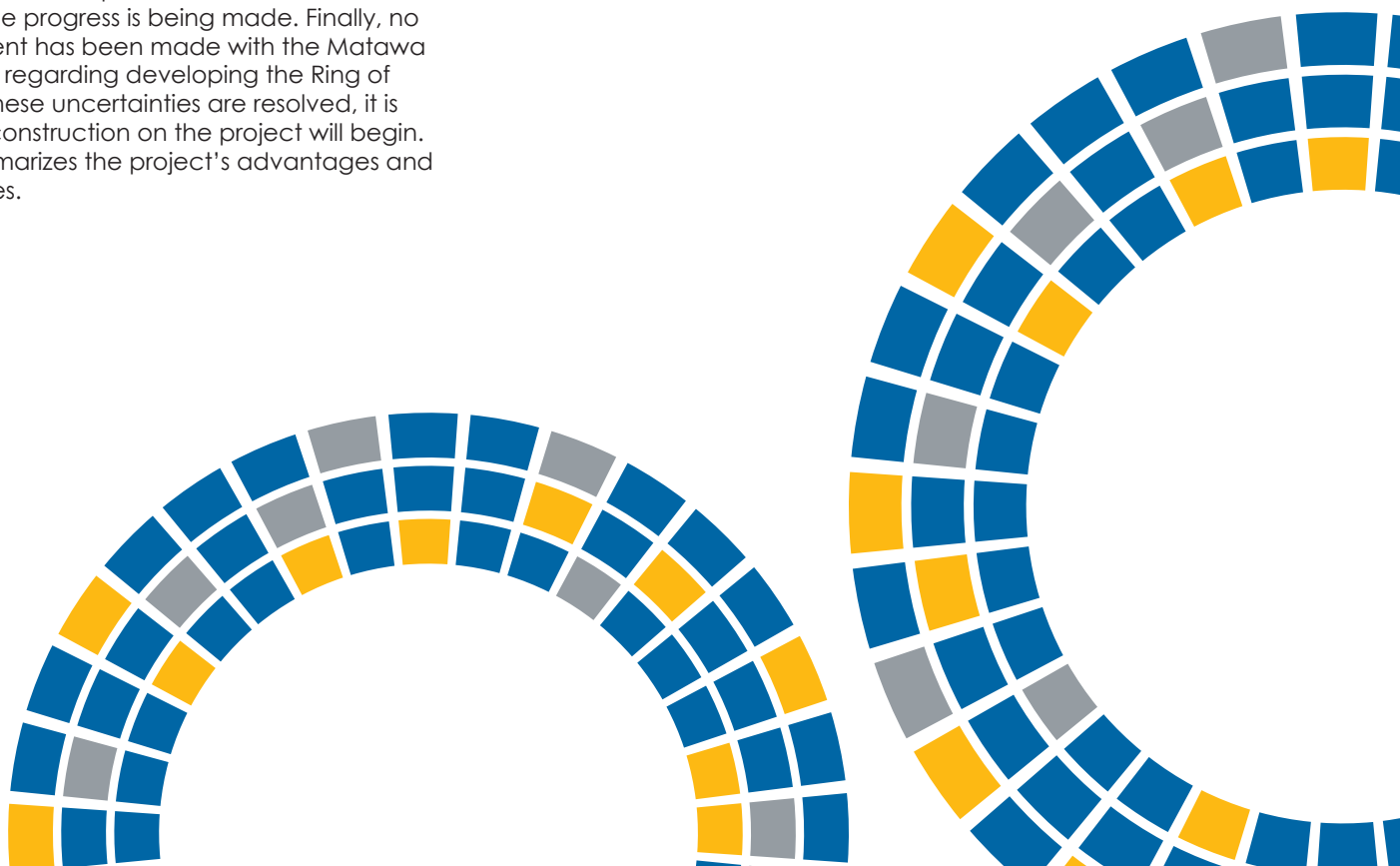
Table 18: Summary of the Eagle's Nest Project

Advantages

- *Rich ore body*
- *Strong Aboriginal support*
- *Training program in place for local workforce*

Disadvantages

- *Complete lack of infrastructure*
- *Low commodity prices*
- *Difficult environmental review process*
- *Discussions still ongoing between the province and the Matawa Tribal Council*



Hammond Reef — Canadian Malartic Corporation

The Hammond Reef project has seen its ownership change three times in the past decade as companies attempt to profit from the large deposit of gold located there (*MarketWatch* 2014b).¹⁰ What began as a promising opportunity has struggled in recent years, however, with rising costs and falling gold prices. The initial expected production date of 2016 can no longer be reached as construction has not yet begun. It appears unlikely that production will take place in the near future (McKinnon 2011; Ross 2013c); see Table 19.

The reason the project was seen as such a good investment opportunity by a number of mining companies is the large number of advantages it enjoys. It has good access to infrastructure, strong local support, a large supply of easily mined gold, and a relatively low operating cost (Danielson 2010; Meadows 2013b; Rennie, Lambert, and Krutzelmann 2009). The site is situated near Atikokan, a community with a long mining tradition (see Rennie and McDonough 2008). This has led to strong local support from that community and its government that includes the construction of a road to the project site (Meadows 2010b; Thompson 2015). In addition, the companies that have owned the project have successfully negotiated agreements with local First Nations and Métis groups (*Marktwired* 2015). In March 2010, Brett Resources signed an agreement with eight local First Nations that promised employment, shares in the company, and resources for education (Meadows 2010a). There has not been substantial opposition to the project's development by any group in the region.¹¹ Finally, the geology of the ore body leads to relatively low operating costs. With 97 percent of the resource within 300 metres of the surface, open-pit mining makes extracting the ore relatively inexpensive (Danielson 2010). There are an estimated 5.1 million ounces of gold in the deposit, with an initial estimated all-in extraction cost of around \$658 per ounce (Rennie, Lambert, and Krutzelmann 2009). This cost has been recently revised upwards to between \$800 and \$850 per ounce (Meadows 2013a), which still makes it one of the lowest-cost producers of the five gold projects examined here. Even with the recent decline in gold prices, the margins are still significant.

Despite these advantages, the project faces two major challenges. One is high initial capital costs, which were estimated at \$682 million in 2009 (Rennie, Lambert, and Krutzelmann 2009), but had risen to between \$1.5 and \$1.8 billion by August 2013 (Meadows 2013a). Despite the relatively healthy margins still present, it is difficult

Table 19: Timeline of the Hammond Reef Project

2006	Brett Resources acquires the property
November 2009	Brett produces economic feasibility study with promising results
January 2010	A road link to the mine site is established
March 2010	Brett signs an agreement with eight local First Nations
August 2010	Osisko Mining Corporation acquires Brett
April 2012	Osisko sign a Memorandum of Understanding with local Métis
May 2012	Construction anticipated to begin in 2014
May 2013	Osisko cuts spending on Hammond Reef by \$3.5 million
August 2013	Osisko writes down the value of the project by \$487.8 million; estimated capital cost of mine rises to \$1.5 billion.
December 2013	Osisko submits Environmental Impact Statement to the Canadian Environmental Assessment Agency.
June 2014	Osisko acquired by Canadian Malartic
June 2015	Shared Interest Agreement signed with the Métis Nation of Ontario

10 See also the Agnico Eagle website," at <http://www.agnicoeagle.com/en/exploration/advanced-projects/hammondreef/pages/default.aspx>; accessed July 2015.

11 Ibid.



to raise the necessary capital to fund this substantial investment. In August 2013, its then owner, Osisko Mining Corporation, stated that the project was not economically feasible at current gold prices (Meadows 2013a). In light of this, Osisko reduced spending on the project and wrote down the value of the asset in its books by nearly \$500 million (*Chronicle Journal* 2013b; Smith 2013b).

The second challenge the project faces is in its environmental permitting process. Although the community has provided strong support for the project, even knowing the potential environmental impacts, the process is taking a considerable amount of time due to the unique nature of the project. It is necessary to drain a lake to make the mine operational, local fisheries are expected to be negatively impacted, and a 60-metre-tall pile of rock is expected to partially obscure the view of the region (McKinnon 2011; Smith 2013a). Despite this, Osisko was able to arrive at private agreements with local hunters and campers to compensate for these negative aspects (Smith 2013a). However, the provincial Ministry of Natural Resources has expressed concern that the message delivered to the public regarding the impact of the project was "not truly reflective of the real impact of the project" (McKinnon 2015).

Overall, the project still has a large number of factors working in its favour. If the price of gold rises and capital costs can be brought down, the project likely will be able to move forward. Table 20 summarizes the project's advantages and disadvantages.

Table 20: Summary of the Hammond Reef Project

Advantages

- *Rich ore body*
- *Strong Aboriginal support*
- *Strong local support*
- *Low cost of production*
- *Good access to infrastructure*

Disadvantages

- *High capital costs*
- *Low commodity prices*
- *Difficult environmental permitting process*

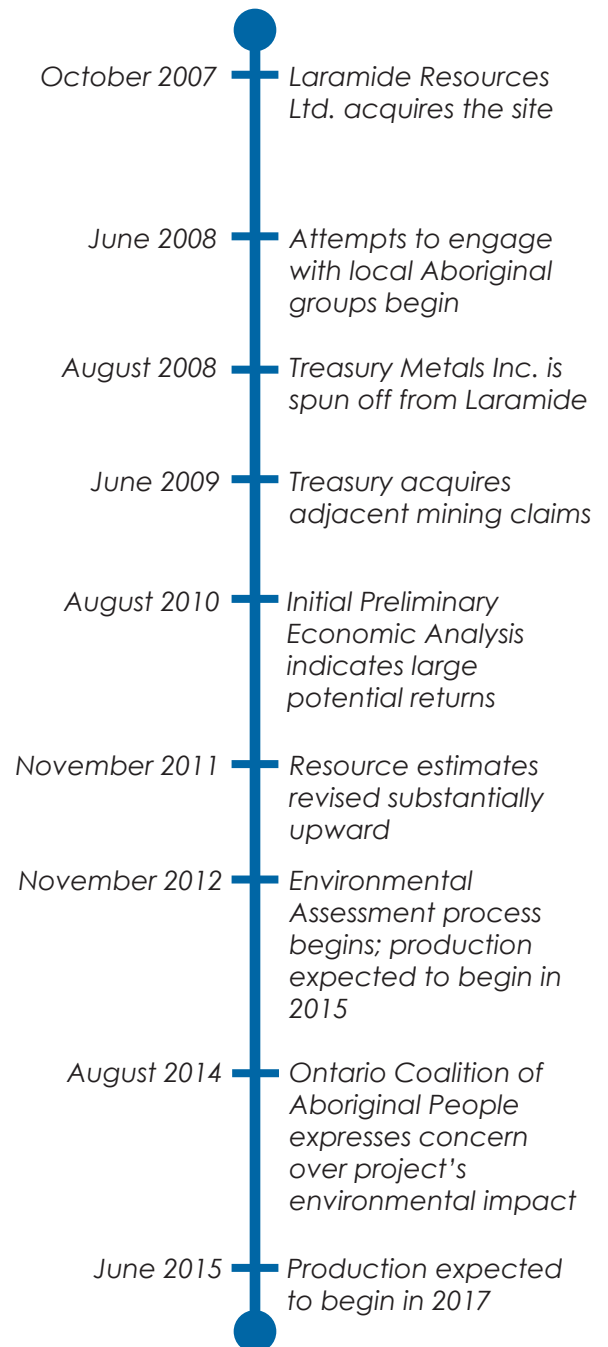
Goliath Gold — Treasury Metals Inc.

Treasury Metals' Goliath Gold project enjoys a number of locational advantages that led many to believe that the project would be able to begin production as early as 2015 (Treasury Metals Inc. 2012). However, a longer-than-expected environmental permitting process and falling gold prices have so far prevented construction. Although the company is still continuing to invest in the property, it is unlikely that the mine will begin production until 2017 at the earliest (Treasury Metals Inc. 2015a); see Table 21.

*“With good **infrastructure**, very low capital costs, and **competitive** operating costs, the **economic** conditions are ripe for the mine’s **development**.”*

The first major advantage the site enjoys is access to a large amount of infrastructure (Stokes 2015). It is located adjacent to the Trans-Canada Highway, and has a power line cutting across the property (Marchand 2012; Treasury Metals Inc. 2015b). Of note is that this project has the smallest amount of gold of those examined here, but its ore is relatively high grade (Lazenby 2014), implying that the mine will be a relatively small operation. These two facts — excellent access to infrastructure and the project’s relatively small size — translate into an extremely low initial capital investment of only \$94 million (Roy et al. 2012), significantly less than the other gold projects examined here. Costs are further kept down by being so close to the population centre of Dryden¹² and access to a source of labour. Although the community’s economy historically has focused on the pulp and paper sector, recent cutbacks at the local mill could provide a workforce that possesses skills similar to those needed by the mining industry. Another advantage is that there

Table 21: Timeline of the Goliath Gold Project



¹² As noted on the website of Treasury Metals Inc., at <http://www.treasuremetals.com/s/Home.asp>; accessed July 2015.

is strong support in Dryden for the mine development (Vaccaro 2012).

With falling gold prices, the site has certainly become less profitable, but this has been partially offset by the falling value of the Canadian dollar. The company believes the project will return a profit so long as the price of gold remains above \$950 dollars per ounce (Roy et al. 2012). With good infrastructure, very low capital costs, and competitive operating costs, the economic conditions are ripe for the mine's development (Secutor Capital Management Corporation 2015).

Despite these benefits, the project still faces some obstacles. First, its operational life is expected to be only ten years, as a limited amount of gold has been identified at the location (Roy et al. 2012). Second, the company has identified eight Aboriginal groups with which consultation is necessary, but no formal agreements have yet been signed with any of them. One particular group, Wabigoon Lake Ojibway Nation, has a demand that Treasury Metals is unable or unwilling to accommodate (see Treasury Metals Inc. 2012) and that, since summer 2011, has caused the negotiation process to stall. In addition, the Ontario Coalition of Aboriginal People has raised concerns about the project's environmental impact, specifically with regard to the region's water (Meadows 2014b). The project's location near human habitation also makes the environmental permitting process more onerous (Marchand 2012).

Overall, the project enjoys a number of significant advantages over other projects examined here. This is reflected by strong investor support, as the company has stated that it already has the necessary funds to bring the project to the construction phase. It is still possible that this project will be operational before the end of the decade. Table 20 summarizes the project's advantages and disadvantages.

Table 22: Summary of the Goliath Gold Project

Advantages

- *Low capital costs*
- *Excellent access to infrastructure*
- *Access to labour*

Disadvantages

- *Low commodity prices*
- *Difficult environmental permitting process*
- *No agreements with local Aboriginal groups*
- *Limited amount of gold*

Rainy River Project — New Gold Inc.

New Gold's Rainy River project has entered the construction phase of its development, and the company has nearly raised all the necessary capital to complete the project.¹³ It is expected that the mine will begin operations by the middle of 2017, later than the original predictions of 2015 (*Chronicle Journal* 2015b; Meadows 2011; New Gold Inc. 2015); see Table 23.

The most obvious advantage of the project is its location in a region of the province with relatively well developed infrastructure. It is adjacent to a highway — indeed, so close that the highway will be moved to accommodate the project — and only 17 kilometres away from a power line (New Gold Inc. 2014). This easy access to infrastructure has lowered the costs of exploring and developing the site. As well, the site is located in a relatively populated area of Northwestern Ontario, close to Fort Frances, a potential supply of the necessary workforce, as the local pulp and paper mill has recently closed (Hardie et al. 2014).¹⁴ A large number of First Nations and Métis groups support the project, although some limited opposition has been registered (*Chronicle Journal* 2013a, 2014a; Meadows 2011; Porter 2014). It was determined through consultation that no traditional First Nations activities occurred on the site, making the development process less objectionable (Hardie et al. 2014). Finally, no major problems were encountered with the environmental permitting process, although it did take longer than initially expected (*Chronicle Journal* 2015a; Hardie et al. 2011).

Economic conditions offer a mixed blessing for the project. On the downside, a relatively large workforce of 600 is expected to be needed at the peak of the project. Skilled labour is already scarce in the province, however, and the cost of hiring 600 workers is not trivial. As well, initial capital costs are quite high at \$931 million, 50 percent higher than the next closest gold project, based on the data presented in Table 4 (Hardie et al. 2014). With a life of only fourteen years, it will be difficult for the project to recoup such a large investment over such a short production run. In addition, operational costs are relatively high, in part due to the low-grade, high-tonnage nature of the deposit (Hardie et al. 2014). The project has also seen some cost escalation during its development, with operating cost estimates increasing by over \$100 per ounce and capital costs by \$250 million (Meadows 2011; Rainy River Resources 2015).¹⁵ The latest projections indicate, however, that capital costs once again might fall due to a lull in

Table 23: Timeline of the Rainy River Project



¹³ See the website of New Gold Inc., at <http://www.newgold.com/>; accessed July 2015.

¹⁴ See also *ibid.*

¹⁵ *Ibid.*

the industry (Meadows 2014a). Overall, though, the expected rate of return for the project has decreased (Hardie et al. 2014; Rainy River Resources 2015). On

the other hand, the fall in the value of the Canadian dollar has worked in New Gold's favour, as expected revenues are now higher than previously estimated (Chronicle Journal 2014b).

At this point, New Gold appears to be in a strong position to move forward with the mine construction. Using its own financial assets plus a recent agreement with Royal Gold, the company has \$738 million of the remaining \$760 million required for mine construction.¹⁶ With all the necessary approvals and permits in hand and with the financing in place, the project should continue to develop to meet its 2017 opening date. Table 24 summarizes the project's advantages and disadvantages.

Table 24: Summary of the Rainy River Project

Advantages

- *Excellent access to infrastructure*
- *Access to labour*
- *Agreements signed with local Aboriginal groups*
- *No major environmental permitting obstacles*

Disadvantages

- *High capital costs*
- *High production costs*



¹⁶ Ibid.

Future Commodity Prices

These nine projects have all been adversely affected by the fall in commodity prices over the past three years. This section examines the forecast price of these commodities for the next ten years, to determine the likelihood that the remaining pre-construction projects will become economically viable during this time.

Tables 25 and 26 are the World Bank's forecast of the price of gold, silver, copper, nickel, platinum, and iron ore for the next ten years. Table 25 reports the prices in current US dollars, while Table 26 adjusts for predicted inflation by keeping prices in constant 2010 US\$ values. Adjusting for inflation is necessary because, all else being equal, the cost of developing and operating the projects will increase with inflation. If commodity prices do not keep pace with inflation, the returns on the projects will decline over time.

The forecasts indicate that gold prices are expected to stay relatively low over the next decade. After adjusting for inflation, they are predicted to fall by over 20 percent. This is a worrisome projection for both those gold projects that have not yet developed in the region and for those that have. If the price of gold is not above the cash operating cost of a mine, it might lead to the mine's closure. If these projections are correct, it is unlikely that either the Goliath or Hammond Reef project will enter the construction phase in the next decade. The Phoenix and Rainy River projects would also be in danger of having to shut down if prices fall as low as predicted.

For the platinum group metal projects, the commodity price predictions are also worrying. Inflation-adjusted copper prices are expected to stay relatively constant, while nickel and platinum prices are predicted to have modest growth. The predicted rise in the price of nickel will help make the Eagle's Nest project more viable, as its ore body contains a large amount of nickel. It is unlikely that the predicted rise in prices would be sufficient to make the Marathon project viable, however, as its ore body is largely comprised of copper. Predictions for the price of palladium are unavailable, but it is possible that a sufficiently large increase could offset the lower prices of the other commodities.

Iron ore prices are predicted to remain relatively low over the next ten years. The Josephine Cone Mine would be economically unviable at the predicted prices. No predictions for the future price of chromite are available, but the price has largely remained around \$1.25 per pound over the past five years; if this trend continues, the Black Thor project will remain economically unviable.

Along with the future movement of commodity prices, the other important economic variable to consider is the future movement of the US-Canadian dollar exchange rate. Two major Canadian banks, RBC and TD, both predict that, in 2016, the Canadian dollar will be worth around US\$0.75 (RBC Economics 2015; TD Economics 2015). Predictions beyond 2016 are not available. If the exchange rate were to remain near

Table 25: Price Forecasts in Current US Dollars, Selected Minerals, 2016–25

	Gold (US\$ per troy ounce)	Silver (US\$ per troy ounce)	Copper (US\$ per pound)	Nickel (US\$ per pound)	Platinum (US\$ per troy ounce)	Iron Ore (US\$ per tonne)
2016	1,156	15.90	2.70	6.16	1,135	57
2017	1,138	16.00	2.75	6.43	1,170	59
2018	1,120	16.10	2.80	6.71	1,207	60
2019	1,102	16.20	2.85	7.01	1,245	62
2020	1,084	16.40	2.90	7.31	1,285	64
2021	1,067	16.50	2.96	7.64	1,325	66
2022	1,050	16.60	3.01	7.97	1,367	68
2023	1,033	16.70	3.06	8.32	1,410	70
2024	1,016	16.90	3.12	8.69	1,454	73
2025	1,000	17.00	3.18	9.07	1,500	75

Source: World Bank 2015.

Table 26: Price Forecasts in Constant 2010 US Dollars, Selected Minerals, 2016–25

	Gold (US\$ per troy ounce)	Silver (US\$ per troy ounce)	Copper (US\$ per pound)	Nickel (US\$ per pound)	Platinum (US\$ per troy ounce)	Iron Ore (US\$ per tonne)
2016	1,074	14.7	2.51	5.72	1,054	53
2017	1,040	14.6	2.51	5.87	1,070	53
2018	1,007	14.5	2.52	6.04	1,086	54
2019	975	14.4	2.52	6.20	1,103	55
2020	945	14.3	2.53	6.37	1,119	56
2021	915	14.1	2.53	6.55	1,136	57
2022	886	14.0	2.54	6.73	1,153	58
2023	857	13.9	2.54	6.91	1,170	58
2024	829	13.8	2.54	7.09	1,186	59
2025	802	13.6	2.55	7.28	1,203	60

Source: World Bank 2015.

that level for the foreseeable future, Canadian mines would experience a large advantage over their US counterparts. Since most of the costs of constructing and operating the mines are in Canadian dollars, these firms would see a large increase in their revenues with no corresponding increase in costs.

It is helpful to understand what is driving the low commodity prices and the relatively low value of the Canadian dollar in order to better understand what might lead to future changes in these values. The change in commodity prices is largely driven by two factors. One is lower global demand, driven primarily by slowing economic growth in China over the past five years; the growth rate there is not forecast to increase in the immediate future. The second factor is the increase in global output and the availability of large inventories of these minerals. New mine developments

are further expected to add to the available supply in the coming years. Combined, low demand and high supply are expected to lead to low prices.

The future value of the Canadian dollar will depend heavily on the movement of oil prices, with low oil prices leading to a falling dollar. At the same time, the US dollar is performing exceptionally well against most global currencies. So it is not just Canadian mines that are benefiting from a weak currency — mining projects outside North America have seen their domestic currencies depreciate as well, increasing their competitiveness.

If these forecast commodity prices and exchange rates are correct, it is unlikely that any of the projects that have not yet reached the construction phase will become operational within the next decade.

Conclusions

An examination of nine mining projects in Northwestern Ontario has provided insight as to why certain projects succeed and others do not. The evidence suggests that falling commodity prices have played the largest role in preventing many of these projects from moving forward. Other important factors include high development costs, often related to a lack of infrastructure, and high operating costs, caused by a lack of skilled labour and high energy costs. Finally, the long environmental permitting process has stopped many projects from capitalizing on high commodity prices.

The obvious first obstacle is the decline in commodity prices, which has affected all of the projects. However, this fall does not necessarily have to equate to the project's failure — if costs are sufficiently low, firms can overcome this problem.

As far as capital costs are concerned, six of the nine projects faced initial capital investment requirements of over \$500 million. The success of both the Phoenix and Cochenour projects is due in part to their relatively low required initial capital investments. Other projects, such as Hammond Reef and Marathon, saw large capital cost escalations during the development process, while others, such as the Josephine Cone and Black Thor projects, required large investments from the outset. Often it is the need to provide infrastructure that causes this cost to be so high. This is certainly the case for the two Ring of Fire projects, as well as for the Josephine Cone and Hammond Reef sites. On the other hand, the Phoenix, Cochenour, and Rainy River projects all benefited from excellent access to infrastructure. Clearly, low capital costs, aided by access to infrastructure, were a major determinant of the success or failure of a project.

As for anticipated operating costs, they are relatively high in Ontario, as shown by the high cost per ounce of gold milled (see Tables 1 and 2), which indicates the minimum level the commodity price must attain to cover operating costs. All nine projects suffer from the relatively high electrical costs that all firms operating in the province face. Some projects are able to keep their operating costs relatively low by accessing different labour markets. For instance, Phoenix and Cochenour have access to the trained labour force present in Red Lake. Marathon can also access the labour force present from the Hemlo mines. Other projects, such as Goliath and Rainy River, can take advantage of the labour force made available from the slowdown in the pulp and paper sector. Phoenix and Cochenour can also access the supply chains

created by the other mines in the Red Lake area to further reduce their costs. Again, these examples show that firms that are able to keep their production costs low are more likely to make it successfully through all stages of development.

The lengthy environmental permitting process is yet another obstacle that firms must overcome. Some projects, such as Phoenix and Cochenour, had the advantage of being situated on previous mine sites, which made the process relatively easy. Other projects, such as Rainy River, faced few objections and were able to obtain the required permits with relative ease. The Ring of Fire projects, however, face substantial difficulties: as no mines have previously been developed in that region, the potential effects of mines there are difficult to quantify. For other projects, such as Marathon and Hammond Reef, the review process took so long that the fall in resource prices made them no longer economically viable.

A final difficulty is the consultation process with local communities, both Aboriginal and non-Aboriginal. In general, the sites that had to deal with a larger number of interested parties required a longer development time. The two Red Lake projects had to consult only with the greater Red Lake community, which has a long history of mining, and two First Nations whose reserves are located a substantial distance away. The two Ring of Fire projects, however, must come to an agreement with the nine members of the Matawa Tribal Council. Other projects, such as Hammond Reef and Rainy River, also faced a large number of interested parties, but were able to reach accommodations. The evidence suggests that having to come to a greater number of arrangements slows down the process, but that when allowed to negotiate, mining firms and local communities are able to come to mutually beneficial arrangements.

Looking at the results in total, it is clear that the right combination of a number of factors is required for a project to make it successfully through the development process. Cochenour and Phoenix held advantages in all of these areas, and were thus able to develop relatively quickly. Rainy River faced high costs, but was able to overcome this challenge thanks to offsetting positive factors. Other projects, such as Black Thor, suffered from challenges in all of these areas that were simply too large to overcome. The other five projects faced challenges in some areas but not others. In the end, the balance was not in their favour, as demonstrated by their failure to develop successfully.

Recommendations

Clearly, much unexploited mineral wealth remains in Northwestern Ontario. The high commodity prices of the recent past encouraged firms to begin developing projects that were previously uneconomical.

Developing a mining project is time consuming, however, as it requires exploration, feasibility studies, community engagement, environmental permits, negotiations with Aboriginal groups, and a period of construction. For instance, Rubicon required thirteen years to reach the post-construction phase from when it first acquired the project. It took Goldcorp seven years from when it acquired the mineral rights to the Bruce Channel deposit. It will take at least twelve years from when Rainy River Resources acquired the site until New Gold begins operation in 2017.

If the goal is to increase the number of projects that reach the production phase, three types of changes should be made: make it less costly to operate a mine in Ontario, shorten the development period, and reduce the uncertainty in the process.

Little can be done to overcome the fundamental economic conditions of the commodity market. If commodity prices are low, many projects will remain economically unfeasible, and the region's mineral wealth will remain in the ground until prices make it profitable for the resource to be extracted. However, steps can be taken to help reduce capital and operating costs, which would make the projects viable at lower commodity prices.

Investment in infrastructure should be made now, while interest rates are at a historic low. Constructing transportation and energy links to the Ring of Fire now will allow projects in that region to become operational when commodity prices inevitably rise again. In the meantime, there would be immediate benefits from infrastructure investment. Connecting remote First Nations communities to year-round surface transportation links would provide its own economic benefits. The unexploited resources will not move, so building these links now would reduce the cost of accessing them in the future, while reducing the amount of time necessary to bring mines into operation when commodity prices rise.

Many of these projects face high expected operating costs for two notable reasons. One is high electricity prices. Mining is an energy-intensive process, and the costs in Ontario are high compared with those in other mining jurisdictions — double those in the two adjoining provinces of Quebec and Manitoba, for example (Ontario Hydro 2013). Again, with interest rates so low, now is the time to invest in energy production and transmission, which would help reduce operating costs and make the mines in Northwestern Ontario more internationally competitive. The second reason for high

“If the goal is to increase the number of projects that reach the production phase, three types of changes should be made: make it less costly to operate a mine in Ontario, shorten the development period, and reduce the uncertainty in the process.”

operating costs is the high cost of labour. There is a shortage of skilled labour in Ontario's mining sector. In the short term, employees must be trained to meet the immediate needs of mines that are facing an aging workforce. Providing information and incentives to students to receive training in this area is a good first step. Programs similar to Noront's and Confederation College's Ring of Fire Aboriginal Training Alliance are another possible avenue. In a similar vein, Lakehead University's Centre of Excellence for Sustainable

*“Investment in infrastructure should be made now, while interest rates are at a historic low. **Constructing** transportation and energy links to the **Ring of Fire** now will allow projects in that region to become **operational** when commodity prices inevitably **rise** again.”*

Mining and Exploration provides an opportunity for stakeholders in the mining industry to engage with researchers on subjects such as mineral exploration, mine development, the socio-economic effects of mining, the environmental effects of mining, and the engagement of Aboriginal communities.

As for the second recommendation, shortening the development period of projects, investment in infrastructure will help, but of greater importance

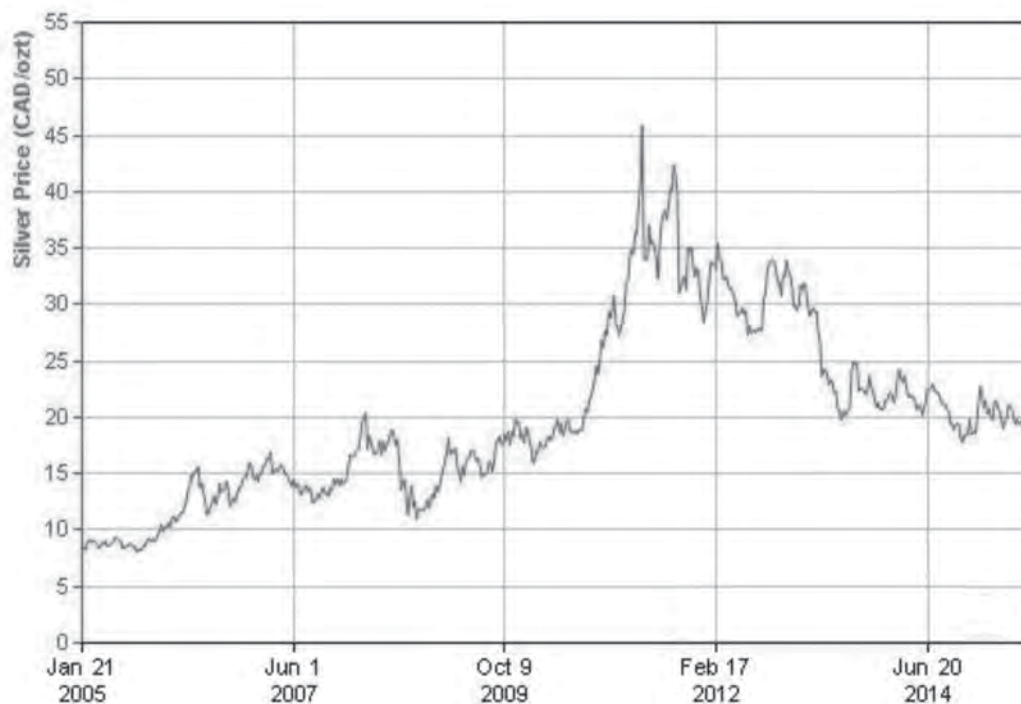
is finding a way to reduce the time required for the environmental permitting process. Legislated timeframes, such as those in the Canadian Environment Assessment Act, 2012, are a good first step, but the process can still take upward of three years. The experience of many of these projects show just how detrimental this wait can be. When commodity prices were high, the projects tried to develop quickly to exploit them. As they waited for their environmental permits, however, commodity prices fell such that many projects were no longer economically viable. Shortening the environmental permitting process could lessen this problem. This does not necessarily mean making the process less stringent. For instance, funds could be made available to allow firms to hire the additional staff necessary to conduct reviews more quickly. Funds could also be made available for local communities, both Aboriginal and non-Aboriginal, to hire the necessary professionals to help them quickly understand the potential environmental costs of projects; currently, delays occur when local communities request additional time and resources to undertake this process. If the time it takes to open up a mine is shortened, more mines could ride the next wave of high commodity prices to the production phase. As Figure 2 shows, even with seven straight years of increasing gold prices, only two new gold projects were able to reach the post-construction phase.

Finally, clarity needs to be provided in dealing with Aboriginal groups. Many firms — such as New Gold, Goldcorp, and Rubicon — have been able to come to mutually beneficial agreements with Aboriginal stakeholders. Others, such as Noront, have been unable to do so. This issue makes it difficult to secure investors, as any agreement ultimately could affect a mine's profitability. The rights of both parties should be made explicitly clear, so that the two sides can negotiate more easily over the project's benefits in a clear fashion. According to economic theory, when property rights are established, clear, and enforceable, it is easier for parties to reach an efficient outcome. In most cases, however, opposition from Aboriginal groups has not led to major disruptions or the failure of any individual project. Notably, in none of the nine cases examined was there serious opposition from non-Aboriginal communities — most nearby towns have previous experience in the resource extraction sector, and recognize the benefits and costs associated with it.

Ultimately, the reason for the failure of most of these nine projects to develop came down to the low expected profitability of the mine. If the three areas mentioned above are improved, however, the next time commodity prices rise the region might indeed experience the mining boom that was predicted three years ago.

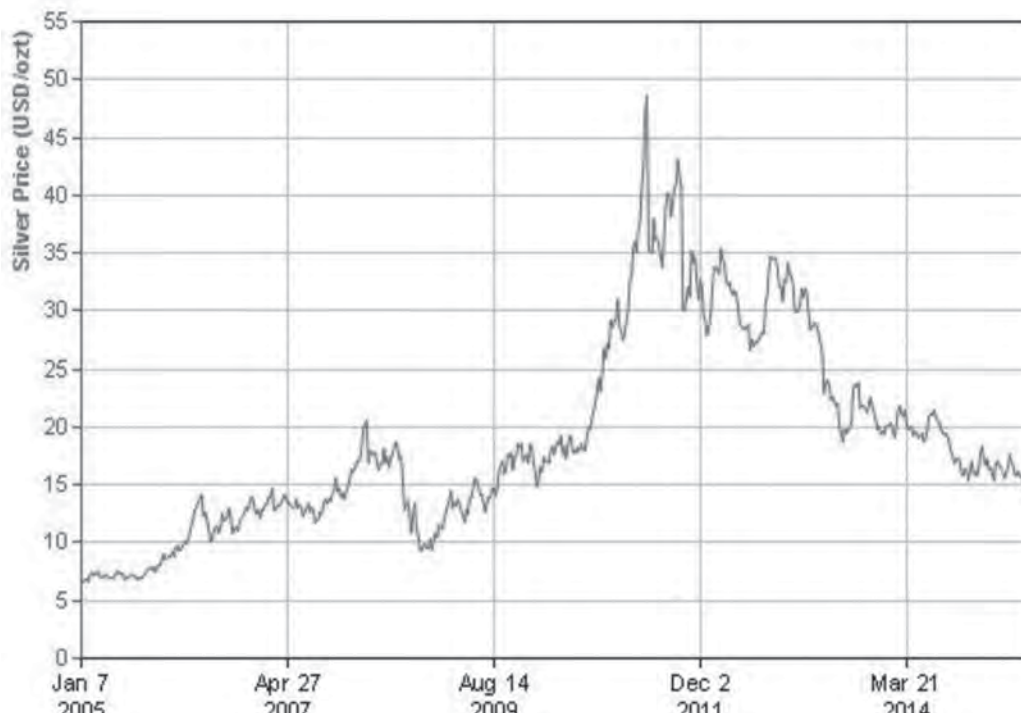
Appendix: Figures of Commodity Prices

Figure A-1: Silver Price in Canadian Dollars per Troy Ounce, 2005–15



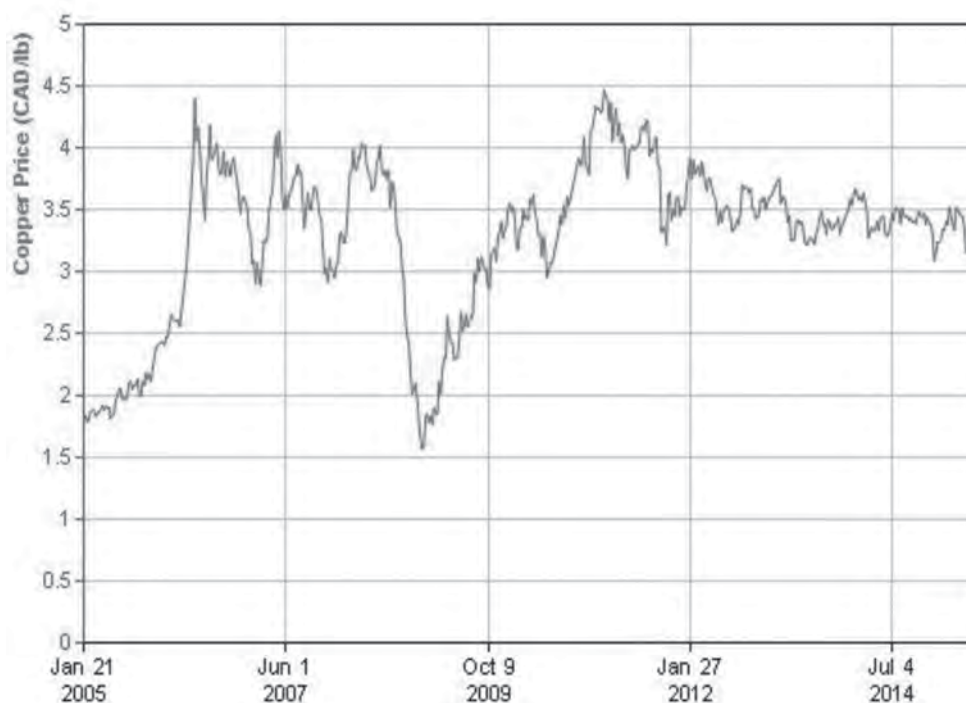
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-2: Silver Price in US per Troy Ounce, 2005–15



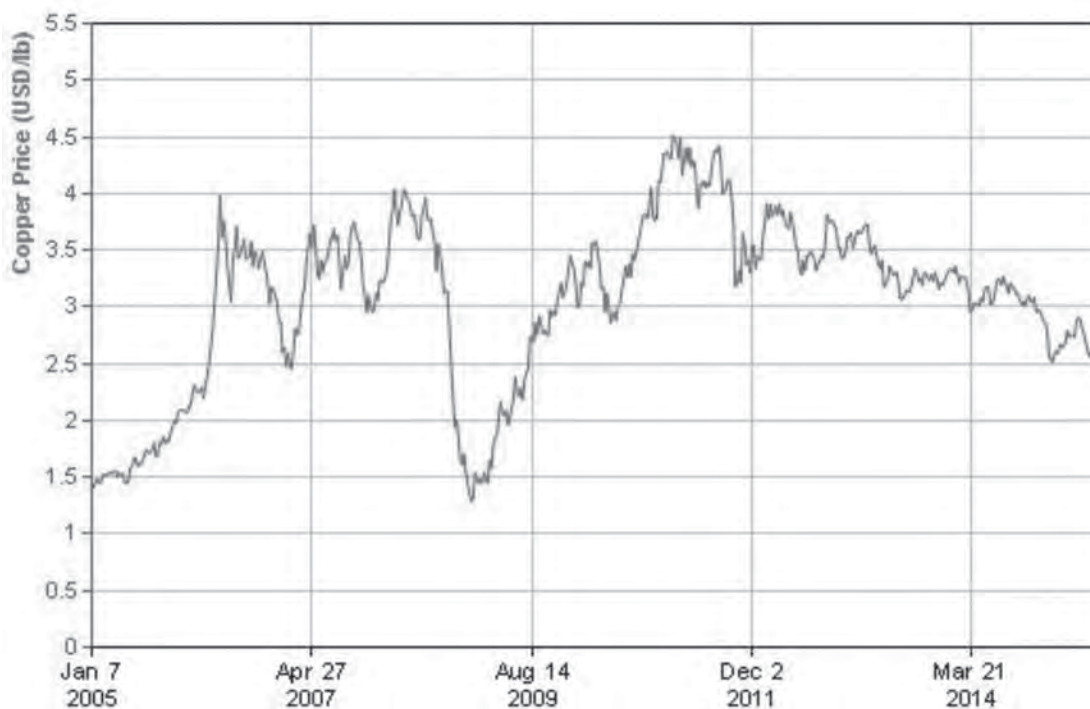
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-3: Copper Price in Canadian Dollars per Pound, 2005–15



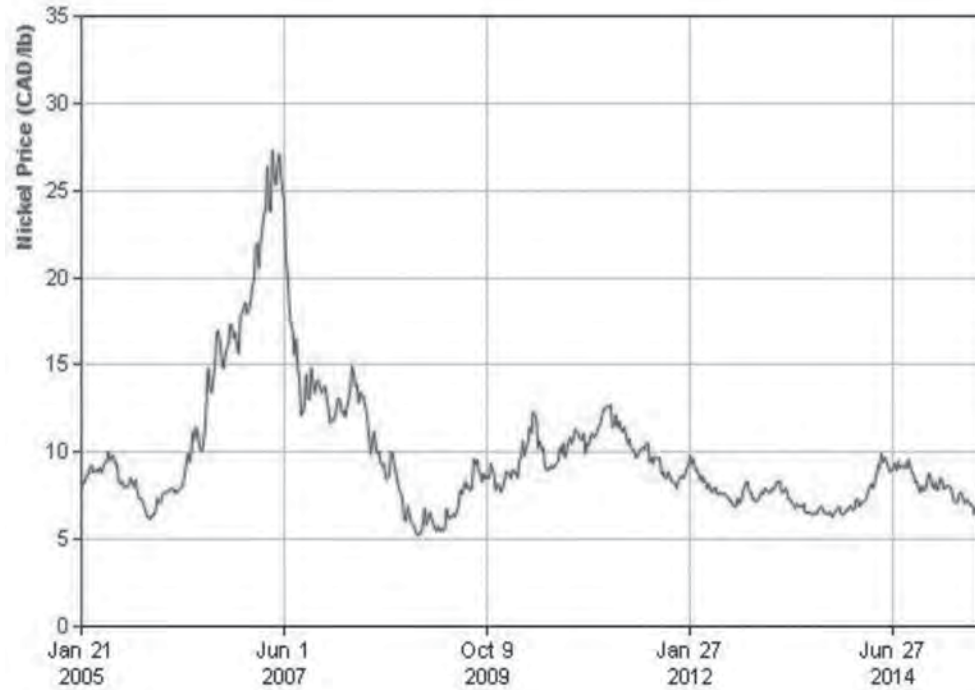
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-4: Copper Price in US Dollars per Pound, 2005–15



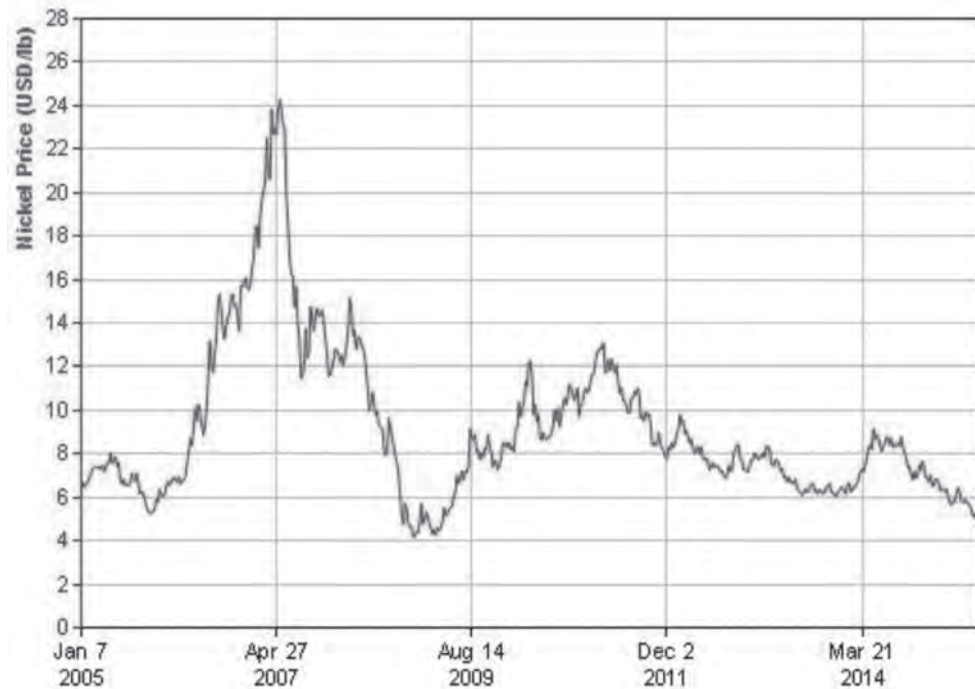
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-5: Nickel Price in Canadian Dollars per Pound, 2005–15



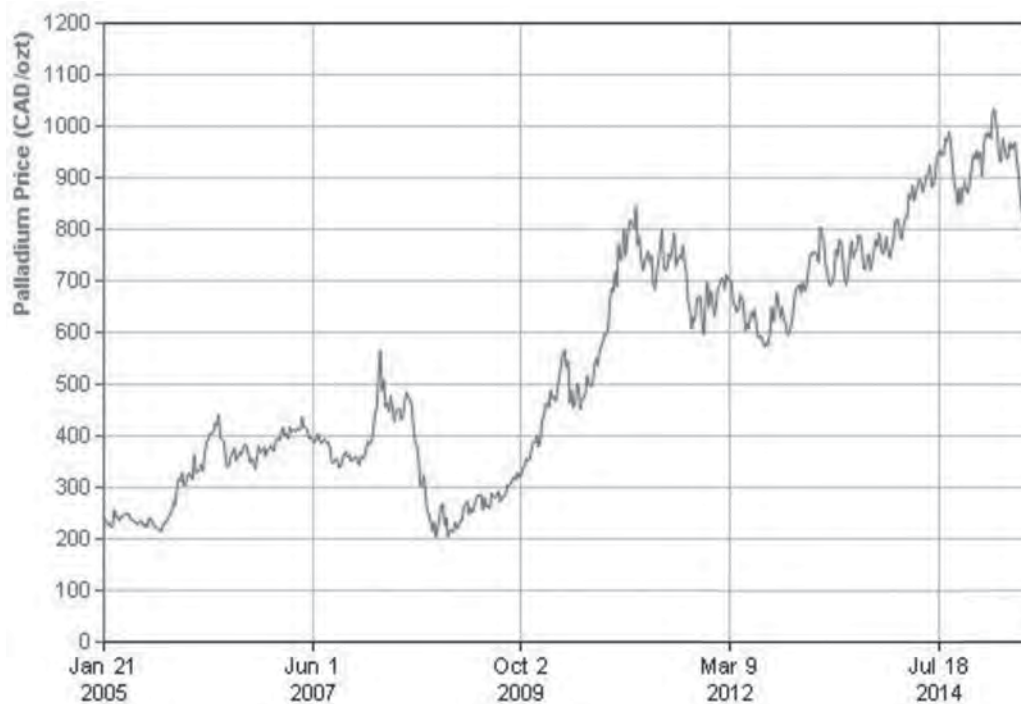
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-6: Nickel Price in US Dollars per Pound, 2005–15



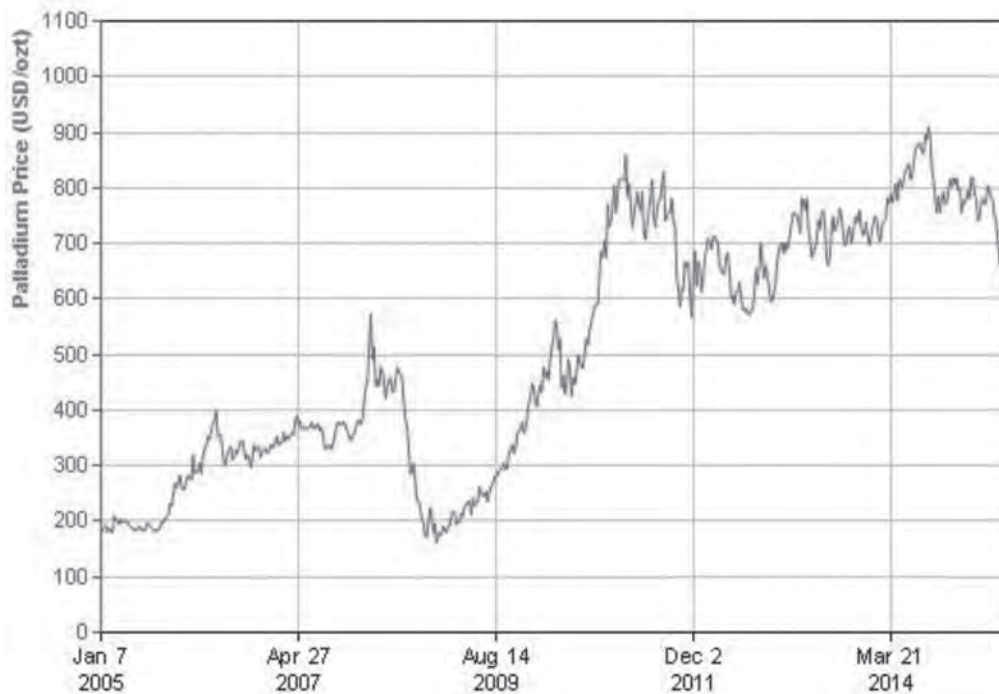
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-7: Palladium Price in Canadian Dollars per Troy Ounce, 2005–15



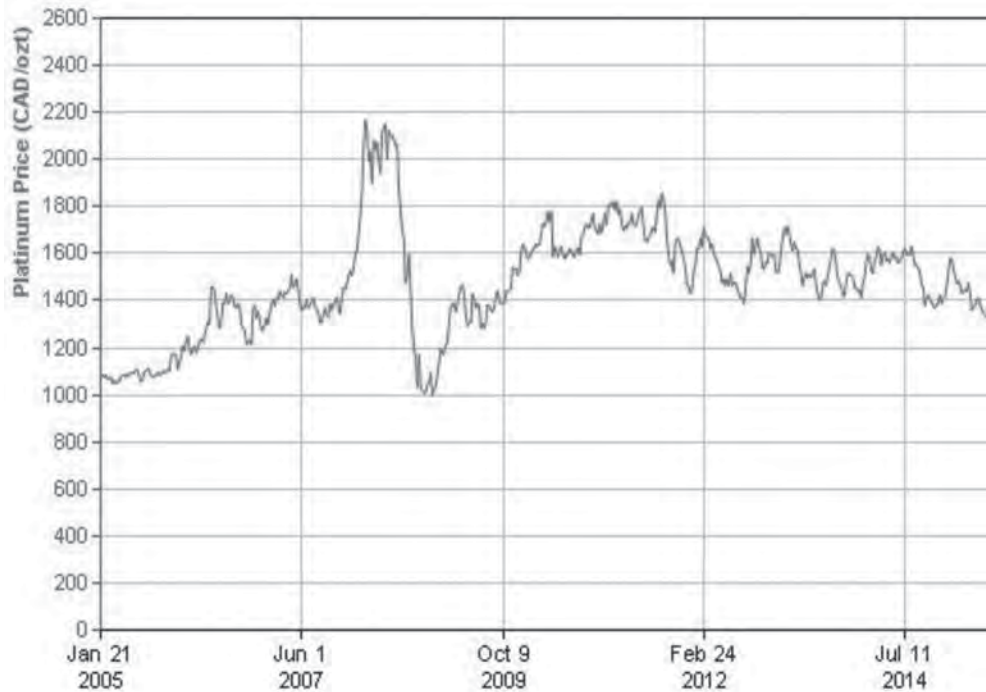
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-8: Palladium Price in US Dollars per Troy Ounce, 2005–15



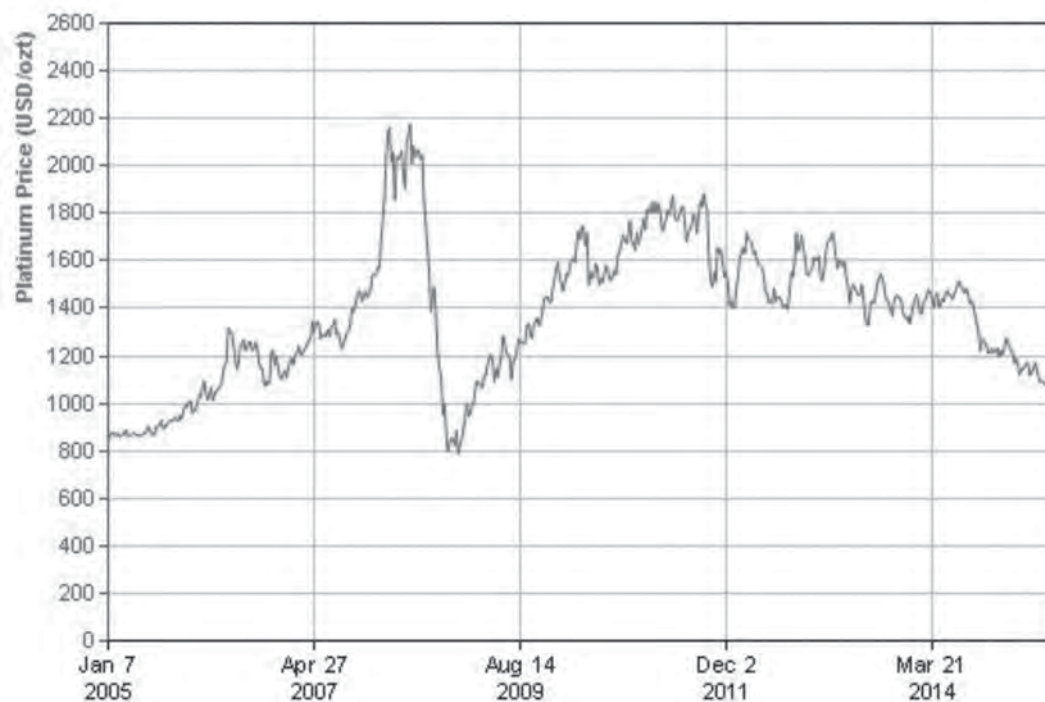
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-9: Platinum Price in Canadian Dollars per Troy Ounce, 2005–15



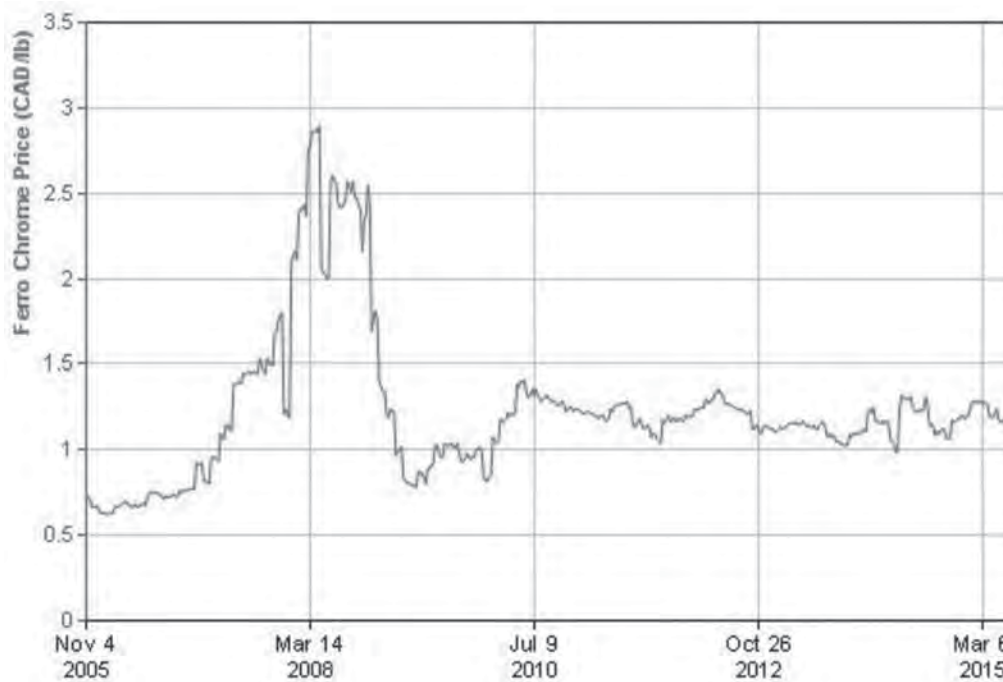
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-10: Platinum Price in US Dollars per Troy Ounce, 2005–15



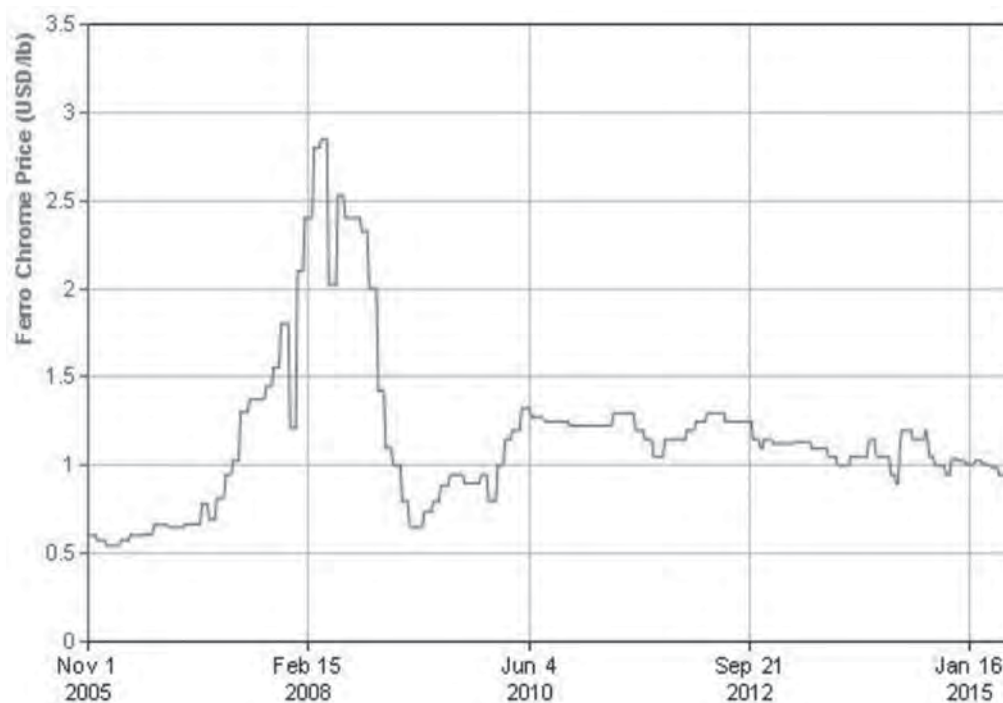
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-11: Ferro Chrome Price in Canadian Dollars per Pound, 2005–15



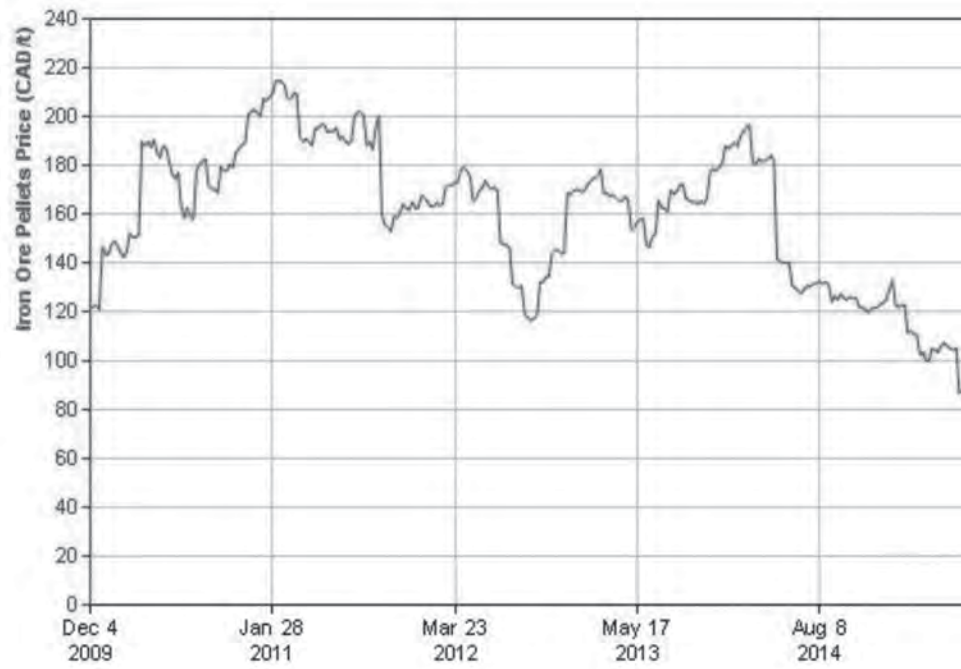
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-12: Ferro Chrome Price in US Dollars per Pound, 2005–15



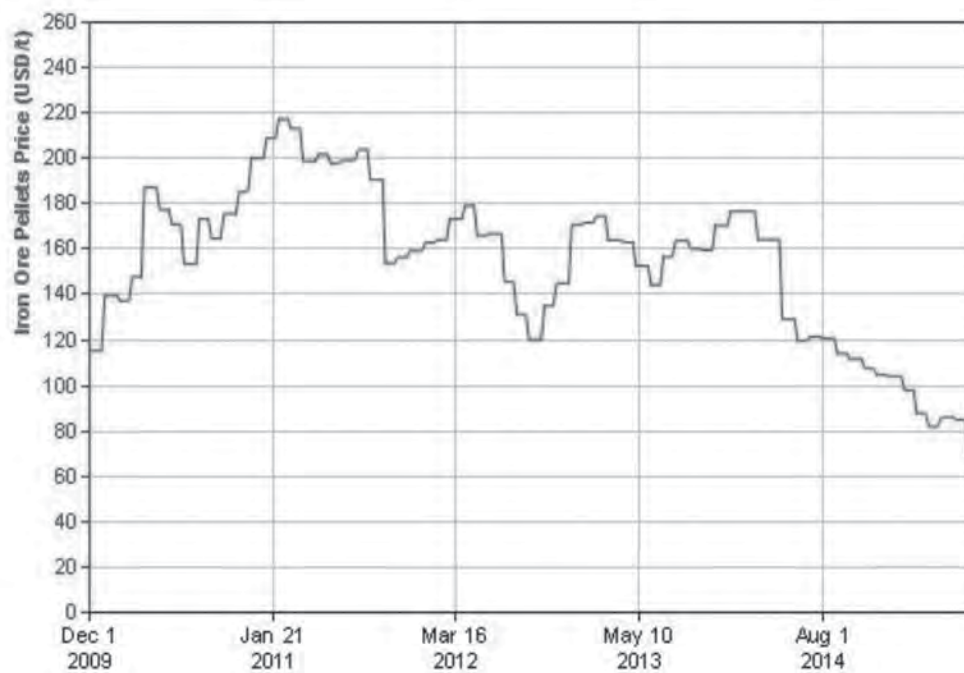
Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-13: Iron Pellet Price in Canadian Dollars per Tonne, 2009–15



Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

Figure A-14: Iron Pellet Price in US Dollars per Tonne, 2009–15



Source: InfoMine.com; available online at <http://www.infomine.com/ChartsAndData/ChartBuilder.aspx?g=127681&cd=1>.

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Northern Policy Institute is Northern Ontario's independent think tank. We perform research, collect and disseminate evidence, and identify policy opportunities to support the growth of sustainable Northern Communities. We operate throughout Northern Ontario. We seek to enhance Northern Ontario's capacity to take the lead position on socio-economic policy that impacts Northern Ontario, Ontario, and Canada as a whole.

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