

Mining in Northwestern Ontario: Opportunities and Challenges

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Small Business Consulting Services

Small Business Consulting Services (SBCS) is a business operated by Lakehead University Honours Bachelor of Commerce students. The organization has been in existence since 1972 and has been able to successfully utilize student education to serve the needs of the region. This business operates out of the Lakehead University campus, and provides assistance at affordable fees. The consulting team working to help prepare this report consists of Casey Kerber, Navjeet Singh, and Keith Wooten.

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This report could not have been completed without the active involvement of all the above mentioned participants. Their considerations and willingness to contribute their perspectives to this study has helped us to meet our objectives in a thorough and meaningful way for all stakeholders.

Disclaimer on Use

This report was commissioned by the Ambassador's Northwest, in partnership with the City of Thunder Bay, Thunder Bay Ventures, and the Thunder Bay Chamber of Commerce for the purposes outlined in Part I, Section I.

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Executive Summary

This study provides an economic analysis of the immediate opportunities and challenges to further developing the mining industry in Northwestern Ontario (NWO). This study is organized as follows:

- (1) an introduction to the study and brief background to the mining industry in NWO.
- (2) the economic impact of further development with consideration for:
 - (a) the value of the un-mined minerals and metals,
 - (b) the employment economic impact,
 - (c) the projected government revenue.
- (3) the present and future challenges facing mining with consideration for:
 - (a) Aboriginal involvement,
 - (b) labour market dynamics, and
 - (c) infrastructure.

Environmental impacts are beyond the scope of this study.

There are a number of mining projects currently underway in NWO. This study focuses solely on nine selected projects to provide Government, Aboriginal peoples, industry stakeholders and community leaders with an estimate of the potential economic benefits immediately available when additional growth in the mining sector is fostered. These nine projects under study are as follows:

1. Bending Lake Iron Group Limited – Bending Lake Iron Property
2. Cliffs Natural Resources Inc. – Black Thor
3. Goldcorp Inc. – Bruce Channel Deposit and Cochenour Project Gold Projects
4. Osisko Mining Corporation – Hammond Reef
5. Noront Resources Ltd. – Eagle’s Nest
6. Rainy River Resources Ltd. – Rainy River Gold Project
7. Rubicon Minerals Corporation – Phoenix Gold Project
8. Stillwater Mining Company – Marathon copper-PGE Deposit
9. Treasury Metals Inc. – Goliath Gold Project

These projects were selected based on the following criteria: they are mature, or near the development stage; they have the potential to become producing mines within the next five years; and they have sufficient public data available.

In terms of dollar value, employment and tax revenue, the economic analysis revealed that the potential worth of the mineral deposits in NWO is substantial.

1. There is a total real option value (i.e., the total value of the un-mined metals and minerals) of \$USD135.40 billion for these nine mines utilizing June 1, 2012 commodity prices.
2. Employment growth is expected to be significant. The direct, indirect and induced employment created for the Province of Ontario is expected to total 23,588 new positions (8,107 from construction and 15,481 from mining operations over an average mine life of approximately 17.5 years). A total of 13,149 of these new positions are expected to remain in NWO (5,719 during construction and 7,430 from mining operations).
3. The potential tax revenue for all three levels of government is conservatively estimated to exceed \$CAD 16 billion. The Federal Government, Province of Ontario and municipal governments will benefit significantly in terms of corporate taxes, personal income taxes, property taxes, other payroll taxes, and indirect taxes, such as sales and excise taxes. These tax revenues will be received over the average operating life of approximately 17.5 years.

Three major issues and challenges facing the development of mining in this region are: (1) Aboriginal involvement, (2) labour market dynamics, and (3) infrastructure in terms of rail, roads, and electrical power. To enhance the involvement of Aboriginal peoples, this study demonstrates that flexible, innovative and collaborative long-term solutions are required. Government and industry can play a critical role in terms of fostering community development, education and training, employment, business opportunities, revenue sharing and developing full partnerships in the mines, energy, other natural resources and its related infrastructure. It is imperative that the Federal Government take a leadership role regarding Aboriginal involvement. Recognition of Aboriginal and Treaty Rights and clearly defined processes for meaningful consultation in relation to the 'Duty to Consult' would help move agreement making beyond traditional impact benefits to relationship and partnership building. Utilizing this approach would help provide certainty regarding land management decisions, as well as maximizing mutual benefit for economic growth and community improvements.

Challenges pertaining to labour market dynamics include a tight labour market, a highly mobile labour force and an aging workforce. Over the next decade, NWO would need to attract upwards of 30% to 45% of the entire new entrants to the mining industry. The occupations expected to be in highest demand are the trades, such as underground miners, millwrights, mineral processors, heavy equipment operators and electricians. Recommendations and strategies to address these challenges include utilizing underrepresented groups in mining, such as Aboriginal people and women; developing strategies for high school, college and university students to consider mining as a career; and creating an industry-wide branding and communication strategy.

Inadequate and limited infrastructure has been a significant factor in hindering the development of the region's immense economic mining potential. The development of an integrated transportation, energy and modern communication network is necessary to realize the potential from mining. An expanded infrastructure network will also provide positive economic and social benefits for local communities and Aboriginal peoples. For the nine mining projects, it is estimated that capital costs for roads, rail and power line transmission are approximately \$1.739 billion. This figure represents approximately 10% of the projected government revenues to be generated by these mines (i.e. \$1.739 billion capital costs divided by \$16 billion in tax revenues). These capital costs will create hundreds of construction and maintenance jobs that have not been quantified as part of this study. Infrastructure development will also open up the NWO region to further development of the minerals and metals potential.

A major constraint in operating the nine mining projects is the requirement for over 550 MW of electrical power. Various industry stakeholders have suggested that surplus power capacity in excess of 500 MW exists within the current generating stations in Thunder Bay and Atikokan and that both these thermal generating stations would have to run at full capacity to meet the needs of the mining industry.

This study demonstrates that the extent of the projected wealth, the positive economic and social benefits and the expected taxes that could be generated by these nine mines is substantial. Existing operating mines and other advanced exploration projects are not considered within this analysis. If these operations had been included, a much greater economic impact would have resulted.

The extent of the magnitude of mining development in NWO calls for effective participation and leadership by the Provincial and Federal Governments to coordinate the required initiatives and to support economic growth that fosters sustainable development for the future of mining in this region.

It is apparent that collaboration amongst the Provincial and Federal governments, Aboriginal communities and industry is required to produce long-term strategies for the success of all parties. This study brings to the forefront and to the attention of all stakeholders, especially the Federal and Provincial governments, that enhancing the opportunities and addressing the challenges, economic and social benefits can be realized for the region of NWO and the Province of Ontario.

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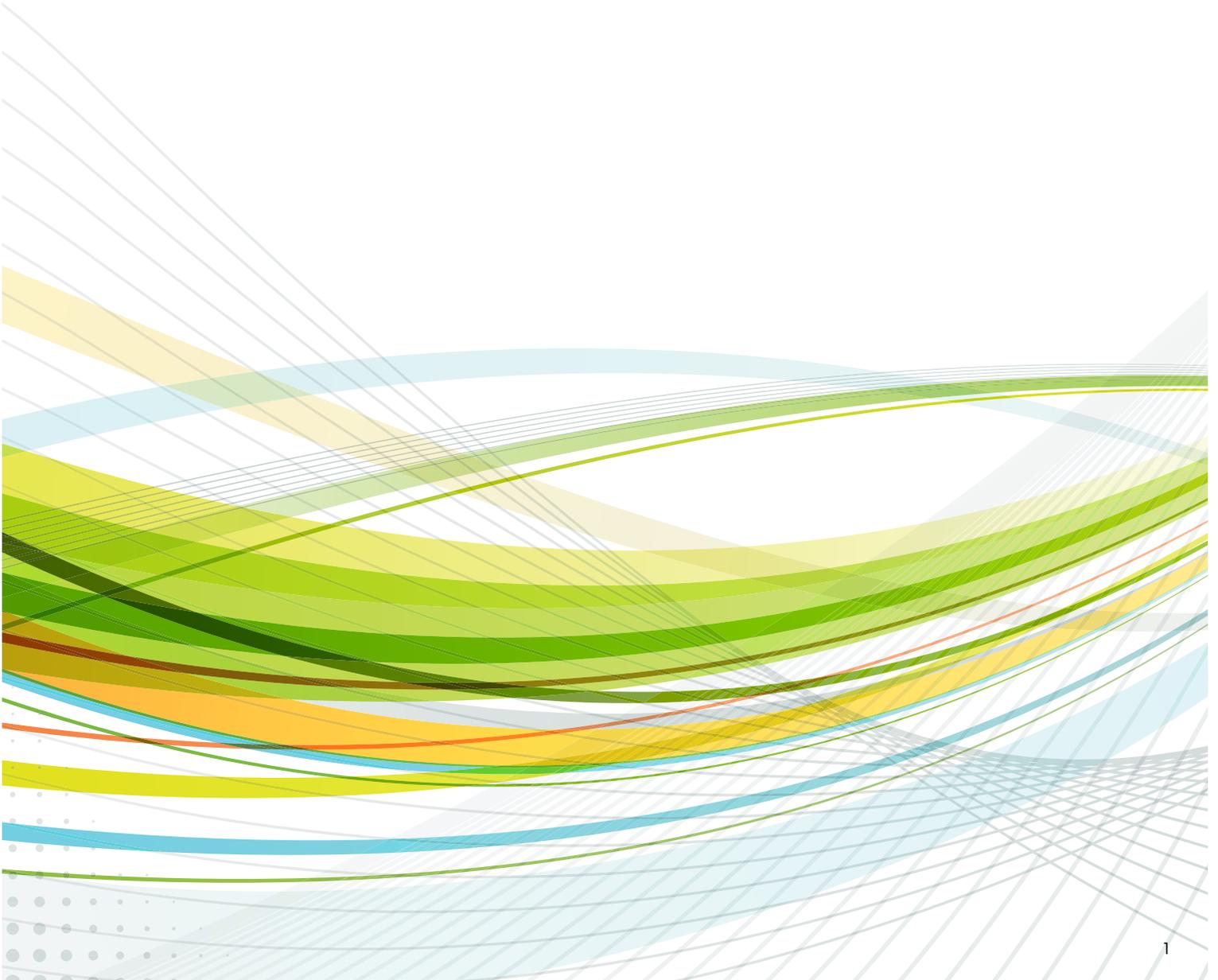
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Part I: Introduction



I. Introduction

Historically, the economy of Northwestern Ontario (NWO) has been tied to the natural resource sectors of forestry and mining with a heavy dependency on the export of harvested resources in a minimal valued-added form. During the last two decades of the 20th century, however, the market for raw lumber material and products has not been strong and the economy of Northern Ontario has suffered a setback, as a result.

The mining sector has had a long history of being a considerable contributor to the socio-economic development and sustainability of many Northern Ontario communities and the Province as a whole. Since the boom in the economies of developing nations (e.g., China, India, Brazil, etc.), the demand for minerals has increased along with investments in the mining sector. The economic impact of mining includes not only the direct benefits from the wages and salaries of the workers directly employed and the corporate taxes paid by active mines but also the indirect impact on industries up and down the production chain and the induced impact from the increased consumption resulting from increases to disposable income from the employment generated. Accordingly, the mining sector provides support for industrial development, transportation, financial services and general goods and services across the north.

Recently, a substantial group of mineral deposits has been discovered in NWO, including major deposits in the Ring of Fire area. Cliff's Natural Resources' Black Thor Chromite Project, for example, is anticipated to be the largest chromium deposit in North America. In addition, there is a host of gold, platinum and other rare earth metal deposits that have been identified by various mining companies throughout NWO. The development of these deposits can offer the prospect of substantial socio-economic opportunity for the region, the province and for Canada. The development of the Ring of Fire alone can impact the well-being of the general population of NWO residents and the local Aboriginal people in terms of job prospects, educational opportunities and improved infrastructure. These same benefits can also accrue as a result of the development of the other mining claims in NWO.

Government, Aboriginal people and industry must collaborate to take advantages of these mining opportunities. Government policy decisions have significant impact on the very survival of existing mines and on the development of new mines. In addition, Aboriginal communities have significant influence over the development of mining claims in terms of environmental impacts and Aboriginal and Treaty Rights to lands.

A few questions that mining companies, Aboriginal groups and governments are considering are: Should government (federal, provincial or local) help preserve existing mines and effectively support the opening of new mines? If so, what would be the economic and social benefit of supporting the mining sector for NWO? Or, should the government play a neutral role and even consider policies that might discourage a particular mining project?

Purpose

The purpose of this study is to help government and Aboriginal communities answer some of the questions raised in the introduction section by exploring the impacts and benefits of further developing NWO's mining industry. Accordingly, this study measures the potential economic contributions and considers the social impacts of further growth in the mining industry on NWO, with a particular emphasis on Aboriginal communities.

It is intended that this study will assist policymakers to predict and measure the consequences of creating a political and business environment that will foster further development in NWO's mining industry. It is of paramount importance for the government, Aboriginal leaders and community planners to recognize the benefits on the level of income, employment, infrastructure and government taxes.

Overall, the purpose of this study is to highlight the significant role that government policy related to the mining industry can have on the economy. The Government, Aboriginal groups and industry must come together to form a working partnership and lead the way forward in order to reach the mining industry's potential.

This report also addresses the issue of sustainable development and the mining. It is true that in a very simple view, mining may be considered an unsustainable activity. Mine reserves are finite and have a limited production life (e.g. the total mineral reserves are limited). However, this simple view of mining industry is misleading. A more sophisticated view suggests that mining is more sustainable than it appears. Companies replace the depleted mine with another mine through new exploration. Technological development provides the opportunity for mining companies to discover or utilize the mining reserves that would have been unfeasible or not profitable. As we move more to recycling, the minerals extracted from the mine will be utilized long after the mine is depleted. Even if we consider mines as a finite reserve, we must realize that mining activity provides revenue and benefits that can be invested in other economic activities and social services, such as health, education, and infrastructure, to improve the well-being of the communities into the future. It is possible to convert nonrenewable resources into renewable human capital. This report will explore the sustainability of mining in further detail.

Scope and Organization

This study is organized as follows:

- The scope of the mines included in our analyses is outlined.
- An estimate of the value of existing metal and mineral deposits in NWO is offered.
- An estimate of the potential direct mining industry employment in NWO and Province of Ontario is presented.
- The potential indirect and induced positions that may arise as a result of the direct construction and operational positions in the mining industry are discussed.
- An estimate of the tax implication and revenue for the local, provincial, and federal governments is offered.
- Some significant factors to be considered in reaching the mining potential are discussed:
 - Aboriginal involvement in mining development,
 - The labour market dynamics and challenges, and
 - The infrastructure required and an estimate of the associated costs

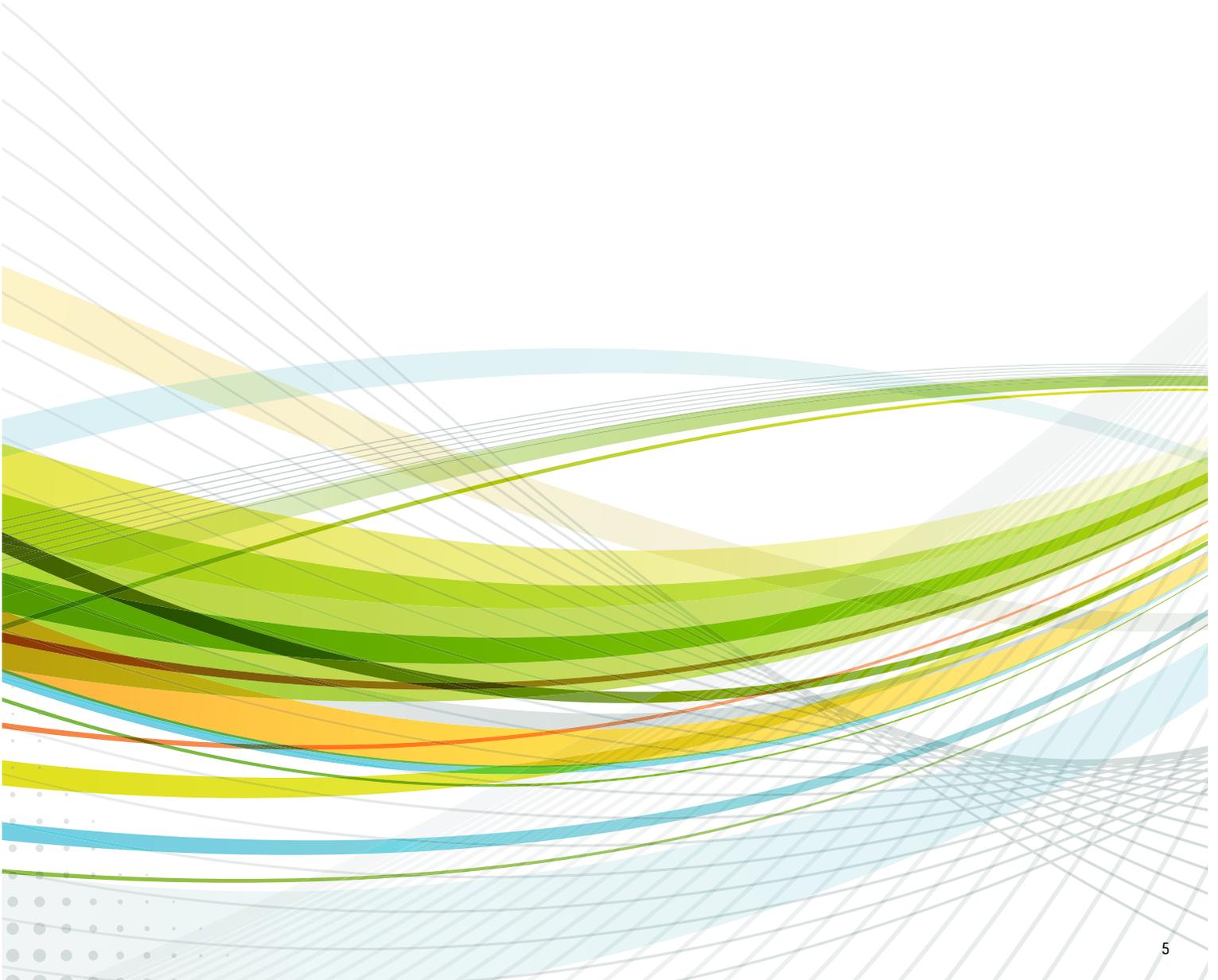
Data and Methodology

Data used in this report was compiled from various public sources. For the quantitative part, the data was extracted from the Bank of Canada, Statistics Canada (CANSIM Table 330-0007: Raw materials price indexes), SEDAR filing system (www.sedar.com), Kitco (www.kitco.com) and InfoMine (www.infomine.com). The information for individual companies (exploration projects) was provided by the Ministry of Northern Development and Mines. These data were updated and confirmed from the companies' web sites and through direct communication with the companies' representatives.

Mining exploration programs were evaluated by using an options-based valuation model similar to the model by Black and Scholes (1973). Options are financial derivatives, whose value (i.e. price) depends on the value of the underlying security. For example, a call (put) option, based on a stock, provides its buyer with a right to purchase (sell) a predetermined amount of stocks at a contracted price ("strike price") on or by a specific date ("maturity"). Real options represent an extension of the techniques developed for financial options to "real assets." Real assets can be thought of as machinery, land, real estate, patents and trademarks. The goal of real options is to provide management with flexibility to adapt and revise decisions in response to unexpected market conditions. In this report, the real option is an option to mine un-mined metals or minerals (see Koller et al., 2005 for more information).

The opportunities and challenges facing the Aboriginal community in regards to mining development were examined within the broad context of the relationship of Aboriginal people within the broader Canadian society, keeping in mind the diversity within the region. The analysis draws from a review of the literature pertaining to indigenous communities and mining development, coupled with semi-structured interviews of Aboriginal and non-Aboriginal people associated with resource development in NWO.

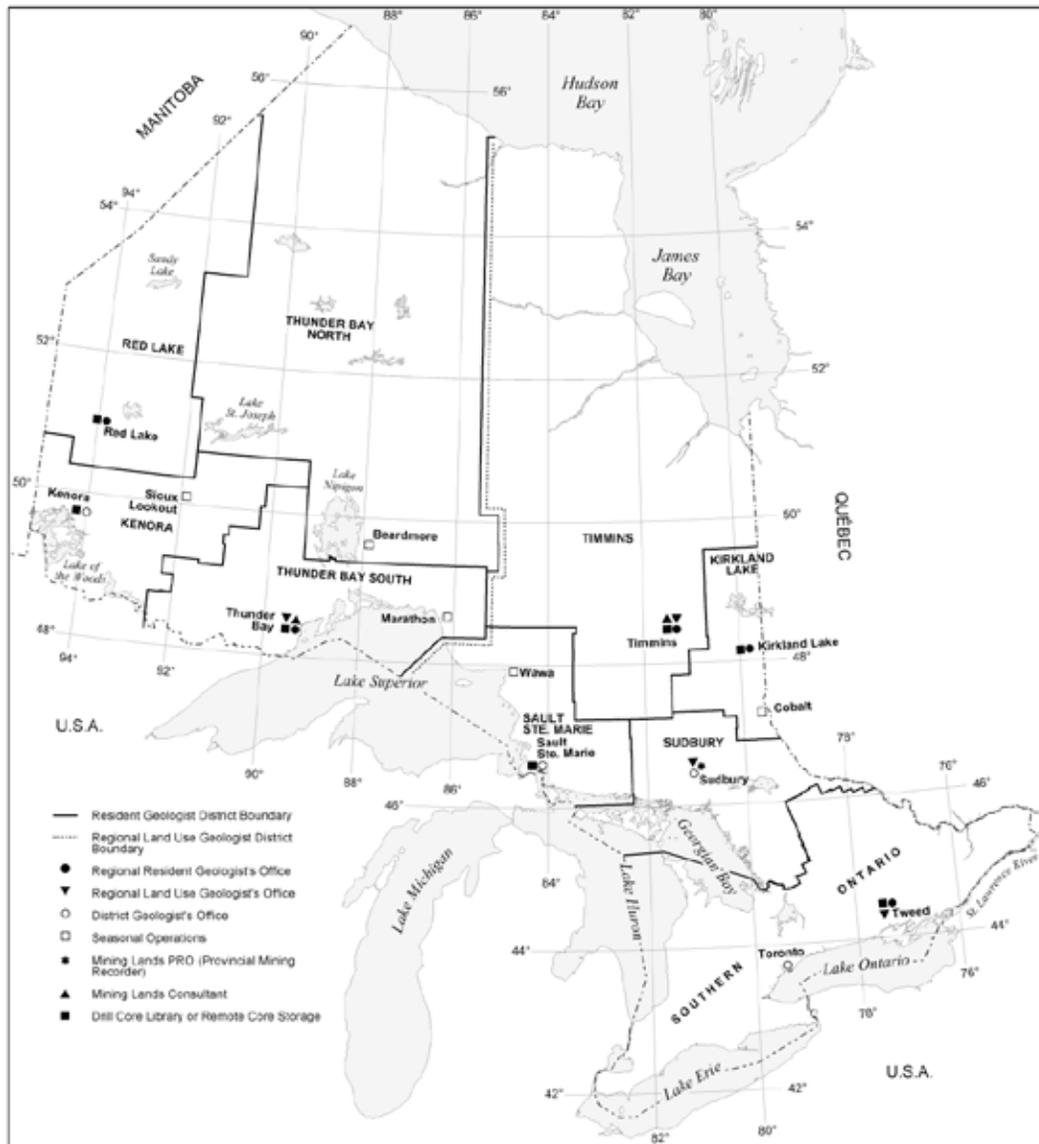
Part II: Background on Mining in Northwestern Ontario



I. Current Mining Activity in Northwestern Ontario

The following synopsis provides a description of the current mining activity in NWO. This section is based on the Ministry of Northern Development and Mines' (MNDM) Ontario Geological Surveys for the Thunder Bay North, Thunder Bay South, Red Lake, and Kenora Districts. Figure 1 below depicts the land area covered by each of these districts.

Figure 1 - Four NWO Districts



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As defined by MNDM, these four districts collectively comprise the NWO region covered by this report. Thunder Bay South is by far the most active geographic region in terms of active mines and overall exploration activity. Thunder Bay North, which partly includes the Ring of Fire area, is the second most active geographic region.

The mining activity has been categorized into the following four categories:

- **Active Mines** are mines that are currently in the extraction and production phase.
- **Mature Exploration Projects** are projects that contain economic mineral reserves and are estimated to move from exploration to production within the next five years (2013 – 2017).
- **Developed Exploration Projects** are projects that are not considered mature enough to move into production within the very near future (i.e. within the next five years). These projects do contain a mineral resource but are developed beyond the prospecting stage.
- **Other Exploration Projects** are projects that are not near the production phase but have substantial budgets and are multi-phase exploration projects.

** Grassroots, early stage exploration projects are excluded from the study.*

*** Please note, the classification term "Advanced Exploration" has not been used in this report as the term has a specific meaning as per the Mining Act.*

Categorizing the mining claims in relation to the Ontario Geological Survey classification system was completed by the authors based on consultation with industry stakeholders and publicly available data. Any classification errors or omissions are strictly the responsibility of the authors.

Appendix I provides a detailed discussion regarding these districts, along with additional details on the mining companies and their projects in the four categories which are outlined below. Table 1 below presents the number of projects in each category.

Table 1 - Mining Activity in NWO by Level of Activity

	Thunder Bay North	Thunder Bay South	Red Lake	Kenora	Total
Active Mines	1	3	1	1	6
Mature Exploration Projects	2	2	2	3	9
Developed Exploration Projects	4	1	3	1	9
Other Exploration Projects	12	36	3	13	64
Total	19	42	9	18	88

Table 1 reveals there are currently six active mines in NWO. The active mines are:

- Goldcorp Inc. – Musselwhite Mine (Thunder Bay North)
- Goldcorp Inc. – Red Lake Gold Mines (Red Lake)
- Barrick Gold Corporation – Hemlo Mine (Thunder Bay South)
 - Williams Mine
 - David Bell Mine
- North American Palladium Ltd. – Lac des Iles Mine (Thunder Bay South)
- Nelson Granite – Four Quarries (Kenora)

NWO is also home to three of the four largest gold mines in Canada (as listed above), which produced 1.2 million oz. of gold in 2010. In addition, NWO also has North America's only primary palladium mine. These active mines employ a large number of individuals both as labour and knowledge workers, with estimates ranging to upwards of 3,545 staff and contractors (2,760 staff). These producing mines expend significant amounts of capital in the region, capital which has a multiplier effect in the local communities and greater region.

This study, however, will not focus on these active mines since the economic benefits derived from these mines have already been documented in various publications (Dungan and Murphy, 2007; Mining Industry Human Resources Council, 2012; Thunder Bay CEDC, 2012). In addition, there are another nine projects in the Developed Exploration stage that have the potential to move into the operation phase in the future but are beyond the scope of this study, as well. Many of the projects in the Developed Exploration stage were either not mature enough and/or lacked sufficient publicly available data to be included in the analyses.

The Developed Exploration Projects are:

- Claude Resources Inc.'s – Madsen gold project (Red Lake)
- Coventry Resources Limited – Cameron Lake project (Kenora)
- Gold Canyon Resources Inc. - Springpole Lake project (Red Lake)
- Magma Metals Limited – Copper-nickel-PGE mine (Thunder Bay North)
- Northern Iron Corp. - Griffith property (Red Lake)
- PC Gold Inc. – Pickle Crow Property (Thunder Bay North)
- Premier Gold Mines Limited – Hardrock project (Thunder Bay North)
- Rock Tech Lithium Inc – Nama Creek Deposit (Thunder Bay North)
- Rockex Mining Corporation – Eagle Island project (Thunder Bay South)

It is important to note that there are also a large number (64) of less developed exploration and prospecting projects in the region. These projects require significant expenditures as part of their exploration programs, partly to employ knowledge workers in the region. Some estimates suggest that mineral exploration in NWO totaled \$400 million in 2010 and \$475 million in 2011 (Thunder Bay CEDC, 2012). Undoubtedly, projects led by prospectors and other junior mining companies have a significant, positive economic impact on the economy of NWO. Early stage exploration projects and junior mining companies, however, are not included in this report's calculations. Excluding the Developed Exploration Projects and the Other Exploration (prospecting) Projects ensures that the calculations in this report are conservative.

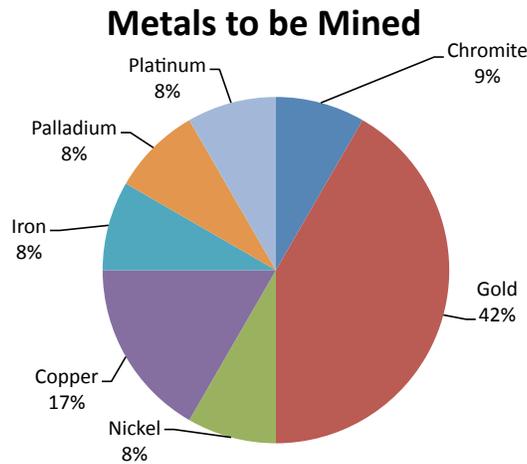
This report focuses solely on the nine Mature Exploration Projects that have the potential to proceed to the production stage in 2013 to 2017. In consultation with various stakeholders, the following projects have been identified as being in the mature exploration stage:

- Bending Lake Iron Group Limited – Bending Lake iron property (Kenora)
- Cliffs Natural Resources Inc. – Black Thor (Thunder Bay North)
- Goldcorp Inc. – Bruce Channel Deposit and Cochenour Project Gold Projects (Red Lake)
- Osisko Mining Corporation – Hammond Reef (Thunder Bay South)
- Noront Resources Ltd. – Eagle's Nest (Thunder Bay North)
- Rainy River Resources Ltd. – Rainy River Gold Project (Kenora)
- Rubicon Minerals Corporation – Phoenix Gold Project (Red Lake)
- Stillwater Mining Company – Marathon copper-Platinum Group Elements (PGE) deposit (Thunder Bay South)
- Treasury Metals Inc. – Goliath gold project (Kenora)

This report analyzes the economic and social benefits that may accrue from fostering the development of these nine projects.

Figure 2 shows the overall metals mix from the metal claims from these nine projects.

Figure 2 - Metal Claims to be Mined



Note: some mines will mine more than one metal. In this case, both metals were included in the above proportions. Proportions are based on the total number of metal claims but do not reflect the total size of each deposit.

Figure 3 presents a map of the Active Mines in NWO, along with the Mature Exploration Projects and Developed Exploration Projects, jointly labeled as “Major Exploration Projects” (denoted by a blue star).

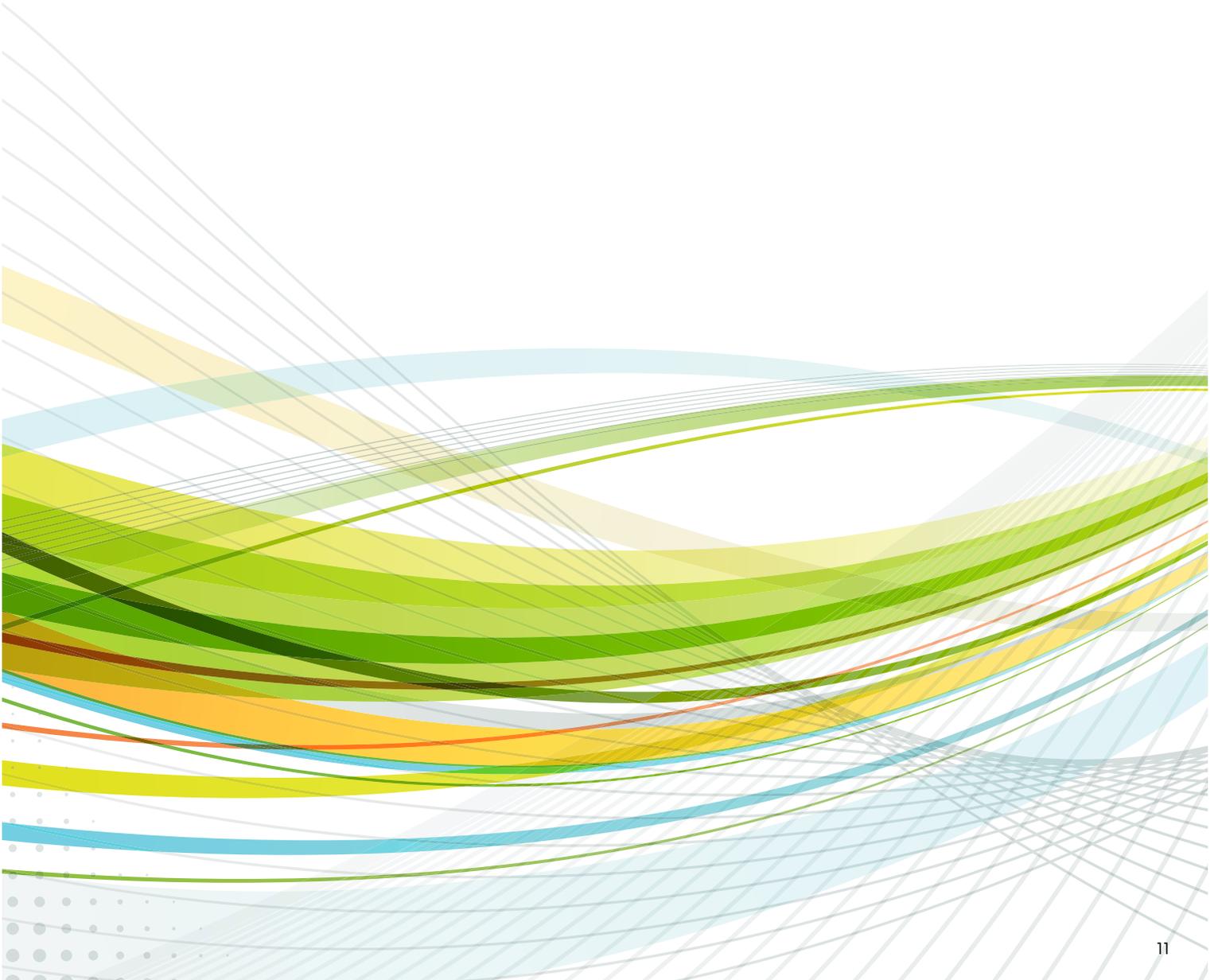
Figure 3 - Map of Various Mining Claims in NWO



© Thunder Bay CEDC, 2012, Community Economic Development Commission, Central Canada’s Mining Hot Spots: Northwestern Ontario.

Although the Developed Exploration Projects and Other Exploration Projects are not included in the calculations of future economic benefits in this report (i.e. the value of un-mined minerals, employment creation, government taxes paid, etc.), these projects would very likely provide future economic and social benefits to NWO if mining growth is fostered. Providing the appropriate political environment and infrastructure to support the mining claims of these projects could lead to a significant increase in the figures presented in this report.

Part III – Economic Impact of Mining Development in Northwestern Ontario



I. Value of Un-Mined Minerals and Metals

The purpose of this section is to provide the value of un-mined metals and minerals estimated by using the real options analysis. To determine the robustness of the real option values, the estimates are subjected to various price and cost sensitivity tests. In addition to the results for a representative mining firm, the final part of this section shows the aggregate real option value per metal/mineral.

Gold Mining

The reported estimates are for a 'representative gold mine' that is based on the weighted average figures (by the production potential) of the major gold exploration programs that are expected to go into production by 2017. The inputs that were used in the calculations include projected average fixed cost of opening a mine [in dollars, \$], projected average annual variable (production) costs [\$/oz], projected average annual production of gold [oz/year], projected average mine life [years], gold price [\$/oz], risk premium (the difference between the market rate of return and a risk-free rate of return) [%], standard deviation of the monthly gold price percentage changes (last five years) [%], average "beta" for the gold mining industry, average corporate tax rate for gold mining companies and average debt-to-equity ratio for the gold mining industry.

Table 2 - The sensitivity of the estimates to gold price changes

	Price [\$/oz]	PV of gold	Exercise price (PV cost)	Real option value
Current (Apr.25, 2012)	\$1637.75	\$7.65 billion	\$2.07 billion	\$6.20 billion
Optimistic (trend)	\$2178.19	\$10.16 billion	\$2.07 billion	\$8.72 billion
Pessimistic (2007, resistance level)	\$650	\$3.03 billion	\$2.07 billion	\$1.69 billion

Table 2 shows that as of April 25, 2012, when the gold price was \$1,637.75/oz, the present value (PV) of gold production¹ of the representative mine over the average life span of the mining projects is \$7.65 billion, while the PV of the fixed cost of opening a mine and variable operating costs (i.e., "exercise price"²) is \$2.07 billion. Under this scenario, the total value of the un-mined gold (i.e. the value of the real option) is \$6.20 billion. The option theory is used because the firms have the right, but not the obligation, to mine the gold in the future, depending on the direction of the gold prices. The estimation formula assumes that there are no costs of holding the property and not developing it and that the mine cannot be closed or abandoned before its projected average life span. In summary, it can be concluded that the real option is deep "in-the-money" (i.e. the PV of gold is greater than the PV of all mining costs) and that gold mining in NWO is currently profitable.

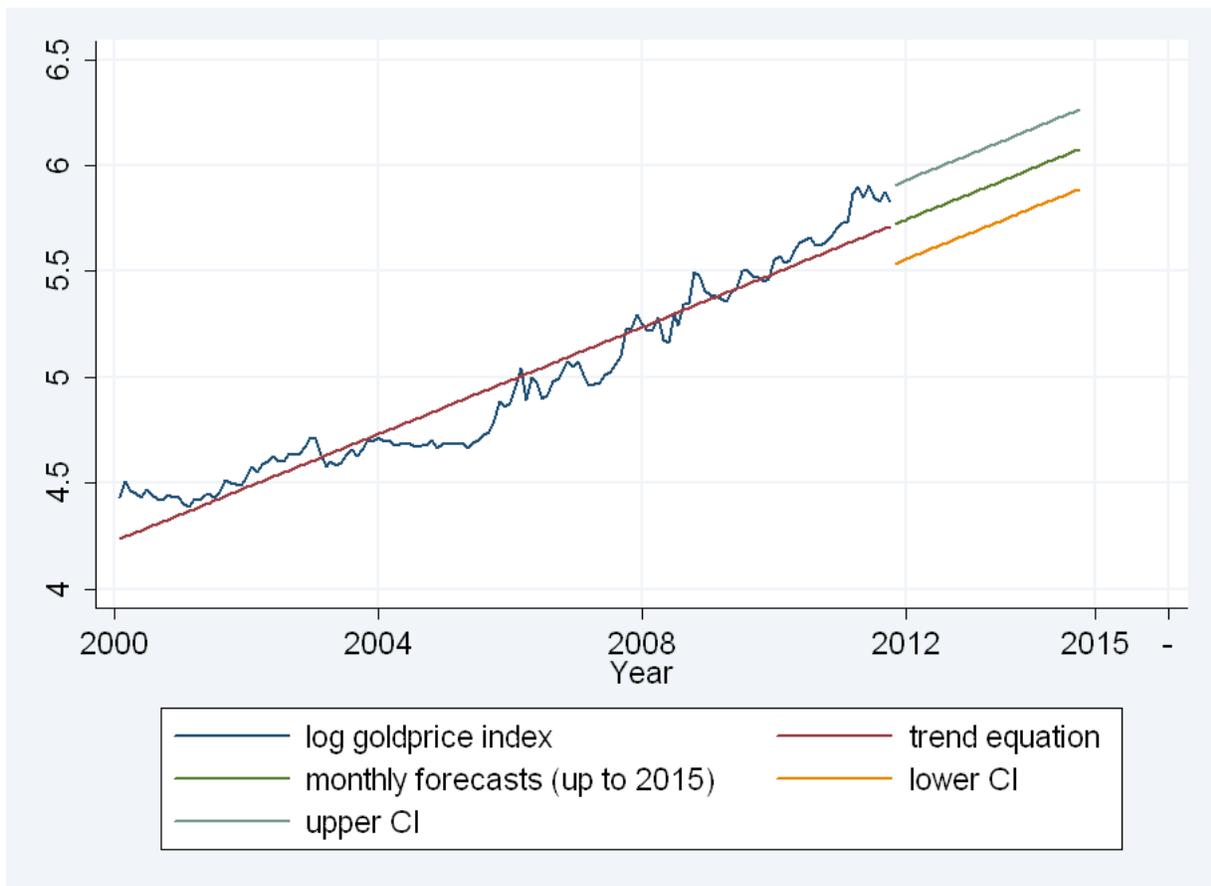
The second optimistic scenario assumes that the current positive economic outlook for gold mining is unchanged and that the future price follows the extrapolated log-linear increasing trend given in Figure 4. In this case, over the period 2012-2015, the price increases by about 33% to \$2,178.19/oz and the real option is deeper "in-the-money." Due to the price increase, both the PV of gold and the real option value increase to \$10.16 billion and \$8.72 billion, respectively, while the PV of the cost remains the same at \$2.07 billion.

The trend equation is estimated based on monthly gold prices from 2000-2012 (April), while the forecasting (out-of-sample) period is the subsequent 36 months. The drawback of the trend equation approach is that it is unable to predict future structural breaks and trend-reversals. To account for that possibility, a pessimistic scenario where the price decreases significantly is also considered. Although it is possible that the pessimistic scenario price level might not penetrate the lower boundary of the 95% prediction interval, the price at the resistance level from 2007 is used. In 2007, when the gold price was around \$650/oz, it stayed relatively stable for almost a year. This was the most recent major trend resistance level, and it is sensible to consider it as the worst case scenario outcome. At such a price, the real option is still "in-the-money," and its value is \$1.69 billion. The cut-off price for the profitability of the real option is roughly \$444/oz which is the price level from mid 2005.

¹ $PV \text{ of gold} = (\text{current gold price}) \times (\text{representative mine's production per year}) \times (\text{representative mine's life span}).$

² $PV \text{ cost} = (PV \text{ of representative mine's operating costs}) + (\text{representative mine's fixed opening cost}).$

Figure 4 - Trend equation for gold and three-year forecasts



Open pit versus underground gold mining

It is useful to differentiate between open pit and underground mining methods. Table 3 displays the value of the representative mine's un-mined open pit gold as a function of the gold price.

Table 3 - The sensitivity of the open pit mining value to gold price changes

	Price [\$/oz]	PV of gold	Exercise price (PV cost)	Real option value
Current (June 1, 2012)	\$1626.30	\$8.36 billion	\$2.52 billion	\$6.58 billion
Optimistic (trend)	\$2178.19	\$11.20 billion	\$2.52 billion	\$9.41 billion
Pessimistic (2007, resistance level)	\$650	\$3.34 billion	\$2.52 billion	\$1.70 billion

For the three price scenarios, the real option value for the representative open pit mine is "in-the-money." Next, we estimate the value of a representative underground gold mine. Again, the analysis is based on the weighted average figures (by the production potential) of the major underground gold exploration programs.

Table 4 - The sensitivity of the underground mining value to gold price changes

Price [\$/oz]		PV of gold	Exercise price (PV cost)	Real option value
Current (June 1, 2012)	\$1626.30	\$5.02 billion	\$1.19 billion	\$4.21 billion
Optimistic (trend)	\$2178.19	\$6.73 billion	\$1.19 billion	\$5.92 billion
Pessimistic (2007, resistance level)	\$650	\$2.00 billion	\$1.19 billion	\$1.24 billion

The real option is always “in-the-money” for the representative underground gold mine, but the values are consistently below the values of an open pit mine across the three scenarios. The observed drop in the value is driven by the weaker average production potential [oz/year] of the underground mines, almost half of the annual production of the open pit mines.³

Copper Mining

The reported estimates are for a ‘representative copper mine’ that is based on the weighted average figures (by the production potential) of the major copper exploration programs that are expected to go into production by 2017. The inputs that were used in the calculations include projected average fixed cost of opening a mine [\$], projected average annual variable (production) costs [\$/lb], projected average annual production of copper [lb/year], projected average mine life [years], copper price [\$/lb], risk premium (the difference between the market rate of return and a risk-free rate of return) [%], standard deviation of the monthly copper price percentage changes (last five years) [%], average “beta” for the copper mining industry, average corporate tax rate for copper mining companies and average debt-to-equity ratio for the copper mining industry.

Table 5 - The sensitivity of the estimates to copper price changes

Price [\$/lb]		PV of copper	Exercise price (PV cost)	Real option value
Current (May 11, 2012)	\$ 3.6693	\$1.34 billion	\$0.51 billion	\$0.98 billion
Optimistic (trend)	\$3.70	\$1.36 billion	\$0.51 billion	\$0.99 billion
Pessimistic (Dec. 2008, resistance level)	\$1.30	\$0.48 billion	\$0.51 billion	\$0.21 billion

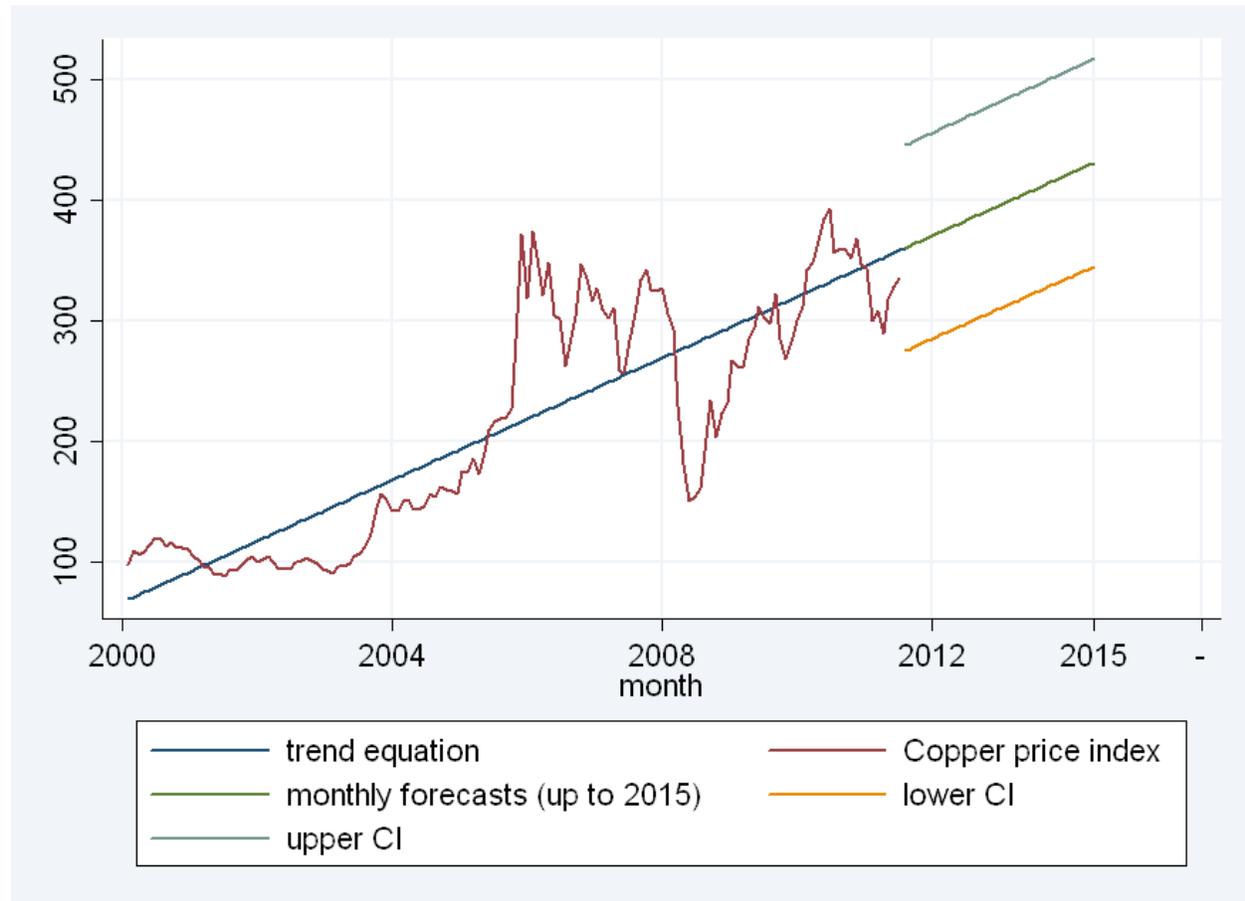
Table 5 shows that as of May 11, 2012, when the copper price was \$3.6693/lb, the PV of copper production of the representative mine over the average life span of the mining projects is \$1.34 billion, while the PV of the fixed cost of opening a mine and variable operating costs is \$0.51 billion. Under this scenario, the total value of the un-mined copper is \$0.98 billion. In this case, the real option is “in-the-money,” and this also holds for an optimistic trend-following increase in the copper price, where the estimated price of the real option is \$0.99 billion. For the copper price growth, a simple linear trend was more appropriate than a non-linear trend that was used for gold prices. Based on the linear trend and the 95% prediction interval, the forecasted copper price for the three-year horizon is slightly greater than the current price and is set at \$3.70/lb. Figure 5 suggests a wider prediction interval, due to the relatively high estimated volatility of the copper price changes (27.38%). In all the optimistic forecasting exercises, we take a conservative approach and use the lower boundary value of the prediction interval.

The trend equation is estimated based on monthly copper prices from 2000-2012 (April), while the forecasting (out-of-

³ The total real option value for gold is not equal to the sum of the real option values for the two mining methods because all figures are estimated for a representative (average) mine. In other words, it is shown that, on average, open pit gold mining is more profitable than underground gold mining; the total mining value is composed of the values of the two mining methods (\$6.58 billion and \$4.21 billion) and is, thus, located between them at \$6.20 billion.

sample) period is the subsequent 36 months. As mentioned before, the trend equation approach ignores potential future trend-reversals, and we also consider a pessimistic scenario where the price decreases to the December, 2008 level (\$1.30/lb). At this price, when taking into account the intrinsic value (i.e. the value of the real option if the production starts immediately), the real option is “out-of-the-money,” but its value is still positive at \$0.21 billion. This is due to the time value (i.e. the amount by which the price of any option exceeds the intrinsic value) of the real option that allows for the future price to increase above the resistance level.

Figure 5 - Trend equation for copper and three-year forecasts



Iron Mining

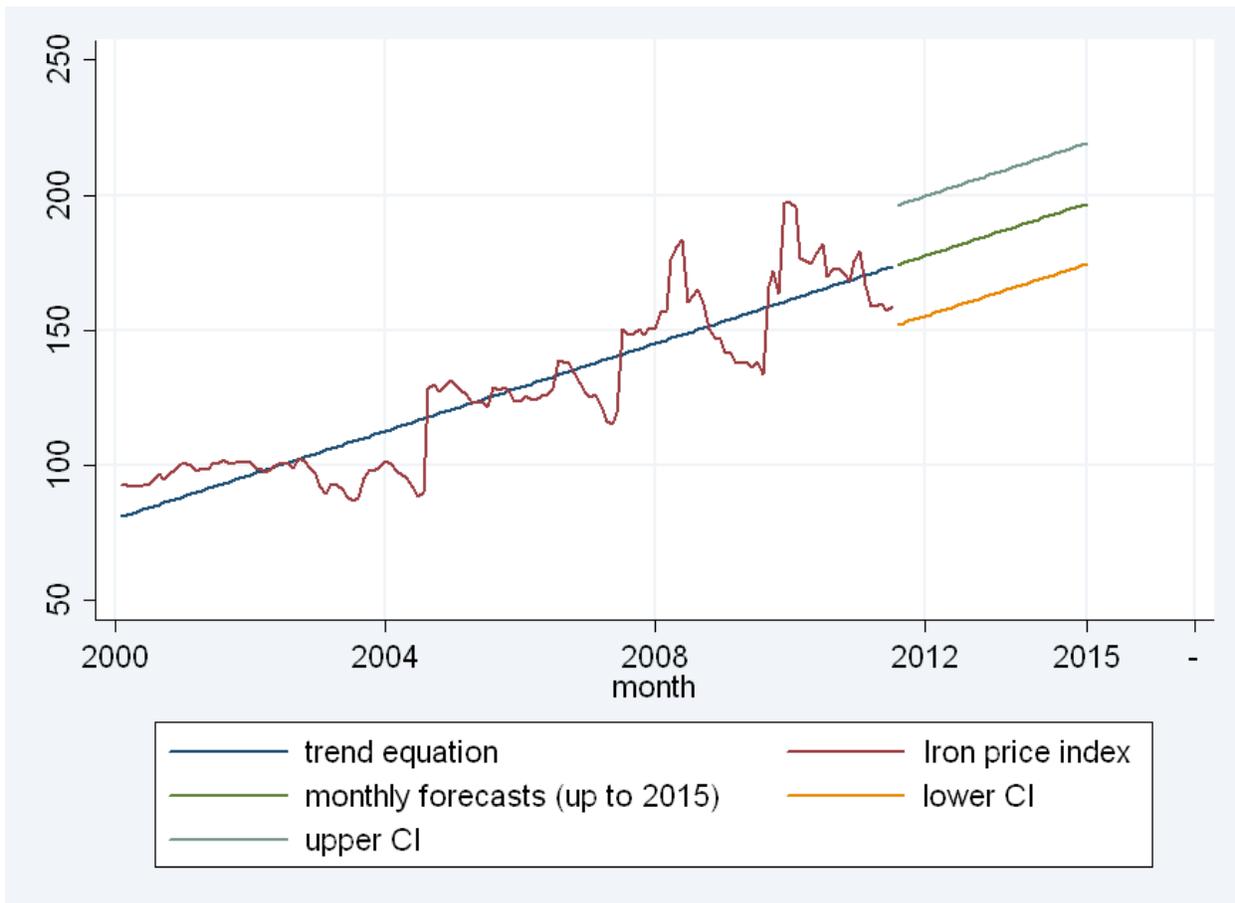
The reported estimates are for a ‘representative iron mine’ in line with the previously applied averaging technique. The inputs that were used in the calculations include projected fixed cost of opening a mine [\$], projected annual variable (production) costs [\$/metric tonne (t)], projected annual production of iron [t/year], projected mine life [years], iron price [\$/t], risk premium (the difference between the market rate of return and a risk-free rate of return) [%], standard deviation of the monthly iron price percentage changes (last five years) [%], average “beta” for the iron mining industry, average corporate tax rate for iron mining companies and average debt-to-equity ratio for the iron mining industry.

Table 6 - The sensitivity of the estimates to iron prices

	Price [\$/t]	PV of iron	Exercise price (PV cost)	Real option value
Current (April, 2012)	\$147.65	\$25.83 billion	\$4.93 billion	\$23.84 billion
Optimistic (trend)	\$150	\$26.25 billion	\$4.93 billion	\$24.25 billion
Pessimistic (Sep. 2006, resistance level)	\$70	\$12.25 billion	\$4.93 billion	\$10.35 billion

Table 6 illustrates that iron mining is exceptionally profitable and the value of the un-mined iron ore at the April, 2012 price is \$23.84 billion. The adjusted R-squared for the trend equation is roughly 80% and a simple trend equation is adequate for explaining historical iron prices. Nevertheless, the trend is not as strong, and based on our conservative approach, we project that the price may slightly increase to \$150/t in three years. This increases the estimated price of the real option to \$24.25 billion, whereas the option is deeper “in-the-money.” The pessimistic scenario (i.e. a sharp drop to September, 2006 price of \$70/t) is also profitable and the value of the un-mined iron ore is estimated at \$10.35 billion. Figure 6 reveals a strong trend in iron prices, but the volatility is not as pronounced as for copper prices. The key reasons for the observed profitability are the long life span of the iron mine, large annual production potential and relatively low production costs.

Figure 6 - Trend equation for iron and three-year forecasts



Nickel Mining

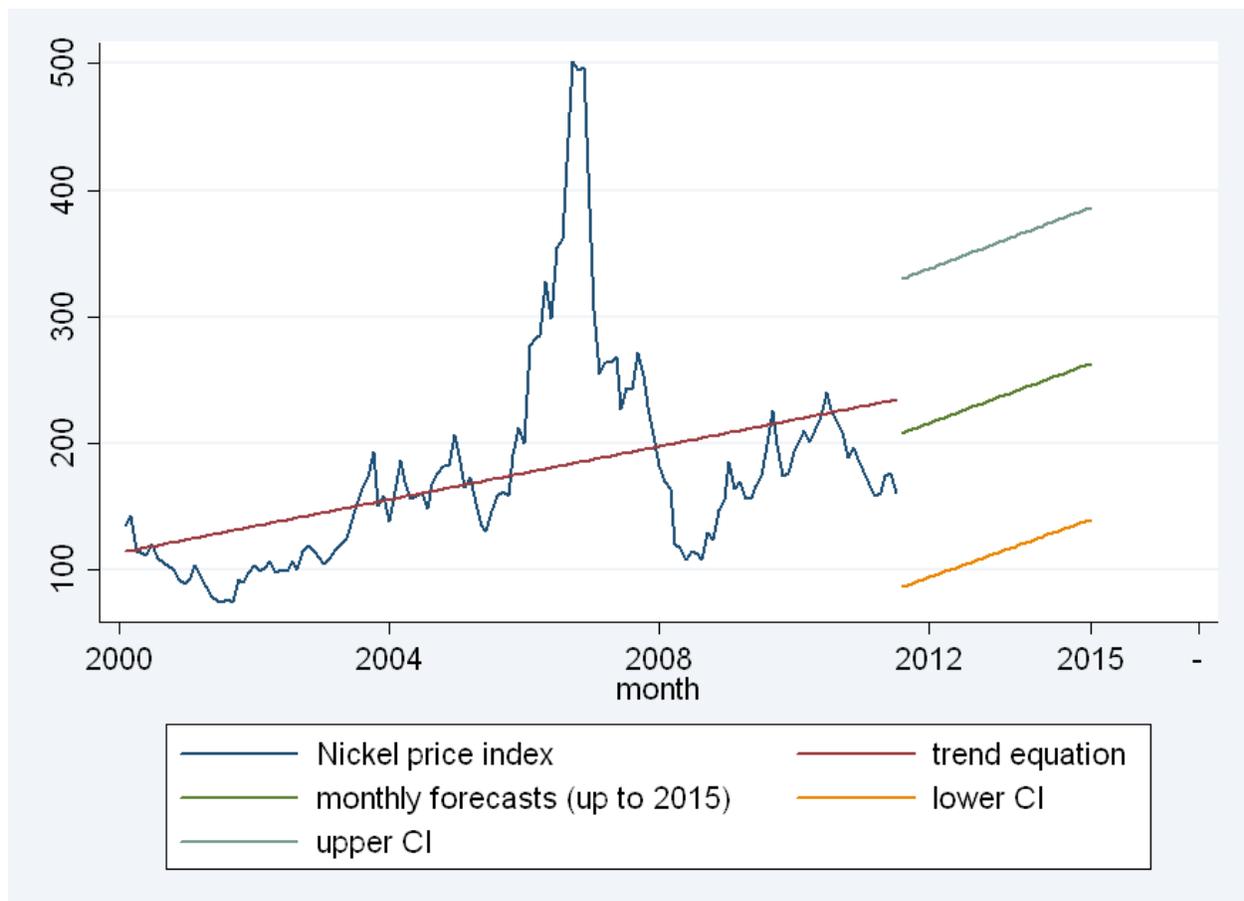
Similar to above, we construct a 'representative nickel mine' for the major nickel exploration programs (2013-2017). The inputs that were used in the calculations include projected fixed cost of opening a mine [\$], projected annual variable (production) costs [\$/lb], projected annual production of nickel [lb/year], projected mine life [years], nickel price [\$/lb], risk premium (the difference between the market rate of return and a risk-free rate of return) [%], standard deviation of the monthly nickel price percentage changes (last five years) [%], average "beta" for the nickel mining industry, average corporate tax rate for nickel mining companies and average debt-to-equity ratio for the nickel mining industry.

Table 7 - The sensitivity of the estimates to nickel price changes

	Price [\$/lb]	PV of nickel	Exercise price (PV cost)	Real option value
Current (May 25, 2012)	\$ 7.7068	\$3.18 billion	\$0.74 billion	\$2.65 billion
Optimistic (trend, 20% decrease)	\$6.17	\$2.54 billion	\$0.74 billion	\$2.03 billion
Pessimistic (Oct. 2008, resistance level)	\$4.00	\$1.65 billion	\$0.74 billion	\$1.18 billion

Table 7 illustrates that, despite the observed high volatility in the nickel price (35%), the value of the un-mined nickel using the May 25, 2012 price is \$2.65 billion. The trend in the historical nickel prices contains several significant trend reversals and, thus, in the optimistic scenario the price declines by 20% to \$6.17/lb over the following three years. In the pessimistic scenario, the price plunges to \$4.00/lb to represent the minimum price level since 2003. It is important to note that the real option is "in-the-money" for both of these projections and the mining project remains profitable. Figure 7 shows the instability as well as high volatility in the nickel prices which produces a relatively wide 95% prediction interval.

Figure 7 - Trend equation for nickel and three-year forecasts



Palladium Mining

The reported estimates are for a 'representative palladium mine' that is based on the weighted average figures (by the production potential) of the figures for the major palladium exploration programs (2013-2017). The inputs that were used in the calculations include projected average fixed cost of opening a mine [\$], projected average annual variable (production) costs [\$/oz], projected average annual production of palladium [oz/year], projected average mine life [years], palladium price [\$/oz], risk premium (the difference between the market rate of return and a risk-free rate of return) [%], standard deviation of the monthly palladium price percentage changes (last five years) [%], average "beta" for the palladium mining industry, average corporate tax rate for palladium mining companies and average debt-to-equity ratio for the palladium mining industry.

Table 8 - The sensitivity of the estimates to palladium price/cost changes

	Price [\$/oz]	PV of palladium	Exercise price (PV cost)	Real option value
Current (June 1, 2012)	\$612	\$0.94 billion	\$0.99 billion	\$0.47 billion
Optimistic (trend)	\$462	\$0.71 billion	\$0.99 billion	\$0.27 billion
Pessimistic (Dec. 2008, resistance level)	\$200	\$0.31 billion	\$0.99 billion	\$0.06 billion
Current (June 1, 2012, zero fixed cost)	\$612	\$0.94 billion	\$0.45 billion	\$0.66 billion
Current (June 1, 2012, \$200/oz production cost)	\$612	\$0.94 billion	\$0.75 billion	\$0.54 billion

Table 8 shows that as of June 1, 2012, when the palladium price was \$612/oz, the value of the un-mined palladium is roughly \$500 million. Despite the relatively high production cost that we assume (\$430/oz), the value of palladium remains positive for all the considered future price scenarios. This is due to the high volatility of the palladium price changes that we estimate at 33%. Given that the real option is "out-of-the-money" in all cases, (i.e. the PV of palladium exceeds the PV of the total mining cost) in the last two rows of Table 8, we include two scenarios with reduced mining costs. As we have already applied the fixed cost of the representative project to the copper mining section (copper is mined together with palladium), we can omit it for palladium. This reduces the exercise price of the real option and, at current prices, it is "in-the-money." Also, if the production cost can be reduced to \$200/oz, even for a non-zero fixed cost, the option is "in-the-money." We conclude that high production costs and a potential major drop in palladium prices may negatively impact the profitability of this mining program.

In the light of the excessive palladium price volatility, Figure 8 shows that forecasting palladium prices is a difficult task. The trend equation is estimated based on monthly palladium prices from 2000-2012 (May), while the forecasting (out-of-sample) period is the subsequent 36 months. The trend regression approach may appear inappropriate for the observed non-linear, U-shaped time series data, but, in fact, it produces a reasonable conservative price forecast for 2015 (\$462/oz). From this price to the resistance level price, the real option is in the range of \$60 to \$270 million.

Figure 8 - Trend equation for palladium and three-year forecasts



Platinum Mining

Similar to the palladium project, major platinum exploration programs (2013-2017) were used in this analysis. The reported estimates are for a 'representative platinum mine' that is based on the weighted average figures (by the production potential) of the figures for the projected exploration projects. The inputs that were used in the calculations include projected average fixed cost of opening a mine (\$), projected average annual variable (production) costs [\$/oz], projected average annual production of platinum [oz/year], projected average mine life [years], platinum price [\$/oz], risk premium (the difference between the market rate of return and a risk-free rate of return) [%], standard deviation of the monthly platinum price percentage changes (last five years) [%], average "beta" for the platinum mining industry, average corporate tax rate for platinum mining companies and average debt-to-equity ratio for the platinum mining industry.

Table 9 - The sensitivity of the estimates to platinum price/cost changes

	Price [\$/oz]	PV of platinum	Exercise price (PV cost)	Real option value
Current (June 1, 2012)	\$1443	\$0.63 billion	\$0.67 billion	\$0.24 billion
Optimistic (trend)	\$1200	\$0.53 billion	\$0.67 billion	\$0.17 billion
Pessimistic (Dec. 2008, resistance level)	\$800	\$0.35 billion	\$0.67 billion	\$0.06 billion
Pessimistic (Dec. 2008, resistance level, zero fixed cost)	\$800	\$0.35 billion	\$0.13 billion	\$0.25 billion
Current (June 1, 2012, zero fixed cost)	\$1443	\$0.63 billion	\$0.13 billion	\$0.53 billion
Current (June 1, 2012, \$200/oz production cost)	\$1443	\$0.63 billion	\$0.60 billion	\$0.27 billion

According to Table 9, as of June 1, 2012, the real option value is \$240 million, while the option is barely “out-of-the-money.” As was the case with palladium, the price volatility of platinum is considerable (24%) and results in a valuable “out-of-the-money” option. However, we assumed extremely high production costs, and, in addition, we accounted for the fixed cost that had already been used (e.g. in the copper and palladium estimations; copper, platinum and palladium are mined together) for the above programs. The last two rows of the table present more realistic “in-the-money” situations with zero fixed cost and a \$200/oz variable cost. Furthermore, for the pessimistic scenario, when the price drops to \$800/oz, after correcting the fixed cost to zero, the option remains strongly “in-the-money.”

Figure 9 - Trend equation for platinum and three-year forecasts



Despite several volatility outbursts during and after 2008, Figure 9 demonstrates a fair goodness-of-fit of the linear trend equation with the R-squared value of about 75%. Put differently, the time trend equation successfully captures 75% of the variation in the platinum price.

Chromite Mining

Chromite mining was the most difficult to quantify due to lack of the appropriate historical data. However, three assumptions were made: 1) standard deviation of the chromite price percentage changes was set at 25%, 2) corporate tax rate for the chromite industry was set at 50%, and 3) chromite production cost was set at \$0.57/lb. It is worth noting that these assumptions are making our estimates more conservative than they probably should be. All other inputs were available and specified in a standard fashion.

Table 10 - The sensitivity of the estimates to chromite price changes

	Price [\$/kg]	PV of Chromite	Exercise price (PV cost)	Real option value
Current (June 4, 2012)	\$2.86	\$85.8 billion	\$21.88 billion	\$76.44 billion
Optimistic (stable)	\$2.86	\$85.8 billion	\$21.88 billion	\$76.44 billion
Pessimistic (minimum for the past 7 years)	\$1.20	\$36 billion	\$0.74 billion	\$27.97 billion

According to Table 10, chromite mining is profitable under all three scenarios. The main drivers of the observed profitability are the high production potential and long life span of the representative mine. Figure 10 shows the historical variability in the chromite price, but the data for our forecasting analysis was unavailable. Nevertheless, our price projections are reasonable and remain on the conservative side.

Figure 10 - Chromium prices over the past seven years (source: InfoMine.com)



Summary Table at Current Prices

Table 11 presents a summary table of the un-mined metal values, along with the aggregate real option value for each metal. Overall, the aggregate real option value for all metals is \$135.4 billion (USD).

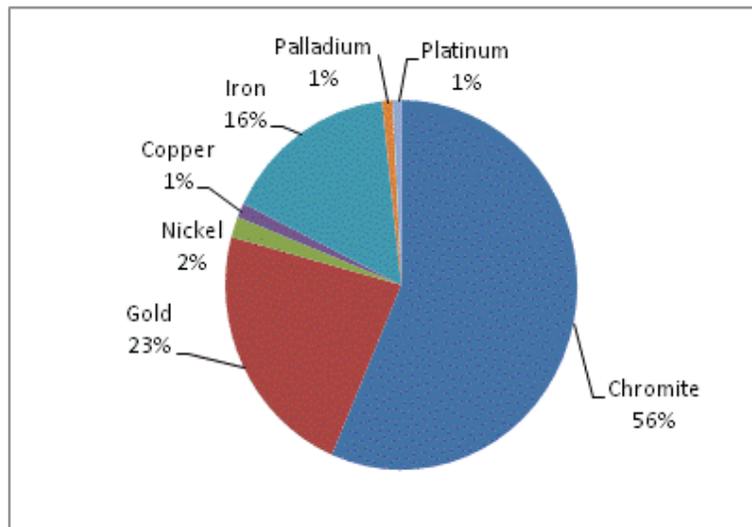
Table 11 - Characteristics of individual representative mining projects (per metal) in billions of U.S. dollars at current prices (June 1, 2012).

Metal/Current Price (June 1, 2012)	PV of metal	Exercise price (PV cost)	Real option value	Aggregate real option value
Chromite/\$2860/tonne	\$85.8	\$21.88	\$76.44	\$76.44
Gold/\$1626.30/oz	\$7.59	\$2.07	\$6.15	\$30.75
Gold-open pit/\$1626.30/oz	\$8.36	\$2.52	\$6.58	\$13.75
Gold-underground/\$1626.30/oz	\$5.02	\$1.19	\$4.21	\$17
Nickel/\$7.27/lb	\$3.00	\$0.74	\$2.48	\$2.48
Copper/\$3.34/lb	\$1.22	\$0.51	\$0.86	\$1.72
Iron/\$135/tonne	\$23.62	\$4.92	\$21.63	\$21.63
Palladium/\$612/oz	\$0.94	\$0.45	\$0.66	\$1.32
Platinum/\$1443/oz	\$0.63	\$0.13	\$0.53	\$1.06
Total				\$135.40

Notes: Except for the last column which shows the aggregate value per metal/mineral, the above values are estimated for a representative mine averaged (weighted) by the production potential. If one, for example, assumes that there exist two copper mining projects, to estimate the approximate aggregate real option value of copper, the representative estimate (\$0.86 billion) should be multiplied by two.

Figure 11 presents the proportion of total value attributed to each metal.

Figure 11 – Proportion of Value for Each Metal



II. Potential New Employment from Further Mining Development

Before presenting the economic impact analysis of mining in NWO, it is necessary to provide a snapshot of the labour market in the region. While there are similarities between issues and challenges faced by NWO, the Province as a whole, and Canada, this section's main themes focus on the unique challenges facing the region. This section begins with a brief overview of the regional labour market and next moves into the growth contributions of the mining sector to the regional labour market.

Regional Labour Market - Brief Overview

The 2011 Census shows that the Thunder Bay District's population has experienced decline of approximately 2% over the past five years (i.e. since the 2006 Census). The Thunder Bay Census Metropolitan Area (CMA) also experienced a decline, but for only 1.1% over the same time period (Statistics Canada, 2011 Census Profile). Table 12 presents the population change for the Thunder Bay CMA, and the various towns or communities in the Thunder Bay District.

Table 12 - Population change from 2006 - 2011 for communities in the Thunder Bay District

Location	2006	2011	Population Change (%)
Greenstone	4,886	4,724	-3.3%
Manitouwadge	2,300	2,105	-8.5%
Marathon	3,862	3,353	-13.2%
Nipigon	1,752	1,631	-6.9%
Red Rock	1,063	942	-11.4%
Terrace Bay	1,625	1,471	-9.5%
Thunder Bay City	109,160	108,359	-0.7%
Thunder Bay CMA	122,907	121,596	-1.1%
Thunder Bay District	149,063	146,057	-2.0%
Ontario	12,160,282	12,851,821	5.7%

Source: Statistics Canada, Census Profile, 2011 Census

The decline in Thunder Bay's population is significant when compared to the population of Ontario and Canada, which grew by approximately 5.7% and 5.9%, respectively (Statistics Canada, 2011 Census Profile).

In regards to major urban centres, only Thunder Bay and Windsor experienced a decrease in population since the 2006 Census (National Post, 2012). Many of the communities in the Thunder Bay CMA experienced much more negative population decline across this same time period. After their mills had closed, Marathon, Red Rock, and Terrace Bay experienced population declines of 13.5%, 11.5%, and 9.5%, respectively.

The communities elsewhere in NWO experienced a similar population decline. Table 13 presents the population change for some of the larger communities that are outside of the Thunder Bay CMA.

Table 13 - Population change from 2006 - 2011 for communities in Northwestern Ontario

Location	2006	2011	Population Change (%)	
Atikokan	3,293	2,787	-15.4%	
Dryden		8,195	7,617	-7.1%
Fort Frances	8,103	7,952	-1.9%	
Kenora District	64,419	57,607	-10.6%	
Rainy River District	21,564	20,370	-5.5%	

Source: Statistics Canada, Census Profile, 2011 Census

The out-migration in many of the NWO cities has been attributed to many factors. One major factor is the decline in the region's forestry industry, which required many individuals to seek employment outside of the region. Another factor is that many other large urban centres in Ontario, especially in the Greater Toronto Area (GTA), are more attractive to immigrants than the more rural or northern regions (The North Superior Workforce Planning Board, 2012).

Across a similar time period, the Thunder Bay District's total employment in small and medium sized enterprises has dropped by approximately 2.2% (see Table 14). It is interesting that both the population and total employment have decreased by approximately 2%.

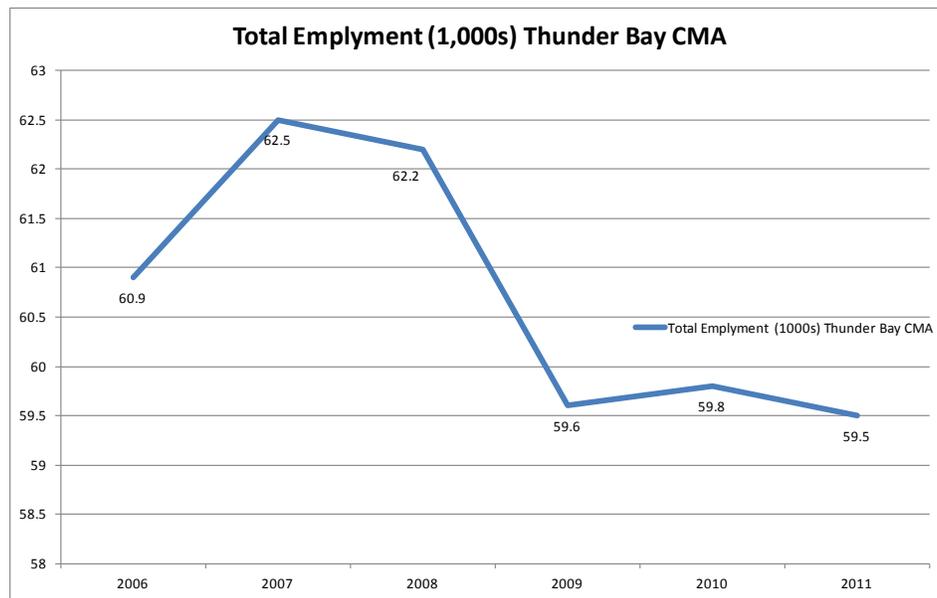
Table 14 - Thunder Bay District's employment change in SME's between 2008 and 2011

	Employment in 2008	Employment in 2011	Absolute Change	Percent Change
Thunder Bay District	46,327	45,310	-1,017	-2.2%

Source: Statistics Canada, 2011, Canadian Business Patterns

The decrease in employment in the Thunder Bay District is consistent with the experience within the Thunder Bay CMA. Figure 12 presents the total employment (000's) for the Thunder Bay CMA and reveals a significant increase in employment from 2006 to 2007. This increase, however, is followed by a much larger decrease in employment during the global credit crisis between the period of 2008 and 2009. A small recovery is noted in 2010, but the negative trend continued in 2011.

Figure 12 - Total employment (1,000s) Thunder Bay CMA



Source: Statistics Canada, 2011, Labour Force Survey Estimates and North Superior Workforce Planning Board, 2012

Although these statistics are for the Thunder Bay CMA, it is reasonable to assume that all of the major towns in NWO have experienced similar declining employment trends as many cities relied upon the forestry/pulp and paper mill industry and have less diversified economies than Thunder Bay.

Table 15 presents some insights into the highest growth and loss industries in the Thunder Bay CMA over the same time period. This table excludes the public sector and focuses solely on the private sector. In regards to the mining industry, Table 15 shows that employment in the industries of Mining and Quarrying (except for Oil and Gas) and the Support Activities for Mining and Oil and Gas have grown significantly by 82% and 17% respectively from 2008 to 2011. In terms of absolute positions, these two industries have created 98 new positions. This increase in the mining industry has been substantiated by the North Superior Workforce Planning Board's (NSWPB) regional consultations which took place between 2010 and 2012 (The North Superior Workforce Planning Board, 2012). The NSWPB has reported that communities, such as Greenstone and Marathon, have indicated significant increase in the levels of mining related activities⁴.

The major losses in employment are in the forestry and logging industry, with the continued downsizing of Paper Manufacturing, Wood Product Manufacturing, Forestry and Logging. This downsizing has had a significantly negative impact on the labour market for many of the communities in the Thunder Bay District. For example, these three industries experienced a combined decline of 41% from 2008 to 2011 which resulted in the loss of 652 positions (1,589 positions in 2008 and 937 positions in 2011). Interestingly, there was an increase of 217 positions for the Support Activities for Agriculture and Forestry. These positions have helped to offset the losses noted above, which resulted in a net loss of 435 positions from the broad and, loosely defined, forestry sector.

Overall, it appears that the losses in the forestry sector (e.g. 435 positions) have not been offset by the mining industry (e.g. 99 positions)⁵. Although these figures are for the Thunder Bay CMA area rather than all of NWO, and they do not include all forestry and mining job categories, it is generally understood from regional stakeholders that the recent job losses in the forestry industry have not yet been offset by the gains in employment from the mining industry in NWO.

As discussed below, the mining sector can lead to the development of many new positions over the next ten years to help offset the losses from the forestry industry. The following section discusses the future employment growth that is possible from the mining sector.

⁴ Page 13, NSWPB, *Building a Superior Workforce: 2009 – 2012 Labour Market Action Plan: 2012 Update*

⁵ It is important to note that job creation from other industries may have offset the forestry job losses.

Table 15 - Industries with greatest gains and losses of SME employment from 2008 to 2011 for the Thunder Bay CMA

Growth	2008	2011	Absolute Change	Percent Change (%)
324 - Petroleum and Coal Product Manufacturing	9	68	59	653.24%
326 - Plastics and Rubber Products Manufacturing	15	45	30	207.92%
115 - Supportive Activities for Agriculture and Forestry	222	439	217	97.55%
212 - Mining and Quarrying (except Oil and Gas)	93	169	76	81.73%
623 - Nursing and Residential Care Facilities	590	943	353	59.92%
485 - Transit and Ground Passenger Transport	275	379	104	37.68%
213 - Support Activities for Mining and Oil and Gas	134	156	22	16.57%
Loss				
211 - Oil and Gas Extraction	16	2	-15	-90.27%
114 - Fishing, Hunting and Trapping	21	5	-16	-76.05%
483 - Water Transportation	16	4	-12	-74.22%
322 - Paper Manufacturing	113	41	-71	-63.47%
518 - Data Processing, Hosting, and Related Sec.	35	17	-18	-52.12%
334 - Computer and Electronic Product Manufacturing	61	30	-31	-50.11%
321 - Wood Product Manufacturing	304	157	-146	-48.22%
113 - Forestry and Logging	1172	739	-433	-36.95%
484 - Truck Transportation	1311	1155	-156	-11.90%

Source: Statistics Canada, 2011, Canadian Business Patterns and North Superior Workforce Planning Board, 2012.

Note: This table excludes the public sector

Potential Labour Market Growth from the Mining Sector

The Mining Industry Human Resources Council (MIHRC) has prepared many detailed forecasts of future hiring requirements for the mining industry. The forecasts for Canada and the Thunder Bay region will be reviewed and analyzed in this section.

Although employment in the mining sector is generally more volatile than in other industries (MIHRC, 2011), since it is largely dependent on commodity prices, the MIHRC forecast for future employment in the mining industry is significantly large. The forecasted growth is significant under various scenarios, including poor economic outlook conditions. For example, the Mining Industry Workforce Information Network (MIWIN) projected a hiring requirement ranging from 75,000 to 140,000 workers from 2011 to 2021 (MIHRC, 2011). However, virtually all these positions are the result of replacing employees who will retire or leave the mining industry for other reasons. Only under an expansionary scenario would there be an additional 20,500 created in the mining industry for Canada (MIHRC, 2011). MIHRC has forecasted expansionary growth in the mining sector for the Thunder Bay District, however, under both a baseline and expansionary scenario (MIHRC, 2012). A decrease was forecasted for only the contractionary scenario. Table 16 presents a summary of the MIHRC's forecasted employment requirements for the Thunder Bay District.

Table 16 - MIHRC's cumulative hiring forecast for the Thunder Bay District (2012 to 2022)

	Change in Employment	Replacement Requirements		Cumulative Hiring Requirements
		Retirement	Non-Retirement Separation	
Contractionary	-410	720	800	1,110
Baseline	660	1,050	1,135	2,840
Expansionary	1,540	1,270	1,270	4,150

Source: Mining Industry Human Resource Council, 2012. Note: Estimates may not add perfectly due to rounding.

Under the expansionary scenario, there is a hiring requirement of 4,150 positions from 2012 to 2022, of which 1,540 will be new positions in the Thunder Bay District (1,270 will be required to replace retiring individuals and a further 1,270 will be required to replace individuals who leave the mining industry). Under the baseline scenario, a total of 660 new mining positions will be required. Under a contractionary scenario, the mining industry will lose 410 positions.

The MIHRC has estimated that the Thunder Bay District's mining sector employed approximately 2,215 workers in 2011. The contractionary scenario suggests a decline in the mining industry employment of approximately 20% (410 lost positions / 2,215 current positions). However, the baseline and expansionary scenarios suggest an increase of approximately 30% (660 / 2,215) and 70% (1,540 / 2,215) respectively.

Note that regardless of the scenario, the MIHRC has forecasted a significant hiring requirement over the next decade to add new positions, replace retirees and replace non-retired workers that leave the industry. Industry participants, government, Aboriginal groups and educational institutions need to work together to ensure the availability of a sufficient talent pool. This requirement will be discussed further in later sections.

Table 17 summarizes the MIHRC's cumulative hiring requirements under their contractionary, baseline and expansionary scenarios for the Thunder Bay District in 2014, 2017 and 2022.

Table 17 - MIHRC's hiring forecast for the Thunder Bay District in 2014, 2017 and 2022

	Cumulative Hiring Requirements		
	2014	2017	2022
Contractionary	180	475	1,110
Baseline	690	1,270	2,840
Expansionary	920	1,995	4,150

Source: Mining Industry Human Resource Council, 2012.

Figure 13 shows the MIHRC's expected hiring requirements for the Thunder Bay district over the next decade for the baseline scenario for all three categories of the cumulative hiring requirement.

Figure 13 – Annual hiring requirement forecasts – Thunder Bay scenario (MIHRC, 2012)
Figure 2
 Annual Hiring Requirements Forecasts – Thunder Bay District
 Baseline Scenario – 2012 to 2022

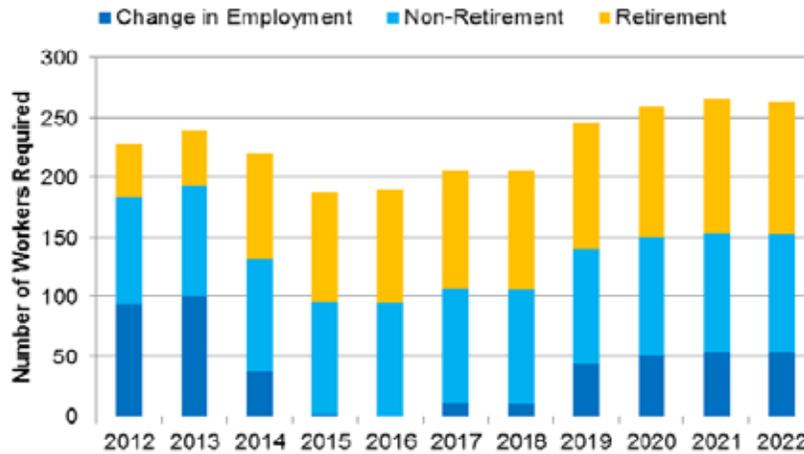


Figure 12 suggests that the mining industry will need between 200 and 250 workers each year over the next decade. In regards to workers for new mine development, the MIWIN has projected that approximately 100 new workers will be required in each of 2012 and 2013, and 40 new workers in 2014. This is a total of approximately 240 new mining workers from 2012 to 2014. The vast majority of the remaining new positions are projected to occur in 2019 to 2022.

The MIWIN forecast for the Thunder Bay District varies significantly from MIWIN's forecasts for the Ontario and Canada mining industry as a whole. The main difference is that the cumulative hiring requirements for both Ontario and Canada workers is not driven by industry expansion, but rather driven by replacement demand alone (MIHRC, 2012).

It is important to note that the MIHRC's forecast is for the Thunder Bay District only and does not include all of potential employment in Northwestern Ontario. The following is a *conservative* forecast of employment estimates for companies in the Developed Exploration Projects in NWO.

Table 18 - New position hiring forecast for Northwestern Ontario

Company	Operating Positions	Construction Positions	Total Positions
Cliff's Natural Resources	700	735	1,500
Noront Resources	376	780	1,200
Rubicon Minerals Corp.	250	50	328
Rainy River Resources Corp.	600	650	1,293
Osisko Resources	500	530	1,060
Stillwater Canada Ltd.	350	400	775
Goldcorp Inc.	100	100	200
Treasury Metals	200	150	350
Bending Lake Iron Corp.	225	600	900
Total estimated positions	3,301	3,995	7,296

Source: Based on information made publicly available by the above noted companies.

Table 18 presents a much more optimistic forecast of new jobs from the mining industry. Specifically, a total of 3,301 new operating jobs will be created in Northwestern Ontario based on the company reported estimates, with an additional 3,995 jobs in the form of construction positions to get the mines up and running. Overall, an estimated 8,071 new positions will be created. Table 19 shows the NWO hiring requirements based on the years the mines are expected to open.

Table 19 - New position hiring by year forecast for Northwestern Ontario

Year	2013	2014	2015	2016	Total
Operating Positions	250	350	1,300	1,401	3,301

Source: Based on information made publicly available by the above noted companies.

Table 20 presents the occupational hiring requirement by broad occupational category. The numbers were estimated by the MIHRC to provide the region with an estimate of the need for future training and support.

Table 20 - MIHRC's cumulative hiring forecast by occupational category

	Cumulative Hiring Requirements (2022)		
	Contractionary	Baseline	Expansionary
Trades and Labour Occupations	475	1,240	1,805
Supervisors, Coordinators, and Foreman	90	215	320
Professional and Physical Science Occupations	55	150	215
Support Workers	45	130	185
Technical Occupations	35	105	140
Human Resources and Financial Occupations	25	55	90
All Other Occupations	385	945	1,395
Total	1,110	2,840	4,150

Source: Mining Industry Human Resource Council, 2012.

Table 21 presents the hiring forecast by occupation for the NWO region based on the MIHRC's forecast for the Thunder Bay District. Essentially, Table 21 presents the number of employees by occupation assuming that the Thunder Bay District occupation requirement, as a percentage of the total requirement, is equivalent to the NWO requirement.

Table 21 - Northwestern Ontario hiring forecast by occupational category

	Percentage in each category	Number Required
Trades and Labour Occupations	43.7%	1,441
Supervisors, Coordinators, and Foreman	7.6%	250
Professional and Physical Science Occupations	5.3%	174
Support Workers	4.6%	151
Technical Occupations	3.7%	122
Human Resources and Financial Occupations	1.9%	64
All Other Occupations	33.3%	1,098
Total	100.0%	3,301

Table 22 provides further details on occupational groups reported in Table 21 by presenting the top five specific occupations within each of the broad occupation categories (Note: numbers are for the baseline scenario). The purpose of this table is to provide further details and insights into the specific occupation categories that will be required. Table 22 reveals that most of the hiring requirement is in the form of trades and labour occupations, with 44% of the total requirement under the baseline scenario. This is consistent with the results found across the country (MIHRC, 2011) as the production and extraction phases for mining are labour intensive.

The next largest category in the baseline scenario is all the other occupations that make up 33% of the total hiring requirement. Note that occupations listed in the "other" category are defined by the MIHRC as *"non-specific to mining and jobs that are commonly found in other sectors (e.g., cleaning and janitorial positions, nonspecific administrative roles, accountants and business analysts, nurses and other roles)."*

Table 22 - MIHRC's cumulative hiring forecast by top five occupations per occupational category

Trades and Undesignated Occupations	Cumulative Hiring Requirements
Underground production and development miners	235
Labourers in mineral and metal processing	160
Construction millwrights and industrial mechanics (except textile)	150
Heavy Equipment Operators (except crane)	105
Industrial Electricians	85
Professional and Physical Science Occupations	
Geologists, geochemists and geophysicists	40
Mining Engineers	30
Industrial and manufacturing engineers	20
Metallurgical and materials engineers	15
Mechanical engineers	15
Human Resources and Financial Occupations	
Financial auditors and accountants	20
Human resource managers	10
Financial managers	10
Specialists in human resources	< 5
Financial and investment analysts	< 5
Support Workers	
Inspectors and testors, mineral and metal processing	65
Dispatchers and radio operators	20
Secretaries (except legal and medical)	15
Transportation route and crew schedulers	15
Administrative clerks	10
Technical Occupations	
Geological and mineral technologists and technicians	40
Chemical technologists and technicians	20
Industrial engineering and manufacturing technologists and technicians	15
Electrical and electronics engineering technologists and technicians	10
Mechanical engineering technologists and technicians	10
Supervisors, Coordinators, and Foremen	
Supervisors, mineral and metal processing	85
Supervisors, mining and quarrying	70
Primary production managers (except agriculture)	35
Contractors and supervisors, pipefitting trades	15
Engineering managers	10

Source: Mining Industry Human Resource Council, January, 2012.

The “supervisors, coordinators, and foremen” category faces the second greatest hiring requirement. Supervisors will be required to oversee the various labourer employees. The need for supervisor workers is not surprising given that the MIHRC has projected that many new mines will be opening up within the next decade.

In summary, it is generally understood that the job losses from the forestry sector have been greater than the employment gains from the mining industry. However, potential new employment from the mining industry is significant based on both the MIHRC projection (e.g. baseline scenario increase in mining employment by 690 new positions over the next decade) and the regional mining company estimates (upwards of 3,600 new operation positions). If they materialize, the new mining positions should more than offset the losses from the forestry sector.

III. Economic Impact Analysis

The purpose of this section is to answer the following question: what are the economic effects of mining and mineral processing in NWO? In answering this question, this section briefly discusses whether mineral wealth can be managed for the economic benefits to be enhanced in the short term and sustained over the long term, even as individual mines inevitably decline. The analysis in this section examines the above issues from both the Provincial and local community economic perspective. The environmental consequences of mining, although important, are not the focus of this study. This section is organized as follows: first, the context of mining and economic sustainability is explored. Next, the main analysis is offered by exploring the direct, indirect and induced economic employment impacts of mining in NWO.

The Context of Sustainable Development

The terms “sustainability” and “sustainable development” help us to understand that markets, for all their advantages in organizing economic affairs, do not always bring us the outcomes we desire. Sustainability, in its simplest form, means that something can be maintained at its current level.

Sustainable development is a more recent and complicated concept. It is a multidimensional, economic, environmental and social concept. In other words, sustainable development requires that human beings act in ways that simultaneously sustain or enhance economic well-being, the quality of the natural environment and social justice.

Mining has the potential to contribute to sustainable development, *if* mineral wealth is created with the appropriate environmental considerations (and restoration) and appropriate investments are made to ensure that mining’s economic benefits are sustained for long term social benefit. Yet, often minerals seem to be a curse. Many nations blessed with abundant mineral resources have not performed well economically over the last several decades. This leads some observers to express a negative view regarding mining operations. However, many observers argue that there is nothing unusual about poor economic performance in the mining economies. Poor performance, it is argued, is due to other (non-mining) factors.

Several observers express concerns regarding the impact of mining on domestic (national) economies and argue that focusing on expanding natural resources may have negative effects on other economic sectors. One of the models that explain the negative impact of the expansion of mining on other sectors is known as the “Dutch disease.” This model is named after the Dutch experience of internal stresses during the 1960s and 1970s as a result of a boom in natural gas exports. The “disease” was the hardship experienced by the other established export sectors of the Dutch economy which shrank when the exports of natural gas expanded. Other sectors serving local markets (for example, services) experienced much less of a disruption as a result of the expansion of natural-gas exports.

Is the Dutch disease really a disease? As Davis (1995, p. 1768) notes:

“There is nothing inherently growth-inhibiting in mineral booms and any resulting Dutch disease phenomena. Total output and income for an economy increases as a result of the boom in natural-resource exports even though traditional exports fall. Any market economy constantly evolves and changes. At any point in time,

some sectors and companies rise while other sectors and companies are in decline. Fundamentally, the Dutch disease represents a change in the structure of a national economy during a period of boom-induced economic growth. It really is only a disease in an economic sense to the extent that: (a) there are stresses associated with adjusting to change, (b) governments respond to political pressure and intervene to protect the industries hurt by the structural change, or (c) the boom in mineral exports is temporary, and it is difficult to restart the traditional export industries. The argument that learning-by-doing is higher in manufacturing than mining is proven to be not relevant. Over the longer term, inputs used in mining could yield more significant economic growth if used in manufacturing”.

Economic Impact Estimation

A good starting point for examining or measuring mining’s contribution to regional economies is the statistics based on mining’s share in the Gross Domestic Product (GDP). GDP is useful for beginning to understand the level and structure of economic activity in an area. GDP statistics are not available for Northwestern Ontario (NWO), however, but they are available for the Province of Ontario. Statistics from Canada and the Province are, therefore, utilized to arrive at reliable estimates of the statistics necessary for this report. Using publicly available information, the Ontario Mining Association (OMA) publications, contacts within government and industry sources and interviews with different mining companies, we arrived at the potential impact in Ontario and NWO for the nine Mature Exploration Projects.

The first part of this section examines the economic impacts of mines when fully in production, while the second part examines the impacts of building or opening the mines.

Production Impacts

The production economic impact consists of three components: direct impact, indirect impact, and induced impact.

Direct Impact

The direct economic impact of a mine are the sales of products by the mining company; the number of employees directly working at the mine; salaries paid to the mines’ employees; as well as the corporate taxes paid by the mine, the personal income taxes paid by the mine employees, and royalties.

The nine Mature Exploration Projects will employ 3,301 workers with the average wage of \$91,000 per year. The total of \$300.4 million earned by the mining industry will be spent on wages and about \$498 million will be the total employee compensation (including pension contribution, Canada Pension Plan and Employment Insurance, other medical benefits, etc.). The wage and benefits per employee are estimated to be over \$150,000. According to Peter Dungan and Steve Murphy (2007) “This comparison highlights how lucrative mine employment is and correspondingly, how productive employment is. The 2006 OMA survey found that, on average across all mining in Ontario, output per employee exceeded \$500,000.00.” Based on the number of employees employed in direct impact and the contribution of each employee to output, the total output will be at least \$1,650,500,000. Considering the price of gold and the fact that the price of other metals is currently far above the 2006 figures, this estimate should be at least 30% higher.

Multipliers

The indirect and induced impacts are assessed with measures called multipliers. Multipliers summarize the estimates of the size of the economic impact of a representative mine. Multipliers indicate the ratio of direct impacts to indirect and induced impacts. For example, a spending multiplier of 0.25 indicates that one dollar of direct spending generates an additional \$0.25 in indirect and induced spending. Put differently, a spending multiplier of 0.25 can also be interpreted as indicating that \$1 of direct spending generates a total spending of \$1.25.

In the case of employment impacts, the multipliers measure the number of full-time equivalent (FTE) jobs supported by \$1 million in direct spending. For example, an employment multiplier of 10 indicates that \$1 million in spending generates 10 indirect and induced FTE jobs.

How large are the multipliers associated with mining? The most important point here is: it depends. The size of a multiplier varies considerably from situation to situation, and it is dangerous to make gross generalizations. Nevertheless, it is possible to identify several guiding principles (see Armstrong and Taylor, 2000). The size of a multiplier depends fundamentally on what portion of the money injected into a region by mining is spent within the region. Any money spent within a region stimulates additional economic activity within the region, while money spent outside the region does not.

Three factors importantly influence what portion is spent within a region and, in turn, determine the size of the multiplier. The first is a region's size⁶. The larger a region, the less likely it is that mining companies will need to purchase inputs from outside the region and that mining households will spend their income on "imported" goods and services. The second important factor is a region's industry structure. The more diversified a region's economy, the more likely it is that the region is capable of supplying inputs and of satisfying the demands of households for goods and services. The third factor is a region's location which is important in several respects. If a region is located such that most workers commute from other regions, then the multiplier will be smaller than if all workers lived within a region. Workers are likely to spend their income where they live. If a region is located close to another region with extensive shopping opportunities, then the multiplier will be smaller than if there were no nearby shopping opportunities. Therefore, for a given type of injection into the region, multipliers are very region-specific. That is, an injection of new mining activity may result in quite different multipliers from one region to another, even if the mining activity itself is identical in both regions.

Considering the above and using the information available from public sources and mining companies operating in NWO, reports from the Ontario Mining Association (OMA), various federal and provincial government departments and special calculations performed by Statistics Canada in its Input-Output Division, reliable calculations of the direct, indirect, and induced impacts of mining for Ontario and NWO can be performed. To maintain reliability and to substantiate the methodology used to calculate the impact of mining, a number of cautious assumptions have been made. For instance, the baseline operational budget figures for salary and benefits must be net of taxes. In all cases, an attempt has been made to make the estimates presented in this report as reliable and conservative as possible.

Indirect Impact

The direct economic impact tells only part of the story. Mining also contributes indirectly to a region's economy through the connections with other parts of the regional economy. The indirect impacts of a mine are the purchases of inputs required for its production and development. The industries that sell inputs to the mines also purchase their materials from other firms, and this process continues down the supply chain. Often, these connections are referred to as backward linkages.

Purchases of inputs, such as food; catering services; professional services (e.g. legal services, accounting services, etc.); insurance; electricity; transportation services and raw materials; as well as the replacement of machinery and equipment that wears out at the mine in the course of production, are considered in this category.

The indirect economic impact generates 7,559 additional jobs in Ontario with the total compensation of over \$390 million (\$342 million for wages and the rest for other benefits). This is based on a multiplier of approximately 2.30 indirect jobs per direct job. The indirect economic impact will affect many industries in Ontario and will provide other provinces with economic benefits. The portion of the indirect inputs imported from the rest of the Province of Ontario, other provinces and from the rest of the world will not have any impact on the NWO economy.

⁶ Size is a comprehensive concept that includes population and concentration of service.

Induced Impact

The induced impact of mining is from increased spending on goods and services as a result of wages (net taxes and savings) paid to employees in the direct and indirect group. In other words, the induced economic impacts are the final demand linkages rooted in the income that is spent by workers employed both directly in the mine and indirectly in all of the supplier industries.

We estimated that the induced impact of the mining project mentioned in this report will generate about 4,621 new jobs in the Province of Ontario. This figure is based on a multiplier of approximately 1.40 induced jobs per direct job. The total induced employee compensation is estimated to be about \$218 million and, of this amount, \$185 million will be for wages and the remainder for other benefits. The average employee's compensation is approximately \$47,000.

Note that the total multiplier for indirect and induced jobs is approximately 3.67 times for each direct job.

Economic Impact of Production on the Northwestern Ontario Region

The purpose of this section is to assess the employment impacts on the NWO region. According to the Ontario Mining Association publication in 2009 (A Made-in-Ontario Success Story), "many economic effects of mining are felt locally. Procurement in general is estimated to be sourced almost completely from local suppliers, and the total value of goods and services procured within 80 kilometers of a mine in Ontario has more than quadrupled since 2001." Considering the level of economic diversity in the region, it is assumed that about 48% of the economic effects will remain in the NWO region (OMA, 2009). Based on this assumption, the contribution of the mining activities in the region is estimated.

With the limitation discussed above, the portion of the economic impact that will stay in the NWO region is estimated. The total number of jobs generated in Ontario for the nine Mature Exploration Projects is estimated to be 15,481. Of this total, 7,430 jobs will stay in the NWO region. To estimate the labor compensation for this report, Peter Dungan's and Steve Murphy's (2007) labor compensation figure is adjusted and used to calculate the average labor compensation per employee of \$71,470 for the NWO region. This figure is higher for the local mine employee and lower for the jobs generated through indirect and induced impact in the NWO region. Based on this estimate, the total labor compensation will be about \$531 million. There are other effects, especially in NWO, beyond the pure economic impact that will be addressed in other sections of the report.

Table 23 presents a summary of the production impacts on labour for the Province of Ontario and NWO.

Table 23 - Production impacts on the province of Ontario and NWO

Direct Impacts	
Employment positions	3,301
Average Employee Wage (annually)	\$91,000
Total Employee Wages	\$300,391,000
Average Employees Wages and Benefits (annually)	\$150,000
Total Employee Compensation (wage and benefits)	\$498,000,000
Indirect Impacts	
Employment positions	7,559
Average Employee Wage (annually)	\$45,245
Total Employee Wages	\$342,000,000
Average Employees Wages and Benefits (annually)	\$51,595
Total Employee Compensation (wage and benefits)	\$390,000,000
Induced Impacts	
Employment positions	4,621
Average Employee Wage (annually)	\$40,035
Total Employee Wages	\$185,000,000
Average Employees Wages and Benefits (annually)	\$47,176
Total Employee Compensation (wage and benefits)	\$218,000,000
Total - Direct, Indirect and Induced Impacts	
Employment positions	15,481
Total Employee Compensation	\$1,106,000,000
Economic Impact in NWO	
Employment in NWO	7,430
Average Employee Compensation	\$71,470
Total Employee Compensation	\$531,000,000

Construction Impact

In this part, the impact of the construction of nine Mature Exploration Projects is estimated.

Direct Impacts Ontario

Opening a mine has three economic impacts: direct, indirect and induced. In this study we assume that the opening of mines in the NWO will take place within four years with the total capital cost of \$7.52 billion. It is assumed that 80% of the capital expenditure is used in construction and the balance is the cost of the machinery and equipment. The direct employment generated as a result of construction activity will be 3,955 new jobs or about 989 jobs per year. The wages paid to direct employees will be about \$193 million with the total compensation of \$233 dollars for the four year duration of construction.

The total multiplier for indirect and induced jobs is approximately 1.05 times each direct job. The indirect and induced impacts are discussed in the following two sections, respectively.

Indirect Impacts Ontario

As discussed in the mining production phase, the indirect impacts are generated as a result of inputs provided to the main activity (in this case, construction) by others and by those that provide input to input. For example, construction needs equipment, equipment requires steel and steel needs coal. It is clear that construction equipment uses a wide range of goods and services which goes down the supply chain. In total, indirect impacts will create 1,819 jobs during the four years of construction. The total wages received by indirect employees are estimated to be about \$73 million dollars. This is based on a multiplier of approximately 0.46 indirect jobs per direct job.

Induced Impacts Ontario

As mentioned earlier, the wages paid to the direct and indirect jobs and their suppliers, net of taxes and savings, will be spent on consumer goods that will result in an additional 2,333 jobs being generated during the four years of construction. The total wages received by the induced labor force will be about \$94 million. This is based on a multiplier of approximately 0.59 indirect jobs per direct job.

Economic Impact of Construction on the Northwestern Ontario Region

In order to assess the impact on the NWO region, it is assumed that the major activities of construction (80% of total capital expenditure) will be heavily localized. To have a conservative estimate of economic impacts for NWO, it is assumed that some workers from other parts of the country will come to the region; as a result, less than 80% of construction services will be provided by the region. It is estimated that from a total of 8,107 jobs created, only about 5,719 will remain in NWO, and about \$301 million will be paid by the employers for labor compensation.

Table 24 presents a summary of the construction impacts on labour for the Province of Ontario and NWO.

Table 24 - Construction impacts on the province of Ontario and NWO

Direct Impacts	
Employment positions	3,955
Average Employee Wage (annually)	\$48,800
Total Employee Wages	\$193,000,000
Average Employees Wages and Benefits (annually)	\$58,915
Total Employee Compensation (wage and benefits)	\$233,000,000
Indirect Impacts	
Employment positions	1,819
Average Employee Wage (annually)	\$40,130
Total Employee Wages	\$73,000,000
Average Employees Wages and Benefits (annually)	\$45,760
Total Employee Compensation (wage and benefits)	\$83,240,000
Induced Impacts	
Employment positions	2,333
Average Employee Wage (annually)	\$40,291
Total Employee Wages	\$94,000,000
Average Employees Wages and Benefits (annually)	\$47,475
Total Employee Compensation (wage and benefits)	\$110,760,000
Total - Direct, Indirect and Induced Impacts	
Employment positions	8,107
Total Employee Compensation	\$427,000,000
Economic Impact NWO	
Employment in NWO	5,719
Average Employee Compensation	301,200,0000
Total Employee Compensation	\$52,670

IV. Government Revenue from Potential Mining in Northwestern Ontario

The revenue impacts for the Federal, Provincial and Municipal level governments have been estimated by employing the Dungan and Murphy (2007) methodology for taxes payable to governments by a representative mine. We have modified the Dungan and Murphy (2007) methodology to reflect: 1) changes to the tax rates from 2007 to 2012 and 2) facts and figures specific to NWO. The following specific adjustments have been made:

- Both Federal and Provincial corporate and employment tax rates have been adjusted to reflect 2012 levels.
- The Ontario Mining Tax has been adjusted to reflect the fact that many of the mines in NWO may qualify for the remote mine rate of 5% (as opposed to the full rate of 10%).
- Canada Pension Plan, Employment Insurance, Employer Health Tax and Workers Safety Insurance Board premiums have been adjusted to reflect 2012 rates and all applicable limits and exemptions.
- The indirect taxes and municipal taxes are based on the Dungan and Murphy (2007) methodology adjusted for NWO characteristics.
- The indirect and induced tax rates (based on the economic multiplier) have been adjusted to reflect NWO.

It is important to note that these figures, although reliable, are estimates based on averages across the nine Mature Exploration Projects. In addition, the calculations below are the totals for the direct, indirect and induced benefits from the mining companies in NWO.

Based on the above methodology, estimates of the total taxes for the Federal, Provincial, and Municipal levels of government are as follows:

- Total taxes from the construction phase of mine development: \$1.296 billion
- Total taxes over the operation cycle of the mines: \$14.717 billion
- Combined total tax revenue for the government: \$16.013 billion

It is important to note that these tax amounts are estimates and subject to various assumptions which may lead to deviation from the future (actual) figures even though conservatism was employed in the methodology. The estimated taxes are intended to highlight the vast amount of tax revenues that further development of the mining industry in NWO, including the Ring of Fire, will generate for the Federal, Provincial, and Municipal level governments.

The following is a discussion of the taxes paid during the mine opening and production phases.

I. Opening a Mine

Table 25 presents an estimate of the government revenues from both the 'opening' (i.e., construction or bringing into production) of the nine Mature Exploration Projects, which is based on the 'representative' mine methodology (Dungan and Murphy, 2007). Note that these estimates are conservative since a representative mine is assumed to "occur in an area that already possesses much of the necessary infrastructure for mining production. That is, a road/rail and power network already exists together with a functioning community and an available work force both to open the mine and to operate it later. One might think, for example, of developing a new nickel mine in the Sudbury area." The economic impacts of opening a mine where no infrastructure exists would be much larger. This information cannot be reliably quantified in a 'representative' fashion, however, since each such project is unique. Hence, our estimates err on the conservative side as infrastructure is required for many of the mines in NWO.

We have estimated total construction costs of approximately \$7.52 billion for the development of the mines in our sample. Assuming these costs are incurred over a three year period, a total of approximately \$2.51 billion would be incurred in each year.

From the \$2.51 billion annual expenditure on mine opening, the Federal government earns about \$194 million annually in revenue over the average three-year period. Approximately half of the taxes come from the personal income tax and the remainder spread evenly across the corporate income tax, Employment Insurance contributions, Canada Pension Plan and all Federal indirect taxes.

The Provincial government is estimated to take in about \$173 million annually in revenue with the largest contributors being the sales tax and the personal income tax. Local governments should derive about \$63.6 million annually in revenue from the construction and machinery activity; with roughly \$40.8 million of this staying in the vicinity of the new mine.

Table 25 - Government revenue related to opening of NWO mines

	Taxes Paid to Governments (\$millions)	
Total estimated mine-opening expenditures	\$2,506.3	
Federal Government		
Personal Income Tax	\$84.8	
Corporate Income Tax	\$33.4	
Employment Insurance Contributions	\$12.8	
Canada Pension Plan Contributions	\$29.1	
All Indirect Taxes (HST, Gasoline, etc.)	\$34.5	
Total:	\$194.7	45%
Provincial Government		
Personal Income Tax	\$43.8	
Corporate Income Tax	\$22.0	
Workplace Safety (WSIB) Contributions	\$34.6	
Employer Health Tax	\$10.0	
All Indirect Taxes (Retail Sales, etc.)	\$63.5	
Total:	\$173.8	40%
Municipal Government		
All Indirect Taxes (Property, etc.)	\$63.6	15%
(Municipal taxes in Mine Locality)	\$40.8	
Total - All Governments	\$432.1	
Estimated construction period (years)	3.0	
Total Government revenue over construction stage of mines	\$1,296.2	

II. Operating Mines

This section examines the government revenue impacts of the operational phase of the mines based on the characteristics of the representative mine. Table 26 presents the taxes to be received by the government during the operational stage of the mine. The overall revenue takes for all levels of government is approximately \$851 million annually, which is approximately 13% of the mine's output value.

From the annual revenue production of \$6.62 billion of the mines in our sample, the Federal government can see an increase in revenues of approximately \$366 million annually⁷. The Federal Government is expected to receive approximately 43 percent of this revenue through Federal corporate and employment taxes, along with contributions to CPP and EI and indirect taxes (including the HST and gasoline taxes). Total Federal taxes are estimated to be approximately \$366 million annually while all of the mines are in production.

The Provincial Government can expect to receive approximately 35 percent of the tax revenue generated by the new mining companies in the form of corporate (including the mining tax) and employment taxes, along with contributions to Employer Health Tax and WSIB and indirect taxes (including retail sales tax, etc.). Total Provincial taxes are estimated to be approximately \$299 million annually while all of the mines are in production.

As part of the corporate income tax, the special Ontario Mining Tax nets the province \$64 million under the assumed 'normal' profitability of the representative mine. The Ontario Mining Tax is paid only by mineral producers and is a profit-based royalty which rises and falls in a fashion similar to the industry's cycles. A weighted average rate has been estimated for the Ontario Mining Tax that reflects the fact that some of the mines in NWO will be eligible for the remote mine rate of 5% as opposed to the 10% rate.

The municipalities and local governments are expected to receive approximately 22 percent of the tax revenue generated by the new mining companies in the form of property taxes and other indirect taxes. Total Municipal taxes are estimated to be approximately \$186 million annually while all of the mines are in production. A rough estimate is that just over \$146 million of this amount stays within the local area of the mine itself, with the remainder going to municipal governments in other parts of the province.

As with all the impacts detailed above, it is important to realize that the representative mine generates these revenues and economic impacts each year through possibly several decades of operations. The average life span of the mines in our sample is 17.3 years. These annual benefits can thereby accrue to the three levels of government over the weighted average annual period of 17.3 years. Given that the mines will open and close at different dates, however, the total tax revenues would be earned over a period that is greater than 17.3 years (with tax amounts that differ from the annual average calculated in Table 26).

Figure 14 presents the share of the total tax revenues to be generated during the processing phase by each level of government.

⁷ Federal revenue estimates are from economic activity generated in Ontario only. Given that the representative mine also generates some economic activity in the rest of Canada, total federal revenues generated would be somewhat higher than those reported here

Figure 14 - Share of Revenue by Government

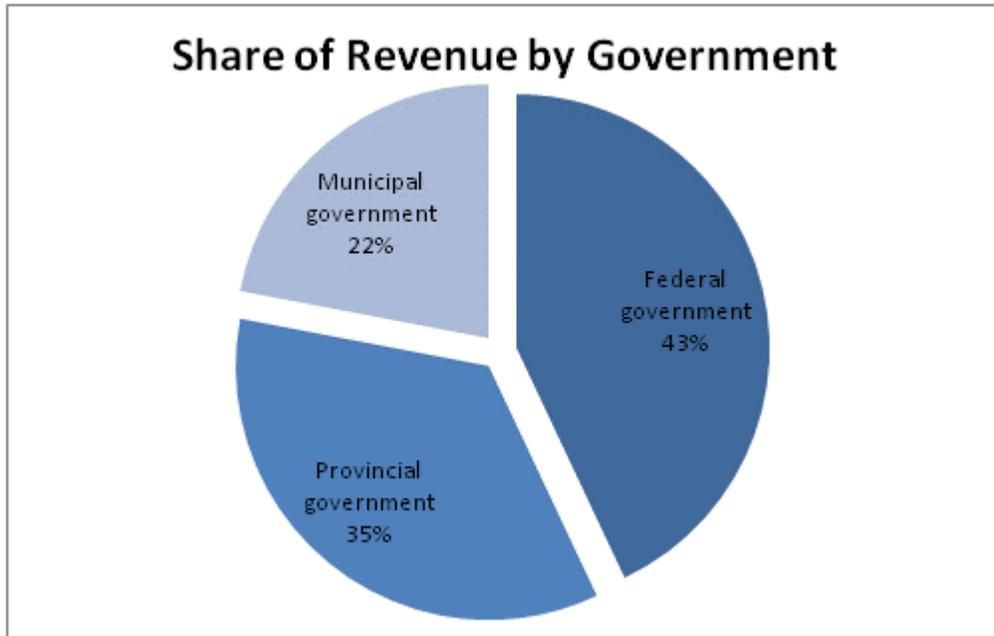
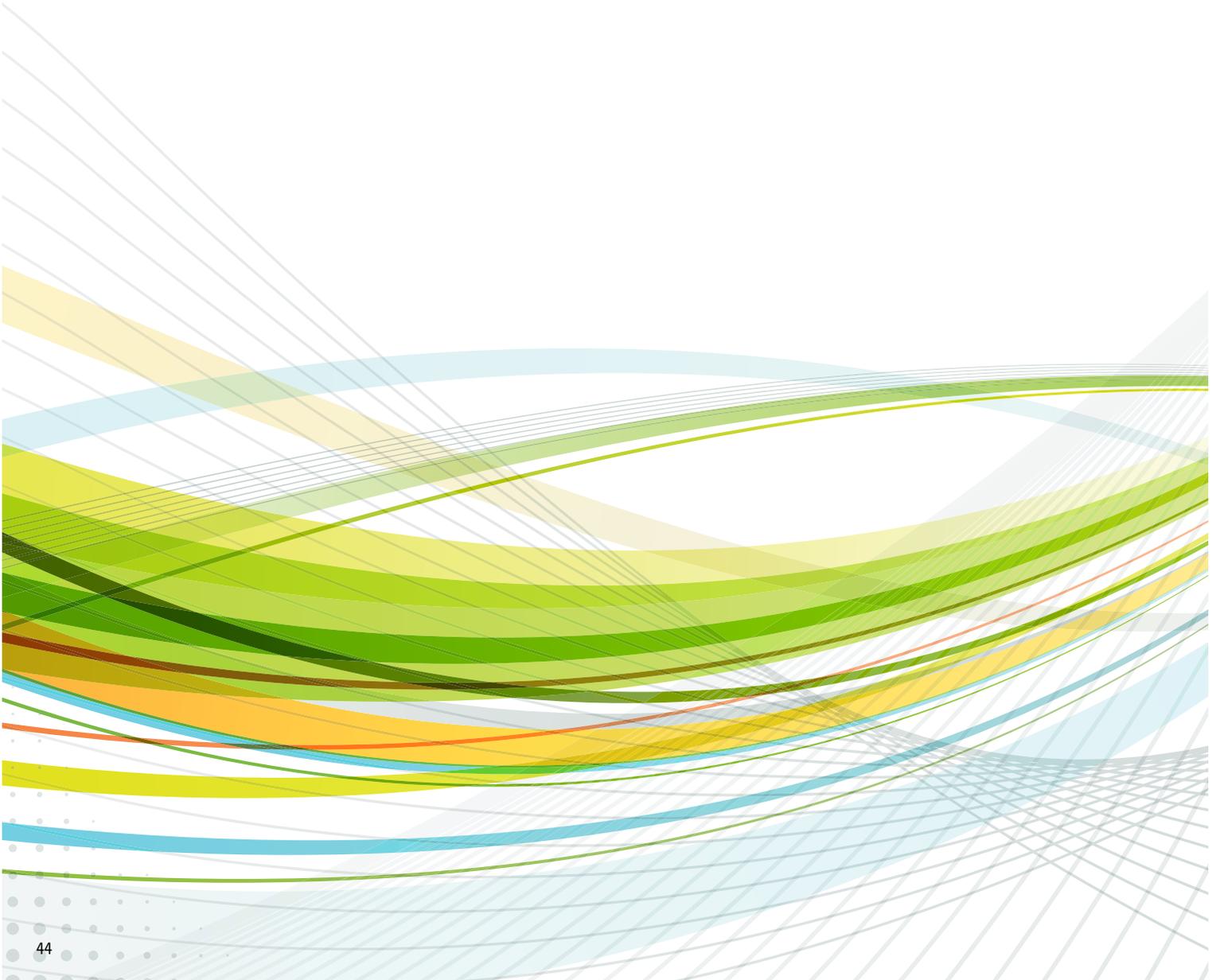


Table 26 - Government revenue related to operation of new NWO mines

	Taxes Paid to Governments (\$millions)	
Mine output/Sales (annual)	\$6,621.9	
Federal Government		
Personal Income Tax	\$127.0	
Corporate Income Tax	\$149.0	
Employment Insurance Contributions	\$16.4	
Canada Pension Plan Contributions	\$38.0	
All Indirect Taxes (HST, Gasoline, etc.)	\$36.0	
Total:	\$366.3	43%
Provincial Government		
Personal Income Tax	\$66.0	
Corporate Income Tax	\$109.3	
of which: Mining Tax	\$64.3	
Workplace Safety (WSIB) Contributions	\$28.4	
Employer Health Tax	\$10.9	
All Indirect Taxes (Retail Sales, etc.)	\$84.2	
Total:	\$298.8	35%
Municipal Government		
All Indirect Taxes (Property, etc.)	\$186.6	22%
(Municipal taxes in Mine Locality)	\$146.1	
Total - All Governments	\$851.8	
Average life cycle (years) of mines in sample	17.3	
Total Government revenue over operating life of mines	\$14,717.5	

Part IV – Present and Future Challenges Facing Mining in Northwestern Ontario



I. Aboriginal Involvement in Mining Development

Introduction

The distribution of benefits and impacts derived from mining are significant socially, politically, economically and environmentally, and the concept of a 'social license to operate' is increasingly being recognized as just as important as a regulatory license to operate (Solomon, et al, 2008). Nowhere is this more apparent than in the increasing shift towards the inclusion of Aboriginal⁸ communities in resource development as partners, employees, employers and service providers.

Aboriginal communities have often been unable to reap the benefits from resource development due to a variety of factors such as limited experience, limited skill development, lack of knowledge about the industry and lack of funding opportunities (Sosa and Keenan, 2001). This section discusses the challenges and opportunities for the Aboriginal community to realize the economic benefits from mining. This examination will be placed within the broad context of the relationship of Aboriginal people within the broader Canadian society, keeping in mind the diversity in the region and the understanding that details would need to be addressed specifically within the context of each community. This analysis draws from a review of the literature pertaining to indigenous communities and mining development coupled with semi-structured interviews of Aboriginal and non-Aboriginal people associated with resource development in this region. This section is organized as follows: The contextual themes will first be presented to form an understanding of the nature of Aboriginal relations and the issues and challenges Aboriginal people face in this region. Next, this background information will be used to inform the main analysis regarding the issues impinging upon development. Thirdly, strategies to enhance the opportunities and reduce the impacts will be offered. The section ends with a brief summary of the main themes and some examples of best practices.

Population Characteristics – A Brief Overview

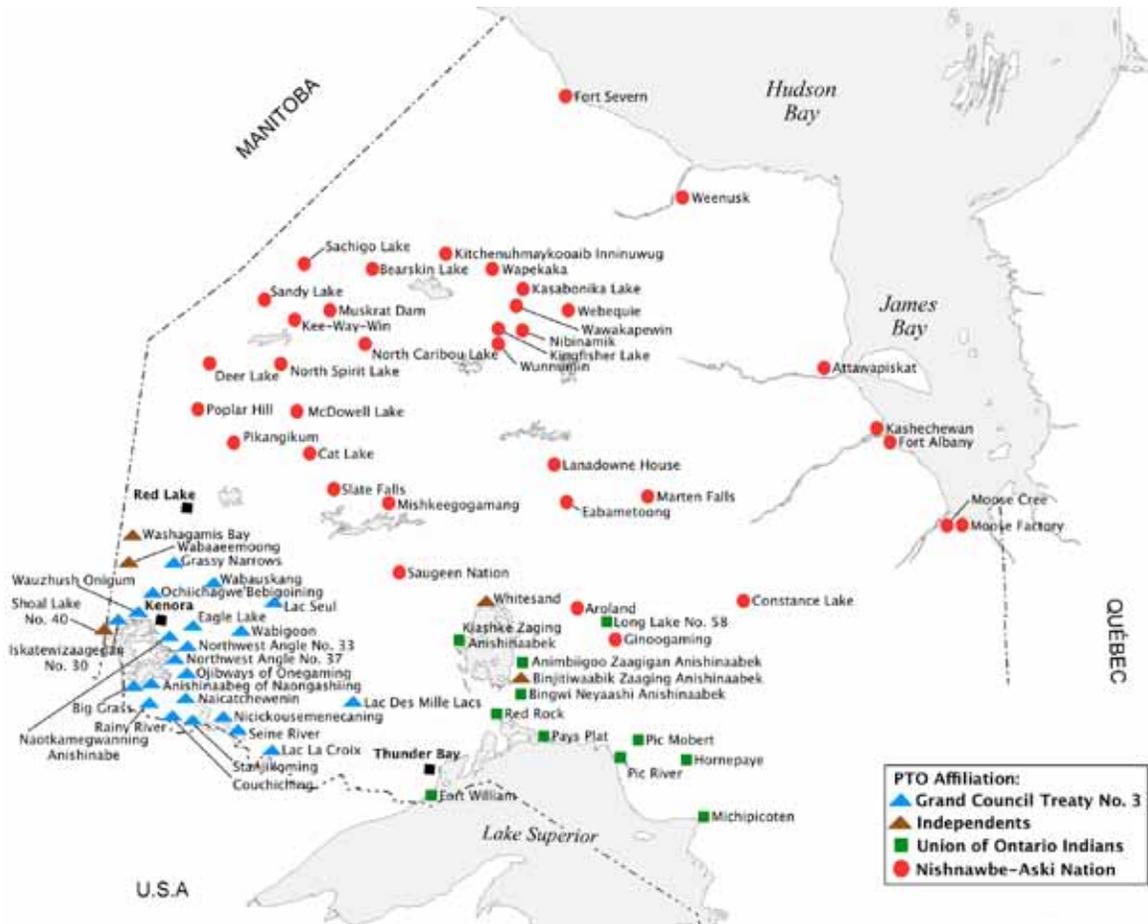
The total population of NWO is sparse and dispersed over a vast region where there is a mix of rural and urban inhabitants and a substantial Aboriginal population of First Nation⁹ people living on and off reserve and Métis¹⁰. According to the 2006 Canada census, approximately 20% or 44,000 people in this region have self-identified as Aboriginal. Of this 20%, 15.3% are North American Indian according to the definitions in the Indian Act, and 3.4% are Métis. The First Nation populations are located within the treaty territories of Treaty #9 and #5 (1905- 1930), Treaty #3 (1873), and the 1850 Robinson Superior Treaty, while the Métis population is dispersed throughout the region in rural and urban areas. Within the three census districts of Kenora, Rainy River and Thunder Bay, the largest Aboriginal population is in the Kenora District at 38.4%; 21.7% of the Rainy River District population, and 28.2% of the population in the Thunder Bay District including the City of Thunder Bay. Diversity in location, culture, socio-economic circumstance, history and aspirations for the future exists between the treaty groups, the communities and between the First Nations and Métis population. Figure 15 displays the communities existing in each treaty area, while Figure 16 presents the Metis Nation of Ontario, Consultations Protocol Areas.

⁸ The term *Aboriginal* is used in this document to refer to all people of native ancestry and *First Nation* is used when referring to the specific group that qualifies for the distinct legal status within the Indian Act, i.e. *Status Indian*, *Non-Status Indian* and *Inuit*. A *Status Indian* is registered as an Indian person under the Indian Act. A *Non-Status Indian* is an Indian person who is not registered according to the Indian Act.

⁹ The term *First Nation(s)* is also the general term currently used to refer to a *Status Indian Band* or *Band Council* or *Indian Reserve* as identified and defined in the Indian Act.

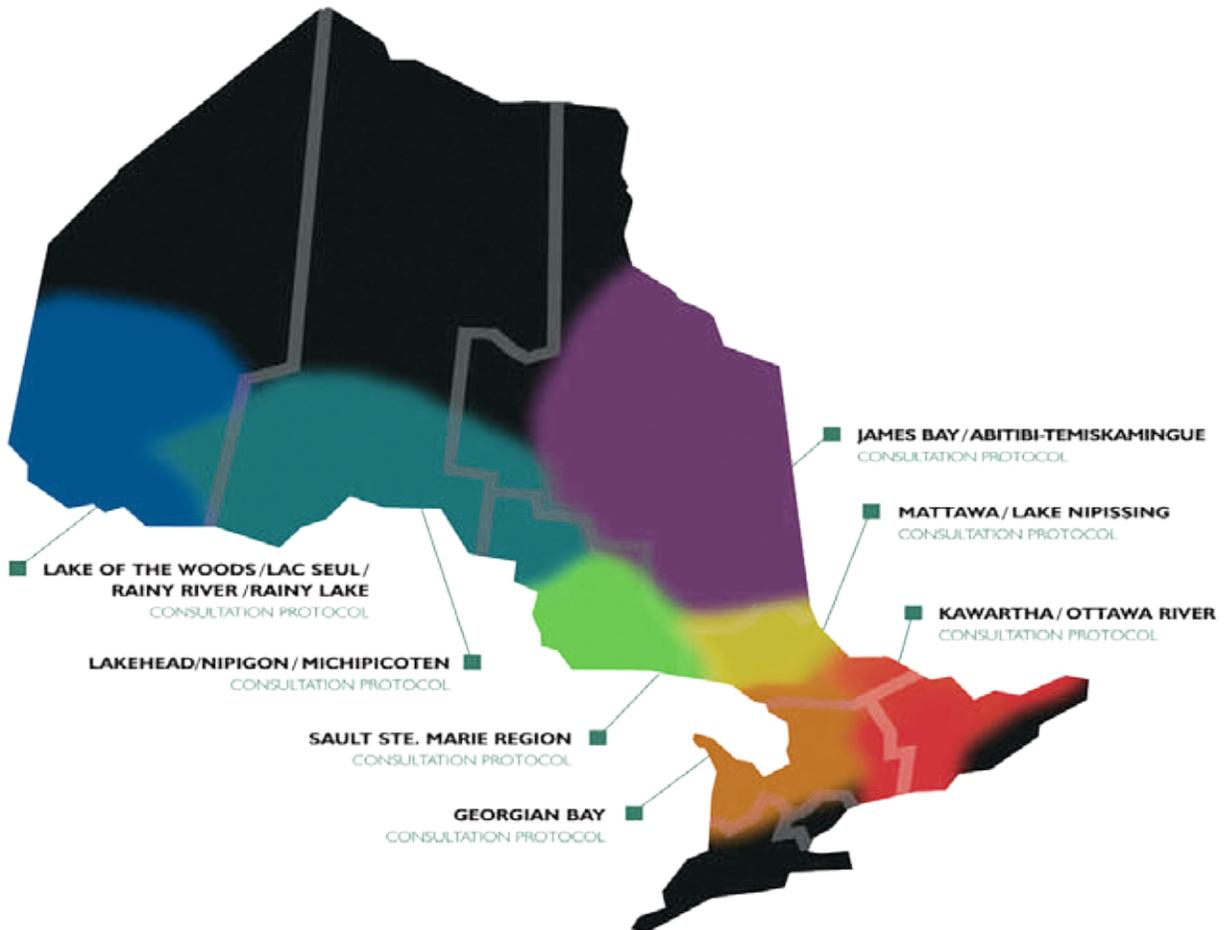
¹⁰ *Métis* is the term used to refer to people having both *Aboriginal* and *non-Aboriginal* ancestry. Upon the arrival of Europeans into North America, the convergence of these two cultures formed a new and distinct people, born of both worlds. *Métis* people have constitutionally protected *Aboriginal* rights but they are not identified and defined within the Indian Act.

Figure 15 - A First Nations Affiliated with Each Treaty Area



Section from Chiefs of Ontario's Map of First Nations

Figure 16 - Metis Nation of Ontario, Consultations Protocol Areas



In general, the First Nation population is more vulnerable than other Canadian citizens. First Nation people have higher unemployment rates, lower educational attainment, higher incidence of welfare dependence, higher levels of family violence, a higher preventable disability rate, higher crime and incarceration rates, are in poorer health, have higher suicide rates, higher incidence of Type II diabetes and its related complications, and higher rates of infectious and chronic disease (North West Local Health Integration Network (NWLHIN), 2010; Lakehead Social Planning Council (LSPC), 2011). People in remote communities, in particular, live in conditions far worse than the Canadian standard.

Institutional Framework

The Aboriginal population within the Canadian context has a unique legal and historical relationship with the Government of Canada that does not exist for other Canadian citizens. There is no other group of people, for example, who are governed by a specific legislation nor can any other group of people enter into treaty or land claims settlements with the Crown. Aboriginal people are connected to the broader Canadian society through the legal and institutional framework of the Indian Act and Aboriginal and Treaty Rights. First Nations are governed by the Indian Act and the federal department of Aboriginal Affairs and Northern Development Canada (AANDC) has a fiduciary obligation for 'Indians' and lands reserved for 'Indians' according to this Act and provide funding support for Band operations.

Aboriginal and Treaty Rights are collective rights which stem from the Royal Proclamation of 1763 and are affirmed within the Canadian Constitution of 1982. Aboriginal Rights are usufructory rights to the land for all Aboriginal peoples, status, non-status and Métis. Aboriginal Rights pertain to the essential activities necessary for the maintenance of a traditional lifestyle (i.e. hunting, fishing, trapping and gathering). Treaty Rights are in addition to Aboriginal Rights and consist of specific aspects within each Treaty, such as education, health care and housing which were negotiated during the signing of treaties. Treaties cannot be entered into with interest groups or stakeholders.

Exploration and mining development presents a unique challenge for business operations when access to and use of resources potentially infringe upon Aboriginal and Treaty Rights. The courts have been clear that government and industry has a Duty to Consult¹¹ before resource development proceeds (Ross and Sharvit, 1998). When this issue has been challenged, the courts have consistently ruled in favour of the continuing efficacy of Aboriginal and Treaty Rights. Past resource development, however, occurred in an era when traditional activities, village economies and the significance of Aboriginal and Treaty Rights were either misunderstood or perceived to be outside the domain of usual business practices. Benefits accrued to external corporate interests and to near-by towns and cities while lasting impacts remained in the areas of undertaking with little benefit accruing to the Aboriginal people. Compensation packages could not adequately address the long-term consequences of disruption to traditional activities and loss of land. Conflict resolution based on adversarial processes had often left relations strained and distrustful (Peterson, 2003).

A Distinct and Changing Culture

Aboriginal people's traditional culture is based on the inherent value of land where beliefs and values are organized in a holistic pattern of relationship where the quality of life is in balance with nature and there is collective responsibility for the stewardship of the land. Traditional societies view themselves as integral to the land, living in harmony with it (Ghostkeeper, 1996).

Aboriginal people, however, are no longer nomadic hunters and gatherers, but contemporary people, living in a modern, industrial society and have varying influences from church affiliations. Without a solid economic base, reserve communities' dependence on external sources of income has led to a cycle of poverty. A cycle of poverty is an interconnected system of traits such as *marginality, helplessness, and dependency where people feel like aliens in their own country, convinced that the existing institutions do not serve their interests and needs* (Lewis, 1998). Lack of sufficient incomes alone can cause social problems, such as drug and alcohol abuse, family violence, delinquency and crime. People in remote areas, in particular, are faced with high costs for goods, services and transportation which is compounded by the outflow of capital generated locally from government transfers and contribution agreements (Louttit, 2012:2). *Housing shortages, overcrowding, increasing youth suicides and drug and alcohol addiction are indicators of an erosion of a traditional lifestyle and community vitality.*

¹¹ The Supreme Court of Canada's *Delgamuukw Decision* (1997) specifically calls for meaningful consultation

Meaningful Consultation

Impacts to traditional territories require consultation and accommodation. Over the past few decades, government and industry have attempted to include Aboriginal involvement in their business practices with varying degrees of success. At issue, is what constitutes an appropriate forum and a process for engagement that meet the requirements for the Duty to Consult. Lack of familiarity by industry regarding legal complexities and definitions has led to confusion as to who the players are and who has the authority to speak on behalf of communities.

To complicate matters, conflicts between the Aboriginal community and government over legislation or land claims can cause delay and ambiguity. In addition, conventional forms of engagement continue to have implications for what these forums ultimately can and cannot achieve. Lack of clear guidelines regarding meaningful consultation has led to inconsistencies and uncertainty regarding approaches and outcomes. Consultation processes set within conventional public participation frameworks do not take into consideration the cultural nuances and decision making protocols of Aboriginal people. The institutional framework described earlier creates different life experiences for Aboriginal people from the general population. The fundamental reason that communication has often been constrained is that Aboriginal and non-Aboriginal people are speaking about “two entirely different perceptions of the world which relates [sic] not only to culture, but to socio-political circumstance” (Deloria, 1973i). Communities endorse negotiated agreements with industry, for example, and they need to be kept fully informed, so they can understand and appreciate the implications of what they are endorsing. Where companies may want to have confidentiality, balancing the need for transparency in communities is a major challenge with the risk for increased skepticism that decisions are being made behind closed doors. Without sensitivity to cultural and socio-political realities, underlying issues or resentment towards the process can remain unresolved, only to resurface again and again, causing confusion and frustration. Conflicts can be triggered and stalemates occur.

The inclusion of Aboriginal peoples in resource development, then, is related not only to the inclusion of local stakeholders, but also to the engagement of a culturally distinct, yet disadvantaged, group of peoples who have legal rights to land and a history of constrained relations with the broader Canadian society. These conditions have implications for how the economic potential of this growing population can be realized.

Types of Impact

As indicated in the previous sections, the mining sector can lead to many new employment opportunities over the next 10 years. Mining development can bring economic benefits in the form of employment, contracts, business opportunities or the purchase of locally-produced and supplied goods. There is much anticipation from all parties that Aboriginal people will benefit from the forecasted direct, indirect and induced economic benefits. Opportunities exist for entrepreneurship in the service industry, such as grocery stores, fuel, hotels, catering, restaurants, janitorial, machine shops, welding shop, security, etc. For exploration and mining, there are such opportunities as road building, transportation, land clearing, as well as access to construction, drilling, high tech jobs, joint ventures and management. Opportunities also exist to partner with municipalities to identify common goals and areas of common interest to develop complimentary projects or to partner on common initiatives. To realize these benefits, the issues and challenges facing Aboriginal communities need to first be understood and appreciated for how they impinge on the successful inclusion of Aboriginal people. Community vitality and displacement from traditional lands are two inter-connected concepts that provide a focus for a brief overview of the types of impacts that have and could occur to Aboriginal people.

Community Vitality and Cohesion

Mining activity can impact whole regions and treaty lands that have far reaching effects now and into the future. Mining projects can generate pollution, displace people from traditional homelands, affect wildlife and country foods, create health effects, social tension, economic inequalities, and disrupt family and community life. With the establishment of mining operations comes the associated increase in cash, alcohol and drugs, influx of workers from outside the area, shifting lifestyles to a wage economy and increasing standards of living where the cultural change itself brings its own complexity

of issues. Women's roles, for example, include such activities as harvesting medicines, keeping the natural and built environment, acting as market vendors, taking the role of primary health care givers, maintaining family and community structures and passing on traditional cultural ways (CSQ, 2001). When men commute to distant work sites on rotational work schedules, they leave behind family and community responsibilities and often in communities that lack safe and stable housing. The risks to Aboriginal communities are a disruption to community functioning, a widening gap between the local have and have nots and a boom/bust economy.

Displacement from Traditional Lands

People on limited incomes rely on or supplement their incomes through land based activities. Environmental impacts and displacement from land decreases their ability to carry out the traditional activities which contribute to the overall health and well-being of households and communities. Damage to sacred areas can cause emotional feelings of loss and suffering. As industry's interest in the mineral potential of the region increases and as industry moves further and further north, there is increasing risk of cumulative impacts caused by past, present and future activity which ultimately put Aboriginal people at risk of increasing displacement from their culture and traditional way of life. The impacts are more severe when there is nothing to replace it.

Key Considerations for Aboriginal Involvement

Impacts from mining can be far reaching, affecting treaty and traditional territories where collective rights come into play. The literature review and interviews were consistent in their depiction of Aboriginal issues as being complex and multi-faceted which require a range of measures to deal with the range of factors. A robust strategy is required to address the challenges facing the Aboriginal community. Engaging Aboriginal communities requires an articulation of resource development within non-market terms and a comprehensive approach for the inclusion of the various actors potentially affected by the undertaking from a rights-based perspective. Meaningful participation enables Aboriginal people to have a say in the decisions that affect their lives and provides the opportunity for mutual learning. Agreement making enables both parties to address their interests and ensure mutual benefit. Employment and economic benefits can be maximized when they are planned carefully, taking into account the culture and life experience of Aboriginal people. This next section identifies the barriers to optimizing opportunities and explores the potential strategies to enhance opportunities and reduce barriers.

Relationship Building

Relationship building requires moving away from adversarial and conventional consultation processes to broadly based dialogues that consider values such as social justice, ecological sustainability, economic equity and cultural diversity, that is, integrating the social within economic and technical frameworks (Howitt, 2001) (Solomon, et al, 2008). Effective communication strategies that include consultation and information sharing on a comprehensive basis, not only with communities adjacent to mine sites but also throughout the neighbouring areas and the differing governance structures, avoids a potential disconnect from the initiatives being planned in the region and for neighbouring communities to hear about initiatives only through the newspaper or radio. Potential benefits; meaningful discussion of values, impacts and issues of concern to communities; as well as scheduling meetings to coincide with the rhythm of community life builds trust that the corporation is genuine in its attempts to include Aboriginal input.

Engaging communities early and jointly creating a Memorandum of Understanding (MOU) or Agreement in Principle (AIP) regarding how the industry and Aboriginal people are going to work together will guide the relationship. By becoming familiar with the governance structures of the treaty organizations or Provincial Territorial Organizations (PTOs), regional Tribal Councils and communities, industry can structure its consultation approaches to meet the requirements of each group. Utilizing Aboriginal protocols for engagement, providing clarity regarding the process for decision making, keeping the community informed about how the resource is being developed, including communities in the development plans and

planning process, providing information in easily understood formats shows respect and recognition for Aboriginal rights, significance of the culture, livelihood and way of life.

By engaging in a learning process about the mining industry, Aboriginal communities can also be proactive in the direction and level of involvement they want to take by becoming aware of what companies can and cannot do, what types of jobs and business opportunities are available and what the paths are to access opportunities and create healthy communities. Building relationships across communities, regions and Treaty territories builds a critical mass for sharing experiences and co-ordinating activities.

Agreement Making

MOUs can lead to the development of an Impact Benefit Agreement (IBA), a partnership or joint venture. IBAs are used to establish a formal relationship in order to reduce the predicted impacts, to influence decision making and to secure economic benefit (Sosa and Keenan, 2001). Environmental and social impact assessments provide the opportunity to engage in collaborative processes to identify impacts early and to establish amelioration and mitigation measures that are acceptable to the community. IBAs can also be used to establish assessment processes in collaboration with the community. Joint working arrangements for environmental assessments and environmental monitoring provide the opportunity to integrate traditional and western knowledge systems to improve the functioning of environmental processes and monitoring systems. Providing opportunities for communities to be directly involved in the project with benefits accruing over the long term enables communities to have a vested interest in the success of the project.

Negotiating agreements are time consuming, costly, onerous, and demanding. Little, if any, discretionary funding is available in Aboriginal communities to participate in consultations with industry. As noted in 2001 by the National Round Table on Environment and the Economy (NRTEE), resources for engagement of professional expertise are often needed by communities to effectively participate in consultation and negotiation processes.

Communities need to have confidence that they can participate in consultations on as equal footing as possible with the much larger corporations or government department sitting across the table. Funding and in-kind assistance from government and industry are therefore essential to ensure that Aboriginal communities have the capacity to participate effectively in consultations. (NRTEE, 2001:82)

In addition, Chiefs and Councils are also dealing with pressing social issues which can slow down negotiations and frustrate companies. The First Nation leadership has an overwhelming responsibility to deal with multi-faceted issues which can derail routine day-to-day operations. Mining companies are highly sophisticated multi-national corporations. Company officials have years of industry experience, as well as experience negotiating in a high stakes and competitive environment which puts the leadership of Aboriginal communities and councils at a competitive disadvantage. The use of technical terms and business language creates an uneven playing field where the advantage goes to the external proponent. Being aware of these circumstances will better prepare companies to be flexible and creative to strive for approaches that promote mutual learning and benefit.

Enhancing Opportunities and Benefits

The follow section will discuss opportunities related to: 1) community development; 2) capacity building; 3) training and education; 4) access and retention; and 5) working conditions.

Community Development

Economic and political drivers are creating pressures for communities to respond rapidly, and many are not sure where development is headed or whether it will actually occur at all. Land use planning in the far north and traditional knowledge

studies of the surrounding areas have been initiated, but most communities still lack a comprehensive community plan in which to incorporate community aspirations and long range socio-economic issues into the development process.

A reliable and affordable energy supply is fundamental for economic development. Community growth has been restricted by the type and amount of energy supplied to communities which affects the building of or improvements to schools, arenas, health care centres, nursing stations and housing. Offsetting limited incomes and enabling economic development can be achieved through community connection to the expanding infrastructure of roads and transmission lines needed for mining. All-weather road connections will increase access to northern municipalities and reduce the costs of food supplies, building materials and other household goods. Improved infrastructure will help communities realize economic benefits through the development of businesses to supply and service mining operations at locations more accessible and affordable to the mine site. Connection to the electrical grid system will also enable communities to move away from aging and costly diesel generation and its associated environmental and health impacts and capacity limitations.

Assessing community socio-economic impacts within the context of cultural change, community social structures, the culture of poverty and the range of social problems common to Aboriginal peoples in northern regions is required. IBAs can contribute to community development through enhancing community infrastructure, housing and facilities; creating and investing in tangible economic development opportunities; and setting training and hiring goals. Government and industry support for the development of comprehensive community planning beginning with a need assessment is required.

Capacity Building

Even in the forecasted tight labour market, the lack of necessary skills and educational qualifications puts Aboriginal people at a competitive disadvantage or not "in the running" at all for the various opportunities that are and will become available. Many lack sufficient backgrounds in science, mathematics and technical subjects to take advantage of the highly skilled job opportunities, and a general lack of experience within a wage economy creates unique challenges for transitioning to the labour market. To maximize Aboriginal employment, the focus on training and education, access and retention, as well as working condition are key areas to be addressed. These categories are not mutually exclusive but inter-connected concepts that function together to provide, encourage and enable individuals to acquire the necessary educational and skills training to access and retain higher skilled and technical jobs.

Training and Education

Much of the training that occurs for Aboriginal communities tends to be piece meal, focused on short term basic skill development that does not lead to certification recognized by industry or higher levels of education and is offered by a number of training institutes, consultants, Colleges, and Universities with no co-ordination among the initiatives. Training often takes place outside the community, a situation which not only adds cost but takes people away from family and community responsibilities for various periods of time. Space for training and accommodation of instructors at the community level is limited and often inadequate. The current supply of building infrastructure often contains mold or is in need of general repair.

A comprehensive long term (five year) education and training plan needs to be developed and committed to by industry, government, educational institutions and the Aboriginal community to co-ordinate initiatives and prepare people to succeed for the long term beginning at the elementary and high school levels through to pre-employment and employment training programs. Training materials and course and program curriculum needs to be culturally appropriate and designed with a focus to leverage into accredited certificate, diploma and degree programs so that transferable skills can be developed and pathways can be created that lead to qualifications recognized by industry and higher institutes of learning. Instructors need to be qualified and familiar with the cultural nuances inherent in the delivery of education and training to Aboriginal learners. Safe facilities and accommodations for students and instructors in communities are required.

Access and Retention¹²

There is a lack of information at the community level about what jobs are available and what to expect in relation to what the jobs entail, what education is required, what path to take to get there and what salary level to expect. Individuals may have limited experience in the workforce or are not accustomed to working away from home. Transition programs need to take into consideration the past experience of new entrants into the workplace.

Many Aboriginal people who enter the labour market for the first time, find it a different world from the one they left behind. Due to lack of training or formal work experience, Aboriginal workers often become systematically segregated into low paying jobs with little chance of advancement. For entry into the workforce, criminal record checks go back a number of years which makes access to jobs more cumbersome and difficult for particular individuals. With rules prohibiting hiring people with criminal records, individuals who have committed even minor offenses will effectively be taken out of the workforce, reducing the number of people eligible for hiring in northern communities.

Current training programs need to be assessed for evidence of systemic discrimination, such as entry level requirements that are not necessary to perform job functions. Minimum requirements for Grade 10 or 12, for example, can arbitrarily exclude less formally educated people, especially older workers. This situation becomes magnified when potential employees become discouraged when the path to employment requires a considerable investment of time for upgrading with subjects that may never be used. Accommodation in the form of aptitude testing and life experience needs to be considered as equivalent in entry level criteria.

Establishing an Aboriginal component within company human resource departments to provide the full range of human resource functions focused on recruitment, support and career counseling and development would help recruit and retain Aboriginal workers. Companies can provide on-site upgrading, trades exam preparation and mentorship programs; have unions commit to maximize Aboriginal employment; relax criteria pertaining to criminal backgrounds and work together with social service agencies to provide the necessary supports for individuals experiencing transition issues. Government could consider shortening the time required for processing pardons to facilitate sustainable job creation in northern communities. Aboriginal communities can work together with industry and government to help forecast and post the broad scope of employment requirements from security and janitorial jobs to executive mining positions and to actively identify and help prepare new employees through accessing funding for training programs and identification of career paths.

Working Conditions

Maximizing the employment of Aboriginal people includes creating the conditions that permit the fullest use of an individual's skills and abilities. Some barriers to opportunity and advancement may be found in the employment practices and work rules imposed by employers, resulting in discouraged workers who give up before they get a chance to transition to the new work environment. Other barriers preventing positive and successful work experiences can also be the assumptions, attitudes and expectations that non-aboriginal people hold and their resulting behaviours. Some strategies to address these challenges are to develop a long term human resource development plan to address hiring, training, and advancement opportunities for Aboriginal peoples; to work together with communities to organize cultural awareness training for executives and company personnel on site; to recognize Aboriginal specific ceremonies or celebrations such as pow wows; to recognize Aboriginal rights by providing flexible work schedules to enable pursuit of traditional activities, such as annual goose hunts; to develop and implement an education program for union members about employment equity for Aboriginal peoples; to provide support services, such as employment referrals, client supports in terms of student allowances, transportation and child supports, initial employment costs, and employee-employer relations support.

¹² It should be noted that many of these issues also apply to non-Aboriginal youth as well.

Summary

There are many capacity building issues facing the attainment of employment opportunities for the Aboriginal population. Lack of information, skilled labour, long term training and education plans, and supportive work environments are the main challenges to provide, encourage and enable individuals to acquire the necessary educational and skills training to access and retain higher skilled and technical jobs. Providing flexible, innovative and collaborative solutions to enhance the employability of individuals increases the potential to develop the human capital in Aboriginal communities for the long term.

Moving Toward Best Practices

The mining industry is essentially based on exploration for and extraction of resources that are geographically constrained and capital intensive. Industry's interest is to reduce the risk of uncertainty over land use and to improve confidence and security about land development decisions, so they can proceed unencumbered with their business operations and be accountable to their shareholders. The Aboriginal community's expectations are to be part of development from a rights based perspective, to be involved in the plans and decisions that affect their traditional territories, so their communities will benefit where there is an increased standard of living, where individuals are prepared to succeed in employment and where environmental guidelines are not only met, but exceeded. These perspectives create a dynamic context that requires a deepened understanding of the social dimension of resource development in NWO.

Negative environmental and socio-cultural impacts can be avoided by early identification. Inclusion of affected groups at early stages of the projects can be beneficial to negotiate benefits and to contribute to the planning needs to reduce impacts and to mitigate potential effects caused by external developments (Peterson, 2003). To meet these expectations, best practices from the literature and comments from interviewees were consistent in the need for a shift from adversarial and ad hoc approaches to one of relationship building, based on mutual respect and trust with the long view in mind. Although none of these arrangements are free from complications or difficulties, the move to relationship based on mutual respect, problem solving and mutual benefit enables industry to move forward in certainty, and communities can be left better off after industry has gone. An important aspect is to work on a pro-active basis and use dialogue as a means to listen and learn in order to build relationships, promote common understanding of issues, identify mutually beneficial outcomes and find common ground on which to work together.

Examples for meaningful involvement include partnerships, impact benefit agreements, memoranda of understanding, job creation, revenue sharing, grievance resolution, collaborative processes and commitment from government and industry to be proactive regarding the legal relationship with the Crown, Treaties and constitutionally protected rights to land. An example from Plan Nord, is the commitment expressed from the government of Quebec through The Minister Responsible for Native Affairs:

The Plan Nord will be implemented in a spirit of mutual respect and future generations can draw inspiration in turn from this innovative partnership model based on dialogue and respect. Its development will incorporate the Aboriginal perspective as it evolves during the implementation process.

(Kelly, 2009)

In a presentation to the Canadian Bar Association, the then Ontario Hydro Manager of the Aboriginal and Northern Affairs Branch stated:

Aboriginal people have often viewed their past experiences with Ontario Hydro as negative because of the environmental, social, and cultural impacts. . . . Ontario Hydro has used a non-adversarial joint-problem-solving approach to address grievances. This approach has been well-received by First Nations. (Baril, 1999:1)

A lesson learned from the Voisey's Bay Nickel Company (VBNC) was to first have internal community consultation to develop grassroots consensus on issues. VBNC provided funding support to the Innu leadership to establish a task force for community meetings which resulted in a clear mandate from the people to move forward with development (Hipwell et al., 2002).

Framing expectations for working with the Aboriginal community at a high level in policy with a focus on rebuilding relationships and utilizing a collaborative approach to engage in partnership and review what was done in the past, can help the parties move forward jointly to optimize employment and business opportunities and reduce the risk of uncertainty over land use. The intent is to cultivate on-going and lasting relationships where the communities are involved in development, common interests are identified, structures and ground rules are jointly decided regarding how the two parties are to work together from the outset and work plans are jointly decided. It takes time and work to get there, but the process is more relevant to Aboriginal communities as it is in line with the spirit of Treaties and, therefore, more prone to have lasting effects (Burroughs, Personal Communication, 2012).

II. Challenges facing the Regional Labour Market's Mining Sector

Many labour market challenges facing the mining sector have been identified. These challenges will need to be addressed in order for the industry to reach its full potential and for Northwestern Ontario to experience the projected employment gains.

The following challenges from an industry perspective have been identified from two main sources: 1) The feedback received from various mining industry executives; and 2) Research conducted by the MIHRC in the region. The results from interviews suggest the following main regional labour market issues: 1) A tight labour market; 2) A highly mobile labour force; and 3) An aging labour force. Challenges that are unique to Aboriginal Peoples are discussed separately.

Tight labour market (Demand to outstrip supply)

The MIHRC reports that many mining industry stakeholders indicated that the mining labour market in the region was tight (MIHRC, 2011). The market was exceptionally tight for positions that required advanced training, trade certifications, and/or education. The sentiment could be summarized as follows: "There is a very high demand for workers in the region, but there are not enough workers, or enough workers with the necessary skills or qualifications to fill all of the current demands" Many mining companies in the region have already expressed a concern about being able to attract and retain sufficiently qualified employees for their operations and that various positions currently remain unfilled.

Projecting future talent requirements can provide some quantification of this challenge. Recently, the MIHRC issued talent projections at the provincial level for Saskatchewan and Ontario. The MIHRC has not provided any projections for regions within the province. Although regional forecasts are not available, the provincial forecasts can be used as a gauge for the regional requirements. Table 27 presents the MIHRC's forecast of talent requirement for Ontario over a two, five and ten-year horizon.

Table 27 - Cumulative available talent, Ontario, all sectors and mining

	2014	2017	2022
Total entrants for 66 occupations all industry sectors	137,560	274,895	457,080
Mining's share of entrants for 66 occupations (assuming the historic rate of 2.2 per cent)	3,015	6,025	10,020

Source: Mining Industry Human Resource Council, January, 2012.

This forecast assumes there will be approximately 457,080 new entrants into Ontario's labour force in the 66 occupations related to mining. The mining industry has historically attracted approximately 2.2 percent of the labour force's new entrants. If this rate continues into the future, the mining industry will attract approximately 10,000 new employees over the next decade.

Table 28 presents the percentage of Ontario's mining employees that Northwestern Ontario will need to attract if the new positions materialize.

Table 28 - Hiring requirement for region as a percentage of Ontario's new mining talent

	2014	2017	2022
Mining's share of entrants in Ontario	3,015	6,025	10,020
Thunder Bay's cumulative requirement (Baseline)	690	1,270	2,840
Percentage required for the Thunder Bay District	22.9%	21.1%	28.3%
Thunder Bay's cumulative requirement (Expansionary)	920	1,995	4,150
Percentage required for the Thunder Bay District	30.5%	33.1%	41.4%
Northwestern Ontario - new position forecast	653	3,301	
Percentage required for Northwestern Ontario	21.7%	54.8%	

The first two sections of Table 28 present the hiring requirement for the Thunder Bay District for new positions and replacements. For example, recall that the baseline scenario hiring forecast for the Thunder Bay District was for 2,840 positions (Table 28). Therefore, the Thunder Bay District would be required to attract nearly 30% (2,840 / 10,020) of the entire new entrants to the mining industry labour pool over the next decade. Under the expansionary scenario, over 40% of the provincially available talent pool will need to be recruited to the Thunder Bay District.

It is important to note that the NWO forecast is only for new positions and does not include estimates of talent required to replace retired or separated talent. Table 28 suggests that NWO will be required to attract upwards of 55% of the total new talent in Ontario for growth alone. Considering the overall out-migration in the region and the difficulty in attracting new immigrants, these statistics suggest a significant challenge to the mining industry over the next decade.

Although forecasts are not available at the job category level, the mining industry's requirement for specific occupations will clearly vary. For example, the production and extraction phases of mining are labour intensive so the underground production and development miners and other labourers will be required in large numbers. Furthermore, millwrights and electricians, heavy equipment operators and truck drivers will be among the specific occupations with the highest demand. These labourers have skills that are highly transferable and will pose a significant challenge to the mining sector in terms of recruiting a larger number of these workers. The mines in the Thunder Bay District will likely experience additional pressure as they compete with other regions in Ontario and Canada that have stronger recruiting factors.

Another category that may pose some difficulty to the mining sector is the 'professional and physical science' and 'technician and technology' occupations. Although the forecasts for these positions do not suggest that a large number of these workers will be required, the mining industry may be hard pressed to recruit these highly educated, experienced and skilled workers since these individuals are highly mobile and have higher levels of transferable skills. The mining sector may find it resource intensive to attract and retain these workers.

Highly Mobile Labour Force

Another labour market challenge for the mining industry is the high degree of labour mobility in the region. The mining industry truly is global, with many of the large mining companies operating as multinational organizations. The competition for skilled labour is intense and provides labour force participants with a high level of mobility. Mining companies are, therefore, competing for labour talent on a global, not regional, level. Although there is global pressure for mining labour talent, the MIHRC has reported that many of the skilled mining labourers that have left the Thunder Bay District have relocated to Southern Ontario or other parts of Canada. Therefore, geographic distances should not be a major barrier in terms of attracting these workers back to the NWO region.

Aging Workforce

A third labour market challenge facing the mining industry is the aging labour force in the region. The demographics and aging workforce suggest that the Thunder Bay District will need to replace a large number of experienced workers. This has precipitated the need to prepare to replace the retiring baby-boomer generation. The MIHRC has reported that most of the retirements are expected to take place in the operating job categories. The mining industry will be faced with an additional challenge in light of these demographic trends as the average retirement age of mining workers in the region is 59.5 years of age, which is over two years sooner than the retirement age of 62 years for the average worker in the region.

The MIHRC has reported that the exploration workforce has a different age demographic than the extraction workforce. The exploration workers, especially those in the geosciences and technician roles, retire at the age of 62 years. However, the mining workforce in the region lacks workers in this category that are mid-career (i.e. 25 – 45 years). The mining industry in the region may face additional pressure to recruit experienced geoscientists and geological technicians to fill vacancies.

Summary

In summary, there are many labour market challenges facing the mining industry. A tight labour market (demand to outstrip supply), a highly mobile labour force and an aging workforce are the main challenges facing the mining industry.

As the mining industry attempts to attract a larger portion of the overall labour force, other industries may react with competitive recruitment and retention strategies. This situation will further increase the competition for skilled talent and the mobility of this portion of the labour market. A robust strategy is required to address the labour market challenges facing the mining industry. The next section explores the potential strategies to fill the talent gap.

Strategies to Fill the Talent Gap

A concerted and coordinated effort from industry participants, government and educational institutions (high schools, colleges, and universities) will be required to adequately address the challenges facing the mining labour market. A coordinated effort to develop and attract labour market participants will help the mining industry grow and prosper in a sustainable fashion. The following strategies could be used to help mitigate the challenges faced by the mining labour market.

High School, College and University Strategies

The mining industry should work with the various regional high schools, Confederation College and Lakehead University in order to help educate, train and develop the future generation of the mining labour force.

Currently, Confederation College offers a diploma in Mining Techniques. It is a one-year program, with the purpose of providing students with skills in basic geology, mining methods, surveying, computer aided drafting, communications, mathematics, basic computer applications, plus essential employability and general education skills. Graduates could enter the workforce. Alternatively, graduates may choose to enter directly into the second year of the two and three-year mining technician and technologist programs at Cambrian College in Sudbury or into the second year of the mining technician program at the Haileybury Campus of Northern College¹³. Alternative delivery methods, such as distance education or module format, where appropriate could be developed to reduce access barriers for Aboriginal students.

Lakehead University does not currently offer a degree that is specifically related to the mining industry. They do, however, offer degrees in geology, environmental, and earth science. The engineering department currently does not offer a degree specific to the mining industry. This may change in the near future as Lakehead University has recently announced that it will create a Centre of Excellence that is focused on Mineral Exploration and Sustainable Mining Development. This Centre will bring faculty together to research mining and its implications from various perspectives, including geology,

13 Retrieved from: <http://www.confederationnc.on.ca/mining>

environmental studies, engineering, business, natural resource sciences and Aboriginal studies. Brian Stevenson, President of Lakehead University, indicates: "What we're trying to do is train people for our region, research for the companies that are working in the Ring of Fire (in) Northwestern Ontario" (CBC 2012).

It could take many years to obtain the necessary resources to develop new programs, attract a sufficient number of students and produce graduates as they progress through the program. If the education system does not react early (e.g. at this stage), it may not be able to meet the future needs of the mining industry. In addition, the MIHRC has reported that most campus recruiting efforts focus largely on mining-related programs (MIHRC, 2011b) but knowledge workers from a variety of disciplines such as operations, finance and human resources are required, as well.

The following specific strategies could be adopted to help further train and develop future mining workers:

- The industry should work with regional high schools to create courses or certificates in mining related fields. The high schools could be targeted to communicate (see the discussion below) the benefits of pursuing a career in mining at the post-secondary level (MIHRC, 2011b).
- The industry should work with Confederation College in the development of the two and three-year mining technician and technologist programs that are currently offered at Cambrian College in Sudbury and the Haileybury Campus of Northern College. These programs could be offered within the region in order to train students locally.
- The industry should work with Lakehead University as it develops its Centre of Excellence in Mining. The development of this Centre will provide an excellent opportunity to develop new programs in geology, engineering and business that are specifically related to the mining industry. Graduates of these programs could fill the supervisory, engineering and geosciences positions within the industry.
- The industry should work with both the College, University, and Ministry of Training Colleges and Universities to develop apprenticeships and co-op programs that will give students the ability to learn through a hands-on learning environment. These programs could be developed to create new graduates with experience in the field in a much shorter throughput time.
- The industry should reach out to a broader base of students to attract knowledge workers from different educational and geographical areas.

The above noted strategies should help facilitate the development of new programs and training routes for the future generation of the mining labour force in the region.

Utilizing Underrepresented Groups in the Mining Industry

The mining industry may be able to recruit talent from groups that are underrepresented and underutilized in the mining labour force. For example, women are under-represented in the Canadian mining labour force (14 per cent compared to 47 per cent in the national labour force). The MIHRC has reported that women represented approximately 11 percent (with a range of 5 to 20 percent) of the mining industry labour workforce. Additionally, many of the women employed in the mining industry work in administrative and clerical roles.

Another underrepresented group is individuals who are newly immigrated to Canada. Many new immigrants are coming to Canada to find opportunities and tend to settle in larger urban centers. The MIHRC's research suggests that the mining industry employed 7% of Canadian immigrants. This is slightly below the 8.7% national average for all industries.

A third underrepresented group is the Aboriginal community. Women, new immigrants and Aboriginals could be targeted as they are underrepresented in the labour force. The mining industry should expand initiatives to attract, train and employ individuals from these groups.

Some initiatives could be as follows:

- Develop workplace skills development programs and occupation-specific training that could be offered to the labour force in exchange for commitments to work in the mining industry (MIHRC, 2011b).
- Provide incentives to these three groups to entice them to obtain the relevant education and experience. For example, partial or full reimbursement of tuition costs, education support networks, and other bursaries and scholarships could be offered.
- Create pre-employment and in-house training programs to ensure equal opportunities for all individuals.

The industry must attempt to remove barriers for these underrepresented groups and provide opportunities for women, immigrants and Aboriginals. It is essential that the mining industry, with assistance from government agencies, targets these groups in order to help fill the district's hiring gap.

Create an Industry-Wide Branding and Communication Strategy

The industry participants could create and adopt an industry-wide branding strategy that:

- Promotes positive aspects of a career in mining, such as a competitive wage and possibility of career advancement;
- Dispels many of the myths or negative stereotypes.

The MIHRC has already developed a brand entitled "*Explore for More.*" The MIHRC has stated that this brand can be readily adopted to meet the industry's needs. Alternatively, the industry participants could create an independent marketing/public relations entity to create and promote the brand, something similar to the Farmer's Industry promotion.

The branding strategy should be used to promote career awareness and outreach activities. The strategy should target specific groups and key stakeholders. For example, the strategy could be used as part of a communication process with the high schools and colleges. Key educators, such as guidance counselors, co-op officers, professors that teach specific courses, etc., could be targeted and provided with promotional material to distribute to students. This approach is already being taken by professional associations, such as accounting and legal bodies. In addition, educators could be provided with materials to further integrate mining into the curriculum (as discussed above). The communication strategy could create collaborative and cooperative hiring strategies, such as holding single career fairs, being involved in college career fairs, developing innovative co-op programs and opportunities, etc.

Aboriginal Peoples' Unique Challenges

The mining industry is also confronted with many challenges and opportunities related to the labour market for Aboriginal peoples. The MIHRC has reported that employers in the Thunder Bay District have experienced differing levels of success in regards to attracting, training and recruiting Aboriginal talent.

Although the mining industry reports greater success in hiring Aboriginal employees than other industries, there is still limited utilization of Aboriginal talent in the regional and national mining industries (MIHRC). When employed, Aboriginal peoples are mainly in labour and support roles. Developing strategies to partner with the Aboriginal communities presents an excellent opportunity to develop and retain mining talent for the region. Working with the Aboriginal community has an excellent potential to alleviate the pressures from a shallow talent pool in the region. Currently, Aboriginal communities are cautiously optimistic about employment prospects in the future as they relate to the mining industry (MIHRC). There are still some challenges to utilizing Aboriginal talent. The most commonly cited challenge is in regards to the skill, experience and education gap that exists between the experience and education of the current talent pool and that which is required to be employed in the mining sector (MIHRC). Some organizations have attempted to reduce this gap through internal

training and developmental programs. These types of initiatives have had some success for the larger companies that have the capital and resources available to allocate to developing these programs. Smaller organizations in the exploration and support services, however, do not have the resources available for internal training programs. These smaller entities require external support for training in the form of government assistance through the education system.

Another challenge is in regards to the timing gap. Many Aboriginal communities require the benefits of the mining sector employment at the current time; however, many of the projects are a few years away from entering the production stage. Strategies must be developed to keep the local communities optimistic until the potential employment growth is achieved and to develop a long term plan with milestones as indicators of achievement. Without proactive strategies, many Aboriginal communities may become disengaged and seek out different opportunities.

Overall, it will be essential to create and support partnerships between the Aboriginal communities, the regional mining sector and the regional education system (trades, College, and University) to make available the appropriate training and support. For example, the program *Mining Essentials: A work readiness training program for Aboriginal People* is a pre-employment program developed jointly by the MIHRC and the Assembly of First Nations. This program delivers many of the essential skills and work readiness requirements of the mining industry, and its delivery has been tailored to the unique needs of its Aboriginal participants so that they can achieve the learning outcomes and become highly employable. This program has completed two pilots, one in Thunder Bay through Anishinabek Employment and Training Services (AETS) in partnership with Confederation College at its Marathon campus, Barrick Gold and the Pic River First Nation. The others are in Hazelton, British Columbia through Northwest Community College (NWCC) in partnership with Eagle Peak Resource Inc., Imperial Metals Corp., and Low Profile Ventures Ltd. Lessons learned from a summative review of these pilots can be used to make adjustments, where necessary, in order to develop a two to three year plan for implementation, attract funders and deliver the model in other areas of the region.

Conclusions

This report shows the following key factors:

1. Overall, it becomes apparent that the losses in the forestry sector industries (e.g. 435 positions) have been much more significant than the gains realized thus far from the mining industry (e.g. 99 positions).
2. The MIHRC has projected, under its baseline scenario, an increase in mining employment by 690 new positions over the next decade. If they materialize, the new mining positions (690 jobs gained) will more than offset the losses from the forestry sector (495 jobs lost). The mining forecast for the entire region of Northwestern Ontario is much more optimistic with a total of 7,356 new jobs forecasted, 3,351 as permanent operating positions and 4,005 as temporary construction positions. However, the mining industry in the region will face various challenges in reaching this potential.
3. A tight labour market (demand to outstrip supply), a highly mobile labour force, and an aging workforce are the main challenges facing the mining industry. The Thunder Bay District would be required to attract between 30% and 45% of the entire new entrants to the mining industry labour pool in Ontario over the next decade. Considering the overall out-migration in the region and the difficulty in attracting new immigrants, these statistics suggest a significant challenge to the mining industry over the next decade.
4. The occupations in highest demand will include trades and production occupations, such as underground miners, millwrights, minerals processors, heavy equipment operators and electricians. In addition, although the demand for the number of knowledge workers is lower than labourers, mining companies may find it very difficult to attract knowledge employees who are short in supply and highly mobile.
5. A concerted and coordinated effort from industry participants, government, and educational institutions (high schools, colleges, and universities) will be required to adequately address the challenges facing the mining labour market. Strategies include the development of programs at the high school, college and university level, utilizing underrepresented labour groups and creating a communication strategy.
6. The Aboriginal peoples are an under-utilized talent pool. A successful partnership with the Aboriginal communities could result in a large talent pool that can help alleviate the pressure that will be experienced from the tight labour market. The main challenge to achieving this potential is in regards to the gap that exists between the skills required to work in the mining industry and the skills currently held by many Aboriginal peoples. Aboriginal participation in the workforce will be crucial to the 'social license' referred to in Part V, Aboriginal Involvement in Mining Development.

III. Infrastructure

Introduction

This section briefly discusses the infrastructure required for the development of mining in terms of rail, road, airport and marine, along with energy and telecommunications.

Transportation Infrastructure

Thunder Bay is situated in Central Canada at the head of the Great Lakes on the Trans-Canada Highway. The Ontario/Minnesota border is less than one hour south of the city. Thunder Bay has ready access to the rail lines of the Canadian National and Canadian Pacific Railways and is a one or two hour flight from major centres in Canada and the United States. The port of Thunder Bay is on Lake Superior at the head of an important waterway link through the Great Lakes and the St. Lawrence Seaway to destinations within Canada, the United States and abroad. Figure 17 below depicts the rail and road network in Central Canada.

Figure 17 - Railways and Major Roads in Central Canada



© Thunder Bay CEDC, 2012, Community Economic Development Commission,
Central Canada's Mining Hot Spots: Northwestern Ontario.

The Rail Transportation Network

As shown in Figure 17, the railway network runs east-west along the southern portion of NWO. There is no north-south rail network. The rail network consists of

- Canadian Pacific Railroad Limited (CP): CP has employees located across Canada and in the United States. CP has a fluid railway system throughout North American for the safe operation of the trains through the more than 1,100 communities where CP operates¹⁴.

The Airport Transportation Network

The existing airport system is centred at the Thunder Bay International Airport. This infrastructure links Thunder Bay by air to major centres, such as Toronto, Minneapolis, Sault St. Marie and Sudbury, as well as the northern communities, smaller municipalities and First Nation reserves.

Thunder Bay International Airport

The Thunder Bay Airport operates on a 24-hour, 7-day per week basis. It is located close to Highway 61 in the southwest portion of the City of Thunder Bay and is one of 26 National Airport System (NAS) airports in Canada. The airfield features a significant general aviation component with a number of on-site corporate, charter, maintenance, training and specialty aviation service companies. Approximately 100 fixed and rotary-wing aircrafts are based at the airport. This number increases considerably during the busy summer season to support forestry, mining and tourist interests based throughout the remote areas of NWO. Regional airline carriers have connections to

- Red Lake
- Kenora
- Dryden
- Sioux Lookout
- Fort Frances

Other smaller regional carriers have connections to

- Pickle Lake
- Red Lake, and
- The remote First Nation communities of Pikangikum, Poplar Hill, Deer Lake, North Spirit Lake, Sandy Lake, Kee-Way-Win, Koocheching, Eabametoong (Fort Hope), Webequie, Nibiamik (Summer Beaver), Wunnumin Lake, Kingfisher Lake, Wawkapewin (Long Dog), Kasabonika Lake, Wapekeka, Kitchenuhmaykoosib Inninuwug (Big Trout Lake), Bearskin Lake, Sachigo Lake, Muskrat Dam and North Caribou Lake.

The Marine Transportation Network

The marine transportation network encompasses the Port of Thunder Bay which is linked to the St. Lawrence Seaway and to American ports in Minnesota. The network is also comprised of smaller marine infrastructure facilities located in municipalities and northern communities that consist of floating docks, breakwaters and boat launch ramps.

Thunder Bay Port Authority

Figure 19 shows the Thunder Bay Port Authority as being located at the head of the Great Lakes - St. Lawrence Seaway System which is a navigable waterway that stretches 3700 kilometres into the heart of the North American continent. Both the Port of Thunder Bay and the Seaway System operate 24 hours a day, seven days a week from the end of March through to late-December. In recent years, however, the season has been extended due to longer periods of open water. Thunder Bay has port facilities for handling all types of cargo and is served by the Canadian National and Canadian Pacific Railways, as well as major trucking companies. Numerous berths mean quick and efficient turn-around time to the more than 400 ships that visit the port each year. Cargo, such as grain, coal, potash, forest products, manufactured goods and dimensional cargo, are shipped throughout the world via Thunder Bay's port facilities. Thunder Bay Port is ideal for receiving mill equipment, for example, and in 2011, gold milling equipment from Spain was first shipped to Thunder Bay and then trucked to Lake Shore Gold in Timmins.

Figure 19 - The Port of Thunder Bay



© Port of Thunder Bay, Map of the Port of Thunder Bay

The Port of Thunder Bay is located at 48°24'50"N 89°13'19"W. The Port serves as Canada's western terminus of the Great Lakes St. Lawrence Seaway system located on Lake Superior.

Energy Infrastructure

Current Status

The current energy system is depicted in the following three Figures. Figure 20 shows the two main generating stations in Thunder Bay and Atikokan; Figure 21 shows the current network of transmission lines; and Figure 22 shows the areas of redundancy. The Thunder Bay generating stations are currently being converted to natural gas while the Atikokan GS is being converted to biomass. The remote First Nations obtain their electricity by diesel generation which is expensive and problematic from both an economic and an environmental perspective (The Northwestern Ontario Joint Task Force, 2012).

Figure 20 - Ontario Power Generation Stations



© Ontario Power Generation, Power OPG Map

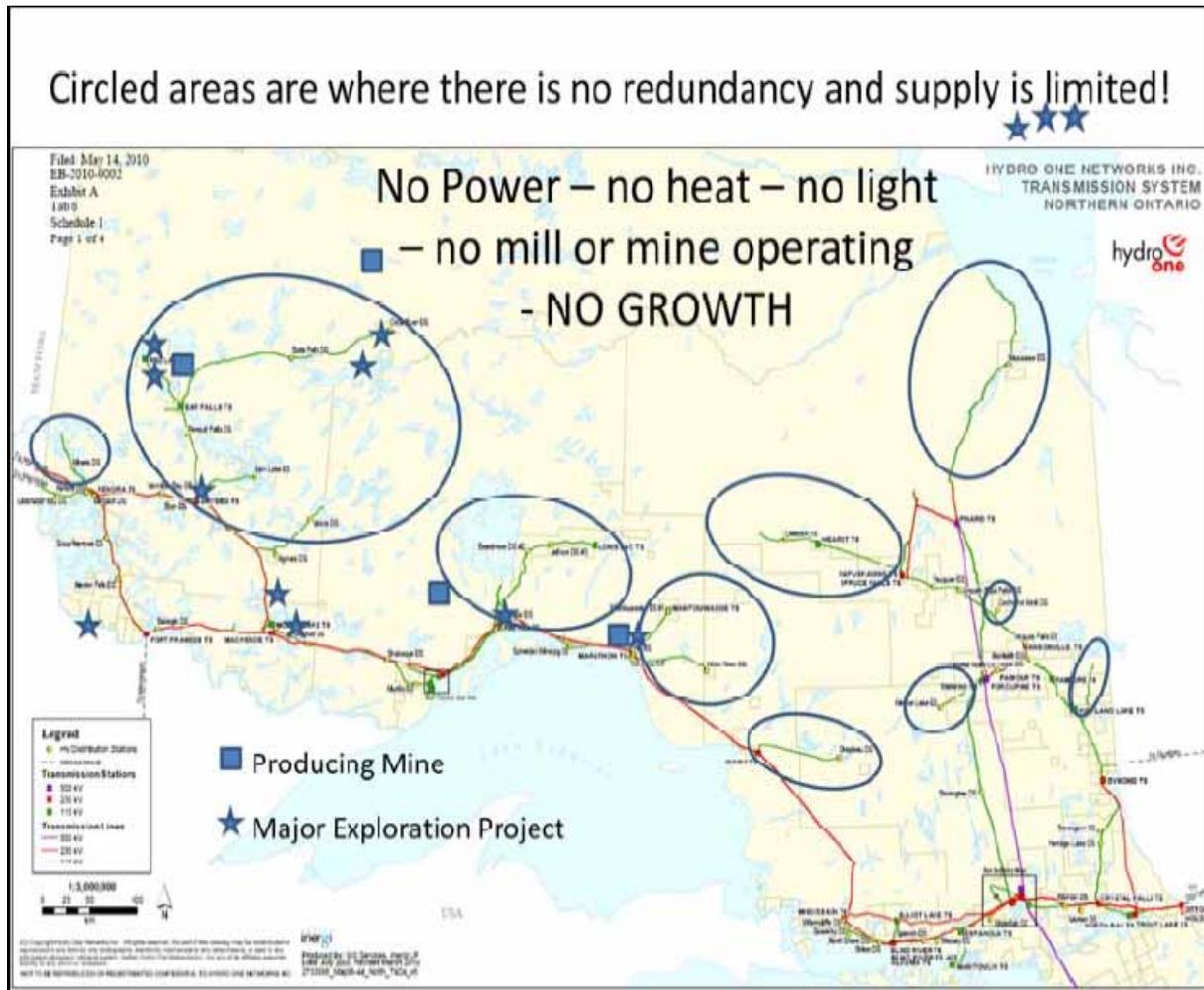
Figure 21 - Hydro One Transmission System for Northern Ontario



© Hydro One Networks Inc., Transmission System Northern Ontario

The transmission line system in NWO consists of 230KV and 115 KV lines, as well as secondary single sets of wires or radial lines. Figure 22 shows four areas within the region that have no redundancy. When these lines are broken, there is no means by which power supply can be continued without interruption. Power supply resumes only when the problem has been isolated and repaired. This situation can take several days and can result in the shut-down of home heating, mines, processing facilities, businesses, hospitals, etc. In addition, most of the existing radial lines are operating at maximum capacity and there is no additional power available for growth, whether it be for industrial, residential or institutional (The Northwestern Ontario Joint Task Force, 2012).

Figure 22 - Hydro One Transmission System Redundancy for Northern Ontario



© Hydro One Networks Inc., Transmission System Northern Ontario

Radial lines are not the only lines at risk. The main East-West transmission line between Wawa and Marathon was down for 10 days last September as a result of a tower being knocked down during a severe storm. During this outage, local supply needs could not be met from the power generated within the region. This example demonstrates how essential it is to have dispatchable generation within the region itself, particularly from the Thunder Bay and Atikokan Generating Stations (The Northwestern Ontario Joint Task Force, 2012).

The current power system is frequently constrained due to limited capacity that does not meet current reliability standards. Major exploration projects that are expected to commence production in the near future (i.e. 2013 – 2017) will require an industry forecast of over 550 MW of power. Surplus power in excess of 500 MW currently exists within the generating stations in Thunder Bay and Atikokan, and both generating stations would have to run at full capacity to meet the needs of industry (The Northwestern Ontario Joint Task Force, 2012). The challenge is to get the 500 MW of power to where it is needed and on a consistent basis. Since these generating stations are not running at their full potential, one alternative option is to tie NWO to the Wawa system through the East-West tie to connect Wawa to Thunder Bay.

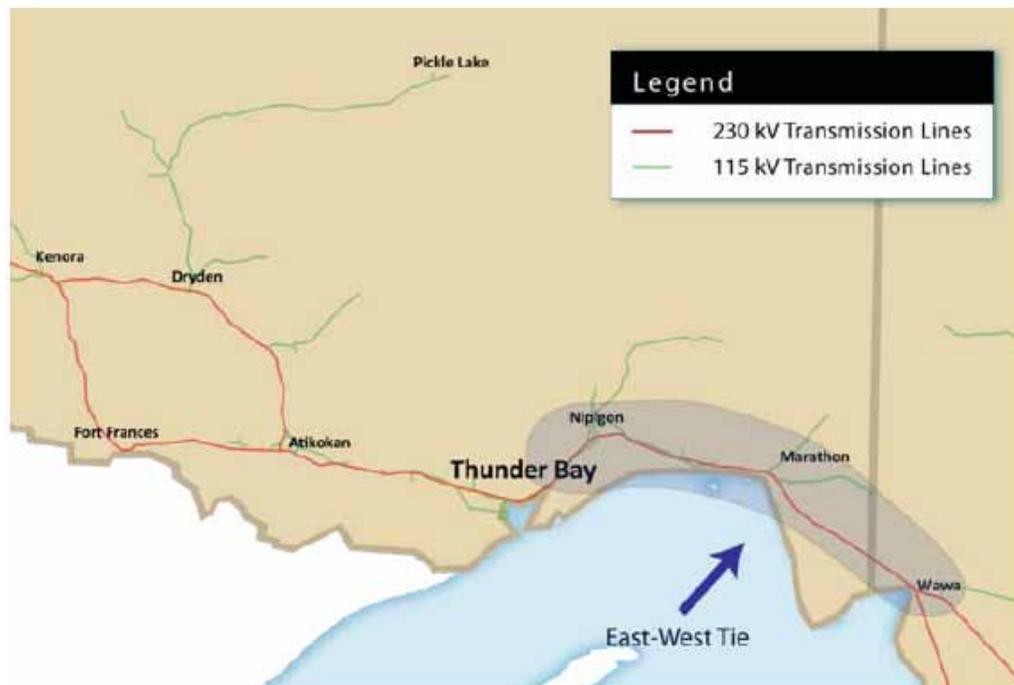
Timing and Rationale for Enhancing the East-West Tie

The use of coal for electricity generation will be prohibited by regulation O. Reg. 496/07 after the end of 2014, so replacement capacity will be required. One proposed alternative is to construct a 400 km, 230 KV double-circuit transmission line running from Wawa to Thunder Bay at an estimated capital cost of \$600 million with a target in service date of 2016/17. Figure 23 shows the proposed East/West link as a future reliable power supply.

There is also demand for electricity north of Dryden that is largely being driven by the mining and industrial sectors. Mining development is leading the demand for electricity growth around Red Lake and Pickle Lake. In turn, industrial growth leads to economic growth in local communities which further increases demand for electricity. A large area north of Dryden is supplied by radial, 115 KV transmission lines and the load requirement is increasing. The current peak load is 85 MW and the forecast indicates incremental growth of 120 MW north of Dryden and 40 MW at the Ring of Fire. The Ontario Power Authority proposes to upgrade the existing 115 KV lines and establish new 115 KV and 230 KV lines. The approximate cost of this project ranges from \$250 million to \$325 million depending on the voltage level selected (OPA, 2011).

The connection of about 20 remote First Nations communities will add 20 MW initially and then grow to 80 MW by 2050. The existing transmission line system cannot supply these additional loads. The existing system is at load capacity and cannot enable other economic connection opportunities. Connection of remote communities will require system capacity at Red Lake and Pickle Lake in addition to the development planned for the Ring of Fire. Expansion of power transmission is a necessity since diesel is not a long-term, viable option due to increasing high costs for fuel and potential for environmental and health hazards.

Figure 23 - East-West Transmission Tie-In Line



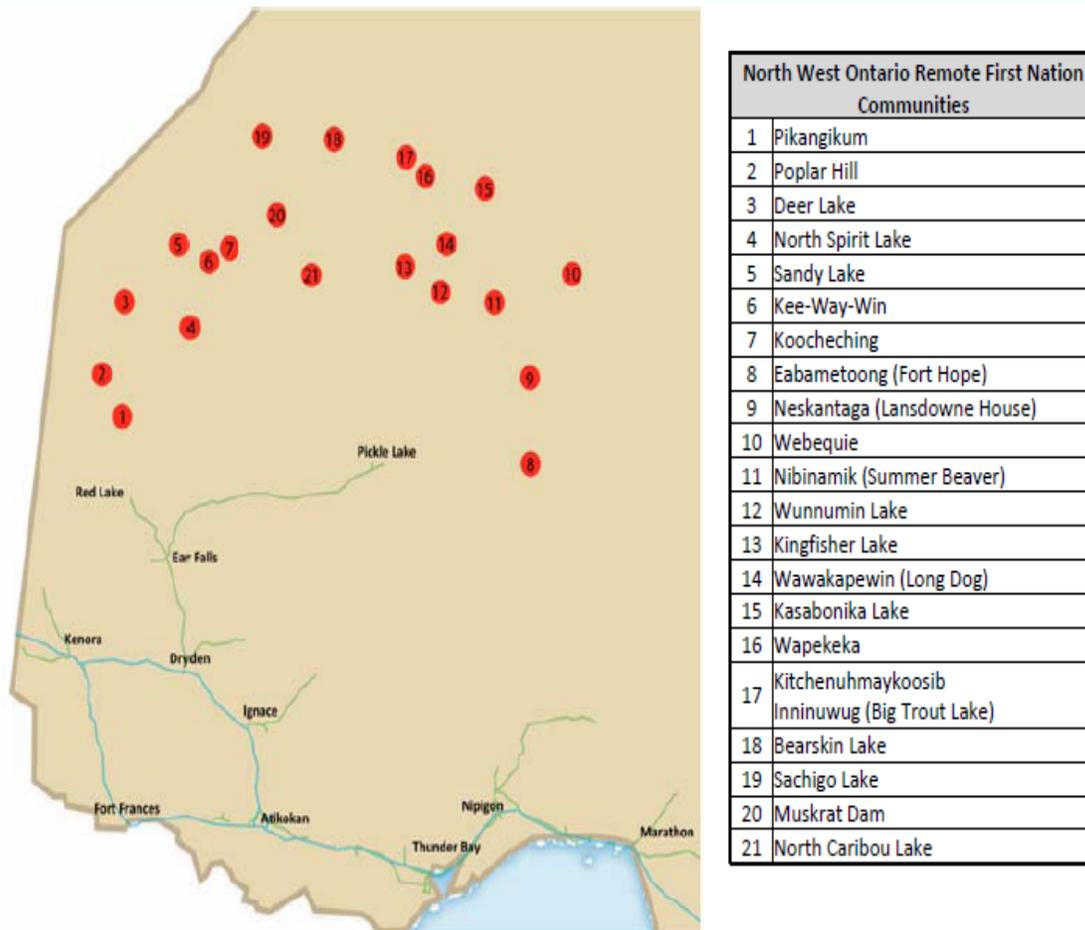
© Ontario Power Authority, Power System Planning in Northwestern Ontario, 2011

Planning for Remote Communities

The cost of diesel generation in remote communities is 3 to 10 times the average cost for electricity in Ontario with Hydro One Remote Communities Inc. subsidizing 2/3 of the cost of service (\$28 million in 2009). Peak demand in 2010 was approximately 15 MW and is projected to double in 20 years. The cost of diesel fuel predicted over the next 25 years is expected to be more than \$1billion. Continued reliance on diesel fuel is increasingly problematic for remote communities. Not only is the cost of fuel high but also the costs to transport diesel by land and air are high. The unreliable winter road conditions can disrupt supply, and there is huge potential for negative environmental and health impacts due to fuel spills on traditional lands and in communities.

About 20 communities north of Pickle Lake, Red Lake and Webequie are economically viable to connect to the power grid. Figure 24 and Figure 25 show the remote communities having the highest potential to connect to the electrical power grid. The Northwest Ontario First Nations Transmission Planning Committee was established in late 2009. Its member First Nations (as identified in Figure 24) are involved in the identification of needs and assessing options for improved energy supply to their communities.

Figure 24 – Potential First Nations Tie In to the Electrical Grid



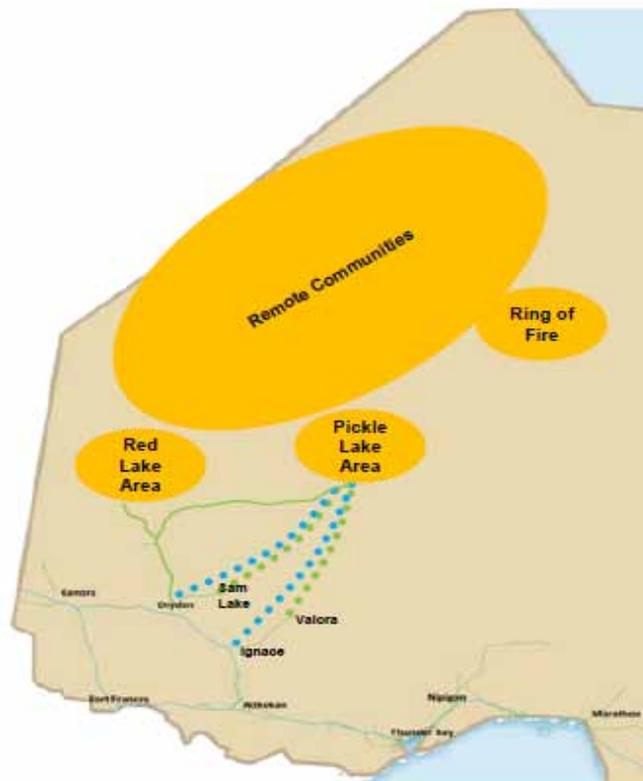
© Ontario Power Authority, Power System Planning in Northwestern Ontario, 2011

Planning for the Ring of Fire

New mine operations planned for the Ring of Fire will require a substantial supply of reliable electricity. Through discussions with potential customers and the Ontario government, the OPA has identified increased demand for Phase 1 of the McFaulds Lake project for 40 MW by 2017 and a potential for up to 100 MW in the long term for Phase 2. The options for supplying this demand are to use large scale diesel generation or to establish new transmission supply to the area. Analysis indicates that in the first 10 years of operation, diesel generation would cost about \$1 billion more than transmission supply (Ontario Power Authority, 2011).

As Figure 25 indicates, there are several options to supply the Ring of Fire with electrical transmission. The first option would be a line extension from Pickle Lake, the second from Nipigon with the third from Sudbury. The overall cost for supplying electricity to the Ring of Fire from the several potential options is expected to be fairly similar.

Figure 25 - Remote Communities - Pickle Lake and Red Lake Tie-In



© Ontario Power Authority, Power System Planning in Northwestern Ontario, 2011

Energy is key to the development of the mining industry in NWO and the development of mining affords an opportunity to develop energy in the north for the north. The development of the renewable energy potential in NWO will satisfy the needs of both the communities and industrial projects. Mapping of northern hydroelectric, along with wind and solar, power can pinpoint sites with development potential. Wind power is attractive as an auxiliary energy source to ensure an uninterrupted supply to satisfy local power needs with the added benefit of reducing dependency on diesel fuel and its associated costs for communities and businesses. Wind power could also assist with peak power demands without causing major constraints to operations. This potential could be developed gradually. Alternative energy supplies, however, are not currently the most economical and there are problems with the management of alternative energy sources (Ontario Power Authority, 2011).

The electrical grid could supply communities and the developing industrial projects and mines. The need for government to develop and operate hydroelectric projects not linked to its main network is imperative to respond specifically to the energy and power needs of the demand for economic growth associated with this development.

Capital Costs of Power Transmission Lines

Power transmission lines

With the proposed mining projects in NWO, there is a need to construct over 858 km of 230 KV line (115 KV line in certain areas), singular circuit, tubular steel pole line at a total estimated capital cost of \$858 million. This capital cost estimate does not include the cost to provide power to the remote First Nations or other communities.

Power Requirement

With the proposed mining projects, there is a need for approximately 550 MW's of additional power that could be generated from the two existing generating stations in Atikokan and Thunder Bay if they were to operate at full capacity. Otherwise, power could be obtained from the proposed East-West link to Wawa.

Ontario's Industrial Electricity Incentive Program

The Northwestern Ontario Municipal Association (NOMA) represents 37 municipalities from Kenora to Wawa to provide leadership and advocacy to all levels of government and organizations regarding regional interests. A media release was issued by NOMA on June 13, 2012 in response to the Government of Ontario's announcement regarding the creation of their Industrial Electricity Incentive Program. Such a program has been a priority of NOMA's energy policy for a number of years.

We have consistently called for an Ontario-wide industrial electrical energy price in order to maintain and attract industry to this province and, in particular, to Northwestern Ontario. One key reason is that the Province of Manitoba, our nearest Canadian competitor, is selling its electricity at anywhere from 3.56 cents to 4.94 cents per kilowatt hour (kwh) while Ontario is charging 7.5 cents per kwh. Tuesday's announcement brings us much closer at 5.5 cents, . . . As the program is designed to utilize 'surplus power' the Northwest is well positioned. . . . We have in excess of 600 MW of surplus generation capacity and as a result the Northwest can utilize this new program to attract energy intensive industry to the region.'. . . Ontario will be the main beneficiary of new investments in mining, forestry and manufacturing in the Northwest. . . . Ontario should pay for the cost of new infrastructure to make mining developments like the Ring of Fire possible. Ontario must become competitive in order to retain and grow industry in the north. (NOMA, 2012)

These statements suggest that the price of energy is moving in the right direction to help foster growth in NWO. This change is significant as many industry representatives have indicated that the cost of power is a major barrier for the development of major exploration programs into mining operations.

Telecommunication Infrastructure

Current telecommunication infrastructure consists of Tbaytel's 4G HSPA+ network which is the latest in next generation wireless technology. 4G HSPA+ networks are the most widely deployed mobile broadband voice and data technology. This system provides mobility subscribers with additional offerings from the previous network in terms of world-wide roaming, content, picture messaging and access to other Smartphone devices, such as Androids and iPhones.

Internet and other broadband services are currently being delivered to 26 remote First Nations through dated satellite and microwave technology. In November 2010, the Northwestern Ontario Broadband Expansion Initiative was announced. At an estimated cost of \$81 million, this investment will bring state-of-the-art, backbone, fibre optic network to these

26 communities. The initiative consists of five projects to be completed over four years and will span more than 2,300 kilometres. The communications provider, Bell Aliant, will work in partnership with Nishnawbe Aski Nation (NAN), the Provincial Territory Organization representing these remote communities. Building this network will enable speeds up to 50 times faster than current systems. The new network will cover a geographic area of roughly 490,000 square kilometres and build on a previous initiative that brought fibre optic technology to Red Lake in 2008. Bell Aliant's share will be \$26 million over four years to construct and operate the fibre optic cable that has the capacity to deliver a minimum of 1.5 megabits per second to each household. The project will provide immediate and long term opportunities, such as tele-health and tele-education as well as provide access to the World Wide Web, for these remote communities and enable them to have full participation in telecommunications into the twenty-first century. (NAN, 2012). The initiative is being supported by the federal and provincial governments, as well as NAN.

Telecommunications Infrastructure

The new infrastructure developments with Tbaytel and Bell Aliant will create network service jobs, improve access to high-speed internet for all users, open up new economic opportunities and enhance the quality of life for First Nations, NWO cities, smaller municipalities in terms of education, health, and social services, as well as for the existing and proposed mining companies. With the increase in satellite capacity, for example, students could access the internet in all schools to source educational content online. The current available technologies satisfy only part of the communication needs of communities and businesses. Given the very high cost of accessing such services in NWO, concrete measures must be implemented promptly to make services, such as high-speed internet and cellular telephone available. Government emphasis on improving the telecommunication networks would broaden access to the NWO region and facilitate entrepreneurial development.

Developing Telecommunications Infrastructure

Telecommunications are essential to any form of economic and social development. Internet access provides the following benefits:

- Increase in bandwidth
- Increase in fibre optic infrastructure
- Increase in high-speed internet
- Increase in cellular telephone capability

It is imperative that improvements be made to the telecommunications network and where required, its establishment along access routes in NWO. This development, in turn, will facilitate trouble shooting of operations, emergency response, in addition to entrepreneurial development. Moreover, new mining technology makes it possible to operate mining equipment from a remote site such as Thunder Bay. In order to support this type of technology, additional funds need to be committed to supportive telecommunications infrastructure. A further benefit would be the ability to attract skilled works as they would operate from a populated city as compared to a remote mining camp. An improved telecommunications network could offset savings for the provincial government by a decreased need for the transportation infrastructure due to operational changes in the mining sector.

Making the North Accessible through Transportation and Communications

The Northern Ontario region abounds in resources and wealth. However, only a small part of the region's immense economic potential has been tapped because of the difficulty of access. The development of an integrated transportation and modern communications services network is necessary to develop this region. The region's vastness poses considerable challenges. The cost of building new transportation and communications infrastructure is often prohibitive because of the considerable distances in NWO as it costs more to establish and maintain the infrastructure and housing. The increased costs are due to the transportation of materials, manpower and the housing of workers. To this end the government, private-sector partners and users need to collaborate and share the costs.

Developing and Integrating the Transportation Network

The government must emphasize the establishment of an integrated transportation network. It will be essential for private investors to be partners in the establishment of transportation infrastructure. Private sector partners will contribute financially to infrastructure projects linked directly to their investment projects. The government must also consolidate the existing network through rehabilitation and maintenance. There must be a prioritizing of initiatives in the realm of transportation.

Projected Infrastructure Capital Costs

The following table shows the projected infrastructure requirements for the major exploration programs in NWO that will go into production 2013-2017.

Table 29 – Projected infrastructure requirements

Infrastructure Type	Distance (Note 1)	Estimated Cost per Unit (Note 2)	Total Cost
Road	671km	\$1 million	\$671 million
Rail	105km	\$2 million	\$210 million
Power line transmission	858km	\$1 million	\$858 million
Total			\$1.739 billion

Notes

- Distance obtained from Thunder Bay Community Economic Development Commission*
- Estimated costs obtained from discussion with industry engineering professionals and discussion with representative mining companies*

Additional Notes:

- All costs are based upon figures obtained in 2012 with no adjustment for cost increases*
- Roads: Road construction costs are based only on all-weather gravel top roads with a 10 meter top*
- Rail: Costs have been quoted between \$1.5 million to \$2.0 million. The highest cost was selected due to the terrain of Northwestern Ontario*
- Power Line Transmission: Costs are based upon a 230 KV line, singular circuit, tubular steel pole.*

Summary

Mining operations are a major component of the economy of NWO as a whole. NWO produces gold, nickel, copper, zinc, platinum group metals and diamonds. It also has resources of chromite, iron ore and rare earth minerals. The mineral resource potential is far from being fully established, however. Significant investments in terms of infrastructure development will help realize the benefits and opportunities from mining in this region. To obtain these benefits it is imperative to develop an integrated infrastructure network as outlined below¹⁶:

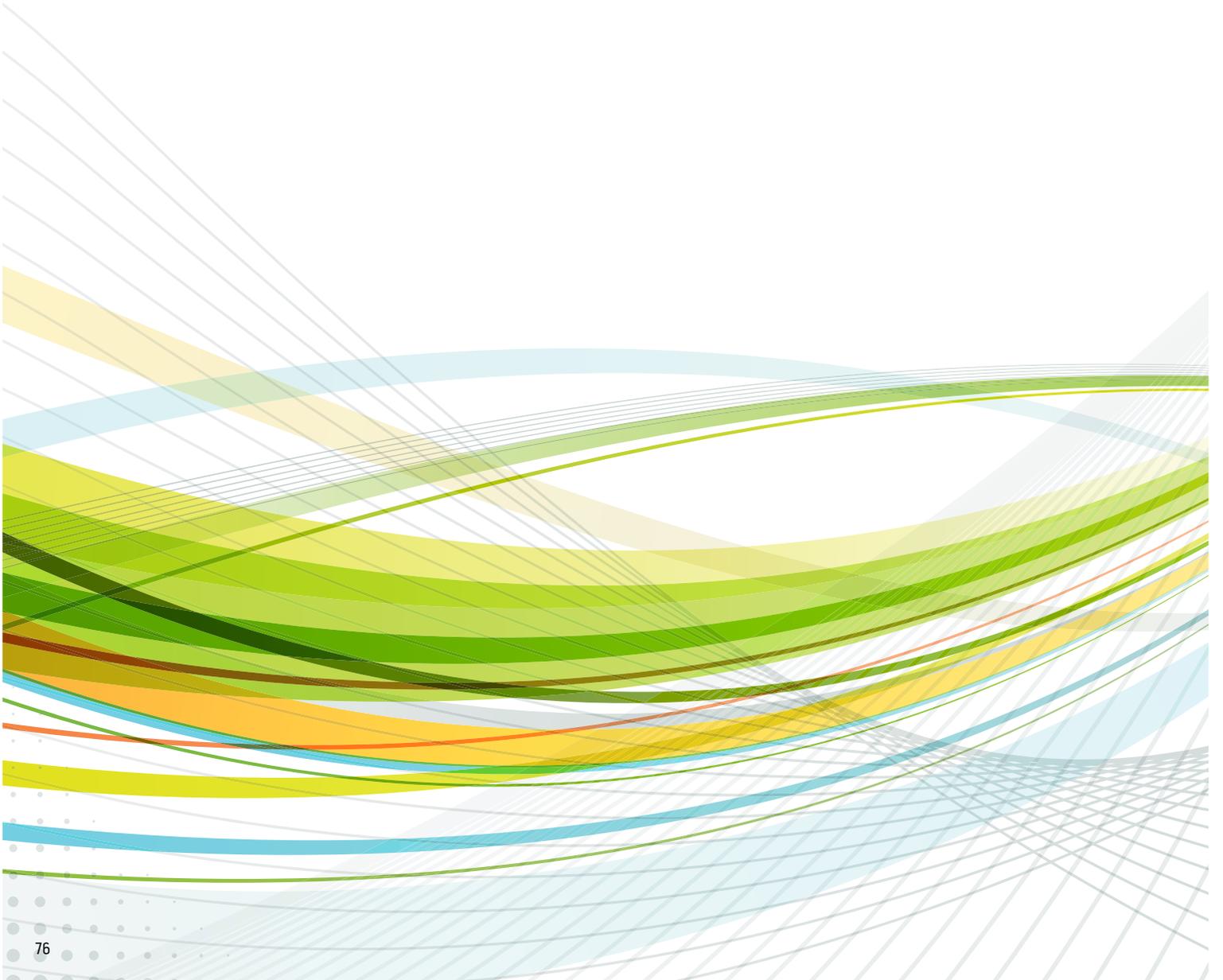
- Coordinate government initiatives concerning an integrated transportation network of:
 - The Port of Thunder Bay, James Bay/Hudson Bay ports if viable
 - The airport system
 - The rail network
 - The road network is strategic, since it allows all users to travel in the region.
- Address the challenges of integrating different modes of transportation into a strategic, coherent network is essential to the development of the region's immense resources. Major rehabilitation and maintenance of the existing transportation network is imperative.
- Pool government expertise from all departments and agencies and collaborate with regional stakeholders and businesses already operating in the region or that have development projects. Leadership by government is essential to coordinate the stakeholders.
- Assess which mode of transportation will significantly reduce shipping time and shipping costs between Asia and Europe.
- Determine the contributions that development projects make to the establishment of an integrated transportation network.
- Provide infrastructure access to the areas with the greatest economic potential and link First Nations and smaller communities.

The Northwestern Ontario Joint Task Force, 2012, has outlined the following benefits from the development of an integrated infrastructure network:

- Maximize job creation opportunities for people living in the Region;
- Maximize business opportunities, use of regional companies related to exploration, construction and operation of mines;
- Enable industrial development with focus on transportation, energy, telecommunications and workforce education & training,
- Enable opportunities for improved quality of life and sustainability particularly for remote northern communities (e.g. road access and hydro-electric improvements);
- Develop local partnerships and business clusters centered around mining supply and services, research and development and education & training;
- Plan for and provide sufficient industrial & residential land supply for new mining related development; and
- Pursue and maximize industrial development opportunities, including mineral processing and value added businesses.

¹⁶ Further due diligence and detailed terrain analysis may be required to develop the final plan.

Part V – Conclusion



I. Conclusion

This study provided an economic analysis of the immediate opportunities and challenges to further develop the mining industry in NWO. This study presented background information regarding mining in the region and an analysis of the economic impact of further development with consideration for (a) the value of the un-mined minerals and metals, (b) the employment impact, and (c) the projected government revenue. Finally, this study reviewed and made recommendations regarding the present and future challenges facing the industry with consideration for (a) Aboriginal involvement, (b) labour market dynamics, and (c) infrastructure.

The economic analysis revealed that the potential worth in terms of dollar value of the mineral deposits, employment and tax revenues is substantial:

- Utilizing June 1, 2012, commodity prices, the total value of the un-mined metals and minerals estimated by using the real options analysis is \$USD 135.40 billion for the nine mines investigated. The estimated value is remarkably stable under various price and cost sensitivity tests.
- Employment growth is expected to be significant. The direct, indirect and induced employment created for the Province of Ontario is expected to total 23,588 new positions, (8,107 from construction and 15,481 from mining operations over an average mine life of approximately 17.5 years). A total of 13,149 of these new positions are expected to remain in NWO (5,719 during construction and 7,430 from mining operations).
- The potential tax revenue for all three levels of government is conservatively estimated to exceed \$CAD 16 billion. The Federal Government, Province of Ontario and municipal governments will benefit significantly in terms of corporate taxes, personal income taxes, property taxes, other payroll taxes, and indirect taxes, such as sales and excise taxes. These tax revenues will be received over the average operating life of approximately 17.5 years.

The three major issues and challenges facing mining development in NWO are Aboriginal involvement, labour market dynamics and inadequate infrastructure:

- Aboriginal communities are often unable to reap the benefits from resource development due to factors, such as limited experience, education and skill development, knowledge of the industry, as well as an uneven playing field in terms of expertise and funding opportunities.
- Challenges pertaining to labour market dynamics include a tight labour market, a highly mobile labour force and an aging workforce. Over the next decade, NWO needs to attract upwards of 30% to 45% of the entirely new entrants to the mining industry.
- The current infrastructure is both limited and inadequate and has been a significant factor in hindering the development of the region's mining potential. For the nine mining projects investigated in this study, it is estimated that capital costs for roads, rail and power line transmission are approximately \$1.739 billion. A major constraint is the requirement for over 550 MW of electrical power.

The following recommendations are provided to overcome the challenges in these three areas:

Aboriginal Involvement:

- utilize flexible, innovative and collaborative engagement approaches keeping in mind the long-term view,
- foster community and social development, education and training, employment, business opportunities, and revenue sharing,
- develop full partnerships in the mines, energy, other natural resources and the related infrastructure,

- recognize Aboriginal and Treaty Rights to develop clearly defined processes for meaningful consultation in relation to the 'Duty to Consult.' The Federal Government needs take a leadership role given their fiduciary obligations.
- move agreement making beyond traditional impact benefits to relationship and partnership building, and
- provide resources in terms of funding and professional expertise to enable meaningful involvement in consultations, negotiations and assessment processes.

Labour Market Dynamics

- utilize underrepresented groups such as Aboriginal people and women,
- develop strategies for high school, college and university students to consider mining as a career,
- create an industry-wide branding and communication strategy.

Infrastructure (rail, roads, and electrical power):

- develop an integrated transportation, energy and modern communication network to realize the potential from mining. The capital infrastructure costs will create hundreds of construction and maintenance jobs that have not been quantified as part of this study. Infrastructure development will also open up the NWO region to further development of the minerals and metals potential.

This study demonstrates that the extent of the projected wealth, the positive economic and social benefits and the expected taxes that could be generated by these nine mines is substantial. The extent of the magnitude for mining development in NWO calls for effective participation and leadership by the Provincial and Federal Governments to coordinate the required initiatives and to support economic growth that fosters sustainable development for the future of mining in this region.

It is apparent that collaboration amongst the Provincial and Federal governments, Aboriginal communities and industry is required to produce long-term strategies for the success of all parties. This study brings to the forefront and to the attention of all stakeholders, especially the Federal and Provincial governments, that enhancing the opportunities that, by addressing the challenges, economic and social benefits, can be realized for the region and the Province of Ontario. Further research into the following areas would enhance the prospects further:

- **Infrastructure Assessment:** A detailed analysis of the infrastructure, including a geographical terrain assessment to provide a more robust estimate of the infrastructure requirements and associated capital costs.
- **Environment Assessment and Monitoring:** A detailed analysis that brings together indigenous and western knowledge systems regarding the cumulative environmental and socio-economic impacts of expansion of the mining industry together with mitigation measures and monitoring systems to reduce the effects.
- **Housing Assessment:** A detailed analysis of the housing in the NWO cities and towns situated near potential mines would identify short and long term needs.
- **Less Mature Projects and Exploration Activity:** A detailed economic and social analysis of the less mature projects and exploration activity in NWO would provide additional insights into the potential opportunities and benefits derived from these mines.
- **Current Mining Activity:** Monitoring the impacts of current mining activity in NWO and frequently updating all the relevant estimates from this report with new data and information as it becomes available.
- **Aboriginal Cultural Impacts:** A study on the cultural impacts of employment and mining activity on Aboriginal communities would provide additional insights into transitions to a wage economy and the dynamic effects on family, communities and traditional economies.

II. References

- Black, F. and M. Scholes, "The pricing of options and corporate liabilities," *Journal of Political Economy*, vol. 81, pp. 637–659, 1973.
- CBC, 2012, Lakehead U to develop mining centre of excellence, Retrieved from: <http://www.cbc.ca/news/canada/thunder-bay/story/2012/04/04/tby-lakehead-mining-centre.html>
- Deloria, Vine Jr. *God is Red*. New York: Grosset and Dunlap. 1973.
- Dungan, P. and Murphy, S. 2007. Ontario Mining: A Partner in Prosperity Building – The Economic Impacts of a 'Representative Mine' in Ontario. Policy and Economic Analysis Program, Institute for Policy Analysis, University of Toronto and Ontario Mining Association.
- Gibson, Ginger and Jason Klinck. "The Impact of Mining on Aboriginal Communities" *Pimatisiwiin. A Journal of Aboriginal and Indigenous Community Health* 3 (1)
- Ghostkeeper, Elmer. *Spirit Gifting: The Concept of Spiritual Exchange*. Calgary: The Arctic Institute of North American. 1996
- Hajkowicz, A., Sonja Heyenga and Kieren Moffat. The relationship between mining and socio-economic wellbeing in Australia's regions. *Resources Policy* 36 (2011) 30 - 38
- Hipwell, William, Katy Mamen, Viviane Weitzner and Gail Whiteman. *Aboriginal Peoples and Mining in Canada: Consultation, Participation and Prospects for Change*. Working Discussion Paper prepared for The North-South Institute. January, 2002
- Hydro One Networks Inc., Transmission System Northern Ontario, retrieved from: <http://www.hydroone.com/RegulatoryAffairs/Documents/EB-2010-0002/A/A-06-01%20Transmission%20System%20Maps.pdf>
- Kelly, Geoffrey. 2011. A Word from the Minister Responsible for Aboriginal Affairs in Plan Nord retrieved from <http://plannord.gouv.qc.ca/english/messages/geoffrey-kelley.asp>
- Koller, T., Goedhart, M. H., Wessels, D., Copeland, T. E., & McKinsey and Company. (2005). *Valuation: Measuring and managing the value of companies*. Hoboken, N.J: John Wiley & Sons.
- Lakehead Social Planning Council (LSPC). *Social Profile for Thunder Bay 2009, Based on 2006 Statistics Canada Census Data*, unpublished report. Oct 2011.
- Lewis, Oscar (1959 *Five Families: Mexican Case Studies in the Culture of Poverty* (1959) New York Basic Books.
- Louttit, Les Deputy Grand Chief. «Key Considerations for Resource Development in NAN Territory Focusing on Mining - A Discussion Paper - « Presentation to the Standing Committee on Natural Resources, House of Commons, Ottawa, February 2012
- Mason, J. 2012. Major Exploration Programs in NWO that will go into Production (2013-17); unpublished report; 2p
- Ministry of Northern Development and Mines, Northern Ontario Winter Roads Map. Retrieved from: http://www.mndm.gov.on.ca/northern_development/transportation_support/northern_ontario_winter_roads_e.asp
- Mining Industry Human Resources Council (MIHRC), 2011, *Canadian Mining Industry Employment and Hiring Forecasts*.
- Mining Industry Human Resources Council (MIHRC), 2011b, *Making the Grade Human Resources Challenges and Opportunities for Knowledge Workers in Canadian Mining*.
- Mining Industry Human Resources Council (MIHRC), 2012, *Custom Labour Market Report - Thunder Bay District Mining Industry*

National Post, 2012. Canada Census 2011: "Canada leads G8 in growth, population hits 33.5 million." Retrieved from: <http://news.nationalpost.com/2012/02/08/canada-census-2011-canadas-leads-g8-in-growth-population-hits-33-5-million/>

Nishnawbe Aski Nation, 2012, Northwestern Ontario Broadband Expansion Initiative, retrieved from: <http://www.nanbroadband.ca/article/northwestern-ontario-broadband-expansion-initiative-115.asp>

North Superior Workforce Planning Board, 2012. Building a Superior Workforce: 2009–2012 Labour Market Action Plan: 2012 Update

North West Local Health Integration Network (NW LHIN). Aboriginal Health Programs and Services Analysis and Strategies Final Report submitted by DPR Canada, April 2010

Northwestern Ontario Municipal Association, 2012, Media Release, NOMA Welcomes Ontario's Industrial Electricity Incentive Program, retrieved from: <http://www.noma.on.ca/article/noma-welcomes-ontarios-industrial-electricity-incentive-program-209.asp>

OFR 6272, Report of Activities 2011, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District

OFR 6271, Report of Activities 2011, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts

OFR 6273, Report of Activities 2011, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District

Ontario Mining Association, 2009, A Made in Ontario Success Story, retrieved from:

<http://www.oma.on.ca/en/economics/ontariosuccessstory.asp>

Ontario Power Authority, 2011, Power System Planning in Northwestern Ontario, November 8, 2011.

Ontario Power Generation, Power OPG Map, Retrieved from <http://www.opg.com/power/OPGmap0309.pdf>

Peterson, Karen. 2003. Negotiate Space: Meaningful Consultation in the Aboriginal/Canadian Context, A Dissertation. Invited presenter at the Ethnicity, Space, and Place Conference hosted by the Canadian Ethnic Studies Association, Banff, Alberta.

Port of Thunder Bay, Map of the Port of Thunder Bay, retrieved: <http://www.portofthunderbay.com/article/the-port-of-thunder-bay-219.asp>

Ross, Monique and Sherly Sharvit. "Resource Development on Traditional Lands. The Constitutional Duty to Consult". unpublished workshop background paper: 1998

Ross, Rupert. *Dancing with a Ghost, Exploring Indian Reality*. Markham: Reed Books Canada. 1992.

Solomon, Fiona, Elvie Katz, and Roy Lovel. Social dimensions of mining: Research, policy and practice challenges in the mining industry in Australia. *Science Direct Resources Policy*, 33, 2008, 142 – 149.

Statistics Canada, 2011, Canadian Business Patterns. Retrieved from: <http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?lang=eng> HYPERLINK "<http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?lang=eng&catno=61F0040X>" & HYPERLINK "<http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?lang=eng&catno=61F0040X>" catno=61F0040X

Statistics Canada, 2011, Census Profile. Various cities and region data retrieved from: <http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E>

Statistics Canada, 2011, Labour Force Survey Estimates.

Thunder Bay CEDC, 2012, Community Economic Development Commission, Central Canada's Mining Hotstop: Northwestern Ontario.

The Northwestern Ontario Joint Task Force, 2012, Northwest Ontario... ready to from, to the Ministry of Northern Development and Mines, June 2012, retrieved from: [http://www.noma.on.ca/upload/documents/northern-ontario-energy-presentation-for-minister-of-energy-june-2012-\(.pdf](http://www.noma.on.ca/upload/documents/northern-ontario-energy-presentation-for-minister-of-energy-june-2012-(.pdf)

Appendix I – Additional Information on the Mining Activity in NWO

The following summary is based on information obtained predominantly from the following three documents:

OFR 6272, Report of Activities 2011, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District

OFR 6271, Report of Activities 2011, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts

OFR 6273, Report of Activities 2011, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District

Any errors, omissions, or misclassifications are strictly the responsibility of the authors.

Thunder Bay North Region

The Thunder Bay North District encompasses Lake Nipigon and extends over 700 km north from Highway 11 to the Hudson Bay coast (See picture below). The Thunder Bay North District includes all of the “Ring of Fire” area. The following communities are situated within the district: Angling Lake (Wapakека First Nation (FN)); Armstrong; Beardmore; Bearskin Lake FN; Big Trout Lake (Kitchenuhmaykoosib Inninuwug FN); Cat Lake FN; Fort Hope (Eabametoong FN); Fort Severn FN, Geraldton; Gull Bay FN; Jellicoe; Kasabonika FN; Kingfisher Lake FN; Lansdowne House (Neskantaga FN); Longlac; Macdiarmid; Martin Falls; Nakina; North Caribou Lake (Weagamow FN); Osnaburgh House (Mishkeegogamang FN); Pickle Lake; Summer Beaver (Nibinamik FN); Webequie FN; and Wunnummin Lake FN.

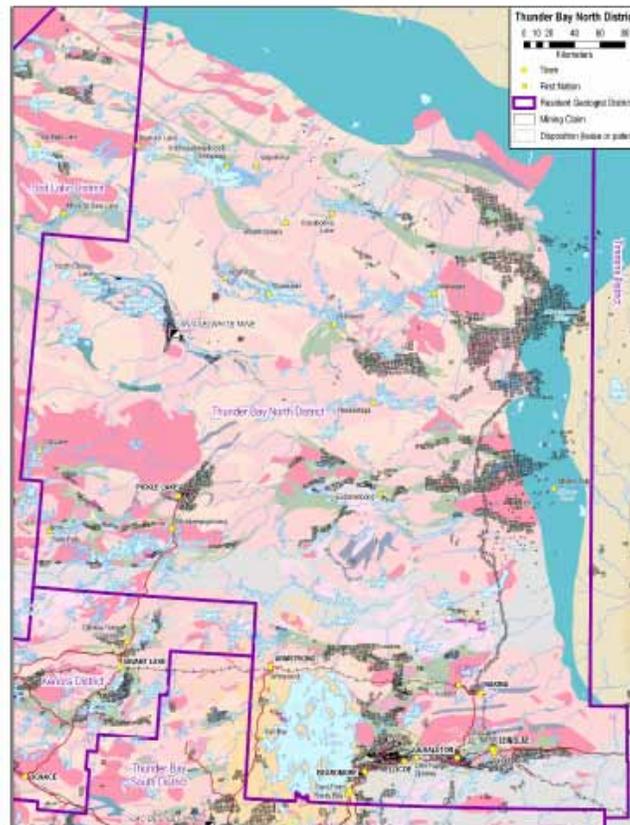


Figure 1. Location of the Thunder Bay North District showing active mining claims as of January 30, 2012.

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Active Mines

Goldcorp Inc. - Musselwhite Mine is the only active mining operation in the Thunder Bay North District. Rising metal prices drove record exploration expenditures in Ontario. Musselwhite Mine is located 126 km north of Pickle Lake. Access to the mine site is by means of an all-weather airstrip or a 43 km, all-weather gravel road connecting the mine site to the northern extension of Highway 599. Musselwhite is a fly-in operation with pickup points in Thunder Bay and 5 northern communities. The mine has 855 employees (Canadian and American Mines Handbook, 2011–2012).

Musselwhite established an innovative agreement with Cat Lake, North Caribou Lake, Wunnummin Lake and Kingfisher Lake First Nations, which provides for a range of education, training and employment opportunities and business-related services for these communities (Goldcorp Inc., www.goldcorp.com/operations/musselwhite/).

In 2011, the mine produced 242 600 ounces of gold from 1 327 300 milled tonnes at a grade of 5.91g/t Au. From 1997 to 2010, 17 914 394 t of ore with an average grade of 5.63 g/t Au were mined and milled to produce 3 102 031 ounces of gold.

Mature Exploration Projects

- **Cliffs Natural Resources Inc.** – Chromite deposit in the Ring of Fire. The mine is expected to go into production by 2015 and has an estimated mine life of 30 years. Recently, Cliffs completed 10,095 m of diamond drilling on the Black Thor and Black Label properties in the “Ring of Fire” area for exploration and resource delineation. Engineering and environmental studies were ongoing throughout the year.
- **Noront Resources Ltd.** – Copper and Nickel (platinum-palladium) deposit based on mineral resources from their Eagle’s Nest deposit, located at its McFaulds Lake property in the “Ring of Fire”. The mine is expected to go into production by 2016 and has an estimated mine life of 11 years.

Developed Exploration Projects

- **Rockex Mining Corporation** – Potential Iron Mine located South of Pickle Lake. Recently, the Company announced a NI 43-101-compliant mineral resource estimate for the company’s *Eagle Island* deposit at its western Lake St. Joseph iron ore project, southwest of Pickle Lake. The program covered the iron mineralization over the island and slightly into Lake St. Joseph.
- **Premier Gold Mines Limited** – Potential Gold Mine located in the Greenstone area through its Hardrock project, was one of the company’s more active projects in 2011. The Hardrock project is host to several past-producing mines that collectively yielded close to 3.0 million ounces of gold, primarily from shallow depths (within 600 m of surface). The Company was also active on their PQ North property, north of Musselwhite Mine, in 2011.
- **PC Gold Inc.** continued with a comprehensive diamond-drilling program on their Pickle Crow property, immediately east of Pickle Lake, in 2011. The company announced the discovery of a new, large-scale, gold-arsenic anomalous zone, named the Central Pat East zone, approximately 2 km northwest of the past-producing Pickle Crow Mine.

Rock Tech Lithium Inc. continued with exploration on a lithium deposit at Nama Creek, southeast of Beardmore, Ontario.

Other Exploration Projects

- **Alto Ventures Ltd.** - Gold exploration, Miner Lake property in Pifher Township, north of Beardmore.
- **Cadillac Ventures Inc.’s** (formerly Richview Resources Inc.) **Thierry Mine project:** completed an extensive diamond-drilling program at its Thierry Mine property located approximately 10 km west of Pickle Lake. (Cadillac Ventures Inc., news release, May 26, 2011). The resource includes Nickel, Silver, Gold, Platinum and Palladium.

- **Fancamp Exploration Ltd.** – Chromite exploration from Black Horse occurrence, on their McFaulds Lake property located in the western James Bay Lowland “Ring of Fire” area. The company also believes the property is geologically and structurally associated with the massive nickeliferous sulphides.
- **KWG Resources Inc.** - Chromite exploration in the “Ring of Fire” area in the James Bay Lowland. The Company announced a historic milestone was achieved on February 3, 2011, when the first high-carbon ferrochrome was produced in a test melt of the **Big Daddy** chromite bulk sample. This demonstration that the Big Daddy chromite may be readily smelted into ferrochrome was considered important in the determination of the economic viability and technical feasibility of the “Ring of Fire” chromite discoveries.
- **Landore Resources Limited’s** - Copper-Nickel exploration in the **Junior Lake property**, east of Armstrong. This property hosts numerous highly prospective mineral occurrences.
- **Laurion Mineral Exploration Inc.** – Gold exploration in the **Sturgeon River** property, located 22 km northeast of Beardmore.
- **MacDonald Mines Exploration Ltd.** - Copper-nickel-PGE exploration continued their exploration programs on the **Butler property**, located within the southern portion of the “Ring of Fire” area, southeast of Webequie First Nation and the Semple–Hulbert property, east of Kasabonika First Nation.
- **Melkior Resources Inc.** - Base Metals, PGM, Gold exploration in their **McFaulds East Rim property**, located 110 km east of Webequie in the “Ring of Fire” area.
- **Northern Shield Resources Inc.** - Copper-Zinc-Silver -PGE exploration in their **Wabassi property** east of Eabametoong First Nation in February, 2011. An airborne magnetic survey identified that the 5 km long gold-bearing structure on TPK can be traced an additional 8 km northwest onto the New Growth property.

Prodigy Gold Incorporated’s (formerly Kodiak Exploration Limited) **Hercules project:** has submitted a closure plan and completed rehabilitation work on portions of the Hercules property, northeast of Beardmore. Most of Prodigy Gold’s work in 2011 in the Thunder Bay North District was conducted on 4 properties east of Longlac, part of the Hardrock East project.

SLAM Exploration Ltd. – Gold exploration on their three properties, including the **Reserve Creek property**, in the Fort Hope (Eabametoong First Nation) greenstone belt in 2011.

Wildcat Exploration Ltd. – Gold exploration in the **McVicar property**, southwest of Pickle Lake.

Thunder Bay South Region

The Thunder Bay South District encompasses an area of about 76 500 km². It extends from longitude 92°30 W in the southwest near Namakan Lake, south of Mine Centre, easterly to longitude 85°20 W, just west of White River. The southern boundary is the international border between Canada and the United States, touching on the states of Michigan and Minnesota. The northern boundary is irregular in nature, but extends up to latitude 50°25 N, just northwest of Armstrong (See map on the following page).



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Active Mines

In 2011, there were three producing gold mines and platinum-palladium mine active in the Thunder Bay South District; David Bell and Williams gold mines are located near Hemlo, and the Lac des Iles palladium mine is located 85 km north of Thunder Bay. In addition, there are several seasonal producing amethyst properties.

- **Barrick Gold Corporation** – In 2011, production from the **Hemlo Mine deposits** consisted of 227,000 ounces of gold at total cash costs of \$774 per ounce from 3,370,000 tons processed at an average grade of 0.071 ounces per ton gold. The Hemlo property consists of two mines:

David Bell, an underground mine; and

Williams, an underground and open pit mine.

Both mine sites are located approximately 350 kilometres east of Thunder Bay, Ontario and 40 km east of Marathon. The Williams and David Bell mines share milling, processing and tailings facilities where ores from the two mines are co-mingled and fed to a standard grind, leach and carbon-in-pulp extraction mill.

Barrick Gold Corporation is undertaking an Open Pit Expansion Feasibility Study at the **Williams Mine**. Under the current mine plans and permits, gold production is scheduled to cease at the end of 2015. The feasibility study will evaluate the deepening of the Williams open pit and determine the potential of extending the mine life to 2026.

North American Palladium Ltd. – In 2011, production from the **Lac des Iles Mine** located 85 km north of Thunder Bay, consisted of 146,624 ounces palladium from 1,689,781 tonnes of ore processed at an average palladium head grade of 3.7 g/t, with a palladium recovery of 78.34%.

North American Palladium Ltd. budgeted \$8.8 million for 2011 exploration on their palladium properties. The primary focus of exploration targeted the Offset zone, as well as the Cowboy, Outlaw and Sheriff zones at the Lac des Iles Mine, located 85 km north of Thunder Bay. North American Palladium Ltd. planned 7000 m of exploration drilling for nearby properties: 3000 m at the Legris Lake property, adjacent to the Lac des Iles Mine property, and 4000 m at the Moose Calf and Kukkee gold properties, both located approximately 55 km west-northwest of Thunder Bay.

Mature Exploration Projects

- **Osisko Mining Corporation** – Gold deposit based on the **Hammond Reef** gold project, located 22 km northeast of Atikokan. The mine is expected to go into production in 2016 and have a mine life of 14 years.
- **Stillwater Mining Company** – Palladium-Platinum-Copper deposit projected to commence operation in 2015 as a start date for an open-pit mine at the **Marathon** copper-PGE deposit, located 10 km north of Marathon.

Developed Exploration Projects

- **Magma Metals Limited** – Potential Copper-Nickel-PGE deposit on the **Thunder Bay North** project, 50 km northeast of Thunder Bay.

Other Exploration Projects

- **Balmoral Resources Inc.** – Gold exploration in the **Northshore** property, which is located in Priske Township immediately south of Schreiber.
- **Beaufield Resources Inc.** – Gold exploration on the **Northern Eagle** property, 10 km east of Marathon.
- **Belmont Resources Inc.** - Gold exploration on the **Lumby/Bufo** base metal property, northeast of Atikokan.
- **Benton Resources Corp.** - was active on three properties in the Thunder Bay District: i) **Bark Lake** copper-nickel-PGE, ii) **Onion Lake** copper-nickel-PGE and iii) **Shebandowan North** gold properties.
- **Canada Iron Inc.** – Iron ore exploration on the **Gunflint** property, located approximately 50 km west of Thunder Bay.
- **Canadian International Minerals Inc.** - Rare metal–rare earth element (REE) exploration in the **Deadhorse Creek**, located 25 km northwest of Marathon. Associated rare metals include yttrium, zirconium, beryllium, niobium, cerium and uranium.
- **Canterra Minerals Corp.** - Gold exploration in the **Bedivere Lake** area, 50 km east of Atikokan.
- **China Metallurgical Exploration Corp.,** - Gold exploration in the **MacGregor** gold property, located approximately 50 km northeast of Thunder Bay.
- **Entourage Metals Inc.** - active on the i) **Black Raven** gold project (20 km northeast of Marathon.), ii) Northern Arm gold-base metal, iii) Rous Lake gold, and iv) Toothpick West gold properties.
- **Fairmont Resources Inc.** – Copper exploration on the **Clay-Powell** property, located 140 km west of Thunder Bay.
- **Foundation Resources Inc.** - Gold exploration on the **East Coldstream** gold property, located 100 km west of Thunder Bay.

- **Gold Cache Inc.** - **Gold Cache** property, located near Shabaqua approximately 80 km west of Thunder Bay.
- **Golden Dory Resources Corp.** – **Lithium and rare metals exploration on the Jackpot** lithium property, located approximately 140 km northeast of Thunder Bay.
- **Golden Share Mining Corporation** - Gold exploration in the **Shebandowan Project**, located about 80 km west of Thunder Bay. The Shebandowan Project now has 2 gold targets on the 10 km Pistol Lake–Band Ore trend.
- **Great Lakes Resources Ltd.** – Iron exploration on the **Jean Iron** property, located in Jean Township, approximately 65 km west-southwest of Thunder Bay.
- **HTX Minerals Corp.** - Copper-nickel-PGE exploration on property called the **Pardee** property located in Pardee Township, 50 km south-southwest of Thunder Bay.
- **Kaminak Gold Corporation** – Gold exploration in their **Hemlo** property, 20 km east-northeast of Marathon.
- **Magma Metals Limited** – Exploration on the **Spruce River** property, located 45 km north of Thunder Bay and consists of 36 contiguous mining claims.
- **MetalCorp Limited** - Copper-zinc mineralization exploration on the **Big Lake** base metal property, 25 km southeast of Marathon.
- **Minfocus International Inc.** - optioned the **Seagull** nickel-copper-PGE property from joint-venture partners, Rainy Mountain Royalty Corp., Black Panther Mining Corp. and Trillium North Minerals Ltd.
- **Mistango River Resources Inc.** – Copper-zinc explored on their **Sackville** property, located 65 km west of Thunder Bay.
- **Nuinsco Resources Limited** - Anomalous uranium mineralization and a broad range of rare metals (e.g., including niobium, tantalum, phosphorous) and rare earth elements (REE) exploration continues on their **Prairie Lake** property, located approximately 45 km northwest of Marathon.
- **Osisko Mining Corporation** – Gold exploration on the **West Hammond Contact** and **Clement Lake** properties, located adjacent to Osisko's Hammond Reef property, approximately 22 km northeast of Atikokan.
- **Pacific North West Capital Corp.** – Copper and Nickel exploration between Poshkokagan Lake and Heaven Lake, 95 km north of Thunder Bay.
- **Platinum Group Metals Ltd.** - recently acquired by staking 12 of their 14 properties in the **Lac des Iles area**, approximately 85 km north of Thunder Bay. Additionally, PGM optioned Benton Resources Corp.'s Bark Lake platinum-palladium project, located approximately 120 km west of Thunder Bay.
- **Rare Earth Metals Inc.** – Rare earth metals exploration over the western and central portion of **Coldwell** alkalic complex, near Marathon.
- **Rio Tinto Exploration Canada Inc.** - nickel-copper-PGE exploration on their **RTX RPT Hicky Lake** property, located 50 km northeast of Thunder Bay.
- **Rio Tinto Exploration Canada Inc.** – Nickel exploration on the **Great Lakes Nickel** deposit, located in Pardee Township, approximately 70 km south-southwest of Thunder Bay.
- **Rock Tech Lithium Inc.** -Rare metal exploration on three properties straddling the Thunder Bay South and North districts in the Georgia Lake area, 40 to 50 km northeast of Nipigon.

- **Silvore Fox Mineral Corp.** - copper-zinc-silver-gold exploration on the **Winston Lake** property, north of Schreiber.
- **Strike Minerals Inc.** - Gold exploration on the **Morley Mine**, **Harkness–Hays Mine** and the **Gold Range** properties, all located in the Schreiber area.
- **TerraX Minerals Inc.** Gold exploration on three properties, all located in the Atikokan area and all within the Thunder Bay South District.
- **Tyko Resources Inc.** - Copper-nickel-PGE exploration on the **Tyko Block** property, which is located approximately 25 km southeast of Manitouwadge.
- **URSA Major Minerals Incorporated** – Platinum group metal exploration on the **Fox Mountain** project, located 75 km north of Thunder Bay.
- **ValGold Resources Ltd.** - Gold exploration on the **Tower Mountain** gold property, located in Conmee Township, 40 km west of Thunder Bay.
- **Xstrata Copper Canada** acquired a significant land position on the western end of the Shebandowan greenstone belt by entering into option agreements with **Freewest Resources Canada Incorporated** (currently **Cliffs Natural Resources**) and **East West Resource Corporation** (currently **Rainy Mountain Royalty Corp.** and **Mega Uranium Ltd.**) for the **Sungold–Hamlin–Deaty’s Creek** project (Freewest Resources Canada, news release, December 21, 2007; East West Resource Corporation, news release, January 2, 2008).

Red Lake Region

While gold is the primary commodity sought, iron has returned as an exploration target. The continuing high gold price kept current gold exploration projects active, and has encouraged exploration work on previously dormant properties. The exploration successes of Rubicon Minerals Corp., Premier Gold Mines Ltd. and major underground work by Goldcorp Inc. Red Lake Gold Mines and Claude Resources Inc. has helped sustain interest in all parts of the Red Lake belt.

Active Mines

- **Goldcorp Inc. - Red Lake Gold Mines:** Gold production in Red Lake continued at the integrated operations comprising the Campbell, Red Lake and Balmer complexes. The workforce, including contractors, is 1,280. Gold production in 2011 was 622,000 ounces at a cash cost of \$US360 per ounce. The average realized gold price was \$US 1,554 per ounce.

Mature Exploration Project

- **Goldcorp Inc.** - Gold deposit based on the **Bruce Channel Deposit** and **Cochenour Project** gold projects, located near their Red Lake mine. The mine is expected to go into production in 2014 and have a mine life of 20 years.
- **Rubicon Minerals Corporation** – Gold deposit based on The **Phoenix Gold Project**, located near Red Lake. The property contains the McFinley shaft and surface infrastructure, where an extensive underground exploration project took place in the 1980s. The mine is expected to go into production in 2013 and have a mine life of 12 years.

Developed Exploration

- **Claude Resources Inc.’s** – Gold exploration on their **Madsen gold property** located in Red Lake.
- **Northern Iron Corp.** - Iron exploration on the **Griffith Mine property** located near Ear Falls.

- **Gold Canyon Resources Inc.** – Gold exploration on an extensive land package in the eastern Birch Lake area, including the **Springpole Lake** project and the **Horseshoe Island** project.

Other Exploration Projects

- **Halo Resources Inc.'s** - Gold exploration on their **West Red Lake Property**, located on Trout Bay on the Bridget Lake portion of the property.
- **Hy Lake Gold Inc.** – Gold exploration on an extensive land package in the western part of the Red Lake greenstone belt in Todd and Ball townships, extending from Pipestone Bay in the west to Martin Bay in the east.
- **Mega Precious Metals Inc.** – Gold exploration on their two project areas in the Red Lake Camp: the **North Madsen** project and the **Headway Gold property**.
- **Redstar Gold Corp. – Confederation Minerals Ltd.** – Iron exploration on property that comprises 13 patented claims totalling 195 ha in Todd Township, approximately 28 km west of the Red Lake Gold Mines.

Kenora Region

The Kenora District extends from the Manitoba border, east to Savant Lake and south to the International Border. It encompasses the towns of Kenora, Vermilion Bay, Dryden, Ignace, Sioux Lookout, Savant Lake and Fort Frances, and a number of First Nation communities of Treaty 3 affiliation.

Active Mines

There was no production of either base or precious metals in the Kenora District in 2011. However, production continued from four granite quarries in 2011 (Nelson Granite - Vermillion Bay Quarry, Red Deer Lake Quarry, Reddit Quarry, and Forgotten Lake Quarry).

Mature Exploration Projects

- **Rainy River Resources Ltd.** – Gold deposit based on the an aggressive exploration program at the **Rainy River gold project** in Richardson Township, approximately 55 km northwest of Fort Frances. The mine is expected to go into production in 2015 and have a mine life of 13 years.
- **Treasury Metals Inc.** – Gold deposit based on the **Goliath gold project**, which is located in Zealand Township approximately 20 km east of Dryden. The mine is expected to go into production in 2016 and have a mine life of 9 years.
- **Bending Lake Iron Group Limited** – Iron deposit based on **the Bending Lake iron property** located approximately 38 km southwest of Ignace. The mine is expected to go into production in 2016 and have a mine life of 35 years.

Developed Exploration Projects

- **Coventry Resources Limited** – Gold exploration on the **Cameron Lake gold project**, located approximately 29 km southeast of the hamlet of Sioux Narrows. These efforts focused on expanding the historical mineral resources at the Cameron Lake gold deposit, but also targeted mineralization related to several of the numerous gold occurrences on the property.

Other Exploration Projects

- **Abitibi Mining Corporation** – Gold exploration on the **Red Hat gold property** located approximately 42 km west of the town of Sioux Lookout.

- **Bayfield Ventures Limited** – Gold exploration on the **Burns Block gold property** located in Richardson Township approximately 55 km northwest of Fort Frances. The Burns Block property is situated adjacent to the eastern boundary of Rainy River Resources Ltd.'s Richardson Township project.
- **Benton Resources Corporation** – Gold exploration on the Abernethy gold property located 10 km southwest of the City of Kenora.
- **Houston Lake Mining Inc.** – Gold exploration on the **West Cedartree gold project**, which comprises 8 properties, approximately 20 km southeast of Sioux Narrows.
- **Hudson River Minerals Ltd.** - Gold exploration on the **Zarn Lake gold property** located 20 km east of Sioux Lookout. This program was design to confirm historical results from the No. 1 and No. 2 quartz veins related to the Alcona gold prospect.
- **Kings Bay Gold Corporation** – Gold exploration on the **Menary gold property** located approximately 45 km northwest of Fort Frances. A thirteen-hole diamond-drilling program, totalling 1567.8 m, completed in 2011, targeted mineral potential at the historical Wagg gold occurrence.
- **Laurentian Goldfields Ltd.** – Gold exploration on the **Thundercloud gold property**, located 50 km southeast of Dryden, in 2011.
- **Manitou Gold Inc.** – Gold exploration on several of their gold properties located in the Upper and Lower Manitou lakes area. In addition, they continued to work on the **Higbee gold property**, located approximately 45 km west of Dryden.
- **Mineral Mountain Resources Ltd.** – Gold exploration in the Straw Lake area, located approximately 62 km north of Fort Frances.
- **Q-Gold Resources Ltd.** – Gold exploration on the **McKenzie–Gray gold property**, located approximately 55 km east of Fort Frances.
- **Opawica Explorations Inc.** – Copper and Gold exploration on the **Atikwa Lake copper-gold property** located approximately 70 km southeast of Kenora.
- **Champion Bear Resources Ltd.** Copper-Nickel-PGE exploration on the **Eagle Rock Cu-Ni-PGE property**, located approximately 64 km south of Dryden.
- **International Lithium Corp.** – Rare earth metal exploration on the **Mavis Lake rare-earth metal property**, located approximately 15 km northeast of Dryden.

Appendix II – List of Acronyms

AANDC – Aboriginal Affairs and Northern Development Canada

AETS – Anishinabek Employment and Training Services

AIP – Agreement in Principle

CEDC – Community Economic Development Office

CMA – Census Metropolitan Area

CN – Canadian National Railway

CP – Canadian Pacific Railroad Limited

CPP – Canada Pension Plan

EI – Employment Insurance

EHT – Employer's Health Tax

FTE - Full-time Equivalent

GS – Generating Station

HST – Harmonized Sales Tax

IBA – Impact Benefit Analysis

KV – Kilovolts

LSPC – Lakehead Social Planning Council

MIHRC – Mining Industry Human Resource Council

MNDM - Ministry of Northern Development and Mines

MOU – Memorandum of Understanding

MW – Mega Watts

NOMA – Northwestern Ontario Municipal Association

NRTEE – National Round Table on Environment and the Economy

NSWPB – North Superior Workforce Planning Board's

NWLHIN - North West Local Health Integration Network

NWO – Northwestern Ontario

NWCC – Northwest Community College

OECD – Organization for Economic Co-operation and Development

OMA – Ontario Mining Association

PGE - Platinum Group Elements

PTO – Provincial Territorial Organizations

PV – Present Value

SME – Small and Medium Enterprises

VBNC – Voisey's Bay Nickel Company

WSIB – Workplace Safety Insurance Board