MINING INDUSTRY WORKFORCE INFORMATION NETWORK

Ontario Labour Market Demand Projections

Presented to the Ontario Mining Association by the
Mining Industry Human Resources (MiHR) Council August 2009

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De Beers Canada, Victor Mine, Northern Ontario

Introduction

In 2007, MiHR began developing the Mining Industry Workforce Information Network (MIWIN), a pan-Canadian labour market information (LMI) and analysis system. The key objective of MIWIN is to project annual hiring requirements in the mining industry over the short, medium and long term, based on key assumptions about future economic and demographic developments.[1] More specifically, the network reveals the number and types of mining jobs available on a provincial and occupation-specific basis.[2] Thus far, MiHR has produced MIWIN reports for British Columbia and Saskatchewan.

This report focuses on labour requirements in Ontario's mining, quarrying and mining support industries over the 2009 to 2018 period.[3] It reflects evolving developments at the provincial, national and global level, as well as the insights of opinion leaders, financial institutions and other stakeholders. The report is based on publically available information as at April 30, 2009.

MiHR thanks Human Resources and Skills Development Canada and the Ontario Mining Association for their cooperation and support of this study. The ensuing report does not represent the views of either of these two organizations. MiHR assumes full responsibility for the content of this report.

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[1] It is important to note that the province-specific labour markets reports produced by MiHR do not explicitly consider the supply of labour, nor do they attempt to determine the magnitude of the gap between the projected demand and supply of labour
[2] There are potentially as many as 400 different job titles in the domestic mining industry.
[3] In the case of mining, we focus on coal, metal ore, and non-metallics. In the case of quarrying, we exclude oil and gas.

Executive Summary

In 2008, the production and exploration of minerals in Ontario generated $10 billion and $600-million, respectively. The province is Canada's largest producer of minerals, accounting for 28% of output in 2007. Approximately 400 mining and exploration companies and 260 other mining-related firms are headquartered in Toronto. Among Canada's 222 producing mines, 43 are located in Ontario, 90% of which are in the northern part of the province. Notably, more than 80% of Ontario's mineral output is exported to the United States, Europe or the Far East.

Ontario has led Canada in mining exploration spending since 2000. Such expenditures rose from $120 million in 2002 to an estimated $625 million in 2008. The number of exploration projects in Sudbury increased from seven in 1990 to 36 in 2006. Ontario receives 25% of Canada's mineral exploration investment and almost 8% of such worldwide investment.

The domestic mining industry has experienced a boom in recent years, however since September 2008 the industry has been negatively impacted by the contraction of the global economy and ensuing collapse in metals prices. Commodity prices have fallen at the fastest rate in decades. Consequently, several mines have closed while planned mine expansions have been postponed or cancelled. Investments in processing facilities have been deferred and most firms have imposed strict cost-control measures. Between October 1, 2008 and April 30, 2009, thousands of Ontario mine workers were laid off, while hundreds accepted early retirement packages.

Projected Hiring Requirements in Ontario's Mining Industry

This study forecasts hiring requirements in Ontario's mining industry over the two, five and ten year horizons. By conducting a series of regression analyses, it was determined that changes in the number of jobs in Ontario's mining industry are directly related to fluctuations in commodity price levels. Hence, in the MIWIN model, the level of future employment varies according to expectations about future commodity prices. The model contains three scenarios – pessimistic, neutral and optimistic — each of which generate different employment outcomes over the forecast period.

Table 1

FORECASTED CUMULATIVE HIRING REQUIREMENTS IN ONTARIO, BY SCENARIO

Hiring Requirements, by Scenario	Workers Required By...		
	2010	2013	2018
Pessimistic	-4,954	-2,220	5,578
Neutral	-3,027	1,277	11,382
Optimistic	-588	4,717	17,004

Table 1 shows cumulative hiring requirements under the pessimistic, neutral and optimistic scenarios, as at 2010, 2013 and 2018. Such requirements reflect future labour needs based on the projected expansion and/or contraction of the industry, as well as the exit of workers due to retirement and voluntary separation. By 2010, such requirements will decline by 4,954, 3,027, and 588 jobs under the pessimistic, neutral and optimistic scenarios, respectively. By 2013, cumulative hiring requirements will rebound under the neutral and optimistic growth scenarios, with 1,277 and 4,717 jobs being created, respectively. The pessimistic scenario is expected to have positive incremental hiring requirements in 2010 and beyond. However, by 2013, it will still not have fully recovered from the negative hiring requirements observed in 2008 and 2009.

By 2018, cumulative hiring requirements will amount to 5,578, 11,382, and 17,004 under the pessimistic, neutral and optimistic scenarios, respectively. It should be noted that while cumulative hiring requirements are expected to be positive in Ontario's mining industry over the next ten years, total employment in 2018 is projected to be lower than in 2008 under the pessimistic and neutral scenarios. Although the incremental change in the total number of jobs over the forecast horizon is negative for these two scenarios, both begin to expand and add jobs as commodity prices rebound following their respective contractions in the initial years of the analysis. Under the optimistic scenario, total industry employment will increase over the next ten years, given the quicker recovery and higher expected growth in commodity prices.

Under the neutral scenario, the mining industry is projected to shed some 5,057 jobs between 2008 and 2009, coinciding with the decline in commodity prices. The number of jobs in the industry will recover slowly with approximately 90% of jobs lost between 2008 and 2009 being recouped by the end of 2018.

The extent of natural job separation and retirements over the forecast horizon will be substantial. Approximately 50% of workers will exit the industry by 2018, more than

half of these, through retirement. Employee losses of this scale will create large hiring requirements for the industry. By 2018, fully 11,382 workers will be necessary to fill vacated positions, under the neutral scenario.

To meet cumulative hiring requirements by 2018 under the neutral scenario, workers with various skill-sets will be needed. As shown in Table 2, the greatest need will be in "Trades and Undesignated Occupations", which comprises some 7,107 or 62% of total hiring requirements by 2018. The other broad occupational categories expected to be in high demand are "Supervisors, Coordinators and Foremen", "Professional and Physical Sciences" and "Technical Occupations", which will account for 1,299 (11%), 1,107 (10%) and 721 (6%) hires.

Table 2

ONTARIO NEUTRAL SCENARIO FORECAST RESULTS, BY BROAD OCCUPATIONAL CATEGORY CUMULATIVE HIRING REQUIREMENTS

Broad Occupational Category	2010	2013	2018
Trades and Undesignated Occupations	-1890	797	7,107
Supervisors, Coordinators and Foremen	-345	146	1,299
Professional and Physical Science	-294	125	1,107
Technical Occupations	-192	80	721
Support Workers	-176	74	661
Managers and Financial	-130	55	487
Total	**-3,027**	**1,277**	**11,382**

Conclusion

The combination of an aging workforce, competition for skilled workers and declining enrolment in mining-oriented academic programs is the source of great concern in the mining industry. Up to 40% of Canada's mine and metals workers are expected to retire by 2014. Clearly, a well-coordinated and thoughtful strategy involving industry, government, academia and other stakeholders will be needed to ensure that the domestic mining sector maintains its global leadership position going forward.

2.0 Overview of Mining Industry: Canada and Ontario

Section two of this report is an overview of Canada's mining industry and Ontario's contribution to it. It also includes a forecast of future hiring requirements in Ontario over the period until 2018.

2.1 Canadian Mining Industry

In 2007, the broad-based Canadian mining and mineral processing industry[4] employed 363,000 workers.[5] About one-half were employed in extraction and smelting while the remainder worked in fabricated metal product manufacturing.[6] The industry contributed $42 billion, or 3.5% of Canada's gross domestic product (GDP). It is clearly an important source of tax revenue, having contributed $8.15 billion in taxes and royalties to federal and provincial/territorial governments in 2006. Moreover, the mining and mineral processing industry accounts for 19% of Canada's exports.[7] Around 3,000 suppliers provide expertise to the industry, in fields such as engineering, technology, finance and the environment. It is significant that mining is the largest private sector employer of Aboriginal Canadians.

In 2007, Canada was the global leader in mining exploration, accounting for 19% of such expenditures, followed by Australia (12%) and the United States (7%). Further, Canadian mining companies accounted for 40% of global exploration budgets in 2006. Almost 1,000 Canadian mineral exploration companies operate outside of Canada.[8]

The mining/quarrying[9] and support activities sectors employed an estimated 51,000 and 102,000 people, respectively, in 2008.[10] In recent years high commodity prices for minerals and metals have encouraged capital investment spending in these sectors, particularly in construction and exploration.[11] However, as discussed subsequently,

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[4] The mining and mineral processing industries include those covered by NAICS codes 212, 327, 331, and 332.

[5] This figure does not include those employed in mining-support activities, such as exploration, transportation and contract drilling.

[6] Source: Mining Association of Canada

[7] "Building on our Strength in Natural Resources", A Brief to the 65th Mines Ministers' Conference, Saskatoon, Saskatchewan, Canadian Mineral Industry Federation, September 2008

[8] IBID

[9] Here we are referring specifically to mineral extraction.

[10] The mining industry includes the tar sands (which are considered oil mining). However, we exclude "other oil and gas extraction activities" from consideration at the NAICS level. Sources: Statistics Canada, MiHR (Mining Labour Market Transition Project Summary Report

[11] "Capital Investment Intentions in Mining Up 20% in 2008", Natural Resources Canada, July 2008

such expenditures had declined markedly by mid-2008, due to the global recession and substantial decline in metal prices.

2.2 Ontario Mining Industry

In 2008, the production and exploration of minerals in Ontario generated $10 billion and $600 million, respectively.[12] The province is Canada's largest producer of minerals, accounting for 28% of output in 2007.[13] Approximately 400 mining and exploration companies and 260 other mining-related firms are headquartered in Toronto, which is arguably the financial centre of the global mining industry. Among Canada's 222 producing mines, 43 are located in Ontario,[14] 90% of which are in the northern part of the province (see Table 3).[15] It is interesting to note that more than 80% of Ontario's mineral output is exported to the United States,[16] Europe or the Far East.[17]

Ontario has led Canada in mining exploration spending since 2000. Such expenditures rose from $120 million in 2002 to $500 million and $625 million in 2007 and 2008 (estimated), respectively.[18] Significantly, the number of exploration projects in Sudbury, northern Ontario's largest city, increased from seven in 1990 to 36 in 2006.[19] Ontario receives 25% of Canada's mineral exploration investment and almost 8% of such worldwide investment.[20]

Ontario leads Canada in the production of many commodities. It generates two-thirds of the nickel and gold, one-third of the copper and 90% of the platinum produced in Canada.[21] In early 2008, South Africa-based De Beers established an $842 million open-pit diamond mine (Victor Mine) in the James Bay Lowlands area of Northern Ontario.[22] Consequently, Canada has become one of the world's leading diamond producers; the domestic market is valued at more than $2 billion.[23]

[12] "Global recessional tsunami' engulfs almost 700 workers at Xstrata Sudbury", The Canadian Press, February 9, 2009

[13] "Modernizing Ontario's Mining Act: Finding A Balancer", Minister of Northern Development and Mines, Aug 2008

[14] "Contribution of the Mining Industry: A Positive Message to Canadians", Mining Association of Canada, February 2009.

[15] "Growing Ontario's mining sector", Northern Ontario Miner, June 2008

[16] "High-tech productivity powerhouse", Canadian Mining Journal, January 2007

[17] "Modernizing Ontario's Mining Act: Finding A Balance", Minister of Northern Development and Mines, Aug 2008

[18] "Mining – The Big Picture", Ontario Mineral Exploration Review, Spring 2008

[19] Explosive mining exploration driving economy", Northern Ontario Business, December 2006

[20] "Ontario's Mineral Development Strategy", www.mndm.gov.on.ca

[21] "Mining Booms In Ontario's North", Site Selection/Mag/Online, November 2005

[22] As reported in Mining.com (January 2009), the mine is expected to produce 600,000 carats of diamonds annually for 12 years. It will likely contribute $4.2 billion to the Northern Ontario's economy.

[23] "Canada: Mining's Global Superstar", Equities, June 2007

The Ontario Mining Association (OMA) reports that the provincial mining industry **directly** employs more than 14,000 people, while mine service companies utilize approximately 5,000 personnel.[24] Ontario mining companies collectively spend almost $1 billion in wages and salaries annually, plus an equivalent amount on goods and services, 80% of which is spent in Ontario.

Table 3

DISTRIBUTION OF EMPLOYEES, PAYROLL AND MINING-RELATED PROPERTY TAXES IN ONTARIO

	# Employees (share)	Payroll ($ millions)	Property Taxes ($ millions)
Northeastern Ontario	2,642 (20%)	196	10
Northwestern Ontario	2,131 (16%)	166	6
Southern Ontario[25]	1,916 (16%)	262	3
Sudbury Basin	6,254 (49%)	580	19
Total	**12,943**	**1,204**	**38**

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[24] It's estimated that as many as 1,000 Ontario companies supply products and services to the industry.

[25] The lower property tax percentage for southern Ontario reflects the fact that, included in this statistic are the corporate offices of many publicly traded mining companies, the property tax for which is generally buried in the rent they pay (and thus not counted in the statistics).

Table 4

VALUE OF ONTARIO MINERALS PRODUCTION (2005)[26]

($000s)	2005	Canadian Total	% of Canadian Total	Canadian Ranking
Metals				
Nickel	2,116,342	3,302,465	64%	1
Gold	1,227,292	2,041,408	60%	1
Copper	797,484	2,454,802	32%	2
Platinum Group (PGM's) & other	358,802	420,060	85%	1
Zinc	182,875	998,208	18%	4
Cobalt	56,896	91,428	62%	1
Silver	52,460	299,269	18%	4
Iron Ore, Uranium & other o/s Ontario	0	3,700,979	0%	
Total Metals	**4,792,151**	**13,308,619**	**36%**	**1**
Salt	254,381	419,927	61%	1
Structural Materials				
Cement	658,822	1,691,025	39%	1
Sand and Gravel	463,376	1,165,047	40%	1
Stone	552,014	1,133,204	49%	1
Lime & Clay products	305,804	495,602	62%	1
Total Structural Materials	1,980,016	4,484,878	44%	1
Other Non-Metals				
Coal, Potash, Diamonds & other	188,591	8,143,561	2%	7
Total Minerals	**7,215,139**	**26,356,985**	**28%**	**1**

2.3 Remuneration of Mining Industry Employees

In 2003, average employee earnings in Ontario's mining industry were $57,935. Moreover, each worker received $30,930 in taxable and/or non-taxable benefits, on average.[27] Statistics Canada's data for 2006 shows that the average wages and salaries in Ontario's mining industry ranged from $61,239 (support activities) to $86,250 (metal ore mining).[28] Significantly, labour comprises the single largest share (22%) of production costs of Ontario mining firms.[29] Table 5 enumerates the weekly earnings in mining and other industries prominent in Ontario.

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[26] "Ontario Mining: A High-Tech Productivity Powerhouse: Economic Contribution Study", OMA, December 2006

[27] "The Economic and Fiscal Contribution of the Mining Industry In Ontario", Ontario Mining Association, November 2004

[28] Source: Statistics Canada Custom Data, 2006 Census, January 2009

[29] "Ontario Mining: A High-Tech Productivity Powerhouse: Economic Contribution Study", OMA, December 2006

Table 5

AVERAGE WEEKLY EARNINGS FOR SELECTED ONTARIO INDUSTRIES (2005)

Sector	Average Weekly Earnings
Services Incidental to Mining and Oil & Gas	$1,360
Pulp, Paper and Paperboard	$1,074
Mining	$1,008
Manufacturing	$956
Construction	$927
Logging and Forestry	$887
All Industries	$769

Source: Statistics Canada CANSIM#281-0027

Mining is one of Ontario's most productive industries. Employees produced more than $500,000 worth of mineral products, on average, in 2007, which is 66% above 1999's corresponding figure.[30] It is interesting to note that on a national basis, mining ranks third, behind finance and utilities, in terms of labour productivity.[31] Ontario mining has been quite profitable in recent years, due to high commodity prices and productivity improvements.[32]

2.4 Labour Market Trends

In 2006, Ontario had the highest share (28%) of Canadian mining workers among all provinces/territories. Ontario and Quebec together accounted for almost one-half (48%) of total mining employment.[33] Ontario's share of employment throughout the 1995-2005 period was relatively stable (Table 7). During the past decade, direct employment in the sector has steadily declined. At the same time production has become more capital intensive, largely due to technological innovations.[34] Statistics Canada data for 2006 indicates that approximately 21,500 people were employed in Ontario's mining industry.[35] Significantly, 1,535 of these employees were Aboriginal Canadians.[36]

[30] "The Economic Impacts of a 'Representative Mine' in Ontario ", University of Toronto and OMA, December 2007
[31] As measured by the value of GDP per labour hour.
[32] "Ontario Mining: A High-Tech Productivity Powerhouse Economic Contribution Study", OMA, December 2006
[33] "Demand for labour in the Canadian mining industry intensifies in 2007", NRCan (Information Bulletin), Aug 2008
[34] "Achieving higher value-added in Ontario's Mineral Industry Cluster", CIM Bulletin, November 2005
[35] This considers the following NAICS: 2121, 2122, 2123 and 2131.
[36] Source: Statistics Canada Custom Data, 2006 Census, January 2009

Table 6

PROVINCIAL/TERRITORIAL MINING EMPLOYMENT, 2006

Province/Territory	Metal Mining	Nonmetal Mining	Coal Mining	Total
Newfoundland and Labrador	1,949	180	-	2,129
Prince Edward Island	-	X	-	X
Nova Scotia	-	X	X	1,124
New Brunswick	X	X	X	1,968
Quebec	6,160	3,039	-	9,199
Ontario	8,202	4,767	-	12,969
Manitoba	2,053	310	-	2,363
Saskatchewan	X	3,573	X	5,434
Alberta	-	X	X	2,948
British Columbia	2,883	832	2,872	6,587
Yukon	-	X	-	X
Northwest Territories	X	1,267	-	
Nunavut	-	106	-	106
Total	**23,691**	**17,672**	**4,973**	**46,336**

Sources: Natural Resources Canada, Statistics Canada, (Number may not add due to rounding)

Another notable trend exhibited during the previous decade is the increase in mine services employment. This includes contract miners, drilling companies and other consultants not directly employed by mineral producers. Their numbers have almost doubled since 1999, due to the outsourcing of specialized mining jobs.

Table 7

EMPLOYMENT IN THE CANADIAN MINING INDUSTRY

# of Employees	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Mining											
Canada	62,536	60,764	64,337	60,090	57,353	56,698	51,213	48,172	47,928	47,706	47,394
Ontario	19,157	18,890	18,893	16,833	16,859	15,887	14,834	13,679	13,700	14,429	14,305
Ontario's Share	30.6%	31.1%	29.4%	28.0%	29.4%	28.0%	29.0%	28.4%	28.6%	30.2%	30.2%
Metals Ore Mining											
Canada	32,830	32,904	35,511	32,354	29,555	29,468	25,633	22,955	22,496	22,091	21,021
Ontario	13,865	14,132	14,196	12,271	11,987	10,881	9,789	8,471	8,362	8,859	8,918
Ontario's Share	42.2%	42.9%	40.0%	37.9%	40.6%	36.9%	38.2%	36.8%	37.2%	40.1%	42.4%

Source: Statistics Canada CANSIM #281-0024, as cited by OMA in "A High-Tech Productivity Powerhouse Economic Contribution Study", OMA, December 2006

2.5 The Economic Environment

The mining industry is highly integrated with the global economy. This is not surprising, since minerals serve as inputs into the production process of numerous products. Since Canadian mining firms are "price-takers" on world markets, they cannot dictate the terms at which their output is sold. However, globally-determined commodity prices influence the capacity utilization rate of mines and whether new exploration and development projects should ensue. Mining is extremely vulnerable to cyclical swings in the prices of minerals and metals, hence such employment is much more erratic than is the case in most other sectors of the economy.

Figure 1 summarizes the extent of volatility for four different measures of employment: total mining employment; non-metallic mining employment; metallic mining employment; and coal mining employment. Each of the series below represents percentage annual changes in employment. The horizontal line in the chart indicates that the average change in total employment over the entire series is about -1 percent.

Figure 1

ANNUAL PERCENT CHANGE IN MINING EMPLOYMENT
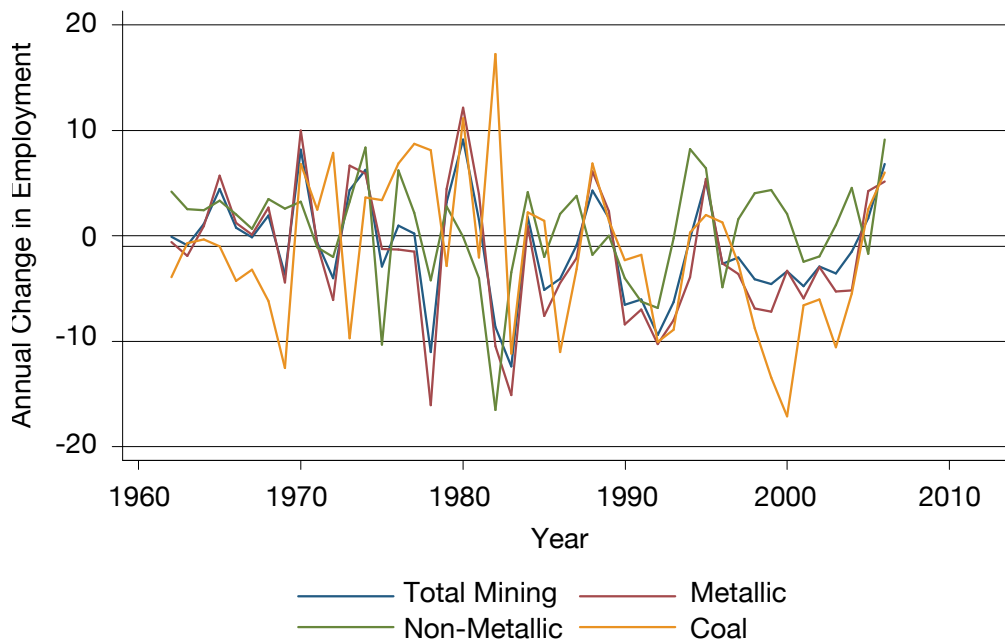
The domestic mining industry has experienced a boom in recent years, largely because of the surging demand for metals in the emerging economies of Asia (e.g.: China, India) and South America (e.g.: Brazil). However since September 2008, the industry has been impacted by the contraction of the global economy and collapse in metals prices.[37] Commodity prices have fallen at the fastest rate in decades, primarily because of decreased global demand for minerals/metals and speculative commodity trading. Base-metal mining companies, in particular, have faced declining margins and rising operating costs, while credit markets have tightened.[38] Several mines have closed (e.g.: Vale Inco, Xstrata Canada, Rio Tinto Alcan) and planned mine expansions have been postponed or cancelled.[39] Investments in processing facilities have been deferred and firms have imposed strict cost-control measures, thus resulting in thousands of employee layoffs.[40] Not surprisingly, the combination of investors' risk aversion, falling equity and commodity prices, and the global recession has discouraged exploration.[41] Some pundits believe that metals prices will not rebound before

[37] MAC represents companies involved in mineral exploration, mining, smelting, refining and semi-fabrication

[38] "Retirees reap benefits of labour shortage", The Northern Miner, Apr 2-Apr 8, 2007

[39] On March 3, 2009, Vale Inco announced it would cut more than 400 white-collar jobs in Canada.

[40] "Pre-Budget Submission to Department of Finance", Mining Association of Canada, December 18, 2008

[41] Mining brought to its knees through no fault of its own", Winnipeg Free Press, November 27, 2008

2011.[42] Between October 9, 2008 and March 3, 2009, more than 1,900 Ontario mine workers were laid off, and at least 200 others accepted early retirement packages.[43] Altogether, Sudbury has lost more than 3,500 direct and indirect mining sector jobs since fall 2008.

In recent years, competitive pressures have caused the mining industry to become more concentrated. As a result of several mergers and acquisitions, it is now dominated by a number of large multinational firms. Some observers speculate that the current recession may cause further industry consolidation. Although greater concentration could result in further job losses, it may ultimately lead to a more efficient and globally competitive domestic industry. In a recent article, the Fraser Institute stated the following: "With the projected demise of many exploration companies, and with the vast majority of mining companies planning to curtail exploration and development investment in 2009, the world may face a shortage of raw materials and skyrocketing commodity prices as the economy moves past the recession and into renewed growth."[44] Among other things, the likelihood of this occurring depends upon the success of government infrastructure projects and other fiscal stimuli designed to combat the recession. To the extent that such an adjustment process occurs, it would offset many of the negative employment consequences of the economic contraction.

[42] "Mining industry contracts sharply as commodity prices decline at historic pace", Telegraph-Journal, November 28, 2008
[43] Source: Ministry of Northern Development and Mines
[44] "Economic crisis hurts mining", Fraser Forum, March 2009

Table 8

SUSPENDED MINING OPERATIONS/LAYOFFS IN ONTARIO, AS OF MARCH 3, 2009[45]

Company	Mine	Status	Date	City	# of employees effected
URSA Major Minerals	Shakespeare (Advanced Exploration)	Suspended	Oct 9, 2008	Sudbury	~ 50 layoffs reported
First Nickel	Lockerby Mine	Care and Maintenance	Oct 19, 2008	Sudbury	~140 layoffs reported
North American Palladium	Lac Des Iles Mine	Care and Maintenance	Oct 21, 2008	Thunder Bay	~ 350 layoffs reported
Liberty Nickel Inc.	Redstone and McWatters Mines	Care and maintenance	Oct 31, 2009	Timmins	~ 45 layoffs reported
Xstrata Nickel	Craig and Thayer-Lindsay Mines	Announced planned closure	Nov 13, 2008	Sudbury	250 employees offered retirement package. 200-220 reportedly accepted (subsequent), Employees to be transferred to Nickel Rim and Fraser Morgan
Vale Inco	Copper Cliff South Mine	Care and maintenance	Dec 9, 2009	Sudbury	365 employees redeployed, no layoffs
FNX	Levack and McCreedy West Mines	Reduced production announced	Dec 10, 2008	Sudbury	307 (59 staff and 248 hourly)
Xstrata Nickel	Craig, Thayer-Lindsley and Fraser	Care and maintenance	Feb 9, 2009	Sudbury	686 jobs cut (union and non union)
Vale Inco	Not applicable	Not applicable	Mar 3, 2009	Sudbury/ Mississauga, Toronto/Port Colbourne	350 in Ontario; 261 – in Sudbury, 74 – in Mississauga, 19 – in Toronto and 6 in Port Colborne. Sudbury #'s include some local 2200 staff but none from local 6500

[45] Source: Information and Marketing Services, Ontario Ministry of Northern Development and Mines

3.0 Projected Hiring Requirements in the Ontario Mining Industry

T he Mining Industry Human Resources Council (MiHR) has produced two, five and ten year forecasts of the hiring requirements in Ontario's mining sector for the period 2008[46] to 2018, under pessimistic, neutral and optimistic scenarios.

The neutral scenario represents the "consensus", or most likely view for Ontario's mining industry over the forecast horizon, in the opinion of several respected senior analysts. The pessimistic and optimistic scenarios, while in the statistical bandwidth of possible outcomes, represent overly negative and positive outlooks for the industry.

The specific data series and details of the six-step methodology used to produce these forecasts are as follows:

Step 1: Collect, graph and analyze data that may potentially explain changes in the number of jobs in Ontario's mining industry;

Step 2: Determine the driver that explains the greatest level of variation in the number of jobs in Ontario's mining industry using x-y scatter plots;

Step 3: Using a meta-analysis technique, produce pessimistic, neutral and optimistic forecasts for the driver determined in Step 2;

Step 4: Using regression analysis, estimate the change in the number of jobs in Ontario's mining industry given a change in the variable determined in Step 2;

Step 5: Combine Steps 3 and 4 to produce the forecasts for the number of jobs in Ontario's mining industry under pessimistic, neutral and optimistic scenarios;

Step 6: Produce forecasts of the total hiring requirements in Ontario's mining industry given growth in jobs (determined in Step 5), the rate of voluntary separation and the rate of retirement.

[46] At the time this forecast was produced, employment data for the year 2008 was not yet available. Thus, 2008 represents the first forecast period in this study.

3.1 Methodology and Data

The following section outlines the methodology used to produce forecasts of the hiring requirements for Ontario's mining sector.

Several indicators were considered based on their potential to explain changes in the level of employment in Ontario's mining industry. Time series data for each indicator was collected and plotted. Potential explanatory variables included:

(1) Real compensation per hour worked in the mining and oil and gas extraction industry;
(2) Real level of production for the mining and oil and gas extraction industry in Ontario;
(3) Real level of production for the mining and oil and gas extraction industry in Canada;
(4) Real level of production for all industries in Ontario;
(5) Real level of production for all industries in Canada;
(6) Industrial Materials Commodity Price Index; and, (7) Selected Commodity Price Indices such as gold and nickel (among others).

As a second step, theses data series were graphed using scatter plots against the level of employment (number of jobs) in Ontario's mining industry.[47]

The regression equation shows the effect that a given explanatory (independent) variable has on the number of jobs (the dependent variable). The R^2 statistic, measures how well a change in the independent variable explains the variability in the number of jobs in Ontario's mining industry.
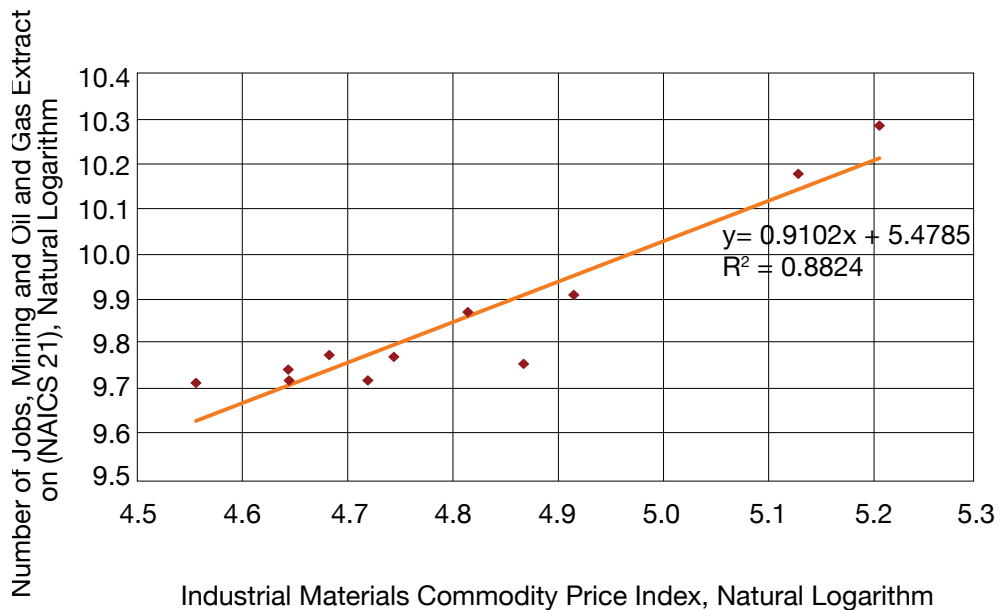
The Industrial Materials Commodity Price Index, compared to other explanatory variables, explains the greatest amount of variation in the number of jobs in Ontario's mining industry. It is evident in the figure below that the number of mining jobs tends to increase with the commodity price index. In fact, the Industrial Materials Commodity Price Index explains approximately 88% of the variation (as measured by the R^2) in employment.[48] As a result of this statistical relationship, commodity prices are used as the basis for forecasting the hiring requirements in Ontario's mining industry.

[47] Scatter plots permit the relationship between two series to be visually inspected in order to determine whether the y-axis, number of jobs, tends to increase or decrease as the x-axis changes.

[48] The Bank of Canada's Industrial Materials Commodity Price Index includes the following components: gold; silver; aluminum; copper; nickel; zinc; potash; lumber; newsprint; and pulp. Given the high correlation between the index and the individual components, the Industrial Materials Commodity Price Index appears to be a good proxy for the variation in commodities underlying Ontario's mining industry.

Figure 2

SCATTER PLOT OF THE INDUSTRIAL MATERIALS COMMODITY PRICE INDEX BY THE NUMBER OF JOBS – 1997 TO 2007 – NATURAL LOGARITHM, WITH TRENDLINE

$y = 0.9102x + 5.4785$
$R^2 = 0.8824$

Number of Jobs, Mining and Oil and Gas Extract on (NAICS 21), Natural Logarithm

Industrial Materials Commodity Price Index, Natural Logarithm

The construction of the three forecasts was done using a meta-analysis technique. This technique blends the results of several independent forecasts with trend projections using the equation in Figure 2 above. Independent forecasts were evaluated based on their outlook for future commodity prices. Forecasts with low, medium and high outlooks for commodity prices were blended to create pessimistic, neutral and optimistic projections, respectively.

Commodity prices are projected to retract in 2009 by 21.9%, 16.6% and 3.5% under the pessimistic, neutral, and optimistic scenarios respectively. Such prices are forecast to return to positive growth for the neutral and optimistic scenarios in 2010. The recovery, however, is not expected to occur until 2011 under the pessimistic scenario as commodity price growth remains negative in 2010. Average annual growth in commodity prices, between 2011 and 2018, are estimated to be 1.4%, 2.2% and 3.0% for the pessimistic, neutral and optimistic scenarios, respectively.

The independent forecasts used in this analysis were collected from various sources, including: BMO Capital Markets; the World Bank; TD Bank Financial Group; and financial market expectations from commodity futures prices.

Regression analysis was used to estimate the relationship of the Industrial Materials Commodity Price Index on the number of mining jobs in Ontario. The regression results are also presented in Table 9.

We then forecasted movements in the Industrial Materials Commodity Price Index for the period 2009 to 2018. Pessimistic, neutral and optimistic forecasts for the index are presented in Figure 3 below, which shows both historical trends in the number of mining jobs as well as forecasts, based on the three growth scenarios.

Figure 3

PESSIMISTIC, NEUTRAL AND OPTIMISTIC FORECASTS FOR THE NUMBER OF JOBS IN ONTARIO'S MINING INDUSTRY – 1997 TO 2007 ACTUAL AND 2008 TO 2018 FORECAST – LEVEL (1982-90=100)[49]
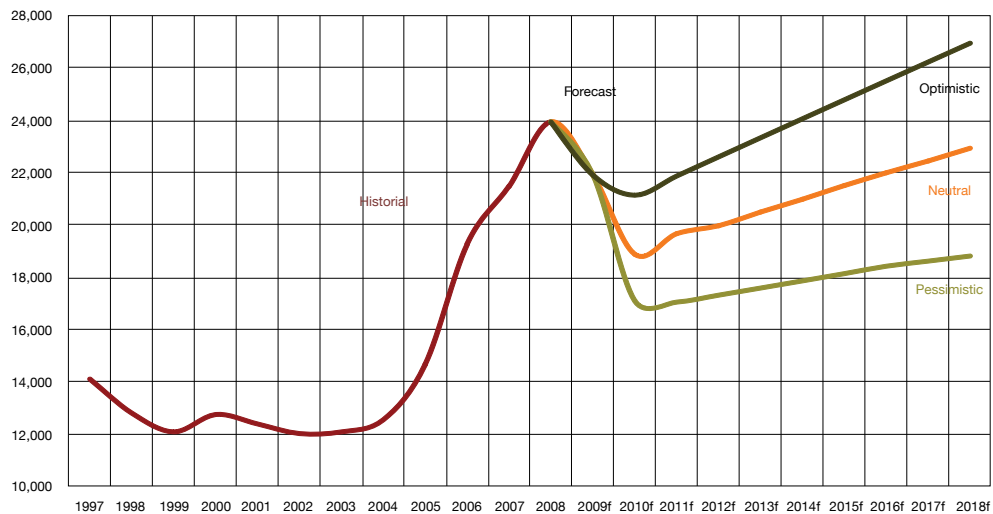
[49] Sources: Statistics Canada. November 2008. Labour Productivity by Industry and Province: Labour statistics consistent with the System of National Accounts, by North American Industry Classification System (NAICS), Annual. Table 383-0010, Series v15914409.

Elasticity is a measure of the proportional change in one variable as a consequence of a change in another variable. The elasticity in Table 9 (coefficient on the Industrial Materials Commodity Price Index), below, is the percentage change in the number of jobs in the Ontario mining industry given a 1% change in the Industrial Materials Commodity Price Index. In other words, for every 1% increase in the commodity price index, employment would increase by 0.91%. It should be noted that the elasticity is statistically significant at the 1% level.

Table 9

REGRESSION RESULTS OF THE INDUSTRIAL MATERIALS COMMODITY PRICE INDEX ON THE NUMBER OF JOBS

Intercept	5.48** (0.53)
ln(Industrial Materials Commodity Price Index)	0.91** (0.11)
Observations	11
R^2	0.88

*Note: Standard errors are reported in parentheses. ** indicates significance at the 1% level.*

3.2 Forecasted Results, by Scenario

Combining the pessimistic, neutral and optimistic forecasts for commodity prices with the elasticity of mining jobs with respect to commodity prices, yielded projections for the level of employment in Ontario's mining industry, between 2008 and 2018.

It is important to note that this historical series is estimated. The level of employment in 2006 is composed of NAICS 2121 (coal mining); 2122 (metal ore mining); 2123 (nonmetallic mineral mining and quarrying); and 2131 (support activities for mining from the 2006 Census). As a proxy for growth in this series, the annual percentage change in the level of employment for NAICS 21 was used.

Finally, the estimated changes in the number of jobs combined with projected non-retirement and retirement rates were used to determine total hiring requirements in Ontario's mining industry under pessimistic, neutral and optimistic scenarios. This analysis also disaggregates the hiring requirements by National Occupational Classification – Statistics (NOC-S). Tables 10 through 22 summarize the assumptions and forecast projections of this study.

The commodity price growth, non-retirement and retirement rates expected in Ontario's mining industry under the optimistic scenarios are presented in Table 20 on page 32. The price growth rate indicates the annual change in the commodity price index. The non-retirement percentage estimates the natural rate of turnover in the mining industry, by year. Finally, the retirement percentage is the expected rate of retirement in the mining industry, by year.

The non-retirement rate was sourced from *Prospecting the Future: Meeting the Human Resources Challenges in the Canadian Minerals and Metals Industry (Mining Industry Training and Adjustment Council, 2005)*. This report estimates that voluntary separation rates in the minerals and metals industry is approximately 2% to 3% per year. Therefore, this study used a 2.5% rate for the pessimistic, neutral and optimistic scenarios.

The retirement rate was calculated based on demographic data from Statistics Canada showing: (1) the distribution of employees in Ontario's mining industry, by age;[50] and (2) the average age of retirement in Canada.[51] Retirement rates were decreased and increased under the pessimistic and optimistic scenarios, respectively to reflect relatively higher rates of retirement in times of higher growth as opposed to lower growth periods.

It is worth noting that the demographic data for the mining industry is disaggregated into numerous age cohorts which describe the working-age population.[52] Approximately one-half of all mining workers in Ontario are over the age of 45. Furthermore, one-third of all workers are within the 55 to 64 years of age cohort. It is expected that in the coming years, the mining industry will experience a surge in the number of retirees as a greater share of their workforce approaches the average retirement age. This expectation is manifested in the higher retirement rates from 2015 onwards.

Tables 19 and 21 show (for pessimistic and optimistic scenarios) by year and scenario, the number of jobs in Ontario's mining industry (Total Employment); the change in the number of jobs in the industry (New Jobs Growth); the number of people who leave their job as a result of voluntary separation (Non-Retirement); the number of people who retire (Retirement); and the total annual hiring requirement for the mining sector (Total Hiring Requirements).

[50] Demographic data came from: Statistics Canada. 2006 Census of Population. Catalogue No. 97-564-XCB2006006.

[51] [1] Average retirement age in Canada came from: Statistics Canada. January 2009. Labour Force Survey Estimates (LFS), Retirement Age by Class of Worker and Sex: Canada; Average; Private Sector Employees; Both Sexes, Annual. Table 282-0051, Series v2342634. [2] Rathje, Kelly. 2003. *Retirement Trends in Canada*. Economica. [3] MacKenzie, Andrew and Heather Dryburgh. February 2003. *Perspectives on Labour and Income: The Retirement Wave*. Statistics Canada. Vol. 4, No. 2.

[52] The age cohorts in the Statistics Canada dataset are as follows: 15 to 24 years; 20 to 24 years; 25 to 34 years; 35 to 44 years; 45 to 54 years; 55 to 64 years; 65 to 74 years; and 75 years and over.

3.3 Forecasted Number of Jobs, Neutral Scenario

Under the neutral scenario, the mining industry is projected to shed some 5,057 jobs over 2008 and 2009 due to the decline in commodity prices.[53] The number of jobs in the industry will recover slowly with approximately 90% of jobs lost between 2008 and 2009 being recouped by the end of 2018.

The levels of natural job separation and retirements over the forecast horizon are substantial. Approximately 50% of workers will exit the industry by 2018. Such employee losses will create large hiring requirements for the mining industry. By 2018, fully 11,382 workers will have been required to fill vacated positions. Tables 12 to 17 enumerate cumulative hiring requirements under the neutral scenario for specific occupations within the six broad categories.

Table 10

NEUTRAL SCENARIO FORECAST DRIVERS – 2008 TO 2018 – Y/Y PERCENTAGE CHANGE

Year	Commodity Price Growth	Non-Retirement	Retirement
2008	-8.4%	2.5%	1.9%
2009	-13.9%	2.5%	1.9%
2010	4.2%	2.5%	1.9%
2011	1.6%	2.5%	2.1%
2012	2.5%	2.5%	2.3%
2013	2.4%	2.5%	2.4%
2014	2.4%	2.5%	2.6%
2015	2.3%	2.5%	2.9%
2016	2.1%	2.5%	3.1%
2017	2.0%	2.5%	3.4%
2018	2.0%	2.5%	3.7%

[53] Based on data for *only* nine of Ontario's forty-one mines, there were approximately 892 layoffs; 250 offered early-retirement packages; and, 365 employees redeployed in 2008. In the first few months of 2009, some 1,046 jobs were cut.

Table 11

NEUTRAL SCENARIO FORECASTED RESULTS – 2008 TO 2018 – LEVELS

| Year | Total Employment | New Jobs Growth | Replacement Requirements | | Total Annual Hiring Requirements |
			Non-Retirement	Retirement	
2008	23,936	-2,015	598	462	-954
2009	21,921	-3,042	548	423	-2,071
2010	18,879	792	472	365	1,629
2011	19,671	320	492	405	1,217
2012	19,991	501	500	450	1,450
2013	20,492	502	512	500	1,514
2014	20,993	503	525	555	1,583
2015	21,496	504	537	617	1,658
2016	22,000	459	550	686	1,695
2017	22,459	460	561	762	1,783
2018	22,919	460	573	846	1,879
Total	**23,379[1]**	**-557**	**5,869**	**6,072**	**11,382**

Note 1: This value does not indicate a total. Rather, it is the projected ending level of employment in 2018.

Table 12

ADDITIONAL HIRING REQUIREMENTS: TRADES AND UNDESIGNATED OCCUPATIONS

Trades and Undesignated Occupations	2010	2013	2018
Underground production and development miners	-729	307	2,744
Mechanics: Heavy duty industrial and millwrights	-314	132	1,178
Heavy equipment operators (except crane)	-258	109	972
Labourers	-189	80	710
Truck drivers	-130	55	488
Industrial electricians	-102	43	383
Welders and related machine operators	-54	23	203
Machine operators, mineral and metal processing	-49	21	184
Drillers and blasters - Surface mining, quarrying and construction	-34	14	128
Steamfitters, pipefitters and sprinkler system installers	-14	6	53
Carpenters	-13	5	49
Plumbers	-4	2	15
Total	**-1,890**	**797**	**7,107**

Table 13

ADDITIONAL HIRING REQUIREMENTS: PROFESSIONAL AND PHYSICAL SCIENCE OCCUPATIONS

Professional and Physical Science	2010	2013	2018
Geologists, geochemists and geophysicists	-118	50	443
Mining engineers	-101	42	379
Mechanical engineers	-18	8	68
Chemists	-10	4	38
Engineering managers	-9	4	34
Other professional occupations in physical sciences	-9	4	34
Industrial and manufacturing engineers	-8	3	30
Metallurgical and materials engineers	-6	3	23
Electrical and electronics engineers	-6	3	23
Civil engineers	-5	2	19
Chemical engineers	-2	1	8
Geological engineers	-2	1	8
Total	**-294**	**125**	**1,107**

Table 14

ADDITIONAL HIRING REQUIREMENTS: MANAGERS AND/OR FINANCIAL

Managers and Financial	2010	2013	2018
Financial auditors and accountants	-55	23	206
Financial managers	-28	12	105
Human resources managers	-23	10	86
Specialists in human resources	-15	6	56
Financial and investment analysts	-9	4	34
Total	**-130**	**55**	**487**

Table 15

ADDITIONAL HIRING REQUIREMENTS: SUPPORT WORKERS

Mine Support Workers	2010	2013	2018
Underground mine service and support workers	-125	53	469
Secretaries (except legal and medical)	-32	13	120
Administrative clerks	-17	7	64
Cooks	-2	1	8
Total	**-176**	**74**	**661**

Table 16

ADDITIONAL HIRING REQUIREMENTS: TECHNICAL OCCUPATIONS

Technical Occupations	2010	2013	2018
Geological and mineral technologists and technicians	-113	47	424
Chemical technologists and technicians	-34	14	128
Land surveyors, Land surveyor technologists/technicians	-19	8	71
Mechanical engineering technologists and technicians	-9	4	34
Electrical and electronics engineering technologists and technicians	-9	4	34
Drafting technologists and technicians	-3	1	11
Industrial engineering and manufacturing technologists and technicians	-3	1	11
Mapping and related technologists and technicians	-2	1	8
Total	**-192**	**80**	**721**

Table 17

ADDITIONAL HIRING REQUIREMENTS: FOR SUPERVISORS, COORDINATORS, FOREMEN

Supervisors, Coordinators, Foremen	2010	2013	2018
Supervisors, mining and quarrying	-225	95	848
Primary production managers (except agriculture)	-102	43	383
Construction managers	-9	4	34
Supervisors, mineral and metal processing	-7	3	26
Construction estimators	-2	1	8
Total	**-345**	**146**	**1,299**

3.4 Forecasted Number of Jobs, Pessimistic Scenario

Under the pessimistic scenario, the mining industry is projected to shed some 6,870 jobs over 2008, 2009 and 2010, coinciding with the decline in commodity prices. The number of jobs in the industry will be extremely slow to recover. By the end of 2018, approximately 30% of all jobs lost in the first three years of the forecast will be recouped.

The levels of natural job separation and retirements over the forecast horizon are substantial. Almost 45% of workers will exit the industry by 2018. Employee losses of this scale will create moderate hiring requirements for the mining industry. By 2018, fully 5,578 workers will be required to fill vacated positions.

Table 18

PESSIMISTIC SCENARIO FORECAST DRIVERS – 2008 TO 2018

Year	Commodity Price Growth	Non-Retirement	Retirement
2008	-8.4%	2.5%	1.5%
2009	-21.9%	2.5%	1.6%
2010	-0.3%	2.5%	1.7%
2011	1.6%	2.5%	1.8%
2012	1.6%	2.5%	2.0%
2013	1.6%	2.5%	2.3%
2014	1.6%	2.5%	2.7%
2015	1.6%	2.5%	3.0%
2016	1.0%	2.5%	3.4%
2017	1.0%	2.5%	3.9%
2018	1.0%	2.5%	4.5%

Table 19

PESSIMISTIC SCENARIO FORECASTED RESULTS: 2008 TO 2018

Year	Total Employment	New Jobs Growth	Replacement Requirements		Total Annual Hiring Requirements
			Non-Retirement	Retirement	
2008	23,936	-2,015	598	369	-1,048
2009	21,921	-4,811	548	357	-3,906
2010	17,110	-44	428	293	677
2011	17,067	265	427	307	999
2012	17,332	269	433	355	1,058
2013	17,601	273	440	410	1,124
2014	17,874	278	447	474	1,199
2015	18,152	282	454	548	1,284
2016	18,434	193	461	633	1,287
2017	18,627	195	466	731	1,392
2018	18,823	197	471	845	1,513
Total	**19,020[1]**	**-4,916**	**5,172**	**5,322**	**5,578**

Note 1: This value does not indicate a total. Rather, it is the projected ending level of employment in 2018.

3.5 Forecasted Number of Jobs, Optimistic Scenario

Under the optimistic scenario, the mining industry is projected to shed some 2,781 jobs over 2008 and 2009 coinciding with the decline in commodity prices. The number of jobs in the industry will recover quickly. By the end of 2013, all of the job losses incurred during the first two years of the analysis will be recouped. In fact, by the end of 2018 some 3,723 jobs, incremental to the base year, will be added to the industry.

Table 20

**OPTIMISTIC SCENARIO FORECAST DRIVERS – 2008 TO 2018 –
ANNUAL PERCENTAGE CHANGE**

Year	Commodity Price Growth	Non-Retirement	Retirement
2008	-8.4%	2.5%	2.3%
2009	-3.5%	2.5%	2.2%
2010	3.5%	2.5%	2.1%
2011	3.3%	2.5%	2.2%
2012	3.2%	2.5%	2.3%
2013	3.1%	2.5%	2.5%
2014	3.0%	2.5%	2.6%
2015	2.9%	2.5%	2.7%
2016	2.8%	2.5%	2.8%
2017	2.7%	2.5%	3.0%
2018	2.7%	2.5%	3.1%

Table 21

OPTIMISTIC SCENARIO FORECASTED RESULTS – 2008 TO 2018 – LEVELS

| Year | Total Employment | New Jobs Growth | Replacement Requirements | | Total Annual Hiring Requirements |
			Non-Retirement	Retirement	
2008	23,936	-2,015	598	556	-860
2009	21,921	-766	548	490	272
2010	21,155	731	529	455	1,715
2011	21,887	729	547	491	1,767
2012	22,616	727	565	530	1,822
2013	23,342	724	584	573	1,881
2014	24,067	722	602	618	1,942
2015	24,789	720	620	668	2,008
2016	25,509	718	638	721	2,077
2017	26,228	716	656	779	2,151
2018	26,944	714	674	841	2,229
Total	**27,658**[1]	**3,723**	**6,560**	**6,721**	**17,004**

Note 1: This value does not indicate a total. Rather, it is the projected ending level of employment in 2018.

The levels of natural job separation and retirements over the forecast horizon are substantial. Approximately, 55% of workers will exit the industry by 2018. Employee losses of this scale, coupled with new job growth, will create massive hiring requirements for the mining industry. By 2018, fully 17,004 workers will have been required to fill vacated positions.

4.0 Conclusions

Results of the analysis performed as part of this study conclude that Ontario's mining industry will shed jobs under all three growth scenarios in the short-term. Hiring requirements by 2010 will decline by fully 4,954, 3,027, and 588 jobs under the pessimistic, neutral, and optimistic scenarios, respectively.

By 2013, cumulative hiring requirements will have rebounded under the neutral and optimistic growth scenarios with 1,277 and 4,717 jobs, respectively. The pessimistic scenario is expected to have positive hiring requirements starting in 2010 and going forward. However, it will still not have fully recouped from the negative hiring requirements observed over 2008 and 2009 (-2,220 cumulative hiring requirement by 2013). By 2018, the cumulative hiring requirements will be 5,578, 11,382, and 17,004 under the pessimistic, neutral and optimistic scenarios, respectively. Table 22 below, summarizes the cumulative hiring requirements for each scenario, at 2010, 2013 and 2018.

Under the neutral scenario cumulative hiring requirements will be almost one-half of the 2008 workforce (47.5 percent). Many of these new hires will require extensive training, both formal and on-the-job, and lack the experience and proficiency of retiring workers. In some cases, experienced workers who were laid off in 2009 and 2010 will be hired back but some may have left the industry to work elsewhere. The mining sector, governments and relevant associations need to be aware of these issues and must take steps now to ensure that there will be a pool of skilled workers ready to assume jobs when the upswing comes.

Table 22

FORECASTED CUMULATIVE HIRING REQUIREMENTS, BY SCENARIO – 2010, 2013, 2018

Hiring Requirements, by Scenario	Workers Required By...		
	2010	2013	2018
Pessimistic	-4,954	-2,220	5,578
Neutral	-3,027	1,277	11,382
Optimistic	-588	4,717	17,004

Under the optimistic scenario, the mining industry is projected to shed some 2,781 jobs over 2008 and 2009 coinciding with the decline in commodity prices. The number of jobs in the industry will recover quickly. By the end of 2013, all of the job losses incurred during the first two years of the analysis will be recouped. In fact, by the end of 2018 some 3,723 jobs, incremental to the base year, will be added to the industry.

The levels of natural job separation and retirements over the forecast horizon are substantial. Approximately, 55% of workers will exit the industry by 2018. Employee losses of this scale, coupled with new job growth, will create massive hiring requirements for the mining industry.

To meet the cumulative hiring requirements by 2018 under the **neutral** scenario, workers of varying skill-sets will be needed to fill the numerous vacancies. In reference to specific occupations, the greatest needs will be for "Underground Production and Development Miners", "Mechanics (heavy duty industrial and millwrights)", "Heavy Equipment Operators (except crane)" and Supervisors (Mining and Quarrying). Such occupations comprise 2,744 (24%), 1,178 (10%), 972 (8.5%) and 848 (7.5%) of the projected hiring requirements, respectively. Collectively, they account for one-half of such requirements.

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