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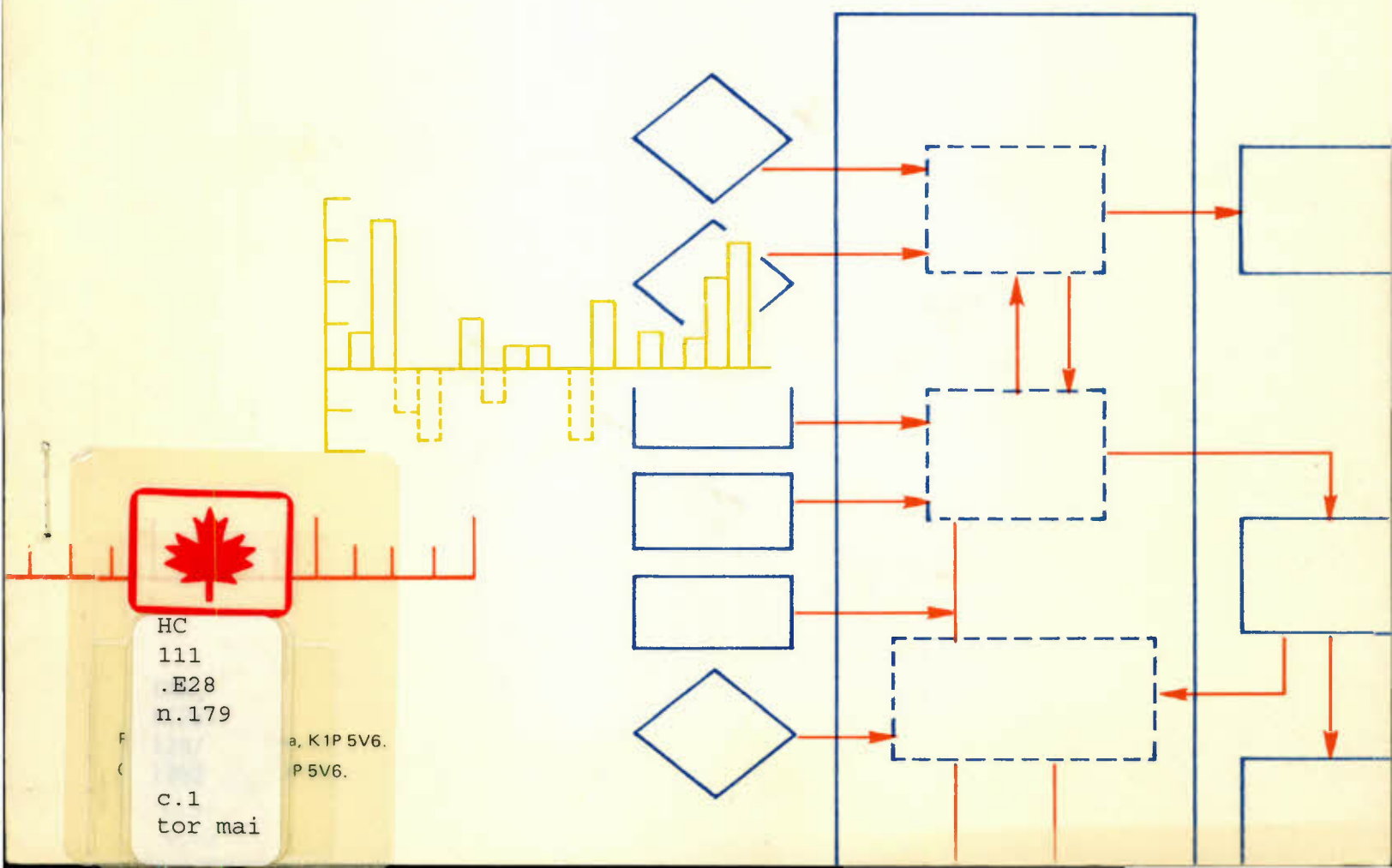

DISCUSSION PAPER NO. 179

Job Creation Prospects in the Newfoundland Mining Industry

by
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We also appreciate the contribution of Donald G. Willmer, our research assistant, Marilyn E. Rivington who typed the drafts and the final copy of the report, and Margot J. Wojciechowski who edited the report.

Résumé*

L'objet principal de cette étude consistait à mener une enquête sur la possibilité de création d'emplois dans l'industrie minière de Terre-Neuve de 1979 à 1983, et à examiner les perspectives jusqu'en 1988. Le travail a été réalisé à partir d'un certain nombre de documents relatifs aux politiques de développement du Gouvernement de Terre-Neuve et du Labrador, notamment le Plan de développement intitulé "Into the Eighties... A Blueprint for Development".

Le Plan, dont on peut dire qu'il est le plus complet de ces documents, présente des objectifs sectoriels d'emploi jusqu'en 1982. En ce qui concerne l'industrie minière, l'objectif consiste en une réduction faisant passer le nombre d'emplois de 6 100 en 1977 à 5 900 en 1982. Le présent rapport appuie cette perspective du Plan, même si nous arrivons à des chiffres différents. D'après nos calculs, il se produirait un faible déclin dans l'emploi minier, qui passerait de 6 575 emplois en 1979 à 6 450 en 1983.

Si l'on regarde plus loin, soit de 1983 à 1988, les perspectives d'une expansion de l'emploi dans l'industrie minière ne semblent guère prometteuses. Aucune augmentation de la capacité de production n'est prévue dans l'industrie des mines de fer, en raison d'un excédent de minerai qui persistera vraisemblablement jusqu'en 1985. Le secteur des métaux communs de la province demeurera marginal, étant donné le bas niveau des réserves. L'industrie des mines non métalliques ne connaîtra probablement aucune expansion. Quant au potentiel minier d'uranium, il est possible qu'il soit accru par suite des découvertes au Labrador.

Les orientations que peut prendre le gouvernement provincial pour relever le niveau de l'emploi au-dessus des objectifs du Plan et des projections de la présente étude sont limitées. L'option la plus prometteuse consiste pour le gouvernement à encourager la prospection. La politique fiscale pourrait ouvrir une autre voie, mais le gouvernement est actuellement à réévaluer les accords touchant l'imposition des mines, afin de percevoir plus de recettes des sociétés minières. Cependant, les répercussions de telles initiatives sur l'emploi et la capacité de production de l'industrie minière se feraient surtout sentir après 1983.

Le présent rapport étudie également l'orientation qui a été donnée aux politiques provinciales touchant l'industrie minière, et en particulier les modifications qui y ont été apportées depuis le milieu des années 70. Ces modifications ont eu pour effet de hâter le jalonnement des concessions, bien que le niveau réel des travaux de prospection était plus faible à la fin qu'au début de la décennie 70, avant la mise en oeuvre de ces modifications. Les recettes perçues du secteur minier ont augmenté également de façon appréciable, mais elles demeurent modestes au regard de celles d'autres provinces.

L'industrie minière tient une place importance dans le secteur terre-neuvien de la production de biens. Selon les constatations du présent document, cependant, une expansion éventuelle de cette industrie n'exercerait qu'un effet modéré sur les revenus et l'emploi dans la

province. Ainsi, une expansion d'un million de dollars dans les mines de Terre-Neuve n'ajouterait qu'un million de dollars aux recettes provinciales et seulement 38 personnes-années additionnelles à l'emploi total, dont un peu moins du tiers représenterait des emplois créés directement dans les mines.

*Note: La présente étude, complétée en 1979, a servi à la préparation du chapitre 7 du rapport de consensus du Conseil économique intitulé Terre-Neuve : Au-delà de la dépendance, Approvisionnements et services Canada, Ottawa, 1980, et a été publiée en même temps que ce rapport en novembre 1980. Nous tenons à avertir nos lecteurs que cet exposé a été rédigé avant la déclaration du premier ministre de Terre-Neuve à l'effet que le projet Kitts-Michelin relatif à l'exploitation possible d'uranium serait retardé jusqu'à ce qu'une solution au problème de l'élimination des résidus ait été trouvée. Une note à ce sujet a été insérée à la page 107.

ABSTRACT*

The main purpose of this study is to investigate the job creation prospects in the Newfoundland mining industry from 1979 to 1983, with an outlook to 1988. The study was carried out against the background of the document entitled 'Into the Eighties . . . a 'Blueprint for Development'' and other pertinent policy-related documents of the Government of Newfoundland and Labrador.

The Blueprint, the most comprehensive policy document, contains sectoral employment targets to 1982. The employment target for the mining industry is for a decline from 6,100 in 1977 to 5,900 in 1982. This report supports the outlook contained in the Blueprint. Although our absolute figures differ, our estimates project a small decline in employment from 6,575 in 1979 to 6,450 in 1983.

Looking beyond 1983 to 1988, we see little prospect for expansion of employment in the mining industry. The outlook is for no increase in capacity in the iron mining industry because of excess supply conditions for iron ores that are likely to persist until 1985. The base metal sector in the province will continue to be marginal owing to the weak reserves position. The nonmetal mining industry will not likely experience any expansion. Additional uranium mine potential may be forthcoming from Labrador discoveries.

The policy options available to the provincial government to raise employment above the Blueprint targets and the projections of this study are limited. The option offering the most promise is for government promotion of exploration activity. Although tax policy is another option, the government is currently reassessing mining taxation arrangements with the view to collecting more revenue from mining companies. However, the impact of these policy initiatives on mining capacity and employment would be felt mainly after 1983.

This report also studies the development of provincial policies towards mining, with particular emphasis on policy changes of the mid-1970s. These changes resulted in a rapid increase in claim-staking, although the real level of exploration effort in the late 1970s was lower than it had been early in the decade, before the policy changes were implemented. Revenues collected from the mining sector also increased appreciably, but they are still modest compared to other provinces.

The mining industry constitutes a significant part of the goods-producing sector in Newfoundland. The findings of this report indicate, however, that the impact of an expansion in the mining industry on income and employment in Newfoundland is moderate. For every million-dollar expansion in mining in Newfoundland, we might expect only a one-million-dollar-increase in provincial income and an additional 38 man-years in total employment, with slightly less than one-third of these jobs directly in mining.

*Editorial footnote: This study, completed in 1979, was used in the preparation of Chapter 7 of the Economic Council consensus report, Newfoundland: From Dependency to Self-Reliance, Supply and Services Canada, Ottawa, 1980, and was released concurrently with the main report in November 1980. Readers should note that this discussion paper was written prior to an announcement by the Premier of Newfoundland that further development of the Kitts-Michelin uranium project would not proceed until problems with the safe disposal of mill tailings has been devised. A remark to that effect has been inserted on page 107.

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1. INTRODUCTION

Terms of Reference

In July 1979, the Centre for Resource Studies entered into a contract with the Economic Council of Canada to undertake a study on job-creation and employment prospects in the Newfoundland mining industry. Specifically, the terms of reference for the project were to:

> evaluate the potential of the mineral industry to generate personal incomes, government revenues, and employment in the province of Newfoundland and Labrador during the period from Confederation (1949) to 1988, and to evaluate the economic development plans that the government of Newfoundland and Labrador has for this industry as declared in its 'Blue Print for Development' in the 1978 Provincial Budget document and in subsequent policy pronouncements.
>
> The research project shall include a critical evaluation of the historical developments of this industrial sector since Confederation (1949) to the present day, paying special attention to the economic implications of policy decisions taken in iron ore, base metals, fluorspar, and asbestos, and it will evaluate major policy options currently open in these sectors and in uranium mining up to 1988. The research will also evaluate the economic implications of major constraints on the mineral sector (including industrial minerals) including the systems of taxation and royalty payments, government regulations, the availability of suitable labour in Newfoundland and elsewhere in Canada, the technology in place, the transportation systems, and the availability of markets.
>
> In order to facilitate a direct evaluation of the development plans of the Newfoundland Government as declared in the 1978 Blue Print for Development, an evaluation will be made of the declared 'trend' in jobs in minerals and related industry sectors, and the declared 'targets' as spelled out in that document, to see if they are reasonable. An evaluation will also be made of the policy changes that are possible and/or necessary to raise job creation from the 'trend' to achieve the 'target'.

This document reports on the job-creation prospects in the Newfoundland mining industry, under these terms of reference.

Provincial Government Employment Goals for Mining

The research has been carried out against the background of the document entitled 'Into the Eighties . . . A 'Blueprint for Development'', made public by the Government of Newfoundland and Labrador as a supplement to the 1978 provincial budget.[1] In addition to the Blueprint, we examined three other current and available policy-related documents pertaining to the mining industry: the 'Speech from the Throne' (12 July 1979); 'An Inventory of Labrador Resources and Potential Development Opportunities', prepared by the Cabinet Secretariat of the provincial government (April 1979); and the 1979 Budget.

The Blueprint is the most comprehensive document. It contemplates the decade ahead to 1988 with particular emphasis on the period 1978-82. It contains an outline of the economic potential of the province and sets out targets for each sector and for the economy as a whole. It anticipates the formulation of a development plan to seek a solution to the high unemployment rate in the province and the income disparity that exists between Newfoundland and the rest of Canada.

The Blueprint enunciates three targets for the period 1978-82 that are '. . . considered to be realisticially achievable.' These targets are:

i) to reduce the unemployment rate to 10 percent by 1982 through the creation of 40,000 jobs;

ii) to increase the Gross Provincial Product at an average of 6 percent per year in real terms;

iii) to increase annual per capita income from $5,000 to $6,300 in constant 1977 dollars.

The job-creation target represents approximately a 25-percent increase in employment over the 1977 level, and a consequent reduction in the rate of unemployment by 5 or 6 percentage points.

Expansion of the province's resource sectors are regarded in the Blueprint as indispensable to reaching these targets. Fisheries and hydro-electricity are

1. It is expected that the Government of Newfoundland and Labrador will released a new "blueprint" for its latest five year plan on government and development in Newfoundland 1980-85, in the autumn of 1980.

viewed as the key potential growth resource sectors. Mining appears to be accorded a relatively unimportant role in meeting the development targets to 1982.

The prospects for expansion in the province's mining industry are the focus of attention in this report. The mining industry is defined as those activities involved in the mining and milling of ores and includes the production of structural materials.[2] Further processing (smelting and refining) is beyond our purview.[3] Thus, in describing further and in evaluating the goals advanced in the Blueprint, we confine our attention to mining and milling activities.

It is observed in the Blueprint that the primary and extractive resource industries have collectively generated no net increase in employment in the province since 1960. At the same time, considerable increases have occurred in the mining sector, notably in iron mining. In marked contrast to this record is the Blueprint's outlook for stagnation in employment for mining in the near term. While the economy-wide target is for employment to rise from 160,000 to 200,000 between 1977 and 1982, employment in the mining sector is expected (targeted) to contract from 6,100 to 5,900, reaching an anticipated low of 5,600 in 1980.

The expectation that the mining industry will not be a source of employment growth is based on the shutdown of the St. Lawrence fluorspar mines in 1978 and the anticipated closure of the Buchans base metal mines. In addition, the outlook for iron mining is for stable production, and the general market outlook is that any major expansion in that industry must await improved world economic conditions and expansion in steel production.

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2. This definition encompasses mining activities as described by the Standard Industrial Classification categories 051 to 087, but excluding 064 (crude petroleum and natural gas). See Statistics Canada, Standard Industrial Classification Manual - Revised 1970 (12-501).
3. Smelting and refining potential as discussed in government and other sources has been confined to aluminum and zinc. As there is no mining of bauxite (nor other minerals needed in aluminum smelting and refining) in Newfoundland, we feel this issue would be better handled in the analysis of energy and hydro power. We feel a zinc smelter is not feasible because the output of zinc ore in Newfoundland is insufficient to operate a smelter; zinc ores and concentrates would have to be imported. In addition, plans to build a zinc smelter in New Brunswick are in the development phase. A New Brunswick smelter would have a competitive advantage over a zinc smelter in Newfoundland, due to its location and availability of ore.

Prospects for new mine development are considered in the Blueprint. These are considered to be realizable only beyond 1982 and to centre around three possibilities. First, the brightest prospects are in uranium mining, notably the Kitts-Michelin deposits in the Postville-Makkovik area of Labrador.[4] Other exploitable uranium discoveries are also thought to be likely. Second, there are a number of prospective base and precious metal deposits on the Island. Should any of these be brought into production, it is thought that each operation would provide 150 to 300 jobs. The third group of prospects consists of industrial mineral deposits on the west coast of the Island, in the Baie St. George - Bay of Islands area and in the Port au Port Peninsula. Both areas contain significant limestone deposits.

In our conversations with civil servants in the Government of Newfoundland and Labrador who are concerned with the province's mineral sector, it was apparent that Labrador is the locale of greatest promise for new mine development. New mine development in Labrador is integrally linked to providing an adequate transportation network.[5] The proposed transport plan centres on the concept of a Port Labrador, visualized as a relatively ice-free, year-round, deep-water port on the Labrador coast (Lake Melville) which, among other things, would serve as a trans-shipment point for iron ores from new mine projects in Labrador West and for uranium from the Postville-Makkovik area. The Port Labrador concept also involves construction of a highway and railway, to link the western region of Labrador with the port, via Churchill Falls.[6]

Background on the Nature of Mining

There are some characteristics of mining which distinguish it from both other resource industries and other sectors of the economy. The most important characteristic is that minerals are depletable resources. The production process must ultimately exhaust a given orebody. The only way production can be sustained over time is through the exploration for and discovery of new orebodies, or a technological improvement in the level of recovery of ore.

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4. Since the appearance of the Blueprint in 1978, Brinex has announced that it plans to bring these deposits into production by 1982. See chapter 5.
5. Cabinet Secretariat (April 1979), pp. 35-36.
6. 'Speech from the Throne' (12 July 1979) pp. 5-6.

As a result of these and other factors, mining is a risky activity relative to sectors where the supply of primary factor inputs is more assured. In addition, other economic factors will affect the viability of a mine. Prediction of aggregate levels of production from mining is thus quite difficult. Production and employment from mining in any given region (or province) over a long time period (20 years) tends to fall, unless either:

i) reserves of minerals are large, relative to expected demand; or
ii) exploration yields a stream of new orebodies over time.

In Newfoundland, mineral reserves are large relative to demand for iron ore, for asbestos and gypsum. Exploration potential is promising for uranium, but only marginal for nonferrous base metals. The long-term viability of mineral production is thus dependent on the iron ore, asbestos, gypsum and uranium industries, with limited new supplies of other minerals coming on stream over time.

There are other characteristics of mining which should be kept in mind when analyzing its potential contribution to the economy.

i) Mining is capital intensive and thus yields relatively few jobs for every investment dollar compared to the more labour-intensive resource sectors such as fishing and forestry.[7]
ii) Mining is generally, and will increasingly, be undertaken in remote areas. This feature presents difficulties in attracting and maintaining a labour force, and increases the capital costs of mine development for infrastructure (access roads, townsite, housing, etc.).
iii) It is difficult to adjust capacity and hence output quickly in reponse to excess supplies or demands in the mineral sector. Mineral markets therefore tend to be cyclical, and it is difficult to predict mineral prices and revenues as a result.
iv) The demand for mineral products may, over the next 20 years, be on a generally downward trend. This is due to the downward trend in devloped countries' consumption of metal-intensive commodities (e.g., large cars), substitution away from metals, and a general decrease in industries consuming metals (e.g. construction, heavy machinery, manufacturing, etc.) due to demographic changes and other factors.

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7. Mining however is similar to many manufacturing industries in its potential to generate employment. See chapter 6.

All of these features of the mining industry should be kept in mind throughout our discussion of its role in the Newfoundland economy.

Method of Analysis

The main issue dealt with in this report is the prospects for job creation and employment in the Newfoundland mining industry to 1983 with an outlook to 1988. In the first instance, our attention centres on projections for direct employment in the industry to 1983. We consider three cases: a base (or trend) case; an optimistic case; and a realistic case. The base case projects employment trends of recent industry experience. The optimistic case bases employment projections on potential supply-side conditions in the provincial mining industry. The realistic case provides a set of employment projections, taking into account various constraints under which the province's mining industry is expected to operate over the period.

In formulating the projections for these cases, we start with a disaggregated approach, and from this build up a set of aggregate direct-employment projections for the mining industry in Newfoundland. The disaggregated approach involves examining in some detail each of the mining operations in the province organized under three sectors: iron ore, base metal, and industrial minerals. In addition, employment prospects for uranium mining are also assessed. The disaggregated results are then summed to give our aggregate employment projections for the mining industry in the province.

Among the constraints considered are the characteristics of the labour supply available to the mining industry. We do not attempt to relate labour supply to demand conditions in the context of a labour market model, because the labour supply and demand data sets are not comparable. Our emphasis is rather to identify some issues on the labour supply side that will affect the industry.

Finally, we evaluate the direct and indirect impacts of mining on the provincial economy with respect to employment and incomes. Our conclusions here are derived from impact studies of the mining industry that have been done at the Centre for Resource Studies and elsewhere.

Structure of the Report

The report has two broad orientations: the first, to provide background information; the second, analysis.

Chapters two, three and four provide information on the development of the mining industry and of government policy towards the industry. Chapter two describes characteristics of the industry as it exists today. It discusses the nature of minerals produced and where they are produced in the province, the size of the industry in relationship to the Canadian mining industry and to the Newfoundland economy, and where the mineral products are marketed. Chapter three outlines the historical development of the mining industry, focusing on the timing, nature and extent of developments and the direct impact of the industry on employment in the post-1949 decades. The development of provincial government policies towards mining, with particular emphasis on the changes that occurred in the mid-1970s, is discussed in chapter four.

Chapters five to seven examine job creation and employment prospects in the province's mining industry to 1983 with an outlook to 1988. Chapter five discusses the current status and potential for expansion in the industry on an operation-by-operation, sector-by-sector basis. This chapter develops disaggregated employment projections for our three cases. These estimates are derived from the methodology in chapter six, supplemented by available operation-specific data. In chapter six the impact of an expansion in the province's mining industry on provincial income and employment is analyzed, and constraints to the industry's expansion are discussed. Chapter seven puts together the disaggregated results of chapter five to formulate aggregate employment projections for the mining industry. Our results are evaluated in the light of existing studies of employment projections for Newfoundland's mining industry.

2. MINING IN THE NEWFOUNDLAND ECONOMY TODAY

In post-confederation Newfoundland, the mining industry has been and continues to be characterized by three main features. First, the industry is a relatively large component of the provincial economy. Second, there are few operators and mining is concentrated in three distinct geographic regions. Third, minerals have been produced primarily in unprocessed form for export markets. In this chapter, a snapshot of these characteristics is given for the late 1970s. In the next chapter a sketch of the historical development of the provincial mining industry is provided as background, and as context for evaluating the prospects for expansion and job creation in the 1980s.

The Size of the Industry

There are some nine firms and enterprises producing seven metallic and four nonmetallic minerals. In addition, structural materials are mined and processed by several firms. It is apparent from table 1, showing the distribution of output for 1978, that most of the production is made up of only a few minerals. The industry is dominated by iron ore, which accounted for 83 percent of the province's mineral production by value in 1978. Iron ore was followed in order by: zinc, 7 percent; copper, 3 percent; and asbestos 2 percent. Lead is produced as a joint product with zinc at the Buchans mines. The other metallic minerals produced in the province (cadmium, gold and silver) are recovered as by-products of base metal mining operations. Although the ranking of production by commodity does vary somewhat from year to year, the data for 1978 fairly reflects the structure of mineral production in Newfoundland in the 1970s.

The mineral production figures for 1978 also show Newfoundland's relative position as a mineral-producing province in Canada. Newfoundland is clearly the dominant producer of iron ore, accounting for 40 percent of the country's output. This share is actually low, however, owing to a 4-month strike at the Iron Ore Company of Canada (IOC),[1] Canada's largest iron ore producer, which has

1. The strike at IOC began on 9 March and ended on 17 July. The strike tied up not only the company's mines and mills but also its railway, the Quebec North Shore & Labrador. This meant that shipments of iron ore from Wabush Mines were also curtailed.

Table 1

MINERAL PRODUCTION BY COMMODITY, NEWFOUNDLAND, 1978

	Quantity (Thousands)	Value ($ Thousand)	Percentage of Newfoundland Value of Production	Percentage of Canadian Production
Metals				
Cadmium	6 lbs.	18	-	0.3
Copper	24,474 lbs.	18,211	3.0	1.3
Gold	16 oz.	3,610	0.6	0.9
Iron ore	17,451 s.t.	504,973	82.6	40.0
Lead	17,909 lbs.	6,595	1.1	2.6
Silver	495 oz.	3,048	0.5	1.3
Zinc	118,289 lbs.	41,113	6.7	5.2
Total Metals		577,568	94.5	
Nonmetals				
Asbestos	30 s.t.	12,539	2.1	2.0
Gypsum	916 s.t.	4,580	0.7	10.5
Quartz	NA	230	-	NA
Soapstone, talc, pyrophyllite	NA	471	0.1	NA
Total Nonmetals		17,820	2.9	
Structural Materials				
Clay products	NA	569	0.1	NA
Cement	NA	5,440	0.9	NA
Sand and gravel	5,100 s.t.	7,650	1.3	1.7
Stone	700 s.t.	2,310	0.4	0.6
Total Structural Materials		15,969	2.6	
Total Minerals		611,357	100.0	

Source: Statistics Canada, Canada Mineral Production; Preliminary Estimate, 1978 (26-202).

NA = Not available.

- = Less than 0.1 percent.

a large part of its mining and milling operations located in Newfoundland. Newfoundland's share of Canadian output of iron ore normally runs around 50 percent. Newfoundland also produces a portion of Canada's gypsum (10 percent), zinc (5 percent), and asbestos (5 percent).[2] Apart from iron ore, therefore Newfoundland is not a major mineral-producing region in Canada. The mining industry is, however, a significant contributor to the province's output and employment. Tables 2 and 3 show, respectively, that mining accounts for approximately 30 percent of production of the goods-producing industries and about 15 percent of the province's gross domestic product. However, as an employer of labour, the mining industry accounts directly for a

Table 2

CENSUS VALUE ADDED IN GOODS-PRODUCING INDUSTRIES, NEWFOUNDLAND AND CANADA, 1976
($ Thousand and Percent)

	Newfoundland		Canada	
Agriculture	14,554	1.1	5,977,630	7.3
Forestry	32,463	2.5	1,348,175	1.6
Fishing	64,716	5.0	392,478	0.5
Hunting and trapping	143	-	31,029	-
Mines, quarries and oil wells[p]	382,178	29.5	11,304,918	13.8
Electric power	137,905	10.6	3,134,442	3.8
Total primary industries	631,959	48.8	22,188,672	27.1
Manufacturing industries	261,044	20.1	42,509,756	51.9
Construction industry	402,823	31.1	17,270,290	21.1
Total secondary industries	663,867	51.2	59,780,046	72.9
Grand total	1,295,826	100.0	81,968,718	100.0

Source: Statistics Canada, Survey of Production, 1976 (61-202), table 1.

p = Preliminary.
- = Less than 0.1 percent.

2. Five percent is a representative figure for asbestos, since the Advocate asbestos mine was closed down for more than three months in 1978 by a strike which lasted from 13 February to 22 May. Production (shipments) of asbestos fibre have during the 1970s generally been in excess of 60,000 short tons per year, compared to the 30,000 short tons in 1978.

Table 3

PROVINCIAL SIGNIFICANCE OF THE MINING INDUSTRY[a] (TOTAL ACTIVITY) BY SELECTED INDICATORS, 1976

	Value Added		Employees		Wages and Salaries	
	($ Thousand)	Percent of Gross Domestic Product	($ Thousand)	Percent of Total All Industries	($ Thousand)	Percent of Total All Industries
Newfoundland	384,593	15.1	6,688	4.3	115,538	7.6
Prince Edward Island	-	-	-	-	-	-
Nova Scotia	91,437	2.0	4,490	1.5	49,993	1.9
New Brunswick	69,559	1.9	2,931	1.3	36,428	1.7
Quebec	818,182	1.8	23,994	1.0	404,721	1.6
Ontario	1,463,273	1.9	32,747	0.9	495,303	1.2
Manitoba	207,979	2.6	5,828	1.4	88,874	2.2
Saskatchewan	370,324	4.6	5,132	1.4	79,673	2.7
Alberta	183,885	0.9	2,893	0.4	47,365	0.6
British Columbia	572,096	2.5[b]	10,927	1.1	189,486	1.6

Sources: Statistics Canada, General Review of the Mineral Industries (Mines, Quarries and Oil Wells), 1976 (26-201);
Statistics Canada, The Crude Petroleum and Natural Gas Industry, 1977 (26-213);
Statistics Canada, System of National Accounts, Provincial Economic Accounts, Experimental Data, 1962-1977 (13-213);
Statistics Canada, Labour Force Annual Averages, 1975-1978 (71-529);
Statistics Canada, Estimates of Labour Income, October-December, 1978 (72-005).

[a] Total minerals, less crude petroleum and natural gas.
[b] Gross domestic product figure includes Yukon and Northwest Territories.

disproportionately small share of the economy's employment, only 4 percent. If a (maximum) employment ratio of 3.35 is assumed,[3] the direct and indirect employment generated by the industry would account for roughly 15 percent of total employment, at most.[4]

Although iron ore dominates the province's mining industry, mining clearly represents a much larger proportion of the economic activity in Newfoundland than it does in Canada as a whole, or in any other province. For Canada, mining (including oil wells) makes up about 15 percent of the census value added of goods-producing industries, as opposed to 30 percent in Newfoundland. Nationally, mining output is 6 percent of Canadian gross domestic product, but it is 15 percent of Newfoundland's. Newfoundland's mining industry exceeds that of all other provinces in terms of: value added as a share of gross domestic product; mining's share in total employment; and its share in wages and salaries. In sum, mining is relatively more important in Newfoundland than in Canada as a whole, or in any of the other provinces.

The Geographic Distribution of Mining

Although the Newfoundland mining industry is widely dispersed geographically, the principal operations are located in three distinct regions: Labrador West, Buchans (Red Indian Lake), and the Baie Verte Peninsula.

Figure 1 shows the location of mines in Newfoundland. The regions demarcated by solid lines encompass producing mines; the regions shown by broken lines relate to prospective mine developments. The map is derived from the Mineral Area Planning Study (1975) and shows the location of mines in production in 1979, with one exception: the fluorspar mines (region 2) closed in 1978.

In the description below of the three main mining regions, the reference in the text to their location on the map is indicated in brackets.

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3. Department of Regional Economic Expansion (May 1977) table 6, p. 28.
4. This estimate is based on employment figures in 1978 of an estimated 7,200 in the mining industry and of 166,000 for the province's economy.

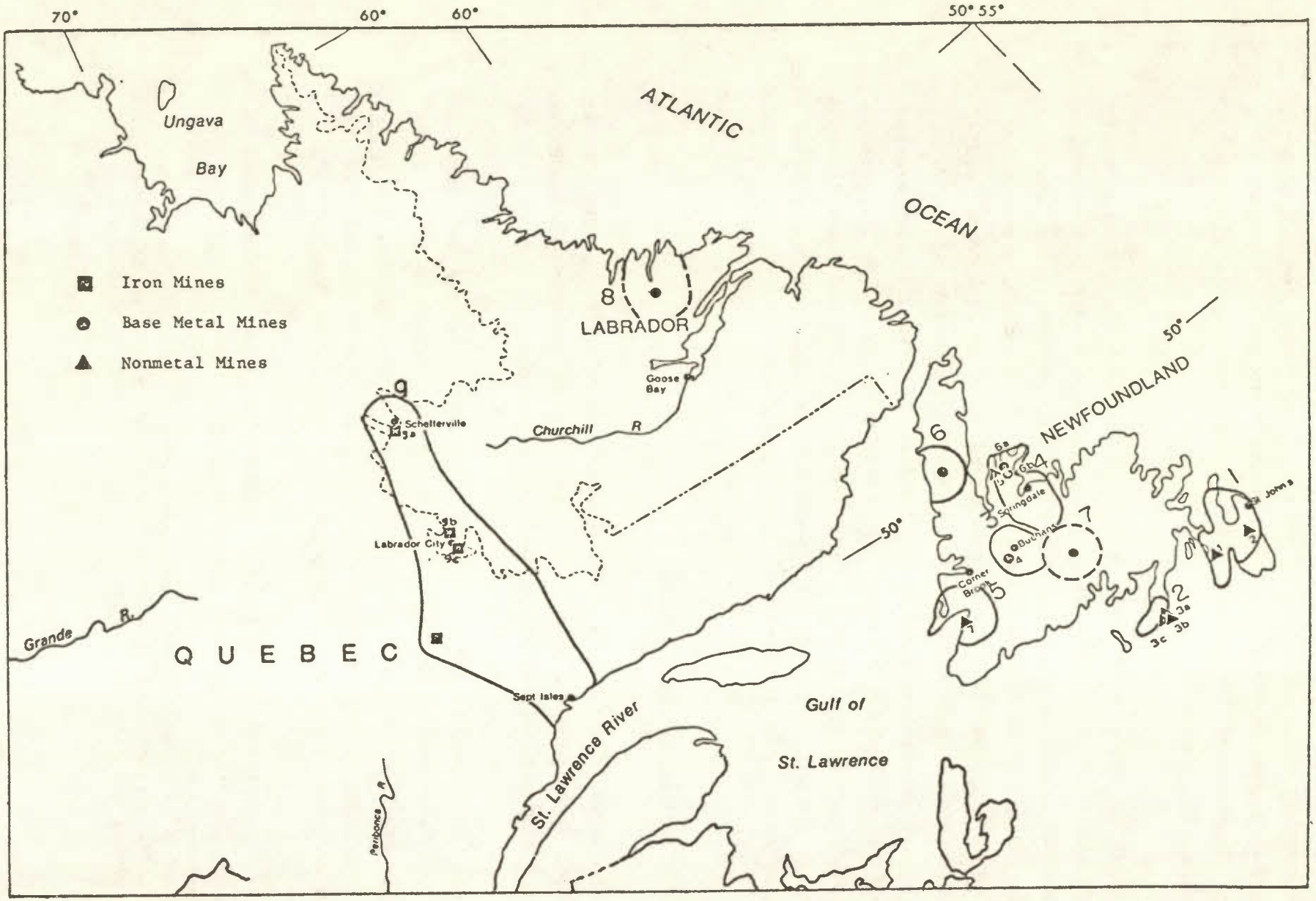

Figure 1. Location of mines in Newfoundland

Source: Energy, Mines and Resources, Mineral Area Planning Study (MAPS), Mineral Policy Series (April 1975), figures 10 (east), 14 (east).

Labrador West

Labrador West (9) is the largest, and geographically most remote, mining region in the province. This region is the location of all iron mining and, to the present time, iron is the only mineral mined in Labrador. Production of iron ore began in 1954 and occurs at three mining sites: the IOC Schefferville (9a) and Carol Lake (9b) operations, and the Scully mine of Wabush Mines (9c).

Buchans (Red Indian Lake)

Buchans (3) is the oldest currently-producing commercial mining region in Newfoundland. Production started in the late 1920s, and Buchans continues to be the centre of zinc-lead mining in the province. The only other zinc mine in Newfoundland opened in 1975 and is located at Daniel's Harbour on the west coast of the Island (6).

Baie Verte Peninsula

Copper and asbestos are the principal minerals produced in the Baie Verte region (4). Mining operations in this area have their origins in the late nineteenth century, but active mining in this century dates from the 1950s. Base metal mining has been sporadic and mining operations have tended to be short-lived. Asbestos mining has been continuous since 1963.

Other Mining Regions

Small pyrophylite and silica mining operations are located on the Avalon Peninsula (1). Gypsum is mined near Stephenville on the west coast of the Island (5).

In addition to the current mining activities, uranium mining is now planned to begin in 1982. Two deposits are to be mined in the Kaipokok Bay area on the Labrador coast (8).

Mineral Product Markets

The minerals produced in Newfoundland are, in the main, destined for export markets and are shipped out of the province in unprocessed form as ores and concentrates. The exported products are shipped either to plants of the owners of the mines or to the free market. A minor part of the province's mineral production is marketed locally, but this is confined to a few commodities. For example, some gypsum output is used to produce wallboard and other gypsum products, and other structural materials are consumed in the province. More detail on commodity markets is contained in chapters five and six.

3. AN HISTORICAL SKETCH OF THE GROWTH AND DEVELOPMENT OF THE NEWFOUNDLAND MINING INDUSTRY

This chapter provides highlights of the development of the industry.[1] Detailed discussion of the existing individual mining operations is undertaken in chapter 5.

In pre-confederation Newfoundland, mining was confined to the Island. After confederation, mining activity shifted rapidly and dramatically to the Labrador hinterland. There the birth and rapid growth of the iron mining industry quickly established Labrador as the premier mining region of the province. Into the 1980s, the most promising new prospects for new mine development appear to be in Labrador, where the long-awaited development of uranium mining is being considered.

Prior to 1949, mining on an important commercial scale was centered in three areas on the Island. In order of the timing of development, these were:

i) iron ore at Wabana (Bell Island);
ii) base metals (zinc-lead) at Buchans;
iii) fluorspar at St. Lawrence.

The mining of iron ore at Wabana began in 1895 and continued until mid-1966, when the mine shut down permanently. The ultimate causes for this closure were changes in the requirements for the iron ore due to technical changes in steel-making processes, and the high cost of underground mining at Wabana, in a world of expanding open-pit iron mining capacity. The base metal mine at Buchans was developed in the late 1920s. Although the deposit had been known to exist as early as 1905, the development of the complex base metal orebody had to await the technical advance of differential (selective) flotation, achieved in the 1920s. In the wake of this metallurgical development, the mine was quickly developed and production started in 1928. Although the mine was threatened with closure on a number of occasions in its history, the life of the mine, and the

1. The sources used in preparing this chapter are: Snelgrove (1953); Bursey (1979); Department of Mines and Technical Surveys (May 1966); Energy, Mines and Resources (1969); Report of the Buchans Task Force (1976); Canadian Minerals Yearbook, selected years; Canadian Mines Handbook, selected years, Iron Ore Company of Canada (1979).

Buchans area, was extended by a sequence of discoveries of adjacent and deeper orebodies. The present prognosis is that the base metal orebodies of the Buchans mining operation are near exhaustion; the mine is expected to close not later than 1980. Fluorspar mining at St. Lawrence began in 1933, and the area has been the sole producer of fluorspar in Canada for many years. For the most part since 1933, the fluorspar mines have been operating divisions of The Aluminum Company of Canada Limited (Alcan). Early in 1978 the mines were closed, ostensibly due to the cost disadvantage of St. Lawrence fluorspar compared to Mexican sources available to Alcan.

The scale and longevity of these mining operations resulted in the establishment of sizable settled communities which will be adversely affected by mine closures. The result may well be decay or abandonment of these communities. As shown by the census population data for Wabana in table 4, the closure of the iron mine resulted in depopulation, and the same prospect may be in store for St. Lawrence and Buchans. In all three instances, however, provincial government policy appears to have been to promote and encourage the establishment of alternative employment opportunities in the affected areas, rather than to move the population to the other centres; that is, to attempt to preserve the economic viability of the mining towns.[2]

In the late 1940s and early 1950s when the Wabana iron mine was running into difficulties, the massive iron deposits in Labrador West were coming under development. The existence of large iron deposits in Labrador had been confirmed in the early 1890s, just at the beginning of mine development at Wabana, but for another fifty years they lay dormant. Then, the rising demand for steel coupled with the threat of iron ore shortages in the post-war years led a group of U.S. steel companies to form The Iron Ore Company of Canada in 1949, to develop the deposits straddling the Labrador-Quebec border at Knob Lake-Schefferville. The vertical integration of American steel interests into Canadian iron ore fields was an outstanding example of the process used by U.S. corporations to tap Canadian resources in the post-1945 period.[3] The development of Canadian resources by American interests strengthened north-south trade flows and effectively integrated the Canadian resource supply regions with the American market, rather than with the host regions in Canada.

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2. Bursey (1979); Report of the Buchans Task Force (1976); Alcan Report (1979).
3. For a discussion of the post-1945 process see Aitken (1961), pp. 66ff.

Table 4

CENSUS POPULATION OF WABANA, ST. LAWRENCE AND BUCHANS, NEWFOUNDLAND 1951-76

	Wabana[a]	St. Lawrence[b]	Buchans[c]	Buchans[d] (Company Town)
1951	6,460	1,451	-	1,944
1956	7,873	1,837	-	2,413
1961	8,026	2,095	-	2,463
1966	7,884	2,130	384	2,159
1971	5,421	2,173	454	1,907
1976	4,824	2,258	521	1,800[e]

Sources: Government of Newfoundland and Labrador, Executive Council, Central Statistical Services, Historical Statistics of Newfoundland and Labrador II(1) (July 1977), table A-10; Report of the Buchans Task Force (June 1976), p. 14.

[a]Incorporated 1950.
[b]Incorporated 1949.
[c]Incorporated 1963. Local Improvement District prior to 1971 census. Does not include Buchans, the company town, which see.
[d]Incorporated 1976.
[e]Estimate.

In the case of the IOC, the owners of the project were and are also the customers. Their ownership, coupled with the remote northern hinterland location of the iron mines, required the construction by IOC of extensive infrastructure. The IOC's infrastructure investment included the Quebec North Shore and Labrador Railway (QNS&L) and ore-handling facilities at Sept-Iles, the southern terminus of the QNS&L. In addition, the development of the Labrador-Quebec iron ore deposits was a major factor in the decision to proceed with construction of the St. Lawrence Seaway.[4]

The first shipment of iron ore from the medium-grade Schefferville deposits took place in 1954. IOC's mining project was based on the production of 10 million tons of direct-shipping ores per annum with a minimum iron content of 52.5 percent. At the time when production began this was a premium product. However, just as the IOC operation at Schefferville was coming on stream, the process of beneficiating low-grade iron ores was gaining commercial application, and large and much-higher grade deposits were being discovered in other parts of the world. These developments led to a decline in demand for

4. Easterbrook and Aitken (1967), pp. 553-557.

medium-grade direct-shipping ores. In response to these changed circumstances, IOC decided to proceed with the development of the low-grade Carol Lake deposits.[5] The project was begun in 1960 and completed in 1963, and involved the development of a mine, a concentrator, and a pelletizing plant in the Labrador City area. An expansion project (1965-67) doubled pelletizing capacity from 5.5 to 10 million tons per year. As a result, iron ore capacity in Labrador was greatly expanded.

While the IOC was embarking on this major expansion, a consortium of Canadian and American steel companies organized the Wabush Mines joint venture, in the late 1950s, to exploit the low-grade orebody situated near the IOC deposit at Carol Lake. The project, begun in 1961 and completed in 1965, involved a mine and concentrator at Wabush and a pelletizing plant located at Pointe Noire (near Sept-Iles). The initial capacity of the Wabush Mines pellet plant was 4.9 million tons per year, and was expanded to 6 million tons per year in 1968.

The latest and last important expansion program in the Labrador iron ore industry occurred in the early 1970s. Between 1970 and 1973 the IOC expanded its concentrator capacity at Labrador City from 12 million to 22 million tons per year, and built a 6 million ton-per-year pellet plant at Sept-Iles to upgrade and pelletize low-grade ores from the Schefferville area. This action substantially extended the life of the ore reserves at Knob Lake-Schefferville.

Although the centre of mining activity shifted from the Island to Labrador West in the post-confederation period, several new base metal mines were developed in the Baie Verte Peninsula. These developments were unspectacular, compared to the Labrador iron ore industry. The base metal mines have been few in number and small in size. As shown in table 5 they were opened in the 1960s. Of the six mines that opened, four had closed down by 1975. Since 1967, the only new mine developed on the Island is the zinc mine at Daniel's Harbour (1975).

The data in table 5 showing the dates of mining operations since 1949 indicate that the nearest approach to a mining boom in Newfoundland took place in the late 1950s and the 1960s, and that, since the late 1960s, the mining scene in the province has been quiet in terms of new mine development.

5. Bennett (1978).

Table 5

MINES AND MAJOR QUARRIES OPERATING IN POST-CONFEDERATION NEWFOUNDLAND, 1949-79

Region and Company Name	Location	Minerals Produced	Date of Operations[a]
Labrador West			
Iron Ore Company of Canada (Carol Operation)	Labrador City	Iron ore	1962-present
Iron Ore Company of Canada (Schefferville Operation)	Near Schefferville, Quebec	Iron ore	1954-present
Wabush Mines	Wabush	Iron ore	1964-present
Buchans (Red Indian Lake)			
ASARCO	Buchans	Copper, lead, zinc, cadmium, silver, gold	1928-present
Baie Verte Penninsula			
Advocate Mines Ltd.	Baie Verte	Asbestos	1963-present
Atlantic Coast Copper Corp.	Little Bay (near Springdale)	Copper, gold	1961-1969
British Newfoundland Corp. Ltd.	Whalesback Pond (near Springdale)	Copper	1965-1972
Consolidated Rambler Mines Ltd.	Near Baie Verte	Copper, zinc, gold	1964-preent
First Maritime Mining Corp. - Gullbridge Mine	Gull Pond (approx. 40 km. south of Springdale)	Copper	1967-1971
First Maritime Mining Corp. - Tilt Cove	Tilt Cove	Copper, gold	1864-1917, 1957-1967
Green Bay Mining	Whalesback Pond (near Springdale)	Copper	1973-1975

Table 5 (Continued)

MINES AND MAJOR QUARRIES OPERATING IN POST-CONFEDERATION NEWFOUNDLAND, 1949-79

Region and Company Name	Location	Minerals Produced	Date of Operations[a]
Avalon - Burin Peninsulas			
DOSCO Industries Limited - Wabana Mines	Bell Island	Iron ore	1895-1966
Dunville Mining Company	Villa Marie (near Dunville)	Silica	1969-present
Newfoundland Fluorspar Ltd.	St. Lawrence	Fluorspar	1942-1978
Newfoundland Minerals Ltd.	Long Pond, Conception Bay	Pyrophyllite	1904-05, 1938-47, 1956-present
St. Lawrence Corporation of Newfoundland	St. Lawrence	Fluorspar	1933-1957, 1959-60
Trinity Brick Products Ltd.	Milton, Trinity Bricks Bay	Bricks	1886-present
West Coast			
Bowater Newfoundland Pulp & Paper Company - Dormston Quarry	Corner Brook	Limestone	? -1970
DOSCO Industries Limited - Aguathuna Quarry	Aguathuna (near Stephenville)	Limestone	1913-14, 1916-24, 1926-31, 1934-64
Flintkote Co. of Canada Ltd.	Flat Bay (near Stephenville)	Gypsum	1952-present
Newfoundland Zinc Mines Ltd.	Daniel's Harbour, Great Northern Peninsula	Zinc	1975-present

Source: B.C. Bursey,"A Half Century of Progress? A History of Economic Growth and Development in Newfoundland, During the Modern Period, 1930-1980," Economic Council of Canada, mimeograph, 1980.

[a]Dates of operation cover all companies who may have operated a given deposit.

In the pattern of post-1949 development traced out by the data on mine production in table 6 (and also table 7), three observations stand out. First, the discontinuities in iron ore production reflect the three phases of iron mining expansion: the mid-1950s, the early and mid-1960s, and the 1970s.

Second, the production of base and precious metallic minerals attained a peak in the 1960s, and dropped off dramatically in the 1970s. The sole exception is zinc, where production since 1975 exceeded output in the mid-1960s, as a result of the opening of the zinc mine at Daniel's Harbour. The general inability of the nonferrous metal mining sector to respond vigorously to the metals price boom of the early 1970s is attributable to a weak and dwindling reserve position on the part of producing mines and, more generally, to a weak base metallic resource base in the province. (See table 36.)

Third, the nonmetallic minerals, asbestos and gypsum, have performed relatively well in the 1970s, when production reached levels higher than those achieved in the 1960s. It appears, however, that expansion in output of these minerals had ceased by the early 1970s.

In brief, the iron ore industry has reached a plateau in capacity, and the same appears to have happened in the nonmetallic mineral sector. The area of grave concern is the base metal sector, which has definitely been in decline in the late 1970s.

The exploration data in table 8 reflect the pattern of mineral development since 1949 and also point to prospects for the future of the mining industry. The land-based exploration activity undertaken by the private sector reached its maximum in 1958-59. Although it is well known that lags, often considerable lags, exist between exploration and mine development stages of mining projects, the late-1950s peak in exploration is clearly associated with the mining boom that occurred in Newfoundland in the late 1950s and early 1960s. The peak in mining investment, also shown in table 8, occurred in 1962. Most of the investment of the early 1960s was for iron mining projects in Labrador, but, as was noted in table 5, several mines on the Island were also developed during these years.

Table 6

QUANTITIES AND VALUES OF MINERALS PRODUCED, BY TYPE, NEWFOUNDLAND, 1949-78

	Cadmium[a]		Copper		Gold		Iron Ore	
	Quantity (Pounds)	Value (Dollars)	Quantity (Tons)	Value (Dollars)	Quantity (Ounces)	Value (Dollars)	Quantity (Tons)	Value (Dollars)
1949			3,617	1,444,837	9,268	333,684	1,657,888	7,947,914
1950			3,221	1,508,910	9,254	352,115	1,169,545	5,851,488
1951			2,899	1,606,233	8,515	313,778	1,724,991	9,145,960
1952			2,959	1,689,079	8,595	294,551	1,653,878	8,668,192
1953			2,814	1,684,862	7,654	263,451	2,686,481	14,201,842
1954			3,481	2,029,876	6,528	222,409	3,758,526	21,749,304
1955			3,052	2,250,672	6,337	218,753	7,206,883	45,701,801
1956			3,108	2,574,274	8,213	282,938	8,463,572	55,620,755
1957			4,535	2,625,986	9,755	327,280	8,174,779	57,898,102
1958			14,751	7,499,372	13,381	454,686	5,390,775	38,226,828
1959			14,989	8,876,570	13,411	450,207	6,105,819	42,974,837
1960			13,863	8,398,362	13,515	458,834	7,611,365	54,673,717
1961			15,752	9,195,817	14,429	511,652	7,611,340	59,889,125
1962			17,308	10,731,154	13,966	522,468	7,986,910	67,753,153
1963			14,012	8,827,797	12,318	465,004	9,683,004	99,601,987
1964			13,615	9,095,013	16,717	631,067	12,763,575	137,038,680
1965			14,823	11,147,108	23,657	892,555	14,500,495	156,888,970
1966			19,394	17,415,394	25,667	967,903	16,546,189	188,603,259
1967			21,965	20,897,555	27,258	1,028,989	16,981,567	207,408,843
1968			23,298	22,413,551	7,803	294,251	19,705,316	246,508,466
1969			20,464	21,049,062	8,982	338,532	14,716,214	194,971,157
1970			15,193	17,639,532	6,611	249,010	23,559,386	292,582,028
1971			13,980	14,762,654	7,341	259,460	21,876,957	289,912,158
1972	158,800	401,764	9,513	9,689,977	14,069	810,487	18,071,738	235,249,411
1973	52,498	191,093	8,646	11,031,913	14,345	1,397,375	24,397,568	314,838,603
1974	5,676	22,573	6,233	9,664,523	11,605	1,802,489	24,280,211	372,188,155
1975	10,853	37,041	8,268	10,541,388	12,992	2,127,843	24,896,192	468,600,400
1976	118,598	311,320	8,187	11,197,883	13,870	1,707,494	29,494,534	631,272,628
1977	166,574	524,708	10,052	13,972,817	14,396	2,261,453	29,385,484	742,132,236
1978p	6,000	18,000	12,237	18,211,000	16,000	3,610,000	17,451,000	504,973,000

Source: Historical Statistics of Newfoundland and Labrador II(1) (July 1977); Central Statistical Services, Executive Council, Government of Newfoundland and Labrador.

[a]There was no production of cadmium before 1972.
p = Preliminary.

Table 6 (Continued)

QUANTITIES AND VALUES OF MINERALS PRODUCED, BY TYPE, NEWFOUNDLAND, 1949-78

	Lead		Silver		Zinc		Fluorspar	
	Quantity (Tons)	Value (Dollars)	Quantity (Ounces)	Value (Dollars)	Quantity (Tons)	Value (Dollars)	Quantity[a] (Tons)	Value (Dollars)
1949	18,608	5,880,191	585,026	434,382	31,909	8,454,091	58,077	1,405,033
1950	17,918	5,178,320	575,524	465,138	30,539	9,558,647	55,595	1,290,361
1951	16,444	6,051,427	534,519	505,388	28,469	11,330,799	67,925	1,966,477
1952	18,059	5,847,571	638,524	533,295	30,517	10,656,475	81,283	2,484,943
1953	17,702	4,576,214	648,389	544,712	28,002	6,698,029	87,693	2,631,698
1954	18,526	4,939,054	742,120	617,867	30,002	7,188,595	118,065	2,946,896
1955	17,855	5,135,085	701,792	618,840	28,636	7,817,635	127,384	2,678,641
1956	22,788	7,068,813	957,125	858,350	34,680	10,293,055	139,801	3,395,061
1957	24,512	6,843,665	1,196,414	1,045,307	35,698	8,631,847		1,662,602
1958	23,980	5,448,339	1,267,078	1,099,950	33,870	7,370,102		1,483,368
1959	22,457	4,765,328	1,125,110	987,622	31,674	7,753,838		1,749,903
1960	24,022	5,131,091	1,271,126	1,130,158	34,208	9,133,517		1,820,769
1961	21,968	4,485,938	1,145,105	1,079,376	34,638	8,722,020		1,951,800
1962	25,330	5,025,529	1,181,648	1,376,620	32,541	7,874,869		1,870,184
1963	23,392	5,146,264	981,005	1,357,711	34,485	8,814,473		1,976,006
1964	25,415	6,831,452	1,089,748	1,525,647	38,982	11,047,407		2,254,060
1965	21,916	6,793,882	1,086,978	1,521,769	36,187	10,928,579		2,677,443
1966	21,754	6,500,156	1,097,425	1,535,298	34,160	10,316,464		1,890,768
1967	19,940	5,583,296	1,073,153	1,858,701	34,851	10,099,901		2,097,391
1968	18,914	5,084,119	895,706	2,071,768	36,729	10,357,709		2,602,230
1969	22,206	6,737,575	1,024,639	1,977,553	32,903	10,022,171		3,036,931
1970	17,730	5,609,750	793,402	1,467,794	29,913	9,530,344		4,595,522
1971	13,481	3,639,735	563,604	879,222	26,833	6,970,621		2,819,091
1972	12,202	3,765,175	572,928	956,790	26,582	10,138,934		5,432,151
1973	8,444	2,725,614	572,918	1,447,191	8,695	4,199,158		4,620,382
1974	15,490	6,414,818	555,689	2,572,284	21,045	14,689,531		7,199,090
1975	5,753	2,331,396	445,004	2,005,188	35,492	26,619,174		[b]
1976	14,204	6,435,294	578,521	2,486,483	46,846	35,251,008		2,934,995
1977	12,233	7,702,122	575,819	2,833,029	57,219	40,660,642		8,685,119
1978p	8,955	6,595,000	495,000	3,048,000	59,145	41,113,000	[c]	[c]

Source: Historical Statistics of Newfoundland and Labrador II(1) (July 1977); Central Statistical Services, Executive Council, Government of Newfoundland and Labrador.

[a]Not available for 1957-77.
[b]Shipments of fluorspar in 1975 were curtailed due to labour dispute.
[c]The fluorspar mine at St. Lawrence closed in February 1978. There was no production in 1978.
p = Preliminary.

Table 6 (Continued)

QUANTITIES AND VALUES OF MINERALS PRODUCED, BY TYPE, NEWFOUNDLAND, 1949-78

	Gypsum		Pyrophyllite		Clay Products		Asbestos	
	Quantity (Tons)	Value (Dollars)	Quantity[a] (Tons)	Value (Dollars)	Quantity[b] (Tons)	Value (Dollars)	Quantity (Tons)	Value (Dollars)
1949	-	-	-	-		25,450	-	-
1950	-	-	-	-		31,089	-	-
1951	-	-	-	-		32,183	-	-
1952	8,660	54,881	-	-		29,285	-	-
1953	26,531	117,208	-	-		39,500	-	-
1954	26,653	124,385	9	230		33,042	-	-
1955	46,459	175,829	7	120		49,338	-	-
1956	37,000	186,727	1,379	12,077		47,145	-	-
1957	29,465	121,800	5,686	47,328		29,500	-	-
1958	36,307	144,510	7,454	109,551		58,282	-	-
1959	37,720	148,617	14,443	200,275		68,000	-	-
1960	34,346	141,668	20,225	262,925		83,435	-	-
1961	40,699	101,696	24,425	404,059		75,890	-	-
1962	83,992	284,564	22,794	343,210		142,000	-	-
1963	232,259	766,298	31,783	476,745		92,120	20,390	3,320,064
1964	331,990	893,484	32,816	492,240		99,038	51,315	6,355,578
1965	442,655	1,088,531	30,134	452,010		72,717	65,626	8,825,182
1966	459,685	1,173,401	40,548	608,220		172,700	57,097	9,301,204
1967	439,156	1,068,604		443,640		199,570	63,725	10,499,143
1968	435,231	1,194,794		535,740		152,200	69,183	11,844,605
1969	469,339	1,299,261		553,935		120,280	58,513	10,588,875
1970	491,354	1,467,449		553,305		37,304	62,727	11,669,402
1971	560,703	1,666,067		393,375		79,605	69,218	12,497,626
1972	735,252	2,145,985		560,010		256,814	63,846	10,841,820
1973	808,833	2,324,614		486,788		260,000	98,622	17,529,667
1974	555,834	1,859,404		507,552		436,000	75,941	16,111,107
1975	642,490	2,314,562		391,073		536,149	63,787	18,139,165
1976	630,111	2,532,286		447,082		568,842	98,124	34,445,154
1977	665,069	3,213,601		756,104		550,000	71,384	29,449,609
1978p	916,000	4,580,000		471,000		561,000	30,000	12,539,000

Source: Historical Statistics of Newfoundland and Labrador II(1) (July 1977); Central Statistical Services, Executive Council, Government of Newfoundland and Labrador.

[a]Not available for 1967-78.
[b]No data.
p = Preliminary.

Table 6 (Continued)

QUANTITIES AND VALUES OF MINERALS PRODUCED, BY TYPE, NEWFOUNDLAND, 1949-78

	Cement		Sand and Gravel		Stone		Quartz	
	Quantity[a] (Tons)	Value (Dollars)	Quantity (Tons)	Value (Dollars)	Quantity (Tons)	Value (Dollars)	Quantity[b] (Tons)	Value (Dollars)
1949	-	-	1,416,202	999,598	392,263	635,975		
1950	-	-	1,619,389	780,315	469,651	787,228		
1951	-	-	1,483,951	648,346	466,440	792,319		
1952	22,068	529,750	1,654,471	936,013	475,704	768,326		
1953	69,271	1,345,073	1,908,187	1,023,622	391,633	647,469		
1954	70,615	1,330,018	2,105,522	1,096,883	359,350	619,474		
1955	81,905	1,492,990	3,142,226	1,660,984	333,982	595,655		
1956	83,902	1,660,300	2,490,580	1,686,320	327,943	604,094		
1957	58,277	1,185,078	2,796,273	1,681,394	348,373	582,374		
1958	50,992	1,079,071	4,062,985	1,484,160	282,439	536,535		
1959	71,253	1,291,516	4,825,724	2,306,864	352,231	583,419		
1960	93,160	1,688,664	3,912,533	3,069,395	380,843	644,588		
1961	86,549	1,789,980	3,383,724	2,777,393	322,820	633,963		
1962	96,916	1,985,524	4,250,942	3,504,594	227,707	445,091		
1963	92,460	1,848,347	4,640,993	4,276,626	382,260	827,465		
1964	90,453	1,833,743	4,657,737	3,501,694	285,357	553,553		
1965	93,777	1,987,220	4,258,678	3,785,071	174,985	496,590		
1966	63,541	1,632,982	3,599,421	3,584,261	153,000	318,000		
1967	82,217	1,744,284	3,143,938	3,086,688	240,000	300,496		
1968		1,922,695	3,812,003	3,632,018	876,768	1,097,848		
1969		1,896,229	3,957,022	3,742,412	189,929	338,703	104,887	263,261
1970		2,875,978	4,335,000	4,474,000	182,400	282,600		170,000
1971		2,932,090	5,564,000	5,827,000	204,091	577,021		215,553
1972		2,709,000	5,433,000	6,829,000	204,245	531,910		339,832
1973		3,659,981	6,466,357	8,370,503	394,311	971,537		363,443
1974		4,024,604	6,772,404	8,727,772	679,826	2,043,999		375,000
1975		4,678,129	6,874,892	9,587,488	966,332	2,889,457		160,000
1976		5,250,927	5,471,681	8,686,713	402,729	1,282,914		218,000
1977		5,175,463	4,924,531	7,022,954	679,883	2,205,701		[c]
1978[p]		5,440,000	5,100,000	7,650,000	700,000	2,310,000		230,000

Source: Historical Statistics of Newfoundland and Labrador II(1) (July 1977); Central Statistical Services, Executive Council, Government of Newfoundland and Labrador.

[a]Not available for 1968-78.

[b]Production started in 1969; not available for 1970-78.

[c]The needs of the ERCO plant for silica (quartz) in 1977 were met from existing inventories. Production continued in 1978.

[p] = Preliminary.

Table 7

VALUE OF MINERAL PRODUCTION, BY MAIN GROUPS, NEWFOUNDLAND, 1949-78
($ Million)

	Metallic Minerals	Nonmetallic Minerals	Structural Materials	Total
1949	24.5	1.4	1.7	27.6
1950	22.9	1.3	1.6	25.8
1951	29.0	2.0	1.5	32.4
1952	27.7	2.5	2.3	32.5
1953	28.0	2.7	3.1	33.8
1954	36.7	3.1	3.1	42.9
1955	61.7	2.9	3.8	68.5
1956	76.7	3.7	4.0	84.3
1957	77.4	1.8	3.5	82.7
1958	60.1	1.7	3.2	65.0
1959	65.8	2.1	4.2	70.2
1960	78.9	2.2	5.5	86.6
1961	83.9	2.5	5.3	91.6
1962	93.3	2.5	6.1	101.9
1963	124.2	6.5	7.0	137.8
1964	166.2	10.0	6.0	182.2
1965	188.2	13.0	6.3	207.6
1966	225.3	13.0	5.7	244.0
1967	246.9	14.1	5.3	266.4
1968	286.7	16.2	6.8	309.7
1969	235.1	15.7	6.1	256.3
1970	327.1	18.5	7.7	353.2
1971	316.4	17.6	9.4	343.4
1972	261.0	19.3	10.3	290.6
1973	335.8	25.3	13.3	374.4
1974	407.4	26.0	15.2	448.6
1975	512.3	21.0	17.7	551.0
1976	668.7	40.6	15.8	745.0
1977	810.1	42.1	15.0	867.1
1978p	577.6	17.8	16.0	611.4

Sources: 1949-67: Newfoundland, Historical Statistics of Newfoundland and Labrador I (1) (October 1970).
1967-72: Newfoundland, Historical Statistics of Newfoundland and Labrador I (5) (November 1974).
1973-76: Statistics Canada, General Review of the Mineral Industries (Mines, Quarries and Oil Wells), selected years (26-201).
1977-78: Statistics Canada, Canada's Mineral Production (Preliminary Estimate), 1978 (26-202).

PPreliminary.

Table 8

ANNUAL EXPENDITURES ON MINERAL EXPLORATION AND INVESTMENT, NEWFOUNDLAND, 1949-78
(Dollars)

	Mineral Exploration					
	Private		Government			
	Onshore	Offshore	Federal	Provincial	Total Mineral Exploration	Mining Investment
1949	736,029	-	51,000	49,000	836,029	4,745,909
1950	1,892,071	-	62,000	39,000	1,993,071	4,021,494
1951	1,512,392	-	121,000	213,000	1,846,392	20,818,280
1952	2,972,078	-	167,000	255,000	3,394,078	26,664,651
1953	1,500,642	-	275,000	190,000	1,965,642	49,074,872
1954	1,540,365	-	86,000	183,000	1,809,365	21,137,665
1955	3,285,249	-	63,000	135,000	3,483,249	15,380,512
1956	3,711,990	-	36,000	117,000	3,864,990	18,945,834
1957	5,363,127	-	86,000	156,000	5,605,127	11,435,980
1958	11,568,238	-	93,000	168,000	11,829,238	4,943,335
1959	15,665,459	-	65,000	133,000	15,863,459	27,305,998
1960	4,921,079	-	103,000	63,000	5,087,079	41,833,468
1961	4,036,770	-	116,000	81,000	4,233,770	59,187,130
1962	5,061,304	-	91,000	73,000	5,225,304	119,144,163
1963	1,815,626	-	120,000	87,000	2,022,626	74,865,905
1964	2,626,321	-	94,000	82,000	2,802,321	66,804,900
1965	3,075,805	-	158,500	160,000	3,394,305	21,249,764
1966	3,276,989	4,822,000	185,259	352,000	8,636,248	45,056,215
1967	4,076,088	3,928,370	210,472	278,000	8,492,930	43,823,423
1968	4,228,898	3,599,300	80,000	290,000	8,198,198	13,284,194
1969	5,711,138	2,770,249	464,000	250,000	9,195,387	10,249,043
1970	5,991,926	3,444,480	414,870	225,000	10,076,276	14,426,208
1971	5,230,214	29,293,755	769,000	165,000	35,457,969	70,765,383
1972	5,198,683	26,928,300	975,000	178,000	33,279,983	64,487,049
1973	6,901,732	35,892,150	1,049,965	203,118	44,046,965	54,520,386
1974	6,349,333	44,506,954	1,416,370	187,683	52,460,340	25,311,409
1975	7,452,674	49,969,000	944,536	291,214	58,657,424	34,228,646
1976[a]	6,338,659	39,909,000	444,343	400,000	47,092,002	23,475,788
1977	7,626,357	1,200,000[b]	1,524,865	355,945	10,707,167	42,903,660
1978[p]	8,500,000	35,400,000	2,500,000[c]		46,400,000	NA

Source: Newfoundland, Department of Mines and Energy.

[a]From 1976 on a new procedure for collection and tabulation of data was started.
[b]No offshore drilling was undertaken in 1977. Some marine geophysical surveys were done.
[c]Provincial plus federal government.
P = Preliminary.
NA = Not available.

Exploration expenditures declined sharply after 1959 and remained at a low ebb throughout the 1960s. The annual level of expenditures was barely sufficient to sustain two efficient company exploration budgets.[6] The low level of exploration in the 1960s has probably resulted in the precarious situation of the base metal sector in the late 1960s.

As indicated by claim-staking activity (see table 14), there has been a revival in exploration. Also, in recent years there has been a modest increase in the nominal dollar expenditures on land-based exploration performed by the private sector (see table 8). But when these expenditures are adjusted for inflation, it is apparent that the level of exploration effort in the late 1970s has been lower than early in the decade (see table 9). It is thus understandable why the provincial government is planning further policy changes to give added impetus to mineral exploration.

An historical perspective on employment in the province's mining industry can be gleaned from the data in tables 10 to 13. Employment in the Newfoundland mining industry has accounted for 5 to 8 percent of mining industry employment in Canada. As with the nation, the large majority of the work force has been in metal mining. Employment in metal mining in Newfoundland has made up a larger share of the provincial mining work force than has employment in metal mining nationally, due to the preponderance of iron mining. Since 1973 at least, employment in iron mining has comprised 80 percent of the total work force in metal mining.[6]

As indicated by table 10, the growth in employment has been moderate and uneven since 1949. In 1976, the total mining work force was about 75 percent higher than the 1949 level. Employment grew at an average annual rate of about 2.8 percent, and employment in metal mining almost doubled over the period. Discontinuous increases occurred in the early 1950s, early 1960s and mid-1970s, reflecting the three development phases in the Labrador iron mining industry.

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6. Mackenzie and Bilodeau (1979) put the minimum budget at $2 million in 1974 dollars.
7. Data provided by the Newfoundland Department of Mines and Energy give the following annual employment figures in iron mining for 1973 to 1977: 3,707; 4,450; 4,573, 4,411; and 4,600. Compare these figures with employment in metal mining in table 11.

Table 9

CONSTANT DOLLAR ANNUAL EXPENDITURES ON MINERAL EXPLORATION AND INVESTMENT, NEWFOUNDLAND 1949-78[a]
($ Thousand, Constant 1935-39 Dollars)

	Mineral Exploration			Mining Investment
	Private[b]	Government[c]	Total[b]	
1949	371	50	421	2,393
1950	896	48	944	1,904
1951	629	139	768	8,667
1952	1,315	187	1,502	11,799
1953	680	211	891	22,236
1954	710	124	834	9,741
1955	1,501	90	1,591	7,026
1956	1,645	68	1,713	8,398
1957	2,358	106	2,464	5,029
1958	5,078	115	5,193	2,170
1959	6,793	86	6,879	11,841
1960	2,131	72	2,203	18,117
1961	1,730	84	1,814	25,369
1962	2,109	68	2,177	49,643
1963	742	85	827	30,608
1964	1,070	72	1,142	27,223
1965	1,228	127	1,355	8,486
1966	1,263	207	1,470	17,363
1967	1,543	185	1,728	16,593
1968	1,567	137	1,704	4,922
1969	2,022	253	2,275	3,629
1970	2,092	223	2,315	5,037
1971	1,804	322	2,126	24,410
1972	1,675	372	2,047	20,782
1973	1,831	332	2,163	14,465
1974	1,376	348	1,724	5,487
1975	1,516	251	1,767	6,963
1976	1,237	165	1,402	4,582
1977	1,363	336	1,699	7,668
1978	1,393	410	1,803	NA

Sources: Table 8; Statistics Canada, Canada Year Book, selected years (11-202E); Canadian Statistical Review, selected issues (11-003E).

[a]Nominal dollar expenditures are deflated by the Canadian wholesale price index (1935-39 = 100).
[b]Excludes offshore exploration.
[c]Federal and provincial government expenditures combined.
NA = Not available.

Table 10

EMPLOYEES AND EARNINGS, MINING INDUSTRY, BY MINERAL CLASSES, NEWFOUNDLAND, 1949-76

	Metallic Minerals		Nonmetallic Minerals		Structural Materials		Total	
	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)
1949[a]	2,951	7,195	279	562	277	1,169	3,807	8,926
1950	2,518	5,946	298	631	742	1,186	3,558	7,763
1951	3,040	8,628	377	1,004	697	1,353	4,114	10,984
1952	3,413	10,921	512	1,294	660	1,620	4,585	13,835
1953	3,296	12,112	498	1,421	747	2,035	4,541	15,568
1954	3,147	10,725	441	1,562	651	2,166	4,239	14,454
1955	3,095	10,750	512	1,606	666	2,413	4,271	14,768
1956	3,706	15,344	506	1,512	820	2,203	5,032	19,058
1957	3,836	15,529	360	1,196	498	1,749	4,694	18,475
1958	3,744	15,8897	210	764	425	1,238	4,379	17,900
1959[b]	3,217	13,058	229	847	418	1,467	3,864	15,372
1960	3,564	17,476	330	1,209	107	339	4,001	19,023
1961	3,847	19,303	347	1,335	99	331	4,293	20,968
1962	3,857	19,080	319	1,269	92	265	4,268	20,613
1963	4,377	26,030	453	2,091	93	287	4,923	28,408
1964	4,137	26,091	x	x	x	x	4,826	29,659
1965	5,879	38,094	x	x	x	x	6,609	42,054
1966	4,989	36,899	764	4,378	x	x	5,782	41,391
1967	4,776	37,966	727	4,511	30	127	5,533	42,604
1968	4,729	40,688	748	4,859	19	79	5,496	45,626
1969	4,316	42,409	783	5,345	6	15	5,105	47,769
1970	4,577	44,401	991	6,942	x	x	5,587	51,421

Table 10 (Continued)

EMPLOYEES AND EARNINGS, MINING INDUSTRY, BY MINERAL CLASSES, NEWFOUNDLAND, 1949-76

	Metallic Minerals		Nonmetallic Minerals		Structural Materials		Total	
	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)
1971	4,404	44,939	843	6,253	x	x	5,276	51,385
1972	4,052	44,450	1,000	8,175	x	x	5,073	52,809
1973	4,771	60,499	1,028	8,700	x	x	5,835	69,469
1974	5,617	77,150	1,023	9,873	35	335	6,675	87,359
1975	5,860	94,526	843	8,942	36	364	6,739	103,832
1976	5,769	104,537	889	10,610	30	391	6,688	115,538

Source: Statistics Canada, General Review of the Mineral Industries (Mines, Quarries and Oil Wells) (26-201).

[a]Figures for 1949-1957 include manufacturing industries related to mining, in the following manner: smelting and refining is included under metal mining; and clay products, cement and lime are included under structural materials.
[b]Beginning in 1959 the revised S.I.C. and new establishment concept are incorporated.
x = Confidential.

Table 11

EMPLOYEES AND EARNINGS, MINING INDUSTRY, BY MINERAL CLASSES, NEWFOUNDLAND, 1972-77[a]

	Metallic Minerals		Nonmetallic Minerals		Structural Materials		Total	
	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)
1972	4,447	41,156	1,121	8,823	1,143	3,940	6,704	53,920
1973	4,597	56,580	1,127	9,418	1,006	3,909	6,730	69,908
1974	5,430	75,325	1,134	10,940	968	4,137	7,532	90,402
1975	5,601	93,412	986	10,573	1,169	6,768	7,756	110,753
1976	5,426	104,017	864	11,714	1,351	6,984	7,641	122,714
1977	5,481	112,988	889	13,752	854	3,908	7,224	130,648

Source: Newfoundland, Department of Mines and Energy.

[a]According to returns under the Regulation of Mines Act.

Table 12

EMPLOYEES AND EARNINGS, MINING INDUSTRY, BY MINERAL CLASSES, CANADA, 1949-76

	Metallic Minerals		Nonmetallic Minerals		Structural Materials		Total	
	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)
1949[a]	46,181	132,275	8,606	19,745	7,591	15,107	62,377	167,127
1950	47,697	142,030	10,116	25,334	7,682	16,261	65,495	183,625
1951	52,271	170,853	10,611	31,035	7,921	19,633	70,803	221,520
1952	55,338	197,683	11,247	36,002	8,082	22,585	74,667	256,271
1953	51,711	191,395	11,099	36,892	8,180	23,393	70,990	251,680
1954	51,599	195,197	10,892	37,878	8,583	26,098	71,074	259,173
1955	53,364	211,249	11,722	42,391	8,468	26,833	73,554	280,472
1956[b]	57,564	242,947	12,548	47,128	8,769	28,508	78,881	318,583
1957	62,554	278,533	12,158	47,709	5,987	20,286	80,699	346,527
1958	61,999	289,630	11,492	46,197	5,808	20,629	79,299	356,456
1959	63,871	306,931	11,514	47,917	5,922	21,594	81,307	376,442
1960	61,882	308,043	11,008	48,610	5,809	21,361	78,699	378,014
1961	58,591	298,984	11,003	50,887	5,235	21,371	74,829	371,242
1962	58,243	306,004	11,408	53,937	5,514	23,391	75,165	383,331
1963	57,119	310,108	11,661	56,425	5,686	25,245	74,466	391,779
1964	57,648	321,605	11,727	60,950	6,044	28,098	75,419	410,653
1965	60,942	356,855	12,116	65,732	6,248	30,860	79,306	453,446
1966	61,670	385,143	12,422	70,941	6,312	33,091	80,404	489,176
1967	61,728	429,383	13,077	80,472	5,779	32,679	80,584	542,535
1968	63,369	474,772	13,673	92,667	5,836	35,019	82,878	602,458
1969	60,550	479,251	14,322	106,241	5,692	36,362	80,564	621,853
1970	66,590	580,546	15,215	117,382	5,345	36,496	87,250	734,424

Table 12 (Continued)

EMPLOYEES AND EARNINGS, MINING INDUSTRY, BY MINERAL CLASSES, CANADA, 1949-76

	Metallic Minerals		Nonmetallic Minerals		Structural Materials		Total	
	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)	Employees	Earnings ($ Thousand)
1971	66,012	612,862	15,105	122,855	5,328	39,722	86,445	775,439
1972	61,994	620,588	14,866	131,746	5,154	42,655	82,014	794,989
1973	66,134	733,085	15,391	146,115	5,276	48,004	86,801	927,204
1974	70,038	862,533	16,198	173,879	6,197	64,326	92,433	1,100,738
1975	69,161	1,006,435	13,703	178,913	6,382	79,251	89,246	1,264,599
1976	68,269	1,112,346	15,649	238,376	5,685	82,468	89,603	1,433,189

Source: Statistics Canada, General Review of the Mineral Industries (Mines, Quarries and Oil Wells) (26-201).

[a]Figures for 1949-1957 include manufacturing industries related to mining, in the following manner: smelting and refining is included under metal mining; and clay products, cement and lime are included under structural materials.
[b]Beginning in 1956 the revised S.I.C. and new establishments concept are incorporated.

Table 13

EMPLOYMENT IN MINING AND MANUFACTURING INDUSTRIES, NEWFOUNDLAND, 1957-75
(Number)

	Mining	Fish Products	Pulp and Paper Mills	All Manufacturing Industries
1957	4,694	2,395	3,419	9,677
1958	4,379	2,387	2,971	9,063
1959	3,864	2,378	3,085	9,095
1960	4,001	2,808	3,082	9,318
1961	4,293	2,938	3,305	9,854
1962	4,268	3,020	3,127	9,894
1963	4,923	3,326	2,988	10,021
1964	4,826	3,313	3,015	9,935
1965	6,609	4,031	2,970	10,463
1966	5,782	4,454	3,142	11,484
1967	5,533	4,415	3,152	11,620
1968	5,496	4,853	2,869	11,908
1969	5,105	5,104	2,747	12,302
1970	5,587	5,458	2,823	12,873
1971	5,276	5,566	2,568	12,580
1972	5,073	5,227	2,341	12,179
1973	5,835	5,961	3,151	13,924
1974	6,675	5,171	3,326	14,124
1975	6,739	4,344	2,903	13,000

Sources: Table 10; Historical Statistics of Newfoundland and Labrador II (1) (July 1977).

Table 11 is included to compare with table 10 data series on employment in the 1970s. The figures for employment in table 11 are collected by the Newfoundland Department of Mines and Energy, whereas those in table 10 originate from Statistics Canada. The data do not agree for any of the series, due to differences in the extent of coverage of the industry. The Department of Mines and Energy makes a full survey, while the Statistics Canada coverage is truncated by the application of its establishment concept, which tends to ignore small operations. The most notable discrepancy is found in the employment figures for the structural materials industry.

Mining has been a major employer in Newfoundland in the post-confederation period. Table 13 compares the record of employment in mining with fish products (processing), pulp and paper mills, and all manufacturing from 1957 to 1975. Employment in mining grew more rapidly than in manufacturing. Within the manufacturing sector, the work force has declined in pulp and paper mills, although there was a short-lived reprieve between 1972 and 1974 with the operation of the now-defunct linerboard mill at Stephenville. The net growth in fish-processing employment was quite remarkable, but this industry, too, suffered a setback in the mid-1970s due to the depletion of fish stocks. Employment in the resource-products manufacturing industries has been located entirely on the Island in the case of pulp and paper mills, and most of the work force in fish processing has also been on the Island. On the other hand, the large part of the mining work force is on the Labrador frontier, and this region will continue to be the centre of mining activity in the province for many years to come.

4. NEWFOUNDLAND GOVERNMENT POLICIES TOWARDS MINING

Introduction

In analyzing current government policy with respect to minerals, it is important to describe and evaluate past policies as well. The development of the Newfoundland mining industry has been affected by many such policies, especially by taxation and leasing arrangements. In this chapter we will look at:

i) provincial government policy in Newfoundland from 1949 to 1979;
ii) leasing and taxation policies;
iii) the implications for mining of the document entitled Into the Eighties . . . A 'Blueprint for Development' (1978), and of the 1979 Budget.

The objectives of provincial government policy towards mining can be organized into categories of policies designed to:

i) increase mineral development and production;
ii) generate public revenue;
iii) protect the social welfare of miners and Newfoundland in general;
iv) create employment.

The particular government policies designed to meet these objectives are, for each category:

i) provision of services, disposition of mineral rights, other regulations;
ii) taxation and leasing;
iii) health and safety and environmental regulations, and regulations relating to mine closures;
iv) government policies towards hiring, manpower training, union certification, and transfer payments.

We will examine the first two objectives and their related policies in detail. The second two objectives are beyond the scope of our analysis. In particular, for (iv) we could find very little about mining-specific labour policies. Although employment policies are very important, they are best handled in an overall analysis of Newfoundland labour markets.[1]

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1. See Prince (1977) and Bursey (1979, chapters 2 and 3) for more information on the historical development of all the policies, and Prince for a detailed discussion of (iii). Prince, and references cited therein, is the source for all factual information in this chapter, unless otherwise noted.

Mineral Development and Production

Government policy towards mineral development over the period 1949 to 1979 can be grouped in two general periods: the Smallwood era, 1949-71; and 1971 to the present. The philosophies of the government decision makers toward mineral development and production are not completely distinct but there are some differences of emphasis which should be noted. The emphasis in the Smallwood era can be captured by the slogan 'develop or perish'.[2] Economic growth through development of the resource base was seen as essential for improving the standard of living of Newfoundlanders. In general, during this period the government encouraged mineral production by making tracts of land available to private companies for exploration and development. The period was also characterized by few regulations regarding land tenure and operations of companies and by low or negligible rates of mining taxation. The government saw its primary function as one of providing services to the industry and enhancing development in any way possible. In the post-Smallwood era, the emphasis has shifted to one of controlled growth. That is, the government still encourages development of its resource base, but retains more control over its direction. There have been attempts, for example, to recover land previously alienated, and to revise the lenient mineral taxation system. We will review government policies throughout the whole period, emphasizing areas where important changes have occurred.

Government Services

To assist in the development process, the Newfoundland government has provided geological surveys, mappings, and a mineral inventory, in partnership with the federal government, first through the federal Department of Mines and Surveys, and since 1971, through the Department of Regional Economic Expansion (DREE).

The provincial government has also had a long history of direct involvement in the mining industry through the creation of crown corporations. These corporations were created to undertake mineral exploration (the Newfoundland and Labrador Corporation, or NALCO, formed in 1951) and to develop mineral

2. Gwyn (1972).

resources (North Star cement mill and Atlantic Gypsum plasterboard mill, established in 1951,[3] Newfoundland Steel Co., established in 1968). NALCO was not successful in finding any major mineral deposit. It was initially capitalized at $1 million, with a government contribution of $900,000 and a group of North American private companies providing the rest. NALCO had exploration leases for an area covering 24,000 square miles with rights to the area until 1985. But one million dollars (even in the mid-1950s) was generally considered to be too small a budget to initiate a viable exploration program. The private interests were attracted into the program with the promise of a 10 percent total share in the profits, but each company's share was too small to elicit much direct participation in exploration. NALCO was sold to Canadian Javelin in 1957.

Since the Smallwood era, governments have continued to have direct involvement in the industry. In 1973, DREE and the Newfoundland Department of Economic Development entered a 5-year agreement to form the Newfoundland and Labrador Development Corporation (NLDC). Its objectives are to provide research and management advisory services, and to finance small and medium-sized businesses. As of 1975, three loans (totalling $1.4 million) had been made to mining operations.

In general, the government has been involved in a passive way with mining operations. The limited success of some of the crown corporations may be due to a combination of insufficient financial incentives, bad management, and simply the fact that they were not economically viable operations to begin with. The governments since Smallwood's appear to be attempting to regain greater control of these crown corporations.

Mineral Rights

The disposition of mineral rights has long been an important policy instrument in Newfoundland, designed to encourage mineral development. The government has control over all unalienated crown land, and under certain conditions can direct

3. The government established but did not operate North Star Cement or Atlantic Gypsum. They were managed by Lundrigans Limited, with an option to buy. Lundrigans exercised that option on 1 January 1979.

exploration and development on alienated lands. There are four types of land tenure and mineral rights in Newfoundland.[4]

i) Private lands are Fee Simple Grants and Reid Lots granted under the 1872 and 1930 Crown Lands Acts (which are no longer in effect). Fee simple grants entitle the holder to all mineral rights in the area in perpetuity and without rental, provided that a certain amount of money is spent on the area in the first five years of ownership. Reid Lots consist of land granted to the Reid Newfoundland Company in the late 19th century in exchange for completing the Trans-Island Railway.

ii) Crown lands are land in which the mineral rights are held by the province unless leased or granted as concessions. The most recent act governing their alienation is the Mineral Act and Quarry Materials Act of 1976.

iii) Crown reservations are areas in which the mineral rights are withheld from staking unless declared open in the Gazette. They may also be released for exploration and development through agreement from the province.

iv) Company concessions are lands held by private companies, as granted by the province, and are exempt from the Crown Lands Acts. If the concession is surrendered by the company, it reverts to the government.

In the past, company concessions have been the most important method of alienating mineral rights. The Smallwood government felt that concessions were superior to the general claiming system because they were more apt to stimulate mineral (and other) development. The reasons given were that:

i) concessions gave a company control over a larger area and were thus more conducive to airborne surveys and exploration in general;

ii) there were historical precedents in railway construction and the forestry industry;

iii) the government could specify the terms of the concession in great detail and could thus, for example, have access to information on the company's activities, stipulate the exact amount to be spent on exploration, etc.;

iv) they encouraged mining activity in remote regions of the province.

The major disadvantages have been the loss of government revenue due to the minimal taxes or royalties levied on the concessions, a possible reduction of interest in exploration due to the distribution of the concessions, and the holding of vast acreage by a small number of companies.[5]

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4. This section is taken directly from Prince (1977), pp. 16-17.
5. These were some of the conclusions drawn by the Royal Commission on the Economic State and Prospects of Newfoundland and Labrador in its Report (1967). See Prince (1977) for more criticism of the system.

From 1949 to 1975, 39 concession agreements were made; however, a few companies held most of the favourable mineral land. The largest concession was to the British Newfoundland Corporation (BRINCO), which in 1953 was granted 60,000 square miles (almost 40 percent of the province). After the first five years, BRINCO was to surrender 18,000 square miles, then an additional 9,600 square miles in the three subsequent five-year periods. Other concessions have been granted to other companies including NALCO and Labrador Mining and Exploration Company. The rationale given by the Smallwood government was that concessions promoted long-term development and economic stability in the province. As noted before, at least one agency reviewing this policy (the Royal Commission, 1967) found these arguments to be invalid for the 1960s and suggested that concessions contribute to slow growth in mining over time.

The major legislative act regarding mineral rights has been (until 1976) the Crown Lands (Mines and Quarries) Act of 1951. Similar to legislation effective in Quebec and Ontario at the same time, it sets out the conditions for staking and claiming crown land. The fees payable for both activities were minimal as shown below. The leasing system proceeds as follows. First, a miner's permit is required for anyone wishing to stake and claim mining land. A claim, which consists of a 40-acre square, can be held indefinitely, but must be renewed annually. Claims up to a total acreage of 240 acres (6 claims) can be turned into a development licence for 50 cents per acre and a small fee. The licence is for one year and may be renewed annually. For $5 per acre, a development licence can be turned into a mining lease which can be held for 50 years. The mining lease requires a $10-per-acre work commitment within the first two years. See table 14 for a record of the number of mining claims staked annually from 1949 to July 1979.

In 1951, the government also enacted the Undeveloped Minerals Areas Act. The act was designed to retrieve land from private leaseholds when, at any time, the mines minister felt that insufficient money had been spent in developing a mineral area in the preceeding ten years. Prospecting permits and development licences could then be issued to other companies. Provisions were made to give the original owner a share of any profits derived from the property. The extent of the share has varied over time (and is currently zero).The act has been used a number of times and has, for example, led to production from areas which might otherwise have been undeveloped. For example, some companies are now producing minerals on land acquired through the Undeveloped Minerals Areas Act (Flintkote, Atlantic Gypsum, Consolidated Rambler).

Table 14

NUMBER OF MINERAL CLAIMS RECORDED IN NEWFOUNDLAND, 1949-79

	Number of Claims
1949	257
1950	298
1951	45
1952	348
1953	-
1954	3
1955	46
1956	60
1957	23
1958	12
1959	50
1960	42
1961	30
1962	-
1963	867
1964	105
1965	1
1966	73
1967	30
1968	40
1969	20
1970	9
1971	42
1972	35
1973	490
1974	1,455
1975	2,711
1976	891
1977	2,045
1978	8,876
1979	2,241[a]

Source: Newfoundland, Department of Mines and Energy.

[a]1 January - 13 July.

The Moores and Peckford governments have been in the process of revising the system of mineral land tenure. Newfoundland, along with Quebec, has been a leader in the country in terms of regaining control of its mineral resources. A number of task forces and studies have been undertaken. Some of the more important changes that have resulted have been to abolish the granting of concessions, to make additional land available for claim-staking, to retrieve mineral rights from claimants who had undertaken no mining exploration, development, or extraction prior to 1974 (through the Mineral (Vesting in the Crown) Act), to limit the rights of previously-granted concessions, and to revoke completely the rights to some existing concessions (Canadian Javelin Ltd.'s rights to the Julienne Lake iron ore deposit in Labrador). All of the changes have culminated in the new Mineral Act and Quarry Materials Act of 1976.

The change in government philosophy regarding mineral rights has had a substantial effect on mineral claims recorded. Table 14 shows that the number of claims jumped from 490 in 1973 to 1,455 in 1974 (the first year of many of the policy changes), and increased again in 1975, 1977, and 1978. Even 1976, a relative low with its 891 claims, had more claims than any year prior to 1974. Although the province cannot be assured of an increase in the number of discoveries of economically viable mineral deposits as a result of this large increase in claim-staking, it would appear that the increase in exploratory activity would increase the probability of discovery.[6]

Generation of Public Revenue

There are at least four objectives for provincial taxation of minerals:

i) to collect a share of the rent generated by minerals owned by the public;
ii) to raise revenue for the provision of government services;
iii) to redistribute income;
iv) to correct resource allocation distortions in the economy.

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6. The conjecture is offset to some extent by the amount of exploration expenditures. These expenditures have generally decreased in real terms since 1971 (see table 9). As many observers (e.g. Mackenzie and Bilodeau (1979)) feel the real dollar value of exploration expenditures is one of the most significant determinants of a successful discovery, the decreasing real value of these expenditures could have a dampening effect in Newfoundland, despite the large increase in claim-staking.

In the past, the Newfoundland government appeared to be concerned with only the second objective (as will be seen) and, even so, collected very little revenue relative to other provinces. More recently, as we have discussed in the previous section, the government has been attempting to reclaim ownership of its minerals. As a result, it is also presumably interested in collecting a share of the rents. Before we examine the experience of the government in collecting revenue, let us review some of the notions of economic rent generated by minerals, and how taxation can be used to collect the rent.

What then is economic rent? For a competitive mining industry, both of the following definitions could be applied: 1) rent is a return to a depletable natural resource whose supply is relatively fixed in the short run but can change over time due to exhaustion and new discoveries; 2) rent is the return accruing to infra-marginal firms because of the existence of heterogeneous orebodies; that is, there will be a marginal mine which just covers its cost given the price of ore. All other firms which have lower costs due to higher quality deposits, for example, will therefore earn rents, or excess profits, in the Ricardian sense. If the industry is not competitive, rents may also accrue due to monopoly control and other market imperfections. It is important to note that resources are not fixed factors of production and do have an opportunity cost at every point in time; i.e., at every point in time, a decision is, in effect, made to produce today or hold the resource in the ground. Resource rents are thus the excess profits after <u>all</u> costs of extraction are netted out, including the opportunity cost of capital.

We cannot, however, generally compute the return to minerals except as a residual. If a market for mining claims existed where all claims exchanged represented proven but unmined ore, the value of minerals of a given quality could be established before production occurred. This is one reason for the changes in mining leasing systems: for example, in Alberta's oil and gas industry, to one of competitive bidding. If rents are calculated as excess profits, a tax on them will generally not affect the allocation of productive resources. However, most provincial mining taxes do not use excess profits as their tax base and thus tax more than just economic rents, especially if the tax rates are relatively high.

In reforming its mineral tax system, any government should try to implement a system which captures rent, if it exists, and does not distort resource allocation. To determine whether rent exists in the Newfoundland mining industry, a tax which, for example, allows full deductibility of all factor payments (including a return to capital) would be advisable.[7] In the case of Newfoundland, we suspect that few rents exist in the industry. It would be a difficult task to check this without access to company financial statements. The government, however, through its tax system, could determine if rents exist and, if so, could capture a share of them. To do this the tax system should be as allocatively neutral as possible, and tax only the return accruing to the companies after all costs of operation are deducted. There are of course many implementation problems: for example, the possibility of artificial pricing of goods traded between related firms, a discussion of which is beyond the scope of our report. As we have not seen the government's current plans for taxation reform, we cannot comment on whether it plans to move in the direction of capturing rents, although the 1979 Budget indicates that this may happen. We turn now to a review of the tax systems and revenues which obtained over the past thirty years.

Table 15 shows, for the fiscal years 1949 to 1977, the amount of revenue derived from mineral royalties and leases. The most important feature of the table is the substantial increase in nominal revenues obtained from both categories (and real revenues from royalties) over the past four years. From 1974-75 to 1977-78 (estimate), revenues from both royalties (taxation) and leases have approximately tripled in nominal terms, going from $4 to $11 million for royalties and $102,600 to $312,000 in the case of leases.

A second point can be made, however. In Newfoundland, the public's share of total mineral revenues is still far below that of other mineral-producing provinces. Table 16 shows the value of mineral production in each province for 1975 to 1977, the total public revenues from mining for associated fiscal years, and public revenue as a percent of the value of production. Newfoundland ranks among the lowest; the question is: why? One possible explanation relates to the marginal nature of most Newfoundland mineral deposits. Another is that the systems of taxation and leasing in Newfoundland are simply more favourable to private companies than those of other provinces.

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7. See Olewiler (1979) for a discussion of the allocative effects of mining taxes.

Table 15

NEWFOUNDLAND PUBLIC REVENUES FROM MINING, 1949-78[a]
(Dollars)

Year[b]	Mineral Royalties	Mineral Leases	Total	
			Current	Constant[c]
1949-50	NA	NA	454,636	229,300
1950-51	NA	NA	175,629	83,200
1951-52	NA	NA	415,723	173,100
1952-53	556,078	6,186	562,264	248,800
1953-54	274,214	4,661	278,875	126,400
1954-55	109,716	9,303	119,019	54,800
1955-56	140,124	9,526	149,650	68,400
1956-57	510,715	9,948	520,663	230,800
1957-58	1,135,832	17,083	1,152,915	507,000
1958-59	1,282,004	14,926	1,296,930	509,300
1959-60	347,846	12,159	360,005	156,100
1960-61	1,151,031	8,903	1,159,934	502,400
1961-62	934,746	14,640	949,386	406,900
1962-63	973,646	20,360	994,006	414,200
1963-64	1,031,381	43,537	1,074,918	439,500
1964-65	636,596	43,494	680,090	277,100
1965-66	2,350,000	20,000	2,370,000	946,000
1966-67	2,650,000	74,000	2,724,000	1,050,000
1967-68	3,250,000	75,000	3,325,000	1,259,000
1968-69	2,816,000	75,000	2,891,000	1,071,000
1969-70	3,490,000	75,000	3,565,000	1,262,000
1970-71	3,223,000	69,000	3,292,000	1,149,000
1971-72	3,947,000	100,000	4,047,000	1,396,000
1972-73	3,605,000	92,000	3,697,000	1,191,000
1973-74	1,700,000	99,400	1,799,400	447,400
1974-75	4,000,000	102,600	4,102,600	899,400
1975-76	7,800,000	193,000	7,993,000	1,626,000
1976-77	10,040,000	301,000	10,341,000	2,018,000
1977-78	11,000,000	312,000	11,312,000	2,022,000

Sources: 1949-75: Newfoundland, Estimates of Revenue and Expenditures for the Financial Year 1 April - 31 March.
1976-77: Newfoundland, Budget.

[a]For years: 1949-50-to 1964-65 the figures are actual revenues;
1966-67 to 1973-74 the figures are revised estimates and 1975-76, 1976-77;
1965-66, 1974-75, and 1977-78, the figures are estimates.

[b]Fiscal year ending 31 March.

[c]Constant 1935-39 dollars; nominal revenues are deflated by the Canadian wholesale price index (1935-39 = 100).

NA = Not available.

Table 16

TOTAL VALUE OF MINERAL PRODUCTION,[a] 1975-77, AND TOTAL PUBLIC REVENUE FROM MINES,[a] FISCAL YEAR ENDING 31 MARCH 1976-78, BY PROVINCE

	1975	1975-76				1976	1976-77		1977	1977-78	
	Value of Production ($ Thousand)	Statistics Canada Revenue[b] ($ Thousand)	Public Accounts Revenue ($ Thousand)	Statistics Canada Revenue/ Value (Percent)	Public Accounts Revenue/ Value (Percent)	Value of Production ($ Thousand)	Public Accounts Revenue ($ Thousand)	Public Accounts Revenue/ Value (Percent)	Value of Production ($ Thousand)	Public Accounts Revenue ($ Thousand)	Public Accounts Revenue/ Value (Percent)
Newfoundland	550,959	6,922	6,866[c]	1.3	1.3	745,029	NA	NA	867,146	14,755[c]	1.7
Prince Edward Island	1,787	-	NA	-	NA	1,684	NA	NA	1,863	NA	NA
Nova Scotia	101,626	1,262	1,492[d]	1.2	1.5	127,231	1,984[d]	1.6	159,426	2,213[d]	1.4
New Brunswick	231,550	2,593	2,590[e]	1.1	1.1	238,477	719[e]	0.3	289,310	1,290[e]	0.5
Quebec	1,232,101	45,727	45,518[f]	3.7	3.7	1,492,901	16,787[f]	1.1	1,674,927	43,358[f]	2.6
Ontario	2,342,354	64,524	63,394[g]	2.8	2.7	2,701,682	41,222[g]	1.5	2,963,188	23,443[g]	0.8
Manitoba	498,793	8,105	17,056[h]	1.6	3.4	477,835	20,208[h]	4.2	523,300	14,453[h]	2.8
Saskatchewan	438,029	112,551	113,685[i]	25.7	26.0	511,153	86,966[i]	17.0	606,131	109,019[i]	18.0
Alberta	363,434	5,324	5,336[j]	1.5	1.5	425,538	10,617[j]	2.5	418,464	19,432[j]	4.6
British Columbia	1,108,520	43,576	46,000[k]	3.9	4.2	1,157,235	60,694[k]	5.3	1,277,578	39,040[k],[p]	3.1
Canada	7,280,062	290,584	..	4.0	..	8,190,831	..	..	9,209,233	..	..

Sources: Statistics Canada, General Review of the Mineral Industries (Mines, Quarries and Oil Wells), 1976 (26-201);
Statistics Canada, Canada's Mineral Production (Preliminary Estimate), 1978 (26-202);
Statistics Canada, Provincial Government Finance, Revenue and Expenditures, 1975, Fiscal Year Ending March 31, 1976 (68-207);
Public Accounts for the provinces of Newfoundland; New Brunswick; Quebec; Manitoba; Saskatchewan; Alberta; British Columbia (for 1975-76 and 1976-77);
Estimates, Nova Scotia;
Annual Report, Ontario Ministry of Natural Resources;
Estimates of Revenue and Expenditure (for 1977-78), British Columbia.

Table 16 (Continued)

Notes:

[a]For total minerals, less crude petroleum and natural gas industry.
[b]Includes personal direct taxes, business direct taxes, indirect taxes, and other revenue; excludes other current transfers from persons, and transfers from other levels of government. Direct taxes include personal and corporation income taxes, payroll taxes, succession duties, and levies imposed on logging and mining profits. Indirect taxes encompass sales tax, motor fuel taxes, insurance premiums, capital and place of business taxes, amusement taxes, and real and personal property taxes; privileges, licences, and permits purchased by business entities, such as natural resource exporation permits, are also regarded as indirect taxes. 'Other revenue' includes interest, dividends, and profits on foreign exchange, royalties and the remitted profits of government enterprises, and revenue not elsewhere specified. This is the latest fiscal-year data available from the published Statistics Canada source.
[c]Includes mining tax and royalties, and mineral leases revenue.
[d]Includes gypsum tax, coal royalties, other royalties, rentals - minerals, exploration claims, government drilling revenue, and miscellaneous revenue.
[e]Includes mining income tax, mining leases and licences, and royalties in mining,.
[f]Under the heading duties and permits, includes mining operation, mining village lots development, operation by mining leases, operation by mining concessions, prospectors, sale of raw precious metals, power storage, and general information.
[g]Includes mining tax, mines royalties, and fees and licences of nonrenewable resource concerns.
[h]Includes mining royalty tax, mining claim lease tax, mineral tax, mineral acreage tax, mineral tax (incremental), metallic minerals tax, and general mines and minerals department revenue not elsewhere specified.
[i]Includes mineral tax, and privileges, licences and permits from metallic minerals, potash and other minerals (excluding petroleum and natural gas).
[j]Includes coal rentals, coal royalties, other nonfuel mining fees and permits revenue, quarrying fees and permits revenue, and revenue under the Mineral Taxation Act.
[k]Includes coal, minerals and metals royalties, free miners' certificates, general mining receipts, mining tax, mineral land tax, and mineral resource tax.
[p]Preliminary estimate.

NA = Not available.
.. = Not applicable.

Until 1976, mining taxation in Newfoundland was basically on a company-by-company basis. This follows largely from the system of granting mineral rights through concessions. Many mining companies were exempt from any form of taxation in the Smallwood era, and others were charged very low rates. Most concessions gave companies a partial exemption from municipal and property taxation. A municipality could not levy taxes on a mining company in excess of 40 percent of the total taxes levied by the municipality. Some companies (iron ore producers) were exempt from provincial gasoline and fuel taxes. All Newfoundland crown corporations were exempt from provincial taxation.

The company-specific taxation system of Newfoundland prior to 1976 is illustrated by tables 17 and 18. Table 17 lists the companies subject to mining taxes and royalites, while 18 gives the royalty rates.

The preceding section discussed the system of mineral rights in detail. Table 19 illustrates the revenues received from land rentals from the companies that were granted concessions. As noted before, companies holding mineral claims paid a fee of 50 cents per acre. Tables 17 through 19 help to show why government mineral revenues were relatively low (even by Newfoundland standards) prior to 1976.

Reforms in the revenue systems were brought in by Moores government. A Royal Commission on Mineral Revenue was established in 1973, and reported to the government in 1974 that government revenues from mining taxes, royalties, and land rentals were grossly inadequate. Over the period 1964-73, the province received only 1.1 percent of the value of minerals produced in Newfoundland.[8] Income tax payments by mining companies were also found to be negligible. The commission recommended a number of changes, and two were incorporated in the Mining and Mineral Rights Tax Act of 1975.[9] The main feature of the new act is an increase in the mining tax from 5 percent of net income to 15 percent on 80 percent of the net income from mining operations. A second feature is a mineral rights tax on the rights-to-mine income of previous holders of mineral rights who transferred the rights to current operators. In the past, these new operators were subject to the same tax treatment as the previous holder had been. Although these changes have increased revenues, the system is still relatively favourable to mining in Newfoundland, as we illustrated earlier.

8. See Report, Royal Commission on Mineral Revenue (1974), pp. 1-6.

Table 17

MINING TAX - ROYALTY LEGISLATION, NEWFOUNDLAND

Legislation	Company	Revenue Designation
The Mining Tax Act	Advocate Mines Ltd.	Mining tax
	Consolidated Rambler Mines	Mining tax
	ALCAN - Newfoundland Fluorspar	Mining tax
	Green Bay Mining[a]	Mining tax
Labrador Mining and Exploration Co. Act	Iron Ore Co. of Canada	Mining tax (royalty)[b]
1905 Pulp & Paper Act	ASARCO - Buchans Unit	Mining tax (royalty)[b]
BRINCO & BRINEX Acts	Whalesback Project	Mining tax (royalty)[b]
NALCO Act	Wabush Mines (associated companies)	Royalty
Flintkote Co. of Canada Act	Flintkote Co. Ltd.	Royalty
Agreement under the Undeveloped Mineral Areas Act (Agreement)	Newfoundland Minerals Ltd.	Royalty
Electric Reduction Co. of Canada Act	Electric Reduction Co. of Canada	Royalty

Source: Prince (1977) p. 30.

[a]Green Bay Mining suspended operation in 1975.

[b]In these three cases, the royalty is given as 5 percent of net income. However, the definition of income for this purpose differs slightly from the definition of income for mining tax purposes. These are really share-of-profit royalties.

Table 18

SPECIFIC AND ESCALATED SPECIFIC ROYALTIES, NEWFOUNDLAND

Company	Rate
Newfoundland Minerals Limited[a]	30¢ per long ton of raw pyrophyllite sold 15¢ per long ton of milled pyrophyllite
Wabush Mines - Pickands Mather[b]	22¢ per long ton of iron ore products shipped. The royalty rate increases in the same proportion as the lower Lake Erie price of iron ore moves upward from $11.70 per ton.
Flintkote Co. of Canada	5¢ per ton of raw gypsum mined
Electric Reduction Co. of Canada	10¢ per short ton of silica removed
Julienne Lake Mining Lease Area[c]	32¢ per long ton of iron ore products shipped. The royalty rate increases in the same proportion as the lower Lake Erie price of iron ore moves upward from $11.70 per ton.

Source: Prin[illegible] (1977), p. 31.

[a]If other than pyrophyllite is mined, 8 percent of profits shall be paid.

[b]Under present legislation, if other than iron ore is mined, the Mining Tax Act applies but the rate is held at a maximum of 5 percent.

[c]This deposit is not yet developed.

Table 19

MINERAL LAND RENTALS, NEWFOUNDLAND

Company (Applicable Legislation)	Fees and/or Rentals	General Remarks
Advocate Mines Ltd. (Advocate Mines Confirmation of Agreement Act)	50¢ per acre per year on area under development licence. $5 per acre per year on area under mining lease.	Now holds a 50-square-mile development area in addition to the mining lease for the operating asbestos mine.
Anglo Newfoundland Development Company (Price Bros. Successor Co.) American Smelting & Refining Co. - Buchans (1905 Pulp & Paper Act)	None payable.	Land held under ninety-nine year lease and entitled to one renewal.
British Newfoundland Corp. (BRINCO) (British Newfoundland Corp. Act - Principal Agreement)	The company is required to pay government an amount equal to 8 percent of profits as defined in the Act.	To date there have been no profits for purposes of the Act and therefore no rental has been paid in respect of the area held under concession.
British Newfoundland Exploration Ltd. (Statutory Agreement issued under the BRINCO Act)	50¢ an acre per year for land held under development licence. $5 an acre per year for land held under mining lease.	The company operated the Whalesback copper mine. This property has been subleased to Green Bay Mining.
Commodore Mining Co. (Commodore Mining Agreement Act)	50¢ per acre per year for land under development licence. $5 per acre per year for land held under mining lease.	The Concession Agreement has now expired. The development licence requested by the company has not yet been approved.
Electric Reduction Co. of Canada (Electric Reduction Co. of Canada (Agreement) Act)	50¢ per acre per year for the land held under mining lease.	Silica is produced for the ERCO plant on a quarry lease which is for a term of fifty years.
Flintkote Co. of Canada Ltd. (The Government - the Flintkote Company - Atlantic Gypsum (Authorization of Agreement) Act)	50¢ per acre per year paid annually for all land held under mining lease.	Mining leases were selected from the Concession area and are for a term of ninety-nine years and are renewable on request.
Labrador Mining & Exploration Co. Ltd. (Iron Ore Company of Canada) (Labrador Mining and Exploration Co. Act)	50¢ per acre paid annually for every acre held under mining licence. 50¢ per acre paid annually on mining leases.	The company holds 919 square miles under mining licences and 61 square miles in mining leases. Mining licences are for a forty-year period and mining leases are for a thirty-year period. Both licence and lease areas are renewable on request.

Table 19 (Continued)

MINERAL LAND RENTALS, NEWFOUNDLAND

Company (Applicable Legislation)	Fees and/or Rentals	General Remarks
Newfoundland Zinc Mines (Leitch Gold Mines Agreement Act and amendments thereto)	50¢ per acre for land under development licence. $5 per acre per year for land held under mining lease.	The concession area covered 472 square miles. The company has applied for a mining lease for zinc deposits in the Daniel's Harbour area.
Newfoundland Fluorspar Works - ALCAN (The Crown Lands Act)	$300 per year on a ninety-nine year lease. Other land held in fee simple.	Approximate area of land controlled by the company is 25 square miles.
Newfoundland & Labrador Corp. and Associates (NALCO Act)	8 percent on profits excluding revenue from iron ore mining from land held under concession. 10¢ per acre per year for lands held under mining lease.	Other than mining lease on which Wabush Mines are operating, no rental has been paid.
Newfoundland Minerals Ltd. (Agreement issued under the Undeveloped Mineral Areas Act)	50¢ per acre per year for land defined as the mineral area.	The company has the right to hold some 1,240 acres for ninety-nine years.
Price Bros. and American Smelting and Refining Co. joint venture (Authorization of Agreement Act, Government, Price Bros. ASARCO)	50¢ per acre for land under mining lease.	Lease area is 48 square miles.

Source: Prince, (1977), pp. 27-29.

The 'Blueprint' and Beyond

The only specific reference in the Blueprint to mineral leasing and revenue policies is a brief comment that:

> mineral exploration has increased under new policies adopted during the past four to five years to annual expenditures of $6.5 to $7.0 million but is somewhat constrained by the fact that many of the high potential areas are still tied up under long-term concessions. The proposed Mineral Holdings Impost Act is expected to encourage much increased exploration in these areas over the next five years. (Pp. 12-13.)

Further stimulus to exploration is also expected to come from the continuation of the program of regional geoscientific surveys funded under the Federal-Provincial Mineral Development Agreement.

Since the publication of the Blueprint, taxation of mining operations has emerged once again as a public policy issue in Newfoundland. The capture of economic rents from mining was debated during the election campaign in April and May. The Peckford Government continued the theme in the Speech from the Throne on 12 July, stating that the government '. . . will ensure by appropriate legislation that companies developing our resources pay . . . a fair share of their profits in return for access to the Province's natural resources' (p. 3). The 1979 Budget (19 July) states that the province is 'not receiving a fair economic rent' from its natural resources (p. 2). We have been informed that mining tax arrangements are to be reviewed by the provincial government. It is expected that mining taxes will be increased, but the nature and scope of the increases are not yet known. Thus, it is premature to indicate what the implications will be for mining operations in the province.

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9. See Prince (1977), p. 32, for a list of the Royal Commission's recommendations.

5. MINING ACTIVITIES IN NEWFOUNDLAND: CURRENT STATUS AND POTENTIAL FOR EXPANSION

Introduction

The objective of this report is to assess the job creation potential in the Newfoundland mining industry over the period to 1988. This chapter addresses this issue by examining the current status of mining operations in the province and their potential for expansion. A disaggregated procedure is used, with a case-by-case description of the operations, output and employment of existing mines. The potential for each operation's continued production and new mine development is discussed.

The discussion of individual mining operations is organized into a number of mining industry sub-groupings. The principal groups are iron mining, base metal mining, and nonmetal mining. Brief attention is also given to structural materials producers. Finally, the prospects for the development of and employment in a uranium industry in the province are examined.

In this chapter we develop trend, optimistic and realistic employment projections to 1983 for each of the mining industry groups. Our projections are derived by using the results of the cross-section analysis in chapter 6, and from information pertaining to particular mining operations in the province. This sector-by-sector, operation-by-operation approach provides the building blocks for constructing in chapter 7 our aggregate employment projections for the province's mining industry.

Iron Mining

The Mining Companies: Ownership, Output, and Employment

The province's iron mining operations are located in Labrador West. There are two operating mining companies producing iron ore products from open pit mines.

The companies are:

i) The Iron Ore Company of Canada, a privately-owned company with mines located at Knob Lake-Schefferville and Labrador City;

ii) Wabush Mines, a joint venture, operating a mine located at Wabush.

Both operations are vertically integrated into North American steel companies. The structure of their corporate ownership as it existed in 1976 is shown in figure 2.

The data in table 20 set out the shipments of the IOC and Wabush Mines by type of product and by point of production (shipment) for the period 1972-78. IOC is by far the larger producer of iron ores. Together these companies produce half of Canada's iron ore output.

Table 21 shows the skill-occupational breakdown of the IOC mine and mill work force for 1975. This is the latest year these data have been published. A similar mine and mill distribution of the work force is not available for the Wabush Mines operations.

Within Newfoundland, the IOC employs about 80 percent of the work force in the iron mining sector. Industry employment by company and location for 1973-77 is produced as table 22.

The Iron Ore Company of Canada

Capacity

The IOC is the largest iron ore producer in Canada. The company operates four mines in the Knob Lake-Schefferville area and three mines at Carol Lake (Labrador City). All mines are open pit operations. The mining season at Knob Lake is 260 days (ore) -- from April to mid-November -- and 365 days (waste); Carol Lake operates year-round (ore and waste). Processing facilities at Labrador City consist of a concentrator with installed capacity of 21.8 million tons per year and a pelletizing plant with a capacity of 10.3 million tons per year. At Sept-Iles, the company has a 6 million-ton-per-year pelletizing plant to upgrade and pelletize ores from the Schefferville mines, and owns and operates port facilities for loading its iron ore products.

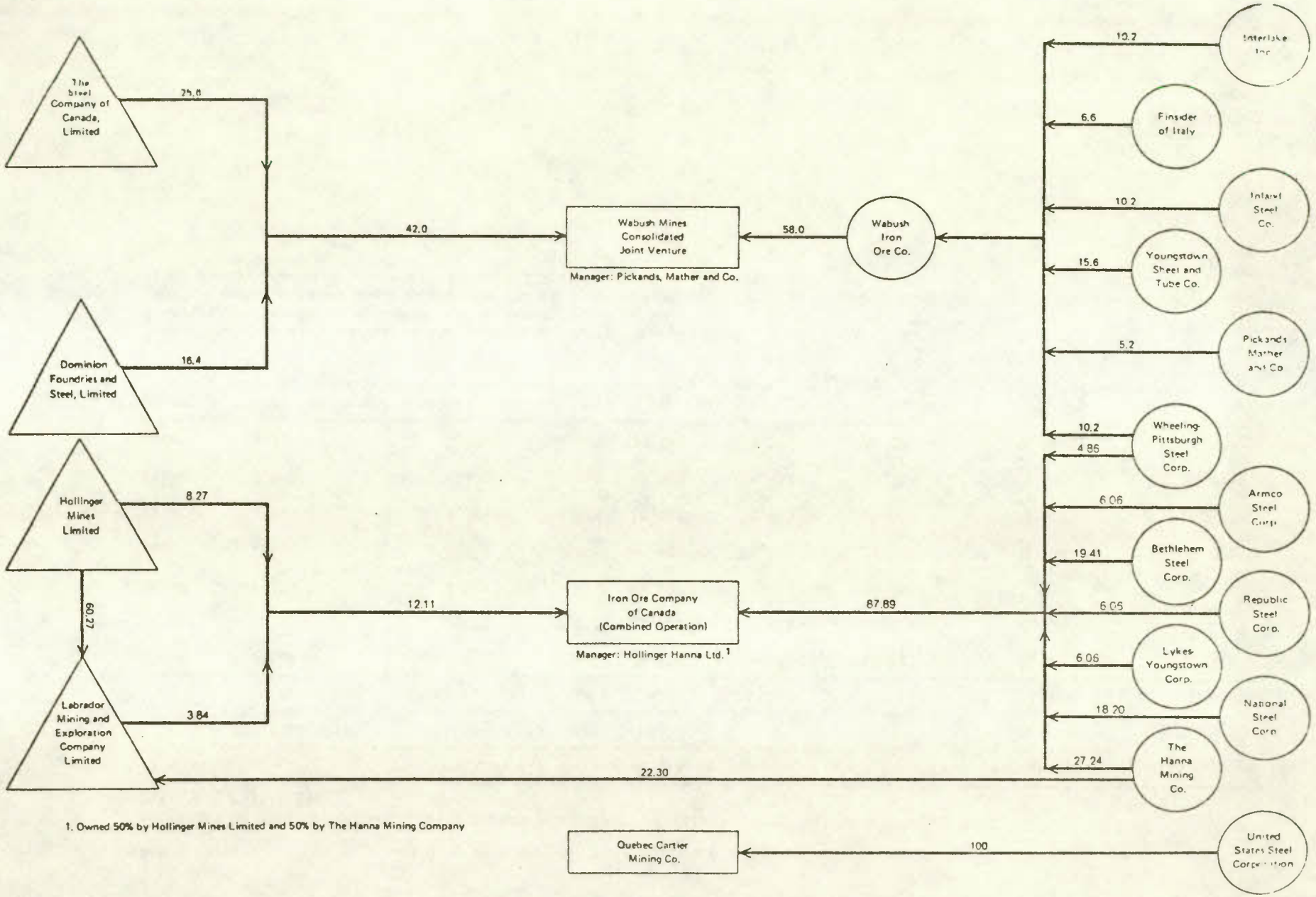

Figure 2. Ownership of the iron ore industry in the Labrador geosyncline, 1976

Source: Energy, Mines and Resources Canada, Iron Ore, Mineral Bulletin MR 148 (Ottawa, 1976) p. 2.

Table 20

SHIPMENTS OF IRON ORE PRODUCTS BY THE IRON ORE COMPANY OF CANADA AND BY WABUSH MINES, 1972-78
(Thousand Metric Tons)

	The Iron Ore Company of Canada						Wabush Mines	
	Schefferville Direct-Shipping Ores	Labrador City (Carol Lake)			Sept-Iles Pellets	Total IOC	Sept-Iles Pellets	Total
		Concentrates	Pellets	Total				
1972[a]	5,127	587	8,113	8,700	-	13,827	5,395	19,225[b]
1973[a]	7,326	3,109	9,877	12,986	378	20,712[c]	5,457	26,236[d]
1974[a]	6,673	4,514	7,693	12,207	1,915	20,795	5,532	26,346[b]
1975	4,134	6,462	9,161	15,623	3,005	22,762	3,258	26,020
1976	4,125	7,301	10,085	17,386	3,585	25,096	5,487	30,583
1977	3,069	6,435	11,158	17,593	4,552	25,214	5,640	30,854
1978	2,960	3,836	6,649	10,485	3,540	16,985	4,349	21,334

Sources: Energy, Mines and Resources Canada, Canadian Minerals Yearbook selected years;
Canada, Department of Energy, Mines and Resources, Canadian Mineral Survey, 1978, p. 55 (reprinted from the Canadian Mining Journal, February 1979).

[a]Converted from data source at the conversion factor 1 metric ton = 1.016 long tons.
[b]Includes shipments of concentrates by Wabush Mines ex Sept-Iles.
[c]Includes shipments of concentrates by IOC ex Sept-Iles.
[d]Includes shipments of concentrates by IOC and Wabush Mines ex Sept-Iles.

Table 21

SKILL/OCCUPATIONAL COMPOSITION OF THE WORK FORCE AT THE MINES AND MILLS OF THE IRON ORE COMPANY OF CANADA, 1975
(Number)

MINES:

	Knob Lake - Schefferville	Labrador City (Carol Lake)	Total
Staff			
Managerial	66	69	135
Other	41	94	135
Total staff	107	163	270
Hourly-Rated Workers			
Drillers and blasters	57	86	143
Heavy equipment operators	207	277	484
Other operators, shovel oilers, dewaterers	57	71	128
General labour	20	26	46
Other	75	14	89
Total hourly-rated workers	416	474	890
Mechanical-electrical[a]	146	379	525
Total mine work force	669	1,016	1,685

MILLS:

	Sept-Iles	Labrador City (Carol Lake)	Total
Staff			
Managerial	13	58	71
Other	32	67	99
Total staff	45	125	170
Crew			
Skilled[b]	110	293	403
General operators, helpers, labour	13	131	144
Other	1	142[c]	143
Total crew	124	566	690
Total mill work force	169	691	860

Source: Canadian Mining Journal, Reference Manual and Buyers' Guide, 1967-77, pp. 67, 87.

[a]Attached to open pit.
[b]Includes some unskilled labour.
[c]Includes 138 contractors' men.

Table 22

EMPLOYMENT IN THE IRON ORE INDUSTRY, NEWFOUNDLAND AND LABRADOR, 1973-77

	1973	1974	1975	1976	1977
Iron Ore Company of Canada: Carol Lake	2,373	2,908	2,999	2,973	3,020
Knob Lake	510	725	781	616	751
Total	2,883	3,633	3,780	3,589	3,771
Wabush Mines	824	817	793	822	829
Total	3,707	4,450	4,573	4,411	4,600

Source: Newfoundland, Department of Mines and Energy.

The average work force in 1978 for the complete project was 6,706. This was distributed geographically as follows: Schefferville, 883; Carol Lake, 2,809; Sept-Isles, 3,014.[1] These average figures are low, however, due to the four-month strikes that began on 9 March and ended on 17July.

Corporate Organization and Ownership

Massive iron ore deposits in the Labrador Trough were known to exist as early as 1893. They remained largely uninvestigated, however, until Hollinger conducted exploration work in the area between 1936 and 1938. It was not until a decade later that the decision was made to proceed with mine development.

In 1949 the IOC was organized as a private company, integrated into North American steel companies. The principals in the formation of the company were the Hollinger, M.A. Hanna, and Labrador Mining and Exploration interests, and several U.S. steel companies. In 1958 the Bethlehem Steel Corporation also acquired an interest. The structure of corporate ownership in 1976 is shown in figure 2. Although changes have occurred in the percentage distribution of equity ownership in IOC, there has been little change in the composition of the corporate participants since the formation of the company.

1. Details on the operations of IOC are drawn mainly from Iron Ore Company of Canada, Iron Ore Company of Canada (1979), and Northern Miner, Canadian Mines Handbook, 1979-80.

The Development Program

The IOC project as it stands in 1979 is the product of three distinct development phases. The first phase (1950-54), which marked the establishment of the company as an iron ore producer, involved: the development of mine and town sites at Knob Lake-Schefferville; the construction of the 357-mile Quebec North Shore and Labrador Railway (QNS&L) to link the Schefferville mining district with the ore receiving and shipping terminal at Sept-Iles; construction of an ore receiving-shipping terminal at Sept-Iles with an ore-handling capacity of 10 million tons per year; and construction of hydro-electric plants to supply power requirements at Schefferville and at Sept-Iles.

The second phase (1958-68) involved the company's operations at Carol Lake. Not only did this occasion a major expansion of the company's operations to new mine sites, but it also expanded the range of its iron ore products. The mines at Schefferville had produced only direct-shipping ores, but with the development of the Carol Lake deposits IOC became a producer of concentrates and pellets. The decision to proceed with mining operations was made late in 1958. During 1959 and 1960 a pilot plant was operated on site and its findings were used to design the concentrator plant. Mine development began in 1960, and the mining facilities and concentrator were completed and in operation by 1962. In 1961 the decision was made to build a pelletizing plant adjacent to the concentrator; the pellet plant was completed in 1963. Infrastructure requirements for the Carol Lake project included a townsite and a 38-mile branch line to the QNS&L trunk line.

In 1965, an expansion program at the Carol Lake operations was begun. Completed in 1968, this project included an increase in mine capacity to 25 million tons of crude ore per year, expansion of the concentrator from 7 to 10 million tons of concentrate per year, and an increase in pelletizing capacity from 5.5 to 10 million tons per year. A new dock was constructed in 1968-70 at Sept-Iles to handle the increased tonnages of iron ore products.

In 1970, plans for the third expansion phase were announced. The basic program was completed in 1973. It more than doubled concentrator capacity at Labrador City to 22 million tons of concentrates per year, from which 10.3 million tons

of pellets can be produced, leaving 10.4 million tons for sale as concentrate. Also, a new concentrator and pelletizing plant with a capacity of 6 million tons of pellets per year was built at Sept-Iles to upgrade and pelletize low-grade ores from the Schefferville area. The decision to pelletize the Knob Lake-Schefferville ores was necessary in order to avoid closing down the company's mining operations there, since the ores in their natural state had fallen below the minimum 54-55 percent iron content required for marketing as direct-shipping ores.

The company encountered considerable difficulties in both the expansion of its Labrador concentrator and the Sept-Iles pellet plant. Technical difficulties at the concentrator expansion in Labrador City were compounded by the loss of many skilled tradesmen as a result of a three-month strike in 1972 (16 June to 13 September). This shortage of skilled tradesmen emerged at a critical time, just as the concentrator plant was coming on stream. The technical problems have since been overcome and the project is approaching optimum staffing.

The technical problems at Sept-Iles, which arise from the fact that the chemical properties of the Knob Lake ores do not make them amenable to pelletizing, have not been resolved. Consequently, the pellet plant has been able to attain only 65 to 80 percent of rated capacity.

As of 1979, the IOC appears to have reached a plateau in its production capacity. No new expansion plans are forthcoming for the foreseeable future.

Markets and Reserves

The distribution of product shipments by the IOC is recorded in table 20. These figures show that pellets are the most important product in the company's operations, followed in order by concentrates and direct-shipping ores.

The company has two principal markets for its iron ore products. First, part of the output is purchased by the owners, mainly in the form of pellets. Second, concentrates are sold to European and Japanese steel interests. Sales in both markets are on a long-term contract basis.

From the beginning of the IOC operations, the owner-consumers contracted to buy ores from the company on the basis of a predetermined formula. The contracts included provision for short-term variations in iron ore purchases in accordance with changes in capacity utilization in the North American steel industry. The expansion of the 1970s was predicated on the continuation of these contracts, and at present these contracts run until 1996. Also, in 1970, the company entered into long-term contracts for approximately 10 millions tons of concentrates per year, half to Japanese and half to European steel interests. Although the contractual arrangements for concentrates sales are not as rigidly prescribed as in the case of pellet sales to the North American market, markets for IOC's products are reasonably assured for the long term.

There will be no reserve constraints on IOC's ability to supply iron products for the long term. Ore reserves at Knob Lake-Schefferville are about 400 million long tons, and at Carol Lake reserves are in excess of 1 billion tons. Another source has estimated that reserves at Schefferville will not be depleted until 1995, and at Carol Lake not until 2100.[2] For all of Newfoundland, crude ore reserves as of January 1976 have been estimated at 3.8 billion tons for producing mines, and 4.1 billion tons in undeveloped deposits.[3]

Wabush Mines

In time and in scale, Wabush Mines is the second iron mining enterprise in Labrador. It is an unincorporated joint venture with Canadian, American and Italian steel interests as partners. Pickands Mather and Company manages the project. The structure of corporate ownership of the Wabush Mines project as of 1976 is shown in figure 2.

2. See Canadian Mines Handbook, 1979-80, p. 144 and Energy, Mines and Resources (1976b), p. 7. Broadly defined, reserves refer to the material that can be economically mined given current and expected price, technological, and cost conditions. Reserves can be expressed in terms of crude ore or metal contained in the ore. This distinction should be kept in mind when interpreting data on estimates of reserves.
3. Energy, Mines and Resources (1977a), p. 11.

Wabush Mines has its origins in the formation of the Wabush Iron Company Limited in 1957 by Pickands Mather, to explore and take a long-term lease on iron ore properties in the Wabush Lake area. In 1960-61 a pilot plant project was carried out and in 1962 construction of the mining project got under way. In the same year the company, Wabush Mines, was organized to take over all operations of the project from Wabush Iron. The total project was completed and put into operation by 1965. The project is located partly in Labrador, partly in Quebec. The Labrador portion of the project comprises the mine (Scully), a 5.3 million ton-per-year concentrator, and housing facilities, all in the Wabush Lake area. A pelletizing plant with a capacity of 4.9 million tons per year and ore-handling port facilities were constructed at Pointe Noire (near Sept-Iles). In 1968, pellet capacity was increased to 6 million tons per year.[4] Production capacity has not been augmented since then, and no expansion plans appear to be in the offing.

Wabush Mines produces only pellets. Production for 1972-78 is shown in table 20. The entire output is consumed by the participating partners in proportion to their equity ownership.

No current data on ore reserves are available. It is estimated, however, that there are sufficient reserves to sustain the operation until the year 2040 or 2050. Another source has estimated ore reserves to be about one billion tons (1973), sufficient to meet output requirements until about 2005.[5]

A Perspective on Employment in the Labrador Iron Ore Industry

The regional employment impact of the post-1950 development of the iron mining industry in the Labrador Trough has been noteworthy in two respects. First, the industry gave birth to and produced the rapid growth of the region of Labrador West. Second, the employment (and other) benefits of IOC and Wabush Mines have been distributed between Newfoundland and Quebec. This section elaborates on these features.

4. The discussion of Wabush Mines is based on information contained in Department of Mines and Technical Surveys (May 1966) and Canadian Mines Handbook, 1979-80.
5. Compare Canadian Mines Handbook, 1979-80, p. 287 and Energy, Mines and Resources (1976b), p. 7, with Newfoundland, Mineral Resource Management (July 1973), pp. 5-6.

The census population data series presented in table 23 for the communities located near the mines in Labrador and for Sept-Iles indicate the rapid rate at which these mining-based settlements have grown. The population data also reflect the timing and location of the rapid-growth phases in production capacity. The growth period at Schefferville was between 1951 and 1961, during the development of the mine and the establishment of IOC as an iron ore producer. Since 1961 population has been static, as subsequent expansion at IOC took place in Labrador City and Sept-Iles.

The development and two expansion programs of the IOC at Carol Lake are reflected in the constant and rapid rate of population growth of Labrador City. Similarly, the very slow growth of Wabush conforms to the unchanged mine-mill capacity of Wabush mines since 1965.

Table 23

CENSUS POPULATION OF LABRADOR CITY, WABUSH, SCHEFFERVILLE AND SEPT-ILES 1951-76

Census Year	Labrador City	Wabush	Schefferville	Sept-Iles
1951	-	-	-	1,866
1956	-	-	1,632	5,592
1961	386	151	3,178	14,196
1966	5,037[a]	2,669	3,086	18,950
1971	7,622	3,387[b]	3,271	24,320[c]
1976	12,012	3,769	3,429	30,617

Sources: Government of Newfoundland and Labrador, Executive Council, Central Statistical Services, Historical Statistics of Newfoundland and Labrador, volume II(1) (July 1977);
Statistics Canada, 1971 Census of Canada (92-702); 1976 Census of Canada (92-802, 92-803).

[a]Local Improvement District, created in 1961.
[b]Local Improvement District, created in 1967.
[c]Boundaries expanded for 1971 census.

The most dramatic growth in population in those communities associated with the Labrador iron ore industry has occurred at Sept-Iles. The selection of Sept-Iles as the southern terminus of the QNS&L, the construction of ore receiving and shipping facilities, and the subsequent location of the Wabush Mines pelletizing plant and a concentrator-pelletizing complex of IOC in this area, have transformed this community from a small fishing hamlet to a moderately-sized industrial port of some 30,000 population.

The second feature is the distribution of employment benefits of the Labrador iron mining industry between Newfoundland and Quebec. This is a matter of some concern to the Government of Newfoundland and Labrador. In recent years the question has received attention from two industrial commissions of inquiry appointed by the provincial government to examine employment problems in the Labrador City-Wabush area (Bartlett (1977); Easton (1979)). The distribution of employment in the iron mining industry between Newfoundland and Quebec was only one feature of these inquiries and we confine our attention here to this question.

The Bartlett Report, in contrast to the Easton Report which is mainly concerned with contracting out, devotes considerable attention to the distribution of employment in the iron mining industry between Newfoundland and Quebec. One of the Commission's terms of reference was '. . . to examine the ratio of Newfoundland workmen employed in Labrador City-Wabush in relation to workmen from outside the province.' (Bartlett Report, p. 1.) The criterion of measurement was not the native origins of the work force living in Newfoundland, but a residency criterion as to what constitutes a 'Newfoundlander'. In addition to the Newfoundland-born, the term 'Newfoundlander' was extended to include:

> a person who, though not born in Newfoundland, was a resident of the area for a period in excess of five (5) years or more. It was also further stipulated by the Commission that to 'reside in the area' meant to have an actual residence in the area and this designation, would, therefore, exclude those transients coming into the area for a period during the construction season and had left again. Even though such persons had been coming back for over five (5) years, they would not be classified as Newfoundlanders for purposes of this Inquiry.[6]

6. Bartlett Report, p. 4.

The Bartlett Report breaks down the employers in the Labrador City-Wabush area into those with fewer than 100 employees and those with more than 100 employees. We examine here the origins of those employed by IOC and by Wabush Mines.

The data on the origins of the IOC's work force given in the Bartlett Report are reorganized and produced as table 24. This table shows that, by the Bartlett criterion, 91 percent of those employed by IOC at Labrador City are Newfoundlanders. On the other hand, the Newfoundland-born comprise 80 percent of the company's work force. The Commission also found that, out of a work force of 822 at Wabush Mines, 90 percent are Newfoundlanders.

The Iron Ore Company submitted similar evidence in its brief to the Bartlett Commission, in support of the company's contention that it '. . . has always followed a policy of giving preference to residents of Newfoundland-Labrador for its Labrador City operations.' In its brief, the IOC defined a Newfoundland employee '. . . as one whose province of residence at time of hire is Newfoundland.' The data in table 25 show that, by the company's definition of Newfoundlander, the percentage of Newfoundlanders in the total IOC work force at Labrador City rose steadily from 82 percent in 1972 to 92 percent in 1976.

The Bartlett Commission went beyond the Labrador City-Wabush Area to examine the extent of the Newfoundland work force employed by IOC at the Knob Lake-Schefferville mines and the place of residence of the employees with the QNS&L. Investigating the concern that only a small number of Newfoundlanders were working at the Knob Lake-Schefferville mines, the Commission reported on the changing ratio of Newfoundlanders employed there.

> In the early years of the operation, the percentage of Newfoundland workers at the site varied between 25 percent and 30 percent. However, in 1962 when the company began the Carol Lake project in Labrador City, those Newfoundlanders who were at Schefferville were given the opportunity of going to work at Labrador City.
>
> A large number of employees availed of the opportunity of returning to Newfoundland to work[7] and consequently the

7. The town of Schefferville is located on the Quebec side of the border, whereas the iron deposits and mining operations straddle the boundary. Approximately 60 percent of the deposits in the Knob Lake-Schefferville area are located in Quebec, 40 percent in Newfoundland. See the Barlett Report, p. 10; Iron Ore Company of Canada (1979), p. 8.

Table 24

ORIGINS OF THE WORK FORCE EMPLOYED BY THE IRON ORE COMPANY OF CANADA AT LABRADOR CITY IN 1977
(Number)

Newfoundland-born		2,390
Not Newfoundland-born but resident 5 years or more:		
Hired in the province	47	
Hired outside the province	267	314
Total Newfoundlanders		2,704
Not Newfoundland-born but resident less than 5 years:		
Hired in the province	108	
Hired outside the province	164	272
Total work force		2,976

Source: Newfoundland, Report of the Industrial Commission of Inquiry into Employment Problems in the Labrador City-Wabush Area (1977), p. 8.

Table 25

NEWFOUNDLAND EMPLOYEES IN THE WORK FORCE OF THE IRON ORE COMPANY OF CANADA LABRADOR CITY OPERATIONS, 1972-76
(Number and Percent)

	Work Force		
	Hired in Newfoundland	Total	Newfoundland Hires as a Percent of Total
1972	497	2,033	83
1973	1,754	2,380	84
1974	2,077	2,800	87
1975	1,465	3,013	90
1976	619	2,988	92

Source: 'Brief Submitted by the Iron Ore Company of Canada to the Bartlett Commission.'

> percentage of Newfoundlanders at Schefferville dropped. The number has been declining over the years and today there are approximately 85 Newfoundlanders out of a total work force of 1,200 at Schefferville. The company stressed the fact that it imposes no restrictions as to place of residence in its recruiting and hiring for Schefferville. This means that any Newfoundlander who wishes to go to Schefferville to work can do so and the company will place no restrictions on employment.
>
> There is now, of course, a potentially serious situation which may develop due to restrictions placed on employment by the Government of Quebec under its proposed Bill 101.[8] Any English-speaking family going into Quebec may encounter difficulties in placing children in English-speaking schools. However, the company has stated that as long as there are any English-speaking-families in Schefferville, that it will maintain an English-speaking school for children.
>
> The Commission recognizes the fact that many English-speaking people would not want to go to Schefferville if there were the chance of employment in Labrador City-Wabush; primarily for the reason that overwhelming percentage of the population there is French-speaking.[9] This situation has developed over the years and the chance of its changing in the near future seems remote.
>
> The company should continue to ensure that employment opportunities at Schefferville are offered to Newfoundlanders and that any positions be advertised in Newfoundland and Labrador newspapers and recorded in the Canada Manpower Officer in Newfoundland and Labrador.[10]

Thus the findings of the Bartlett Commission with respect to the Knob Lake-Schefferville mining operation are that:

i) only about 7 percent of the work force is Newfoundlander;

ii) there are ethnic-political, not corporate policy, reasons militating against a higher percentage of Newfoundlanders being employed there.

In sum, most of the employment benefits of the mining activities in the Knob Lake-Schefferville area have accrued and will continue to accrue to Quebec workers. Benefits to Newfoundlanders will remain minimal.

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8. Bill 101 was enacted as the Charter of the French Language (1977). The bill was enacted and given assent on 26 August 1977.
9. In 1976, 71 percent of the population of Schefferville specified French as their mother tongue, 23 percent of the population, English. Statistics Canada, 1976 Census of Canada (92-822).
10. Bartlett Report, pp. 11-13.

The commission then went on to examine the place of residence of the employees of the QNS&L. The QNS&L is a wholly-owned subsidiary of IOC. The main line runs from Knob Lake-Schefferville to Sept-Iles. In order to develop the iron deposits at Knob Lake, a deep-water ice-free port was required to trans-ship iron ore from the railway to ocean-going and seaway carriers. The port of Sept-Iles was chosen by IOC to provide this trans-shipment point. This meant also that the rail yards and machine shops would be located at the port terminus and that most of the employees of the railway would be based at Sept-Iles. In 1977, the QNS&L had 1,305 employees, of which 1,247 were based in Sept-Iles while only 50 lived in Labrador City and 8 in Schefferville.[11] Thus, only about 4 percent of QNS&L's employees are stationed in Newfoundland.

The Commission's study of the residence of the employees of the QNS&L addresses a somewhat different question: namely, the proportion of the work force of the mining project resident in Newfoundland. The Barlett Commission did not investigate this question beyond its study of the QNS&L work force, however.

A more appropriate approach for evaluation of the distribution of employment benefits would be to determine precisely the residence of employees in the total mining projects of IOC and Wabush Mines. An internally consistent set of annual data is not available for IOC's operations, but comparisons of data for adjacent years can be used to give a rough indication of how the project's work force is divided between Newfoundland and Quebec locations. The data we use are for either 1977 or 1978. Table 26 shows figures by place of residence for the IOC and Wabush Mines employees.

There is, however, one problem in determining the distribution of employment between Newfoundland and Quebec: how to handle the estimates for the work force at Schefferville. There are two difficulties here. First, the minor problem of different estimates of the work force should be noted. The figure from the Bartlett Report is obviously the seasonal (summer) maximum employment level, (see table 27) whereas the others are annual averages. The IOC and Newfoundland Department of Mines and Energy figures are for different years.[12] Since our

11. Bartlett Report, p. 14.
12. It is not clear whether the Newfoundland Department of Mines and Energy figure refers to the total IOC work force at Schefferville or to the estimated Newfoundland component. A definitive answer was not obtained in our follow-up with the Department. We presume that the figure is for the total work force.

Table 26

PLACE OF RESIDENCE OF THE WORK FORCE OF THE IRON ORE COMPANY OF CANADA AND WABUSH MINES, 1977-78
(Number)

Company, Data Source and Date	Schefferville	Labrador City-Wabush	Sept-Iles	Total
Iron Ore Company of Canada				
IOC (1978)	883	2,809	3,014	6,706
Newfoundland Dept. of Mines and Energy (1977)	751	3,020	NA	NA
Bartlett Report (1977)	1,200	2,976	NA	NA
Wabush Mines				
Department of Energy, Mines and Resources (1977)		850	750	1,600
Newfoundland Dept. of Mines and Energy (1977)		829	NA	NA
Bartlett Report (1977)		822	NA	NA

Sources: Department of Energy, Mines and Resources; Iron Ore Company of Canada, Iron Ore Company of Canada (1979), p. 7;
Newfoundland, Department of Mines and Energy; Newfoundland, Report of the Industrial Commission of Inquiry into Employment Problems in the Labrador City-Wabush Area (1977), pp. 8, 12.

NA = Not available.

most complete set of employment data is for 1977, our estimates of the Newfoundland-Quebec distribution are based on that year.

The second problem is more serious: how to split the Schefferville work force between Newfoundland and Quebec. From the standpoint of place of residence, the allocation is clear-cut: all the work force goes to Quebec. Any other procedure would, of necessity, require some arbitrary decision. One such would be to split the work force in accordance with the distribution of the size of the deposits straddling the border (60 percent Quebec; 40 percent Newfoundland). This would allocate about 300 of the work force to Newfoundland. This can be taken as a maximum number of the Newfoundland-based work force at Knob Lake-Schefferville. We have adopted this arbitrary procedure in estimating the Newfoundland-based portion of the work force at Schefferville and made adjustments to the employment figures accordingly. For 1977 in the IOC and Wabush Mines operations combined, average annual total project employment was approximately 8,350,[13] and roughly 4,150, or 50 percent of the employment generated by the IOC and Wabush Mines projects was located in Newfoundland. If, however, all of the employment at Schefferville is allocated to Quebec (by virtue of residence) then the estimate for the Newfoundland share of the work force is 46 percent.

An evaluation of the distribution of employment in the Labrador iron mining industry between Newfoundlanders and Québecois must also take into account the seasonal nature of the operations. In this respect, the balance is decidely in favour of Newfoundland workers.

It will be recalled that 90 percent of the work force at the Labrador City-Wabush area operations of IOC and Wabush Mines is made up of Newfoundlanders. These are year-round operations, providing stable employment. By contrast, the IOC's Knob Lake mining division and the QNS&L have markedly seasonal variations in employment, and are staffed mainly by Quebec natives.

These contrasting seasonal employment characteristics are shown in table 27. This table gives a breakdown of IOC's employment by division in mid-February and the last week of August 1979. These points represent the low-employment

13. Total employment was estimated as follows from table 26: Schefferville, 750; Labrador City, 3,850; Sept-Iles, 3,750.

Table 27

THE AUTHORIZED WORK FORCE[a] OF THE IRON ORE COMPANY OF CANADA, BY DIVISION, AS OF 18 FEBRUARY 1979 AND 26 AUGUST 1979
(Number)

	18 February	26 August
Knob Lake Mining Division	703	1,167
Carol Lake Mining Division	2,846	2,901
Carol Lake Technical Services	12	7
Sept-Iles Division	1,255	1,274
Transportation Operation - Sept-Iles	1,131	1,549
Services Division[b]	564	593
Ore Movement Division[b]	93	132
Total	6,604	7,623

Source: The Iron Ore Company of Canada.

[a]Authorized work force includes those working, on vacation, other (n.e.s), and openings.
[b]Pertains to total project operation.

and peak-employment levels in the annual operations of IOC. It will be noted that the difference in employment at Carol Lake is relatively small (2 percent of peak), whereas the differences at Knob Lake and in the transport division (QNS&L) are respectively 40 percent and 27 percent of peak employment. The Sept-Iles division, which includes beneficiation and ore terminal operations, has stable employment over the year, as at Carol Lake.

One final observation should be made concerning employment at IOC's Carol project. Although employment is stable, the Carol Lake division is overstaffed. This resulted from the loss of skilled workers during the three-month strike of 1972, just when the expanded concentrator was coming on-stream. In order to staff the greatly increased concentrator capacity, the company had to hire apprentices to fill the posts vacated by the skilled employees during the strike. This created an imbalance in the ratio of skilled to unskilled workers, running upwards of three to four apprentices per journey-

man. In recent years the company has been gradually reducing this imbalance, but it is not yet eliminated. Therefore, it can be expected that the size of the IOC work force at Carol Lake will be lower in the future than it is now. At present, the concentrator is not operating at full capacity owing to the softness in offshore concentrate markets. Under full-capacity and optimum-staffing operating conditions, the work force at the Carol project would be around 2,700. Thus, even if the Carol division were to operate at full capacity over the next five-year period, the size of the work force will probably fall as the operation approaches optimum staffing conditions.

Political Economy of Concentrator and Pelletizing Plant Location

Since concentrator and pelletizing plants provide stable year-round employment for a large number of workers, (see table 21)[14], it is appropriate to ask why the plants are located where they are. In this section we examine economic and political factors that affected the mill-location decisions of the mining companies.

The locations and capacities of the various plants are recapitulated in table 28.

For efficient operation, iron ore milling plants will tend to be located either at mine site or at a shipping node. By locating milling operations at the mine site, savings in transportation costs are realized by removing waste from the ores and shipping out the product as concentrates or pellets. Location at a natural trans-shipping point also entails potential cost savings compared to handling the iron ore products at some other location.

Transportation cost minimization is not the only criterion, however. Other economic, and political factors may have to be evaluated in the decision as to the location of milling plants.

14. We could not obtain separate employment figures for concentrator and pelletizing plants for either the IOC or Wabush Mines milling operations.

Table 28

LOCATION AND CAPACITY OF MILLING PLANTS FOR PROCESSING LABRADOR IRON ORE

Company	Type of Plant	Location	Annual Capacity
Iron Ore Company of Canada	Concentrator	Labrador City	22 million tons of concentrates: 12 million tons for production of pellets; 10 million for sale as concentrates
	Pelletizing	Labrador City	10 million tons of pellets
	Concentrator-pelletizing	Sept-Iles	6 million tons of pellets
Wabush Mines	Concentrator	Wabush	7 million tons of concentrates[a]
	Pelletizing	Pointe Noire (near Sept-Iles)	6 million tons of pellets

Sources: Iron Ore Company of Canada, Iron Ore Company of Canada (1979); Northern Miner, Canadian Mines Handbook, 1979-80.

[a]Centre for Resource Studies estimate.

There are striking differences in the location of the three milling operations in the Labrador iron mining industry. First, the IOC Carol Lake project has both the concentrator and pelletizing plant near the mine site. Second, the IOC concentrator-pelletizing complex at Sept-Iles processes ore from the mines at Knob Lake; that is, the mine and mill are located, respectively, at the northern and southern terminal points of the QNS&L. Third, the Wabush Mines operation has the concentrator located at mine site, while the pelletizing plant is located on tidewater at Pointe Noire (near Sept-Iles).

The interesting question is why these three distinct locational arrangements exist. In addressing this basic question, we investigate: why the locations are different for the IOC and Wabush Mines operations in the Labrador City-Wabush area, when the two mining projects were developed at roughly the same time; and why the Schefferville ores are milled at Sept-Iles rather than at mine site.

In the early 1960s IOC and Wabush Mines developed mines in the southwestern corner of Labrador. The original plans for the IOC Carol Lake project were for a mine and concentrator. It was not until late in the summer of 1961 that a decision was made to build a pelletizing plant adjacent to the concentrator. The pellet plant was completed in 1963. The Wabush Mines decision was to locate the concentrator at mine site and the pellet plant at Pointe Noire. This project was brought into operation in 1965.

It should be observed that both the IOC and Wabush Mines concentrators are located at mine site. Location near the mine is efficient because beneficiation eliminates the gangue, thereby raising the iron content of the product. This results in transportation cost savings by shipping concentrates rather than crude ores. In fact, it was only because of the development and commercial application of beneficiating technology that the low-grade (35 percent) specular hematite ores became economic deposits.

"Additionally, the QNS&L, although a wholly-owned subsidiary of IOC, operates as a common carrier under the Railway Act and the authority of the Canadian Transport Commission (CTC). Moreover, the QNS&L charges IOC and Wabush Mines the same level of tariffs for iron ore shipments and for other traffic.[15]"

15. Railway Act, R.S.C. 1970, C.R-2. The QNS&L is required to file its tariff schedules with the CTC, and these schedules are on open file at the CTC.

The reasons for the different decisions on pelletizing plant location have to be sought in factors other than the transport costs of shipping iron ore products to tidewater. Timing, plant scale, and the nature of ores can also be ignored. The plants were brought to completion less than two years apart. The plant scales were similar: IOC, 5.5 million tons per year; Wabush Mines, 4.9 million tons. The properties of the iron ore deposits worked by IOC and Wabush Mines are also similar.

Capital costs to construct a pellet plant would have been lower at tidewater than in the Labrador hinterland, but this would have been equally advantageous to both IOC and Wabush Mines.

It appears that the cost of shipping supplies, including fuel oil, did affect the decision of Wabush Mines to locate its pelletizing plant at tidewater.

The decision on whether to locate a pelletizing plant, employing 200 or more workers, in Newfoundland or in Quebec was politically sensitive, and the political factor appears to have entered into the calculations of both mining companies in deciding where to build their plants.

Although, in retrospect, IOC's decision to locate its pellet plant in Labrador was the correct private economic decision, the economic arguments of the day made it a toss-up as to where the plant should be located - at Labrador City or at Sept-Iles. The decision was ultimately based on a political position taken by the company that Labrador ores should be processed in Labrador.[16]

Economic considerations may have tilted the decision of Wabush Mines in favour of the Pointe Noire site, but the decision was strengthened by the prospect that the Quebec government, an important steel purchaser, would place orders with the steel companies participating in the Wabush Mines joint venture.[17]

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16. As communicated to the Centre for Resource Studies by The Iron Ore Company of Canada.
17. Gwyn (1972), p. 250. Dofasco and Stelco combined hold 42 percent of the equity in Wabush Mines (see figure 2).

We move on now to consider the decision of IOC to build a concentrator-pelletizing complex at Sept-Iles. Falling ore grades at the Knob Lake-Schefferville deposits meant that the IOC could not meet the minimum 54-55 percent grade required for ores to be marketed as direct-shipping ores. Therefore, if the company were to keep the mines at Schefferville in operation the ores had to be beneficiated. Thus, in the early 1970s the company built a concentrator-pelletizing plant at Sept-Iles to upgrade and pelletize the Schefferville ores. The plant was completed in 1973.

The decision to locate the concentrator-pelletizing plant at Sept-Iles rather than at Schefferville was governed strictly by economic considerations. In fact, a number of economic factors favoured the choice of Sept-Iles. First, the capital costs of constructing the plant were lower. Second, labour would be easier to obtain and retain at Sept-Iles. Third, the cost of hauling materials, including reagents for the froth flotation concentrating process and bunker C, would be avoided. Finally, there was a power constraint at Schefferville. In order to meet the hydro-electric power requirements of a plant at Schefferville, incremental hydro power capacity would have had to built. By contrast, hydro power was readily available at Sept-Iles. In short, the remote location of Schefferville and the lack of a hydro-electric power delivery system militated against selection of Labrador as the site for the plant.

Employment Potential in Iron Mining

Projections for total direct employment in the Labrador iron mining industry for the period 1979-83 are shown in table 29 for three cases: trend, optimistic, and realistic. The three cases are based on the following common assumptions. First, the Newfoundland component of the IOC work force at Schefferville is assumed to be 40 percent of the figures shown in table 22. Second, there are no reserves constraints. Third, there will be no change in capacity.

Trends. The trend projection is flat. This is derived from: the three-year average of employment at Carol Lake for 1975-77; the four year average at Knob Lake for 1974-77; and the five-year average at Wabush Mines for 1973-77. The

Table 29

NEWFOUNDLAND-BASED EMPLOYMENT POTENTIAL IN THE LABRADOR IRON MINING INDUSTRY, 1979-83
(Number)

	1979	1980	1981	1982	1983
Trend	4,125	4,125	4,125	4,125	4,125
Optimistic	4,290	4,350	4,550	4,750	4,750
Realistic	4,125	4,100	4,075	4,050	4,025

years 1973 and 1974 are deleted from the Carol Lake estimates because during these years the concentrator plant expansion was overcoming technical and labour-shortage problems. The jump in employment at Schefferville was associated with the start-up of the Sept-Iles pelletizing plant.

Optimistic. We see only two possible developments that could raise the level of employment above trend. First, the recommendation of the Bartlett Report (p. 15), that 500 jobs associated with the QNS&L be relocated from Sept-Iles to Labrador, could be implemented. We assume here that this would be phased in beginning in 1980 and that the relocation would be completed by 1982.

The second possibility is the full-capacity operation of the mines and mills. The shipments data in table 20 indicate that only the Carol Lake pellet plant has attained rated capacity in recent years, although the Wabush Mines plant has had some years when it operated at near full capacity. The IOC concentrator has operated consistently at less than full capacity. The employment levels with all mills operating at full capacity can only be estimated, since this information has not been obtained in practice. If, however, IOC's Sept-Iles pellet plant were to achieve rated capacity, the size of the Schefferville work force would probably be little affected because the main output would be diverted from producing direct-shipping ores to pellet production. It is also likely that the incremental work force at IOC's Carol project and at Wabush Mines would be rather small if both operations were to increase production to full capacity. We assume that full capacity is attained in 1979 and is maintained to 1983.

Realistic. We do not expect the recommendation of the Bartlett Report to be realized. Neither do we anticipate production of concentrate at the Carol Lake concentrator to approach capacity during this period. We assume that the apprentice-journeyman imbalance will continue to be corrected and that this will result in a net reduction in the work force of 25 per year after 1979.[18]

Base Metal Mining

The Mining Companies: Ownership, Output, and Employment

Production from the base metal sector of the Newfoundland economy comes currently from three mine-mill operations, all from underground mines on the Island. All three process ore to the concentrate phase, and ship concentrates to Quebec, Europe, or the USA for further processing. The three operations are:

i) the Buchans mines, owned by Asarco Inc. of Connecticut, producing copper, lead, and zinc, and some gold, silver and cadmium, located in central Newfoundland near Red Indian Lake;

ii) Consolidated Rambler Mines Ltd. of St. John, N.B., operating the Ming Mine in the Baie Verte area, producing copper, with gold and silver by-products;

iii) Newfoundland Zinc Mines Ltd.'s mine at Daniel's Harbour on the west coast of Newfoundland, producing zinc. Newfoundland Zinc is owned by Teck Corporation of Vancouver (63 percent) and Amax Inc. of the U.S., (27 percent).

As noted in the historical overview, base metal production had come from a larger number of mines in Newfoundland in the 1950s and 1960s. The decline in the number of producing mines is due in large part to the nature of the

18. The Easton Report (1979) recommended that both IOC and Wabush Mines be requested to relocate their purchasing department to Newfoundland (Labrador). We have been informed that IOC has relocated some of its purchasing department staff to Labrador City. We were unable to get the figures, but the number of staff involved is probably small. We have not incorporated an estimate of this staff relocation in our employment projections shown in table 29.

resource base. Many of Newfoundland's nonferrous metal deposits have limited reserves and/or are of relatively low ore grade, and tend to have short operating lives.[19] One finds, for a number of mine closures over the period 1949-79, the cause listed in public documents as exhaustion of the ore.[20] Clearly, other factors (economic and political) are important, but the nature of the mineral resource base in Newfoundland is a critical factor in determining this sector's potential to generate income and employment. Owing to the limited mineral base of proven reserves, the potential for expansion of the sector over the next 5 to 10 years depends heavily on the outcome of exploration programs currently underway.

We now describe the operations of mines which have been in production over the past five years, and their potential for continued production and/or expansion over the next 5 to 10 years. Table 30 shows each company's daily mine and mill capacity and total output of ore over the past five years. Table 31 gives concentrate and contained metal equivalents for each company's products. Table 32 gives the approximate value of each company's total mineral output over the same period. Table 33 provides total employment levels for each company 1973-77, while table 34 gives a more detailed description of employment as of June 1979. Table 35 shows ore reserves of producing mines for the past five years. Table 36 gives aggregate ore reserves by type of metal for the whole province. It should be noted (see table 33) that the employment generated by the base metal sector is very small, relative to other mineral products.

Each operation will be discussed and, after examining the potential for continued production and/or expansion of the sector, the aggregate impact of the sector will be summarized.

Asarco Inc., Buchans Unit

Production from the Buchans area commenced in 1928 and is expected to continue at least through 1979. Ore reserves are nearing exhaustion and, unless current exploration efforts yield an economically viable deposit, the underground mine

19. Buchans is a notable exception. Its ultimate recoverable reserves have been fairly large relative to Canadian base metal mines.
20. See Energy, Mines and Resources (1976e); Canadian Minerals Yearbook, selected years.

Table 30

MINE AND MILL CAPACITY AND ORE PRODUCTION FROM MAJOR BASE METAL MINES IN NEWFOUNDLAND, 1973-77

Company, Mine	Capacity (Tons per Day)		Ore Production (Tons per Year)					Average Annual Production
	Mine	Mill	1973	1974	1975	1976	1977	
Asarco, Buchans	1,000	1,250	124,000	264,000	232,000	208,221	192,002	204,045
Consolidated Rambler	1,200	1,500	292,011	183,201	224,563	206,446	218,203	224,885
Newfoundland Zinc	1,500	1,500	-	-	243,149	522,718	542,915	523,513

Sources: Canadian Mining Journal, 'Annual Mineral Review and Forecast', selected years; Energy, Mines and Resources, Canadian Minerals Yearbook, selected years.

Table 31

PRODUCTION FROM MAJOR BASE METAL MINES IN NEWFOUNDLAND, 1973-77

Company, Mine, Mineral	Production									
	1973		1974		1975		1976		1977	
	Concentrate	Contained Metal	Concentrate	Contained Metal	Concentrate	Contained Metal	Concentrate	Contained Metal	Concentrate	Contained Metal
Asarco, Buchans										
Copper, tons	2,565	1,109	5,563	2,399	4,801	2,040	4,136	1,793	4,046	1,717
Zinc, tons	20,561	13,272	42,325	27,267	35,283	22,600	32,115	10,585	28,916	19,112
Lead, tons	11,459	7,633	23,959	15,459	20,246	13,098	18,243	13,098	17,466	10,824
Gold, oz.	-	2,526	-	5,106	-	4,085	-	3,495	-	3,305
Silver, oz.	-	375,615	-	741,438	-	610,847	-	553,517	-	498,621
Consolidated Rambler										
East Mine[a], Copper, tons	2,818	688	1,798	432	-	-	-	-	-	-
Ming Mines, Copper, tons	22,866	5,579	23,230	5,599	29,691	7,072	31,156	7,178	34,554	9,142
Gold, oz.	-	9,158	-	9,047	-	10,463	-	11,642	-	12,924
Silver, oz.	-	73,250	-	90,054	-	108,490	-	111,274	-	117,637
Newfoundland Zinc[b]										
Zinc, tons	-	-	-	-	24,988	15,639	67,476	41,886	78,585	49,902

Sources: Energy, Mines and Resources, Canadian Minerals Yearbook, selected years;
Northern Miner, Canadian Mines Handbook, 1979-80;
Canadian Mining Journal, 'Annual Mineral Review and Forecast', selected years.

[a]Mine closed year end, 1974.
[b]Mine opened July, 1975.

Table 32

TOTAL VALUE OF MINERAL PRODUCTION FOR MAJOR PRODUCING BASE METAL MINES IN NEWFOUNDLAND, 1973-77
($ Thousand)

Company, Mine	1973	1974	1975	1976	1977
Asarco					
Buchans	11,466	27,617	21,162	35,824	62,449
Consolidated Rambler					
All mines	9,077	10,124	10,390	10,890	14,136
Newfoundland Zinc					
Daniel's Harbour	-	-	10,640	28,574	32,142
Total	20,543	37,741	42,192	75,288	108,727

Source: Compiled from average price of base metals received in Newfoundland, Statistics Canada, 26-201; and
Energy, Mines and Resources, Canadian Minerals Yearbook, selected years, for company production figures.

Table 33

TOTAL EMPLOYMENT IN NEWFOUNDLAND BASE METAL MINES, 1973-77

	Total Employees				
Company	1973	1974	1975	1976	1977
Asarco, Buchans	617	647	628	606	472
Consolidated Rambler	218	253	231	181	175
Green Bay Mining	55	80	-	-	-
Newfoundland Zinc	-	-	169	170	164

Source: Newfoundland, Department of Mines and Energy.

Table 34

EMPLOYMENT AT NEWFOUNDLAND BASE METAL MINES, JUNE 1979

Mine	Mine Labour				Mill Labour		Total
	Staff	Stoping	Development	Hoisting & Hauling	Staff	Crew	
Buchans	22	176	119	70	8	39	434
Consolidated Rambler[a]	13	33	14	16	9	35	120
Newfoundland Zinc	14	44	NA	NA	6	29	NA

Source: Canadian Mining Journal, Reference Manual and Buying Guide, 1979.

[a]The most recent figures obtained are for 1977.
NA = Not available.

Table 35

ORE RESERVES OF PRODUCING BASE METAL MINES, 1973-77

Mine	Thousand Tons Ore, Year End				
	1973	1974	1975	1976	1977
Buchans	1,600	1,330	1,098[a]	890[a]	699[a]
Consolidated Rambler	1,509	1,209	660	720	493
Newfoundland Zinc	-	-	4,500	3,800	3,230

Sources: Northern Miner, Canadian Mines Handbook, selected years. Figures are those reported by company. Energy, Mines and Resources (1976e).

[a]Estimated by Centre for Resource Studies.

Table 36

ESTIMATED RESERVES[a] OF SELECTED BASE METALS, NEWFOUNDLAND AND CANADA, 1974-78, AS OF 1 JANUARY

Metal	1974	1975	1976	1977	1978
Newfoundland Reserves					
Copper, short tons	58,400	43,600	27,900	42,000	27,700
Lead, short tons	112,000	93,100	61,200	45,600	33,300
Zinc, short tons	588,000	546,800	500,900	419,900	327,400
Silver, troy ounces	6,398,400	5,380,400	3,019,000	2,752,100[b]	1,977,300
Gold, troy ounces	154,100	117,900	64,300	77,600[b]	51,900
Canadian Reserves					
Copper, short tons	18,775,600	18,792,200	18,520,500	18,335,400	18,155,700
Lead, short tons	10,282,500	10,262,300	10,116,900	9,951,200	9,848,500
Zinc, short tons	31,664,000	31,166,200	31,011,900	30,210,800	29,660,600
Silver, troy ounces	912,345,700	919,096,800	894,125,700	980,274,400[b]	935,095,800
Gold,[c] troy ounces	11,935,400	11,972,000	11,359,900	12,732,200[b]	11,780,800

Sources: 1974-75: Energy, Mines and Resources, Canadian Reserves of Copper, Lead,Zinc, Molybdenum, Silver and Gold, January 1, 1974 and January 1, 1975, by D.A. Cranstone and S.A. Hamilton, Mineral Bulletin MR 166 (Ottawa: May 1976), pp. 36, 38, tables 5 and 6.
1976-77: Energy, Mines and Resources, Canadian Reserves of Copper, Nickel,Lead, Zinc, Molybdenum, Silver and Gold, as of January 1, 1977, by D.A. Cranstone, J.A. McIntosh and A. Azis, Mineral Bulletin MR 178 (Ottawa), p. 25, table 4.
1978: D.A. Cranstone and R.J. Whillans, 'Canadian Reserves of Seven Metals', Canadian Mining Journal, v. 100 no. 2 (February 1979), pp. 50-51.

[a]Measured and indicated reserves of metal contained in mineable ore, either in producing mines or in deposits being developed for production, and including a few mines not in operation but included in company ore reserves. No allowance is made for losses in milling, smelting and refining.
[b]Byproduct silver and gold grades were not estimated for many deposits in 1976. Such estimates, made for the first time in 1977, are responsible for many of the increases in silver and gold reserves. Without these additions, national silver reserves as of January 1977 would amount to 890,582,700 troy ounces and gold reserves to 9,806,100 troy ounces.
[c]Gold reserves in placer deposits could not be estimated.

and mill complex will close in the near future. Its history was one of fairly continuous exploration and discovery of reserves until the mid-1950s. From the mid-1960s to the present there has been a steady decline in reserves.[21]

The mines have yielded an average of 224,000 tons of ore over the past four years. The last major strike occurred in 1973 and lasted for seven months, decreasing ore production to 124,000 tons in that year. The principal metal produced has been zinc, followed by lead and copper, with smaller amounts of silver and gold recovered (see table 31). The mill produces concentrates which are shipped to Belgium, Britain, West Germany, and Italy in the case of lead, and France, Belgium, Norway, and Britain for zinc. Various countries receive the copper concentrate. The labour force at the mine and mill over the past eight years has declined from a high of 737 in 1972 to a June 1979 estimate of 434. Approximately 165 workers were laid off in late July 1979, leaving a work force of between 250 and 275.

When the mine closes, approximately 175 persons employed in the Buchans town area could be affected, in addition to those employed at the mine. Buchans is a company town and would be unable to sustain employment of a total labour force of almost 600 people without the Asarco operation. The next largest non-service employer is the forestry operations of the Price Newfoundland Company (two pulpwood and two sawmill operations). About 35 people were employed in the forestry operations in 1976 and it is not likely that this sector will absorb unemployed miners from Asarco unless it expands substantially.

The Buchans Task Force recommended, in 1976, preservation of the town and its economic base through, for example, exploration for and development of mineral deposits in the area, expansion of the forestry operations, and development of related industries and recreational opportunities. These recommendations were based to a large extent on the inhabitants' expressed desire to stay in Buchans. As of 1976, the town and area population were stable, with turnover at the mines less than 3 percent per year. If a viable mineral deposit could be developed and the mill at Buchans kept in operation, the preservation of the town could be achieved.

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21. For more historical information, see Bursey (1979), ch. 2. T. Morrison, 'Buchans Mining Future Uncertain', Rounder 4 (October 1978), and Report of the Buchans Task Force (1976).

Table 37 details the deposits known but not producing in the Buchans area. Some of the deposits have desirable attributes, but it would require a substantial capital investment by Asarco to bring them into production. The Great Burnt Lake copper deposit, for example, has proven reserves of 1 million tons, grading 2.9 percent, but it is 60 miles from Buchans and the deposit is too small to warrant a mine-mill operation. There has been discussion of shipping the ore to Buchans for milling (Task Force 1976), but road-building costs would be substantial. Using relationships derived by O'Hara (1979), and in chapter 6 (pp. 113ff) this study, the Centre for Resource Studies estimates that the capital cost to bring that deposit to production could be as high as $62.5 million (1978 dollars), with $12 million of that due to road construction. A million ton reserve would last for only five years (using 1,000 tons per day mine capacity and 200,000 tons per year ore production as an output indicator). The labour force required to mine Great Burnt Lake would be approximately 200 people, or close to one-half the existing employment level.

Obviously, the more deposits that can be discovered and brought into production of equal or greater magnitude, the more optimistic the outlook for Buchans. Other smaller deposits are known, but do not appear to be economically viable in the near future.

A million-dollar exploration program is currently being undertaken by Price-Asarco, on the 2,000-square-mile mineral concession owned by Price and leased by Asarco in the Buchans-Red Indian Lake Region.[22] To date, no major discovery has been made.

Prospects for future production from Buchans are fairly dim. Exploration activities could employ about 20-40 people per year for an annual budget of $200,000 and drilling of about 10,000 feet per season. Obviously, a major discovery is needed to sustain the population. The trend is downward and indicates virtually no mineral output or mine employment by the end of 1980. An optimistic case would visualize development and production from a 1,000-ton-per-day mine or mines, employing roughly 200 people. A realistic case is closer to the trend, unless a substantial discovery is made.

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22. Price and Asarco have had an agreement since 1926, revised in 1976, which grants Asarco the right to mine from Price's leaseholds in the area. Asarco operates the mine and receives 49 percent of the receipts, Price receives the remainder and also controls the exploration program.

Table 37

UNEXPLOITED MINERAL DEPOSITS IN THE BUCHANS AREA

Deposit	Reserves as of 1 January 1975 Total Tonnage	Grade and Content	Comments
Clementine Deposit	400,000	Low-medium grade 4.9% zinc; 2.6% lead; 0.3% copper	
Connel Option Deposit	Small tonnage, figures NA	Very high grade - no content specified	
East Branch Deposit	NA	Low grade - no content specified	
Great Burnt Lake	1,000,000	2.9% copper	Largest deposit south of Red Indian Lake
Little Sandy Deposit	Small tonnage, figures NA	Low-medium grade copper	
Mudhole Orebody	Low tonnage, figures NA	High grade - no content specified	
Sandfill Deposit	Small tonnage, figures NA	Medium grade - no content specified	
Skidder Deposit	300,000	Low-medium grade 2.33% copper; 1.95% zinc	
South Pond	300,000	1.3% copper	
Tulks Hill	800,000	5.6% zinc; 2% lead; 1.3% copper	
Victoria Mine	Low tonnage, figures NA	Up to 10% copper Less than 3% lead-zinc	Has four exploration shafts

Source: Report of the Buchans Task Force (1976).

Consolidated Rambler Mines Ltd.

As Bursey (1980) has noted, the discovery of a copper-gold-silver deposit at Baie Verte was made in 1905. Further exploration by both government and private companies occurred in the late 1930s and throughout the 1940s, but no arrangement could be made to develop the property until the early 1960s. The provincial government appropriated the property under the Undeveloped Minerals Act, and Consolidated Rambler developed the property. Production commenced in 1964. Four orebodies have been exploited since 1966. The most recently discovered deposits, the Ming (discovered in 1972) and Ming Extension (1976), currently produce the mine's copper, gold, and silver ores. The ore production has averaged almost 225,000 tons over the past five years. Copper concentrate is shipped to Noranda's Gaspé smelter at Murdochville, Quebec. Depressed copper markets in 1976-77 and impurities from mercury decreased production from the recent five-year high of over 386,000 tons of ore in 1973.

The mine and mill have employed an average of about 210 workers over the past five years. The most recent figures put employment at 120 (June 1977), but this number is low due to the decline in production associated with the market and technical difficulties mentioned above. The mine's workers come from the region. No company town was constructed.

Reserves as of December 31, 1978 were 493,000 tons and, without further discoveries in the area, production could continue for about another 2½ years. It is likely, however, that continued drilling will augment reserves to some extent. The current escalation of copper prices to over $1.00 (U.S.) per pound will no doubt stimulate current production, plus additional developmental drilling at the existing site. The company is exploring for ore in the region, but no discoveries have been announced.

The trend is thus for continued production at around 200,000 tons of ore per year for the next 2½-3 years with an employment level of from 170-200 workers. A realistic case would be the discovery of additional reserves sufficient to maintain production and employment at current levels for the next five years. An optimistic case would be a major discovery which yielded continued operation beyond five years and/or an increase in annual production to levels in excess of 300,000 tons per year.

Newfoundland Zinc Mines Ltd.

Newfoundland Zinc's mine at Daniel's Harbour is Newfoundland's newest base metal mine, opening in 1975, although the discovery of zinc in the area dates back to 1963 (by Amax and others). Capital costs to develop the 1,500-ton-per-day mine and mill were $18,000,000 (1975 dollars, which would be $25 million today). Zinc is the only metal produced, with concentrates being shipped to Canadian Electrolytic Zinc's plant at Valleyfield, Quebec, as well as U.S. destinations. Employment over the 2½ years of operation (to 1977) has averaged 168 workers, and annual production has averaged over 523,000 tons of ore.

At the time production started, proven reserves were 4.5 million tons, grading 8.8 percent zinc. As of 30 September 1977, reserves were 3.23 million tons (at 8.4 percent). In 1975, the company estimated a mine life of nine years, which appears to be accurate, based on average production levels in the past 3½ years. Since 1975, an active exploration and development program has been underway. No major discoveries have been announced. The company plans to spend $500,000 per year over the next three to five years for on-going capital expenditures. The trend outlook for the mine is thus continued operation at over 500,000 tons of ore per year, with 160 workers per year until at least 1984. An optimistic outlook would be a major discovery, of a deposit of a size comparable to the existing mine, with production commencing in the early 1980s and continuing for a decade. A realistic case is the operation of the complex to the end of the 1980s through development of the existing orebody.

Additional Base Metal Potential

As noted before, continued production from, and/or expansion of, the mining sector depends on the development of new deposits. These deposits must either be discovered through exploration or be known and 'on the shelf'. Newfoundland's prospects for expanding base metal production in the next five years are dim. Over the next ten years, one new deposit could be brought into production. This forecast follows from an examination of Newfoundland's known nonproducing deposits and its exploration activities.

In their survey of known base metal mineral deposits in Canada which could be economically mineable before 2000, Annis, Cranstone and Vallée (EMR, 1978b) noted only two from Newfoundland - Great Burnt Lake, as discussed in the Buchans section, and a manganese deposit owned by Brinco. Annis, Cranstone and Vallée listed five deposits which are unlikely to be mineable before 2000. All are copper and zinc or lead deposits which are either too small and/or have too low an ore grade to be economically viable. In an addendum to this report for 1977, nine more deposits are listed (see table 38), but no indication of their viability is given. With one exception, the Hand Camp deposit, all have very low indicated tonnage and appear to be nonviable unless new reserves are discovered.

No new base metal mines were under development as of April 1979.[23] Exploration activity in the sector has been in central Newfoundland. A number of companies have been involved, including Price-Asarco, Consolidated Rambler, Brinex, Noranda, and others. In western Newfoundland, near Daniel's Harbour, exploration has been active for the past 15 years. Noranda Exploration made a lead discovery in 1977 (tonnage and grade not given) in the Sops Arm area and is continuing exploration activity. In 1978, Brinex, Pacific Coast Mines, and Geophysical Engineering all conducted major drilling programs in the western part of the province in the hopes of finding deposits similar to that of Newfoundland Zinc.

In 1977, a gold discovery was made by Riocanex near Port aux Basques. As of 1978, three zones were outlined, with a combined total of 0.5 million tons of gold-silver ore with low values of copper, lead, and zinc. More drilling is planned in 1979 to further delineate the orebody.

It is generally felt by the government and industry that the climate for exploration is good, due to the taxation and leasing system. Nearly 300,000 square kilometers of crown land are open for claim-staking and more is expected to be available in the next few years. The Newfoundland Department of Mines and Energy, Mineral Development Division, has carried out regional surveys and makes its geoscience expertise available to the industry.

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23. See McArthur (1979) for a discussion of current mineral exploration in Newfoundland. McArthur is the source of the information presented on exploration in this section.

Table 38

MINERAL DEPOSITS IN NEWFOUNDLAND EITHER UNLIKELY TO BE MINED BEFORE 2000, OR ECONOMIC FEASIBILITY CURRENTLY UNKNOWN

Deposit	Owner	Location			Commodities	Tons and Grades	Remarks
		NTS	Latitude	Longitude			
Ackley City or Recontre East[b]	Newfoundland govt.	1M/11	47°41'30"	55°12'30"		125,000 at 0.5% MoS_2	
Colchester[a]	Colchester M.L.	12H/9	49°38'21"	56°04'55"	Copper	1,000,000 at 1.39% copper	Too small. Known since 1878
Fortune[b]	Unknown	1L/13				8,860,000 at 96.37% SiO_2	
Garrison Hill[b]	NALCO (?)	1M/12				1,032,000 silica;	Up to 96.6%
Gullbridge[a]	First Maritime Mng.	12H/1	49°11.8'	56°09.3'	Copper	1,360,000 at 0.69% copper	Producer: 1969-71 Deposit grade too low
Hand Camp[b]	Commodore Mg. Co. Ltd.	12H/9	49°16'55"	56°04'50"		2,500,000 at 2.62% copper; gold up to 0.39 ozs/t; silver up 1.64 ozs/t	
Hodder[b]	D.B. Parsons	12I/1	50°07'30"	56°08'20"		30,000 at 2.0% copper	Inferred
Pilley's Island[a]	Brinex	2E/12	49°30.5'	55°42'	Copper	412,000 at 1.7% copper	Too small. Known since 1875
Quartz Zone[b]						1,200,000 feldspar material	SiO_2
Rendall Jackman[b]	Kontiki Lead & Zinc Mines Limited (in 1969)	12H/9	49°33'48"	56°11'		11,081 copper	Grade from less than 1% to 4.65%
Terra Nova Mine[b]	C.F. Bennett Estate Ltd.	12H/16	49°55'18"	56°13'48"		20,000 at 2.5% copper 0.049 ozs/t gold; 0.29 ozs/t silver	On stockpile
Tulk's Brook[a]	Terra Nova Properties	12A/11	48°31'	57°12.5'	Copper; lead; zinc	600,000 at 1.5% copper; 1.5% lead; 5% zinc	Too small
York Harbour[a]	Big Nama Creek M.L.	12G/1	49°02.8'	58°18.5'	Copper; zinc	282,000 at 1.92% copper; 4.67% zinc (diluted)	

Source: Energy, Mines and Resources, A Survey of Known Mineral Deposits in Canada That Are Not Being Mined, by R.C. Annis, D.A. Cranstone and M. Vallée, Mineral Bulletin MR 181 (Ottawa, April 1978), table III and addendum.

[a]Unlikely to be economically mineable before 2000.
[b]Economic viability unknown.

Whether all this exploration activity will lead to the development of new base metal mines is difficult to say. It is possible that a discovery similar in size to Newfoundland Zinc's Daniel's Harbour deposit could be made, but unlikely that production would begin within the next five years. It takes three to five years to prove up and bring a deposit into production. Beyond the next five year period, a new mine would be feasible.

Potential of the Base Metal Sector Over the Next Five to Ten Years: Summary

Table 39 shows the aggregate production of base metal ore and total direct employment from 1979-83, for three cases: trend, optimistic, and realistic. The numbers are of course speculative and based on the mineral potential as discussed in this section, and do not consider market conditions or other factors.

The assumptions behind each case are as follows:

i) Trend. Mine and mill production from Newfoundland Zinc is 525,000 tons per year, or close to its three-year average, throughout the period. Buchans produces at a diminishing rate until it closes in mid-1980. Consolidated Rambler operates for two years at its five-year average (about 225,000 tons) then production diminishes to 200,000 for the next two years and 100,000 in 1983 as ore reserves become depleted. No new mine comes on stream until after 1982.

ii) Optimistic. Newfoundland Zinc and Consolidated Rambler operate at their five-year averages for the entire period. Consolidated Rambler's production in 1981-83 comes from development of orebodies near its existing mine. Production from Buchans tapers off in 1980, but the development of a new mine in the area keeps its current labour force employed for two years 1980-81, and the new mine comes into production in 1982 at 200,000 tons per year. A new mine is discovered and development of a 2-3 million ton orebody begins in 1982, with production commencing 1983-84.

iii) Realistic. Newfoundland Zinc and Consolidated Rambler continue to produce at their five-year averages. Buchans closes in 1980. No major orebody is ready for development before 1983.

Table 39

ESTIMATED POTENTIAL OUTPUT AND EMPLOYMENT FOR NEWFOUNDLAND'S BASE METAL SECTOR, 1979-83

	1979	1980	1981	1982	1983
Trend Case					
Mill output (Thousand tons ore)	900	825	725	725	625
Mine and mill employment	650	450	320	320	300
Optimistic Case					
Mill output (Thousand tons ore)	900	825	725	925	925
Mine and mill employment	650	500	500	650	850
Realistic Case					
Mill output (Thousand tons ore)	900	825	750	750	750
Mine and mill employment	650	450	350	350	350

Nonmetal Mining

The Mining Companies: Ownership, Output and Employment

The nonmetal mining sector in Newfoundland is small. At present, there are four operating companies each producing a different nonmetallic mineral. The companies are:

i) Advocate Mines Ltd. of Toronto, producing asbestos from an open pit mine at Baie Verte; majority-owned by European interests, with Johns-Manville Canada Inc. holding 31 percent of the equity, and operating and managing the company from the start of production;

ii) Flintkote Company of Canada Ltd., owned by the Flintkote Company, producing gypsum from a quarry at Flat Bay (near Stephenville);

iii) Newfoundland Minerals Ltd., mining pyrophyllite near Manuels for its U.S. parent, American Olean Tile Company Inc. of the National Gypsum Group;

iv) Dunville Mining Company, owned by Erco Industries Limited and producing silica at Villa Marie for the parent's elemental phosphorus plant at nearby Long Harbour.

The total employment at each of these mining operations for the years 1973-1977 is shown in table 40. In this section the operations of these companies are described and employment projections for the nonmetal mining sector are developed.[24]

In addition to these producers, it should be noted that the employment for Alcan's fluorspar mines at St. Lawrence is also shown in the table. These mines closed down early in 1978, and there are no plans at present for the mines to reopen. For this reason fluorspar mining operations are not dealt with in this section. The employment fortunes of the unemployed fluorspar mine workers are discussed in chapter 6.

Advocate Mines Ltd.

The asbestos deposit at Baie Verte was discovered in 1955. An open pit mine was brought into production by Advocate in mid-1963. Initially the operation employed about 350 workers and in late 1978 provided employment for about 635.

The mill has a capacity of 7,500 tons of ore per day and is capable of producing 90,000 tons of fibre per year. Table 41 shows data for ore milled, fibre produced and shipped, and year-end ore reserves for 1970-1978. Based on ore reserves and current production, the mine is expected to last until about the year 2000. No expansion plans are in the offing and, at the present size of operations, the maximum potential employment is around 700.

The skill/occupational distribution of the work force at the company's mine and mill for the year 1974 is shown in table 42, the most recent year for which published data are available. The total number of employees (347) is markedly lower than the approximate 500 reported by the Newfoundland Department of Mines and Energy. Also, the figures for 1974 are well below the 1978 work force of 635.

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24. Details on nonmetal mining operations were obtained from: Bursey (1979) Department of Mines and Technical Surveys (May 1966); Energy, Mines and Resources (1969, 1976c, 1976d); Newfoundland, Mineral Resource Management (July 1973); Canadian Mines Handbook, 1979-80; Canadian Minerals Yearbook, 1977 (preprints).

Table 40

TOTAL EMPLOYMENT IN NONMETAL MINES, NEWFOUNDLAND, 1973-77
(Number)

Company	1973	1974	1975	1976	1977
Advocate Mines	497	504	510	525	541
Flintkote Company of Canada	110	104[a]	108[a]	91	102
Newfoundland Fluorspar	464	463	309	191	178
Newfoundland Minerals[b]	40	43	41	43	42
Dunville Mining[b]	16	20	18	2	16
Total nonmetal mines	1,127	1,134	986	852	879

Source: Newfoundland, Department of Mines and Energy.

[a]Part seasonal employees.
[b]Seasonal employees.

Table 41

ASBESTOS ORE MILLED, FIBRE PRODUCED AND SHIPPED, AND ORE RESERVES, ADVOCATE MINES LTD., 1970-78

	Ore Milled (Thousand Short Tons)	Fibre Produced (Short Tons)	Fibre Shipped (Short Tons)	Ore Reserves at Year-End (Thousand Short Tons)
1970	2,245	72,931	62,727	59,319
1971	2,450	75,721	69,218	57,332
1972	2,335	73,195	63,850	53,032
1973	2,174	80,349	98,622	52,659
1974	2,143	79,986	75,941	51,415
1975	2,445	69,600	63,787	50,091
1976	2,080	84,446	98,124	48,672
1977[a]	2,261	83,024	71,383	46,671
1978[a]	1,083	43,914	NA	45,678

Sources: Canadian Mines Handbook, selected years;
Financial Post Survey of Mines, selected years.

[a]Converted from the data sources at 1 metric ton = 1.012311 short tons.
NA = Not available.

Table 42

SKILL/OCCUPATIONAL DISTRIBUTION OF THE WORK FORCE, ADVOCATE MINES LTD., 1974

(Number)

Mine	
Staff	16
Hourly-rated workers:	
Drillers and blasters	10
Hourly equipment operators	90
Other operators, dewaterers, shovel oilers, secondary breaking	26
General labour	9
Total hourly-rated	135
Total mine	151
Mill	
Staff	31
Crew:	
Mechanical and electrical maintenance	33
Other	132
Total crew	165
Total mill	196
Total mine and mill	347

Source: Canadian Mining Journal, Reference Manual and Buyers' Guide, 1974, pp. 42, 70-71.

Although it is necessary to take into account differences in scale in using 1974 data to describe current operations, what is important in examining the skills/occupational profile is not so much the numbers but the distribution of the work force. The breakdown for the mill work force is very sketchy where the large proportion of the work force is classed as 'other'. However, a number of pertinent observations can be made from these data:

i) the mine/mill work force is distributed about 45/55 percent;

ii) the total project staff/crew structure is distributed 15/85 percent;

iii) the largest group of skilled workers in the operation of the open pit mine consists of heavy equipment operators, who make up about 60 percent of the mine work force and 25 percent of the employees on the total project.

The third observation is particularly relevant in allocating labour from nonmining activities, especially construction, to open pit mines. Heavy equipment operators can be readily trained, and workers with these skills in other industries are easily adapted to open pit mining techniques.

Advocate Mines produces chrysotile asbestos fibre in groups four and six. These are medium-length fibres used in the production of asbestos-cement products, friction materials such as brake linings, and paper and pipe coverings. The firm's products are exported to European, North American, and South American markets, under long-term contract with the company's owners. In 1977, a new sales contract was negotiated with Johns-Manville and Compagnie Financiere Eternit S.A. whereby these companies will purchase all of Advocate Mines production to 31 December 1985, with option for an additional five-year period.

Flintkote Company of Canada Ltd.

Gypsum production was begun in 1952 by Flintkote of Canada's predecessor. Flintkote began as a producer in 1962, and in the mid-1960s had a production capacity of approximately 500,000 tons per year, with plans to expand to 1 million tons per year. As of 1976, however, capacity was about 700,000 tons per year. Since 1973 the gypsum operation has provided jobs for about 100 people.

In 1969 the gypsum quarry had proven reserves of 45 million tons of better than 90-percent purity. Since then about 7 million tons have been produced. Assuming a constant-capacity rate of production of 700,000 tons per year, the company has sufficient reserves for at least fifty years of production. Unofficially, total gypsum reserves are thought to exceed 200 million tons.

Some of the raw gypsum produced by the company is consumed locally, but most of the output is exported to affiliated manufacturing companies in the United States. Locally, gypsum is supplied to the Corner Brook plants of Atlantic Gypsum Ltd., for the manufacture of gypsum wallboard and plaster of paris, and to North Star Cement Ltd.[25]

25. Atlantic Gypsum employs about 250. We were not able to obtain the employment figures for North Star Cement.

As a producer of gypsum, the Newfoundland quarry is a high-quality deposit, is comparatively inexpensive to mine, and is situated near low-cost high-bulk shipping facilities. In spite of these apparent advantages in North American regional markets, the fortunes of the Newfoundland operation are tied to the level of activity in the construction industry. Thus, demand, not supply, would appear to be the limiting factor for operations in the near future.

Newfoundland Minerals Ltd.

Newfoundland Minerals produces pyrophyllite from an open pit mine near Manuels. The mine dates back to 1938, and intermittently produced small quantities of the mineral until 1956. Since 1956, when Newfoundland Minerals acquired the property, the mineral has been produced continually. Although annual production figures are not available for the years since 1967, production is estimated to vary between 20,000 and 35,000 tons per year. The output is shipped to the company's parent in Pennsylvania where it is used in the manufacture of ceramic tile. Reserves are extensive, and therefore the volume of pyrophyllite production will be governed by the market for the parent company's ceramic tile products.

Throughout the 1970s about 40 workers have been employed at the mine annually. This figure is down from the employment of about 55 men in 1964.

Dunville Mining Company

This company produces silica (quartzite) from a quarry at Villa Marie. The operation is owned by Erco Industries Limited. The silica is hauled the short distance to Erco's plant at Long Harbour where it is used as a flux in the manufacture of elemental phosphorus. This plant requires about 100,000 tons of silica annually.

In recent years about 20 people have been employed at the silica mine. The workers are full-time employees of Erco who work part of the year at the silica mine. Changes in mine employment will be contigent upon Erco's operations.

Employment Potential in Nonmetal Mining

Table 43 sets out three annual employment projections for the nonmetal mining industry for 1979 to 1983. The three cases are: trend, optimistic and realistic. These projections are based on capacity potential and the specific asumptions underlying the estimates for employment. These assumptions are:

i) Trend. Employment at Advocate Mines expands along the trend for 1973-77; the trendless employment levels over the same period are maintained for Flintkote, Newfoundland Minerals, and Dunville Mining; the fluorspar mines will remain shut down.

ii) Optimistic. Employment at Advocate Mines rises to its maximum potential in 1980 and remains at that level; Flintkote capacity expands to 1 million tons per year in 1980, thereby fully realizing the expansion plans anncounced in the late 1960s; the Newfoundland minerals work force increases to its mid-1960s level in 1980 and is sustained; the fluorspar mines are reopened in 1980 with a gearing-in period extending over two years, attaining a maximum work force of 300 by 1982; the work force at the Dunville mining operation remains at its 1970s level.

iii) Realistic. Employment at Advocate Mines continues at its early 1979 level of approximately 625 workers; the fluorspar mines remain closed; the respective 1973-77 employment levels at Flintkote, Newfoundland Minerals and Dunville Mining persist.

Table 43

EMPLOYMENT POTENTIAL IN THE NEWFOUNDLAND NONMETAL MINING INDUSTRY, 1979-83
(Number)

	1979	1980	1981	1982	1983
Trend	700	725	725	750	750
Optimistic	800	1,000	1,100	1,200	1,200
Realistic	800	800	800	800	800

Structural Materials

Review of Operations

Structural materials include sand and gravel, limestone, and shale. In Newfoundland, the structural materials industry comprises a large number of producers which, for the most part, are small operations employing fewer than 20 workers per operation. However, employment in the industry has amounted to approximately 15 percent of total employment in the Newfoundland mining industry.[26] Annual employment for 1973-1977 is shown in table 44.

These figures show that the structural materials sector accounts for a significant proportion of the work force in the mining industry. In terms of numbers, this industry employs more workers than either base metal or nonmetal mining. Structural materials production is labour intensive and creates more employment per dollar of investment than the other mining sectors. On the other hand, the operations are small and geographically dispersed, and create little in the way of income and employment spillover.

The markets for these products are local. The fortunes of the producers and the prospects for employment depend therefore on the state of the Newfoundland economy, especially conditions in the construction industry.

Table 44

TOTAL EMPLOYMENT IN THE STRUCTURAL MATERIALS INDUSTRY, NEWFOUNDLAND, 1973-77
(Number)

1973	1,006
1974	968
1975	1,169
1976	1,360
1977	864

Source: Newfoundland, Department of Mines and Energy.

26. Based on data provided by the Newfoundland Department of Mines and Energy. See table 11.

Employment Prospects

It is difficult to make projections for the level of employment in the structural materials industry. It is quite apparent from table 44 that employment is characterized by marked variations from year to year. This reflects the cyclical sensitivity of the industry, which relies heavily on construction activity. The cyclicity is compounded by ease of entry and exit. Owing to the ease of entry and exit, and the nature of the resource base (largely aggregates), an estimate of capacity potential for this industry is elusive. Therefore, in deriving estimates for the three cases, a point figure is taken from data of table 44 to apply to each year for 1979-83 for each of the respective cases. The estimates of employment potential are as follows:

i) trend	1,075
ii) optimistic	1,350
iii) realistic	1,000

The 'trend' is simply the five-year average. The 'optimistic' case is in the neighbourhood of the maximum level of employment attained during the period 1973-77. The 'realistic' case is projected to be lower than the five-year average. The rationale for this conclusions lies in the reduction in the real level of provincial government capital expenditure over the next few years. Provincial government capital expenditure has been a major contributor to construction activity in Newfoundland during the post-confederation years.

Uranium

The Kitts-Michelin Project[27]

Twenty-five years after initiating exploration for uranium in Labrador, Brinco Ltd. is now expected to bring a uranium mine into production in the early 1980s. This will be the first uranium mine in the province. Brinco's exploration activity started in 1955, and in 1956 the small Kitts deposit was

27. Information contained in this section is drawn from: Henderson (1979a, 1979b); Silver (1979); Welsh (1979); Globe and Mail (June 7, 1979); Mining Journal (May 25, 1979, June 22, 1979, August 10, 1979); Northern Miner (April 19, 1979, August 23, 1979). Information was also supplied to the Centre for Resource Studies by Brinex.

discovered. Ten years later Brinco, through its subsidiary Brinex, joined with the West German firm Metallgesellschaft (which later transferred its interests to Urangesellschaft) to continue exploration work, and the larger but lower-grade Michelin deposit was found. Since 1966, Brinex has concentrated exploration for uranium in the Kaipokok Bay area. It was only in 1979 that the decision was made to proceed with the development of a mine-mill complex to work the Kitts and Michelin deposits in the vicinity. The mines are expected to phased into production in 1981-82.

The Kitts and Michelin deposits are located near the communities of Postville and Makkovik near the Labrador coast. Michelin is approximately 100 miles north of Goose Bay and the Kitts deposit is a further forty miles to the northeast.

Table 45 summarizes characteristics of the orebodies. The total recoverable uranium oxide is expected to be about 20 million pounds.

To date pre-development work on the Kitts-Michelin project has involved an outlay of $20 million. In 1978, $1.6 million was spent, $600 thousand going into exploration. Feasibilty studies were completed this year at a cost of $3.5 million. In addition, Brinex has filed an environmental impact study with the government of Newfoundland and Labrador, and has submitted a preliminary site report to the Atomic Energy Control Board.

Table 45

CHARACTERISTICS OF THE KITTS AND MICHELIN URANIUM DEPOSITS IN LABRADOR

	Kitts	Michelin
Ore reserves (thousand tons)	295	7,181
Average grade (pounds of uranium oxide per ton of ore)	11.4	2.4
Total recoverable uranium oxide (thousand pounds)	2,961	17,234

Source: Henderson (1979b).

The decision to proceed with the combined Kitts-Michelin project was contingent upon obtaining financing, which, in turn, depended upon acquisition of long-term contracts. Brinco has reached agreement in principle with Commonwealth Edison Company of Chicago under which the latter's wholly-owned subsidiary, Edison Development Canada Inc. will arrange financing for the construction of the mine and mill and purchase up to 18 million pounds of uranium. In conjunction with this deal, Brinex has exercised an option on the 40 percent interest of Urangesellschaft Canada, Ltd. in the joint venture covering parts of Brinex concession areas in Labrador and has agreed to transfer that interest to Edison Development. This transfer is subject to Canadian and U.S. government and regulatory approvals.

The total project is budgeted to cost $160 million. This cost includes: the development of the Kitts and Michelin mine sites; the construction of a mill at the Michelin mine; and the building of a 40-mile winter road connecting the Kitts mine with the Michelin mill and an 85-mile all-weather road and a power line south from the Michelin site to North West River, near Goose Bay.[28] Goose Bay will be the centre for service operations. This community, abandoned by the United States as an air force base some years ago, already has adequate air, shipping and recreational facilities.

The mill is to have a capacity of 1,500 tons of ore per day, processing 1,400 tons from the Michelin mine and 100 tons from the Kitts. The combined operation will produce 1.3 million pounds of uranium oxide per year and the operating life of the project is expected to be 15 years. Mining at the Michelin site is scheduled to begin in the second half of 1981. Open pit mining is planned to last 8 years at the Michelin site, with underground operations being phased in during the sixth to eighth years. Work at the Kitts mine is scheduled to begin late in 1981. Kitts will be mainly an underground operation and is expected to be exhausted in eight to ten years. The mill is scheduled to go into operation by mid-1982. Before the project can be brought to fruition, however, its backers must satisfy environmental hearings (scheduled for the fall of 1979), obtain a construction permit, and get Ottawa's approval for export contracts. (In 1980 the Premier announced that permission to develop the uranium mines would not be forthcoming until an environmentally safe means of disposing of tailings from the mill was developed.)

28. Brinex has approached the government of Newfoundland and Labrador to share in the capital costs of the Michelin-North West River road. To date, the provincial government has taken the position that the road should be privately financed.

Additional Uranium Potential

Brinex is optimistic about the prospects for additional uranium reserves in the Kaipokok Bay area. No further reserves are expected at Kitts, but the Michelin deposit has shown signs of yielding more reserves. As of mid-1979, Michelin had been drilled to 850 feet. The company believes that, for each additional one hundred feet of vertical extension, the deposit will yield an additional 1.3 million pounds of uranium oxide.

In a 1,200-square-mile area of east-central Labrador, Brinco has uranium properties at Melody Hill and Mustang Lake. In 1978 a train of radioactive boulders, ranging in grade from 2 to 18 percent, was discovered at Melody Hill and boulders grading up to 6 percent have been discovered in the Mustang Lake area. Both Melody Hill and Mustang Lake are within ten miles of Michelin, and exploration work is continuing at both sites. Brinex expects to spend between $1.1 million and $1.8 million for uranium exploration in 1979.[29]

Several companies have been conducting exploration for uranium both in Labrador and on the Island. The only other discovery of apparent significance was the finding by Westfield Minerals Limited of uranium boulders in the Deer Lake area on the west coast of the Island in the fall of 1978.[30] No estimates of reserve potential have yet been announced pursuant to these discoveries.

Employment Prospects

The only uranium mining prospect expected to come into production in Newfoundland over the next decade is the Kitts-Michelin project. Hence, only this project is considered in evaluating employment potential in the uranium mining sector for the near and medium term.[31]

Initially, the work force is planned to number 265. This will increase to 450 when all mining operations are underground. As noted above, this will be fully realized eight years after mining operations at Michelin have begun: that is, not until 1989.

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29. See footnote 27 for sources.
30. McArthur (1979).
31. The information on employment was supplied to the Centre for Resource Studies by Brinex.

Details on the composition of the work force for the total project in the early years are presented as table 46. The work force will be located at the mine sites on a crew-rotation arrangement from Goose Bay on a one-week-on, one-week-off basis. Seventeen of the administrative personnel will be based in Goose Bay, the service centre for the operation.

Table 46

PLANNED WORK FORCE FOR THE BRINEX KITTS-MICHELIN URANIUM PROJECT
(Number)

		Mines			
	Administration	Kitts	Michelin	Mill	Plant Maintenance
Staff		8	17	16	6
Other		50	55	24	49
Total	40	58	72	40	55

Source: Brinex, Ltd.

The procedure for hiring the work force is to be agreed upon by the company and the provincial government. The company will probably work through the Canada Manpower Centre in Goose Bay.

The hiring policy of the company is to give preference to Labradorians, then to Newfoundlanders (Islanders), and finally to workers outside the province. Brinex is undertaking to ensure that the local residents (Goose Bay-Happy Valley and Postville-Makkovik areas) are aware of the job opportunities. The company intends to be competitive in wage offers and this could draw some workers from the iron mines in Labrador West. The company would also offer positions to unemployed miners at Buchans and at St. Lawrence. Workers from outside the province will be hired only if they have special skills which are not available in the region.

The skill requirements of the mining work force differ between the open pit low-grade Michelin mine and the underground high-grade Kitts mine. The greater proportion of the mine work force at Michelin is to be trained by Brinex, focusing on Labradorians. The underground Kitts mine will be contract-mined, and will require a higher level of skill and experience than the mine at Michelin. The Kitts work force will therefore probably draw more heavily on miners from the Island and from eastern Canada.

We now summarize the employment prospects in the uranium mining sector to 1983. We suggest two outcomes. The worst possible is that the project would be aborted because of government policies such as refusal to grant export permits, or because of corporate policies resulting in the collapse of financing and marketing arrangements. The realistic case is that the Kitts-Michelin project will be the only operating mine and that the project will come on stream as scheduled: mining at the Michelin site begins in mid-1981; the mill starts up by mid-1982; and the Kitts mine comes into production in mid-1982. It is assumed that plant maintenance employees are distributed between the Kitts and Michelin sites in proportion to the size of their respective site work forces. On the basis of these assumptions and the figures in table 46, annual estimates of employment are shown in table 47.

Table 47

EMPLOYMENT PROJECTIONS FOR THE URANIUM MINING INDUSTRY IN NEWFOUNDLAND, 1979-1983
(Number)

1979	1980	1981	1982	1983
0	50	150	250	275

Looking beyond 1983 to 1988, the work force at the Kitts-Michelin project is expected to rise to 450 as the Michelin mine goes from an open pit to an underground operation. The phasing-in is scheduled to take place in the sixth to eighth year of operations, that is, 1986-1988. The transfer to underground operations is not expected to result in any considerable layoff of workers employed in the open pit operation, although some retraining will be required. The underground operation will be highly mechanized, and similar technologically to open pit methods: scooptrams will be used in place of front-end loaders; drill jumbos will be used instead of the rotary drills customarily employed in open pit mining.

6. THE IMPACT OF AN EXPANSION IN NEWFOUNDLAND MINING ON PROVINCIAL INCOME AND EMPLOYMENT

Predicting the Impact of Mining on the Provincial Economy

Although one can illustrate and describe the past and present impact of mining on Newfoundland's employment, unemployment, and income levels, it is difficult to estimate accurately the impact of an expansion in this sector on the economy over time. Tables in chapter 3 show mining's contribution to Newfoundland over time, while tables in chapter 2 illustrate its significance at a point in time relative to other commodities and provinces. A projection of its impact in the future depends on relationships between many complex variables. There are some techniques which have been used to estimate more abstractly an industry's contribution to the provincial economy. These techniques are largely aggregate, in the sense that they generally look at the effect of an expansion in the entire mining industry, not by each mineral or by phase of mining activity (exploration, development, production). We refer to income and employment multipliers, used to estimate the total (direct plus indirect) impact on income or employment of an increase in the real output of a sector. In the published studies cited in this report, input-output tables (for a number of different years) have been used to derive the multipliers. Other techniques have been used to measure the impact of mining nationally (e.g., general equilibrium economic models), but unfortunately, they do not derive results for individual provinces.

We have, in addition, derived some measures of the direct employment effects of mining at a more disaggregated level by looking at the three stages of mining: exploration, development and construction, and production to the concentrate stage. Both this and the multiplier approach will be used to determine the hypothetical impact on the Newfoundland economy of an expansion in its mining industry. In chapter 7, we compare our results with forecasts made for the mining industry by other analysts.

Mining Impact Estimates: Multipliers

Mining is a capital-intensive industry. Most studies have shown that an expansion of the industry is likely to require rather large capital expenditures. The expansion will generate few jobs, compared to other natural resource industries such as forestry and fishing, but its effect will not be significantly different from that of an expansion in manufacturing industries. Care must be taken in interpreting the figures presented and more particularly in using them to make projections. These multipliers are based on input-output tables and therefore on a given technological relationship at a point in time. There is no guarantee that these relationships will persist over time. The numbers are best interpreted relative to other industries. Comparison of mining multipliers with those for other industries is thus made whenever possible.

The most frequently-used multiplier is the income multiplier which shows the change in national or provincial income due to a change in the output of the industry in question. There are a number of different estimates of these multipliers for the mining industry in Canada, both nationally and provincially. Unfortunately, many of the estimates are not comparable. For Canada as a whole,the multipliers for crude mineral production are relatively similar, ranging from 1.41 to 1.52.[1] These estimates are close to the multipliers for other industries. For example, in one study,the multipliers for semifabricated minerals range from 1.38 to 1.58, and an aggregate measure for all other industries is 1.66. In another study, the nonmineral multipliers range from 1.26 to 1.56.

Table 48 shows the income multipliers for each province for selected industries. Newfoundland's mining multiplier is the lowest of all the provinces at 1.00. A multiplier of 1 may seem low compared to the figures for the whole country, but it is higher than the multipliers for some other Newfoundland industries. For example, the textile income multiplier is 0.75, metal fabricating 0.76, and machinery 0.92. The mining multiplier is very close to that for fishing at 0.99, while that for forestry is 1.28. It should be noted that provincial multipliers are generally smaller than national ones due to the higher level of imports and exports of goods and services across provincial boundaries compared to national boundaries, which is also why a

1. Nickel et al. (1978) is the source for all the numbers in this section unless otherwise indicated.

Table 48

PROVINCIAL INCOME MULTIPLIERS FOR SELECTED INDUSTRIES
(Dollars of Provincial Income per Dollar Increase in Industry Output)

	Mines & Quarries[a]	Agriculture	Forestry	Fishing, Hunting, and Trapping	Machinery[b]
Newfoundland	1.00	1.12	1.28	0.99	0.92
Prince Edward Island	1.11	1.00	1.38	0.95	0.71
Nova Scotia	1.09	1.03	1.18	1.19	1.10
New Brunswick	1.06	1.01	1.23	1.03	1.07
Quebec	1.20	1.30	1.45	1.40	1.01
Ontario	1.29	1.41	1.45	1.55	1.16
Manitoba	1.17	1.23	1.55	1.32	0.74
Saskatchewan	1.02	1.36	1.10	1.30	0.85
Alberta	1.14	1.33	1.24	1.51	0.87
British Columbia	1.14	1.29	1.22	1.19	0.93

Sources: Department of Regional Economic Expansion, Economic Development Analysis Division, Interprovincial Input-Output Model, Version III (May 1976) p. 59, table 2.6.

[a]Excluding coal and incidental services.
[b]Excluding electrical.

multiplier can be less than one. That is, a $1 million increase in output in one province can lead to less than a $1 million increase in provincial income due to flows of factors, factor payments, and goods out of the province through the input-output matrix. The national versus provincial multipliers are also not comparable, as the input-output tables used to derive them are from different years. They do, however, give a rough idea of the leakages out of the Newfoundland and other provincial economies, and of the size of the overall potential impact of an expansion in the mining industry.

It is in its impact on national and provincial employment that mining is low relative to other sectors. There are a number of measures of the impact of an industry on employment. One is the employment ratio which shows the total number of jobs generated in all sectors by a particular industry, divided by the direct jobs in that industry. A ratio of 2 thus means that, for every job in that industry, one job is created outside it, either in industries using minerals as inputs, or in supplying goods and services to the mining industry. Table 49 shows the ratios for mining in Canada, and table 51 shows the employment ratios for selected industries in the provinces.

Although the two tables are not strictly comparable, the numbers in tables 49 and 51 are quite interesting, as mining ranks low in the national table, but very high in Newfoundland. The highest ratio in table 51 is for mining in Newfoundland (3.35). This measure, of course, says nothing about the effects on employment of a particular increase in mining activity, as we shall see by turning to the second measure, an 'employment multiplier'. The employment multiplier shows the number of man-years of employment associated with a million-dollar increase in output in a given industry. It is not a conventional multiplier but can be interpreted in an analogous fashion. Table 50 gives employment multipliers for Canada, and table 52 illustrates the provincial measures. The tables indicate that mining generates roughly the same number of jobs as does manufacturing nationally, is behind manufacturing in Newfoundland, and that Newfoundland's mines and quarries are third lowest among the provinces in generating employment.

These two measures may appear to give conflicting evidence. However, they are not inconsistent. The employment ratio says that 2.35 jobs are created outside mining for every job directly in mining. The employment multiplier however,

Table 49

NATIONAL EMPLOYMENT RATIOS FOR SELECTED INDUSTRIES

Industrial Category	Employment Ratio
Metallic and nonmetallic mineral ores and concentrates	2.64
Iron ore and concentrates	3.28
Uranium ore and concentrates	4.33
Iron and steel mill products	7.93
Pulp and paper products	5.64

Source: McCulla and Stahl (1977) as cited in Nickel et al. (1978), p. 47.

Table 50

CANADIAN 'EMPLOYMENT MULTIPLIERS'
(Man Years of Employment Induced by a $1 Million Increase in Industry Output and Incomes, Selected Industry Groupings)

Industry Groupings	Employment Multiplier
Average mining (unweighted)	77.6
Iron Ore	25.6
Gold and platinum	156.7
Average fabricated minerals (unweighted)	93.6
Average of five nonmineral manufactured products	76.1

Source: McCulla (1974) as cited in Nickel et al. (1978), p. 47.

Table 51

PROVINCIAL EMPLOYMENT RATIOS FOR SELECTED INDUSTRIES
(Total Provincial Jobs Created per Provincial Job in an Industry)

	Mines & Quarries[a]	Agriculture	Forestry	Fishing, Hunting, and Trapping	Machinery[b]
Newfoundland	3.35	1.39	1.78	1.23	1.64
Prince Edward Island	1.34	1.49	1.60	1.26	1.55
Nova Scotia	2.47	1.44	1.76	1.59	1.54
New Brunswick	2.25	1.48	1.77	1.30	1.63
Quebec	2.57	1.71	1.93	1.50	2.21
Ontario	2.41	1.98	2.30	1.54	2.68
Manitoba	1.93	1.76	1.51	1.17	1.94
Saskatchewan	2.30	1.92	3.02	1.14	1.61
Alberta	2.20	1.72	2.21	1.16	1.81
British Columbia	2.24	1.54	2.69	1.81	2.13

Sources: Department of Regional Economic Expansion, Economic Development Analysis Division, Employment and Occupational Impacts Using the Version III Interprovincial Input-Output Model (May 1977), p. 28, table 6.

[a]Excluding coal and incidental services.
[b]Excluding electrical.

Table 52

TOTAL PROVINCIAL EMPLOYMENT IMPACT OF SELECTED INDUSTRIES PER UNIT OF INDUSTRY OUTPUT
(Man Years of Employment Induced by a $1 Million Increase in Industry Output and Personal Income, Estimated for 1975)

	Mines & Quarries[a]	Agriculture	Forestry	Fishing, Hunting, and Trapping	Machinery[b]
Newfoundland	38.09	93.11	81.34	145.85	59.52
Prince Edward Island	97.43	104.33	117.58	164.15	58.04
Nova Scotia	40.22	109.18	85.31	94.43	87.66
New Brunswick	32.12	103.36	83.43	137.48	74.73
Quebec	45.66	111.11	83.50	122.12	58.81
Ontario	50.42	91.35	70.97	114.46	57.27
Manitoba	39.63	67.01	93.50	229.37	44.64
Saskatchewan	25.32	54.26	43.22	223.44	51.68
Alberta	41.18	64.59	53.77	226.44	45.16
British Columbia	33.12	95.18	50.32	64.34	44.29

Sources: Department of Regional Economic Expansion, Economic Development Analysis Division, Employment and Occupational Impacts Using the Version III Interprovincial Input-Output Model (May 1977), p. 27, table 5.

[a]Excluding coal and incidental services.
[b]Excluding electrical.

says that the total number of man-years created by mining in Newfoundland is only 38.09 per million dollars of output. So, while the employment ratio is high, the total impact is relatively low. Another way to see this is to look at the number of direct jobs in mining created per million-dollar expansion in output. Table 53 gives this expression for mining versus other industries for the ten provinces. A million-dollar expansion creates 11.4 jobs in mining, or slightly less than one-third of the total jobs created directly and indirectly by mining in all industries. Looking at all measures of employment effects of mining thus gives us a better picture of its impact than any one indicator taken in isolation.

Summarizing this section, we see that, for every million-dollar expansion in the mining industry taken as a whole in Newfoundland, we might expect only a one-million-dollar increase in provincial income, and an additional 38 man-years of employment, where slightly less than one-third of the jobs created are directly in mining.

We should also note that it would be appropriate in the case of mining to examine the multiplier for a contraction of the sector, as in the case of depletion of an orebody. We suspect that these contractionary multipliers would not equal the expansionary ones, but have found no discussion of this in the literature.

Mining Impact Estimates: Disaggregated Approaches

We now look at the mining industry in a more disaggregated fashion to get a series of original estimates of the direct impact of an expansion of the industry on provincial employment. By looking at the possible ways in which the mining industry can be expanded, we can get an idea of the possible total costs and revenues and employment generated from the sector. The numbers and relationships we present are fairly crude and must be used only as a rough measure of the possible impact of an expansion in the mining industry. Our results draw from several published studies and from our own work. See, for example, O'Hara (1979) and Hoskins and Green(1977). We examine the three main phases of mining: exploration, construction and development, and production.[2]

2. See Mackenzie and Bilodeau (1979) for a detailed discussion of the characteristics of these phases.

Table 53

DIRECT PROVINCIAL EMPLOYMENT IMPACT OF SELECTED INDUSTRIES
(Man Years of Direct Employment in Mining and Selected Other Industries, Induced by a $1 Million Increase in Corresponding Industry Output, Estimated for 1975)

	Mines & Quarries[a]	Agriculture	Forestry	Fishing, Hunting, and Trapping	Machinery[b]
Newfoundland	11.366	66.925	45.806	118.281	36.242
Prince Edward Island	72.640	69.934	73.533	130.407	37.428
Nova Scotia	16.293	75.743	48.583	59.553	56.874
New Brunswick	14.302	69.961	47.028	105.888	45.810
Quebec	17.769	65.094	43.336	81.320	26.122
Ontario	20.885	46.103	30.891	74.258	21.390
Manitoba	20.566	38.038	61.741	195.677	23.062
Saskatchewan	11.015	28.515	14.051	196.018	32.115
Alberta	18.718	37.645	24.315	195.573	24.974
British Columbia	14.756	61.803	18.695	35.573	20.762

Sources: Department of Regional Economic Expansion, Economic Development Analysis Division, Employment and Occupational Impacts Using the Version III Interprovincial Input-Output Model (May 1977), pp. 40-119, table 9.

[a]Excluding coal and services incident
[b]Excluding electrical.

Exploration

In general, exploration activities in mining generate few jobs, and are undertaken over a limited part of the year. They are the most volatile aspect of mining, in the sense that they are generally the first activity cut in cyclic downturns of the industry. Exploration may be undertaken either by producing companies, or by companies specializing only in exploration. Table 8 has shown annual exploration expenditures in Newfoundland, 1949-1977, and gives an idea of gross value generated. We have no estimate of how much of these expenditures stay in Newfoundland as payments to provincial factors of production, but will try to give a rough picture of the employment that is generated by some typical exploration programs.

The only measures of employment creation through exploration that we have are from case studies from the USA (see Hoskins and Green (1977)). Exploration for minerals involves aerial and land surveys, claim staking, and eventually some exploratory drilling to delineate the ore deposit (if found). Very few jobs are created by surveying and claim staking: perhaps 5-10 jobs per project. The numbers increase when we add drilling activities. One employment measure is a ratio of jobs created per drilling season (three to five months) in most northern areas per foot drilled.[3] This ratio ranges from .0025 to .004 man-months per foot drilled. The ratio includes both permanent employees of the exploration unit of a company and those employed by the company under contract drilling. The feet drilled in the U.S. season ranged from 4,500 to over 11,000 feet. Average wages paid to company employees ranged from $2,800 per drilling season to $8,000 (1976 U.S.$) per drilling season. The reason for the large difference is in part due to location of the project. The $8,000 figure was for a hypothetical project in Alaska, the other for a project in the western USA in an area relatively close to established communities. One suspects the high figure would be more applicable to exploration undertaken in Labrador.

Payments to employees working for contract drillers are not identifiable as wages, because they are part of total contracted drilling costs. Average drilling costs (per foot) vary narrowly around $20 to $24 (1976 U.S. dollars).

3. This ratio is compiled from the case studies presented in Hoskins and Green (1977).

The breakdown of employment requirements for two projects is presented in table 54. One is for a small surveying project in southwest Montana, and the other a project in the western USA consisting of surveying and extensive drilling. From these studies, we can get an idea of the nature of employment and wages, relative to the type of program and drilling activity.

If we knew the number of feet drilled in Newfoundland and Labrador per year, and the expected exploratory drilling in feet over the next five years, we could estimate employment from these phases of mining activity. We have not been able to find a figure for anticipated exploratory drilling, however. Using the employment multiplier and the average mining exploration budget over the past five years, we get a total employment figure of about 260 man-years. If we use the multiplier for just direct employment effects, we get almost 80 man-years of employment from average exploration figures over the past five years. We suspect that these numbers are too high, because most studies indicate that the number of jobs created in exploration is lower than in the other phases of mining.

The Newfoundland Department of Mines and Energy is currently engaged in a study of contract drilling within the province. When this information becomes available, our figures for the employment generated by exploration should be improved.

Construction and Development of Mines

A bit more information exists for this phase of mining. Stahl and Van Steenburgh (1974) have used the Candide model to derive some national income multipliers for the assumed two-year construction and development phase of a relatively large mine. The multiplier shows the impact on national income of an autonomous 10 percent increase in investment in various industries, broadly defined. The mining category includes mines, quarries, and oil wells (MQO) and is thus not comparable to some of our other multipliers which do not include oil wells. They find the investment multiplier for MQO to be 1.42, followed by utilities at 1.33, manufacturing at 1.03, and agriculture at 0.99. MQO has a relatively high multiplier because of its large construction component. Construction costs (for access roads, housing facilities, plus the mine and

Table 54

CASE STUDY OF EMPLOYMENT GENERATED BY EXPLORATION ACTIVITY

Project	Duration of Project (Days)	Average Permanent Employment	Employees of Company	Employees of Contractors	Total Company Wages ($ U.S.)
Montana	120	8	8	0	64,500
Western U.S.	159	30	13	17	178,850

EMPLOYMENT AND WAGES FOR MONTANA PROJECT

Employee	Number	Duration (Months)	Monthly Wage ($US)	Total Wage ($US)
Geologist	1	12	2,000	24,000
Geochemists	4	4	1,500	24,000
Geologists	2	2	1,500	12,000
Magnetometer operator	1	3	1,500	4,500
				64,500

EMPLOYMENT FOR WESTERN U.S. PROJECTS

Employee	Number
Gelogist	3
Field assistants	3
Cooks	2
Surveyors	2
Labourers	4
Drilling personnel	14
Helicopter pilots	3

Source: Hoskins and Green (1977).

mill) amount to 75 percent of fixed capital inputs for MQO compared to 37 percent for manufacturing. Construction involves relatively few direct and indirect imports (which are leakages from the national income model and thus reduce the size of the multiplier). This investment multiplier would presumably be fairly applicable to a particular province, again due to the local nature of most construction activities.

McCulla and Stahl (1977) have estimated the employment impact of the development of a new mine, using an investment function. For a $20 million investment, 3,600 man-years of employment is generated by MQO versus 1,800 for manufacturing. Again, this is due to the importance of construction in the total costs of developing a mine. These numbers should be interpreted with care as they apply to a very stylized mine which may not represent mining development in Newfoundland.

Another example of the capital costs and labour required for a new mine is a real case, that of Newfoundland Zinc's mine and mill, constructed in 1974-75. For a capital investment of $18 million (1975 Canadian dollars), 140 men were employed over a one-year period in the construction of the complex with an estimated labour payment of $5 million.[4]

More general estimates exist for capital and labour required for open pit and underground mines in the development stage. In one case study done of an underground lead-zinc mine in Canada, 8 men, or 101 manshifts per month at a total wage bill of $120 per shift or $12,120 per month, were required to bring a 2,000-ton-per-day mine into production after the initial construction phase.[5] These jobs included the drilling, blasting, and loading of waste and ore, necessary before production could begin. O'Hara (1979) has compiled formulae for capital costs for underground and open pit mine construction. Unfortunately, there is no simple way to summarize his work. The costs are specified for very particular geological and mechanical requirements of orebodies. If we knew these factors for a particular mine, we could estimate the costs. O'Hara gives a very crude estimate of total capital costs of mine and mill (in 1978 Canadian dollars), but warns that one should be cautious in using the figures. Nevertheless, he finds for an underground mine that total costs (C) = $\$800{,}000T^{0.6}$, and for open pit mines, C = $\$400{,}000^{0.6}$, where T is the tons of ore mined and milled daily.

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4. Fish (1975).
5. See Hoskins and Green (1977).

It is difficult to summarize this section, but one could say that, to develop a mine with a capacity of 1,500-2,000 tons per day, costing $18-20 million (1975 dollars), would require about 140 workers, or 3,600 man-years of employment. The employment multiplier for direct effects gives a number higher than the 140 men for a $20 million investment; it predicts that over 195 man-years would be required. Again, we suspect this multiplier overestimates acutal employment required in this phase.

Production

Much more information is available about the employment requirements for operating mines. We have done some estimation of aggregate labour requirements as a function of mine and mill capacity for open pit and underground mines, based on a cross-section of Canadian mines operating in 1978-79. We feel this approach is justifiable on the grounds that, over the long run, capacity is one of the most reliable indicators of labour demand at an individual mine. Mines typically do not adjust employment levels quickly to changes in mineral prices and demand. In some cases, companies can change the number of shifts working a mine or mill, but large adjustments are costly. In periods of excess supply, the typical experience is to produce for inventory, and to shut down or lay off a substantial portion of the labour force only if the market downturn is prolonged. In periods of excess demand, it is of course difficult to operate a mine and mill beyond their capacity limitations. Additional shifts can be added in the mine because mines typically operate on five-day weeks with one or two eight-hour shifts. Mills are typically operated continuously for 365 days per year. There is thus less flexibility in adding shifts to mill operations. Of course, the opposite relationship holds (in mine-mill shift adjustment) for a contraction; that is, mills are more flexible than mines. However, it should be stressed that changing the level of hours of employment is costly to both the company and its employees. It is difficult to maintain a stable labour force in remote areas, and frequent changes due to extensive overtime and layoffs tend to lead to high turnover. For purposes of long-run projection, we therefore feel mine and mill capacity are reasonable indications of mine/mill employment for any given mine.

One would like of course to estimate a relationship that is more consistent with economic theory, such as a production function (e.g., Cobb-Douglas, constant elasticity of substitution) or cost function. Unfortunately, we cannot obtain data on factor inputs (especially capital) for a large enough sample of mines to permit meaningful statistical analysis. Nor are we able to get information on shifts per day per mine-mill complex, or even on capacity utilization or total man-hours of operation per year. These detailed microdata are unavailable in public sources, and there was insufficient time to sample individual companies across the country. There are also econometric problems in estimating cost and production functions for mines. The notable difficulty with production functions is defining output, due to the joint-product nature of many mineral operations. The problems associated with defining and measuring capital inputs are also well known.

The year 1978-79 was chosen because of the availability of data. The source is the Canadian Mining Journal's Reference Manual and Buying Guide (1979) which reports detailed employment figures for those operating mines in Canada that respond to the journal's surveys. Estimating the relationship between employment and capacity for more than one year would be desirable. Unfortunately, very few companies responded to the Canadian Mining Journal's survey in previous years. We could not obtain a constant sample size and were therefore unable to compare years. Some important mining operations are omitted (e.g., Inco and some of Hudson Bay Mining and Smelting's operations), presumably because they did not respond fully to the survey. There are clearly a number of limitations to this approach, but we feel it is a useful guide to employment requirements that could be expected with an expansion of Newfoundland's mining sector over time.

Table 55 presents the results of our estimates, and table 56 illustrates the labour requirements derived for a number of different mine/mill capacity levels. We have used this information in chapter 5 to project, in a very crude fashion, the labour requirements for operating Newfoundland mines over the next five years.

The difficulties with the regressions should be noted. Mine and mill capacity explain only about one-half the variation in the dependent variable (employment), implying that we have omitted variables which may be more powerful

Table 55

MINE AND MILL LABOUR REQUIREMENTS ESTIMATED FOR CANADIAN OPERATORS, 1978-79

	Equation	$\bar{R}^2$	Durbin-Watson Statistic	Number of Observations
Underground Mines				
1	$L = \underset{(4.45,\ 25.35)}{112.7} + \underset{(5.29,\ 0.007)}{0.036C}$	0.45	1.35	34
2	$L = \underset{(53.36,\ 0.013)}{C^{0.685}}$	NC	2.12	34
Open Pit Mine				
3	$L = \underset{(4.31,\ 19.51)}{84.1} + \underset{(3.28,\ 0.001)}{0.0037C}$	0.23	1.46	34
4	$L = C^{0.511}$	NC	1.35	34
Mills				
5	$L = \underset{(3.52,\ 9.16)}{32.3} + \underset{(5.82,\ 0.0016)}{0.009C}$	0.40	1.63	51
6	$L = \underset{(61.06,\ 0.008)}{C^{0.508}}$	NC	1.99	51
7	$L = \underset{(4.42,\ 8.01)}{56.38} + \underset{(7.04,\ 0.0007)}{0.003C}$	0.24	1.88	59
8	$L = \underset{(68.68,\ 0.007)}{C^{0.501}}$	NC	1.98	59

Source: Centre for Resource Studies estimates.

Notes:
L = labour requirements, number of employees.
C = mine or mill capacity in tons per day ore.
Figures in parenthesis are the t-statistic and standard error of the estimate respectively.
NC means the $\bar{R}^2$ was not computed for equations without a constant term.

Table 56

ILLUSTRATION OF EMPLOYMENT GENERATED BY ESTIMATES PRESENTED IN TABLE 55

Equation	Capacity (Tons Per Day Ore)					
	1,000	1,200	1,500	2,000	3,000	5,000
UNDERGROUND MINES AND MILLS						
Mines						
1	149	156	167	185	221	293
2	114	129	150	182	241	342
Mills						
5	41	43	45	50	59	77
6	33	37	41	48	58	76
Total Employment						
1 + 5	190	199	213	235	280	370
2 + 6	147	166	191	230	299	418

	Capacity (Tons Per Day Ore)				
	10,000	15,000	20,000	30,000	50,000
OPEN PIT MINES AND MILLS					
Mines					
3	121	140	158	195	269
4	111	136	158	194	252
Mills					
7	86	101	116	146	206
8	101	124	143	175	226
Total Employment					
3 + 7	207	256	274	341	475
4 + 8	212	260	301	369	478

Source: Table 55.

in explaining mining employment, and which may change the coefficient of the capacity variable, if included. It should be noted that cross-sectional analyses typically produce low R^2's. The regressions also base actual employment in a particular year on capacity that has been in place for a number of years. If 1978-79 were a year in which there was a large cyclical upswing or downswing in metal demand or had peculiar institutional features (e.g., a strike), the employment figures would not be very representative of potential labour demand. Preliminary investigations suggest, however, that 1978-79 was not an unusual year for most mining companies in Canada.

Our results are also somewhat similar to the findings of other researchers. O'Hara (1979) derives expressions for operating personnel requirements in open pit mines and mills as a function of daily mine capacity, and in underground mines as a function of mining techniques (stoping technique, stope width) and daily tonnage. He does not provide any description of his sample, sample period, or statistical properties of his estimates, but for sake of comparison we present them below. It is interesting to note that our equation 4 (table 55) is close to his estimate for open pit mines, as are the estimates for mill labour.

Estimates of Number of Employees Required by Mining/Milling Technique

L (open pits)	$= 0.573C^{0.5} + 0.035C^{0.7}$	
L (blast hole)	$= 19.64\ (C/W)^{0.5}$	
L (cut and fill)	$= 5.46\ (C^{0.5}/W^{0.5})$	underground mining
L (Shrinkage)	$= 4.50\ (C^{0.5}/W^{0.5})$	techniques
L (room + pillar)	$= 2.16\ (C^{0.5}/W^{0.5})$	
L (mill)	$= (1.06 \text{ to } 1.14)C^{0.5}$	
L (general + service)	= (0.14 to 0.24) L (mine - mill crew)	

where L = number of employees
C = daily capacity in tons of ore
W = width of stope

Source: O'Hara (1979).

A different technique has been used by MacMillan et al. (1977). Using a more conventional economic model of the entire mining labour market for Canada, he estimates the demand for mining labour (as part of a simultaneous system) using a time series, 1952-73. The only significant economic variables in his equations turned out to be lagged employment (one period) and the quantity of ore mined per year. His results for production workers in the metallic and nonmetallic mineral sectors are presented below.

Labour Demand, 1952-73[a]

$$L \text{ (metallic minerals)} = \underset{(-0.683)}{-1.838} \times E^{\underset{(3.95)}{.626}} \times Q^{\underset{(4.37)}{.574}} \times \underset{(-4.68)}{(-0.049)T}$$

$$R^2 = .716, \quad D.W. = 1.956$$

$$L \text{ (nonmetallic minerals)} = \underset{(1.52)}{1.699} \times E^{\underset{(6.42)}{.781}} \times Q^{\underset{(2.44)}{.046}}$$

$$R^2 = .831, \quad D.W. = 1.813$$

where L = demand for labour in thousand man-years
E = aggregate employment in the metallic or nonmetallic mineral industries in thousand man-years, lagged one year
Q = ore mined per year in thousand tons
T = linear time trend
D.W. = Durbin-Watson statistic.

Source: MacMillan et al. (1977).

[a]Numbers in parentheses are t-statistics.

Over 95 percent of the explanatory power of the regressions comes from lagged employment. An aggregate equilibrium model of the labour market is, however, not very useful in predicting employment requirements of new mine development in a particular province. Newfoundland, for example, has a relatively small labour force in mining compared to the Canadian total, and is very sensitive to mine openings and closures. Relatively large shifts in employment can occur from year to year as a result.

Both O'Hara's and our estimates of employment elasticity, with respect to output (in his case) and capacity (in ours), are, however, fairly similar, ranging from 0.5 to 0.685 for all mine workers. MacMillan is in the middle with 0.574. Thus, with any of the regressions, a one-percent increase in mine output or capacity in a given year could lead to an increase in mine employment of between 0.5 and 0.7 percent. The demand for labour therefore appears to be relatively inelastic with respect to production (level or capacity).

Summary

In this section, we have attempted to examine means of estimating the labour requirements of the three phases of mining. If Newfoundland were to bring a new 2,000-ton-per-day underground mine into production over the next five years, we might expect the total capital costs to be on the order of $25 million (1979 dollars) and direct labour requirements to be:

Exploration and exploratory drilling	10-25 men for 1-2 years
Construction and development	120-160 men for 1-2 years
Production	230 men for the life of the mine (5 to 20 years)

Alternatively, we can use the employment multipliers to show the direct impact of a $25 million expansion. The increase in direct employment would be 285 man-years. Total employment effects would come to about 950 man-years for Newfoundland as a whole. Our disaggregated estimates thus yield estimates of the same order of magnitude as the direct employment multipliers estimated for Newfoundland by DREE.

Constraints to Expansion of the Mining Industry in Newfoundland

The figures presented in earlier sections of this report for the income and employment generated by an expansion of the mining industry do not take into account any of the constraints which may affect the potential expansion. These constraints include the market demand for mineral products, the availability of labour in Newfoundland, political factors from both the government and private sectors, and so forth. For a more realistic evaluation of both the potential for Newfoundland mining and the government's proposals to increase employment and incomes and decrease unemployment by expanding the natural resource sectors, we must examine these constraints and their impact on Newfoundland's mining industry.

In the next few sections, we will consider:

i) mineral markets;
ii) labour supply characteristics;
iii) government and corporate policies
iv) mineral reserves;
v) other relevant factors.

Market Conditions for Mineral Products

Nonferrous Base Metals

As noted in chapter 5, we find it unlikely that any new base metal mine and mill capacity will come on stream before 1983. Expansions to existing capacity at, for example, Newfoundland Zinc and Consolidated Rambler are possible. In any event, Newfoundland is such a small producer relative to Canadian and total world producion of nonferrous metals that it is reasonable to assume that any incremental output produced in Newfoundland will be sold at prevailing market prices.

We now turn to an examination of expected aggregate demand, prices, and production costs over the period to 1983 and beyond. It is of course important to remember that all these forecasts are highly speculative.

A number of forecasts have been made for the aggregate supply of and demand for various base metals, their prices, and costs of production over the next 5 to 10 years.[6] The forecasts from Chase Econometrics were found to be representative of the currently available documentation. Table 57 summarizes some of their forecasts for copper, zinc, and lead. It shows the expected growth rate in metal consumption, metal prices, total cost of new capacity, and the variable costs of an efficient producer, for the period 1979-88.

Some interesting relationships and possible trends can be seen from the table. All the metals are expected to recover from the slump of 1974-79. From 1980 to the end of the period, growth rates in consumption are positive. The average forecast growth rates in consumption for the world are 3.3 percent for copper, 3.9 percent for zinc, and 3.0 percent for lead. Looking at individual consuming areas, however, a slightly different picture emerges. As noted in chapter 5, Newfoundland sells all its copper, zinc, and lead as concentrate to smelters in either Canada, Europe, or the USA. Looking at the relevant markets for each commodity, we can get a better idea of potential demand and production.

Copper

Newfoundland copper from Consolidated Rambler is sold to Noranda's Gaspé smelter. Thus, the relevant market is Canada for ore, but could also include the USA and Europe (Noranda's copper consumers). The growth in demand in the Canadian market is somewhat cyclical but, until the end of the period (1987-88), expected to be higher than that of the rest of the world. Consumption is expected to grow from over 255,000 tons in 1979 to over 400,000 tons in 1988. Because Newfoundland is such a small copper producer, it is reasonable to assume that all copper produced will be sold.

Nominal copper prices are expected to rise relative to the total cost of installing new capacity only after 1983.[7] From 1979-83, the total cost of new

6. See, for example, Chase Econometrics (1978), (1979), Commodities Research Unit (1979), and reports from major financial institutions.
7. The total costs for installing new capacity are for a hypothetical mine, mill, and smelter complex built anywhere in the world. The costs are thus not directly applicable to Newfoundland but give an indication of trends in production costs over time. It is impossible to say if they are an under- or overestimate, relative to Newfoundland.

Table 57

MARKET FORECASTS FOR COPPER, ZINC AND LEAD, 1979-88

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Copper										
(Refined consumption forecast annual percent change over previous year)										
USA	-2.3	3.9	6.0	3.9	3.6	3.0	2.5	3.3	4.0	3.7
Canada	3.1	3.9	7.9	8.8	6.4	11.3	4.5	3.7	2.2	0
Europe	5.2	3.5	2.1	2.5	1.9	1.4	1.2	3.5	NA	NA
Total world	2.7	3.5	3.7	3.1	3.0	3.0	3.1	3.7	3.8	3.8
Forecast Metal Prices										
U.S. producer price (US ¢/lb.)	74	87	111	136	157	176	203.5	208	213	225
LME price (US ¢/lb.)	69	82.5	105.5	130	160	190	220	225	230	225
LME price (1978 US ¢/lb.)	64	72	87	101	118	134	147	142	138	128
Forecast Production Costs										
Total cost new capacity (US ¢/lb.)	113	123	134	145	157	170	185	197	211	225
Variable cost - most efficient producer (US ¢/lb.)	63	68	74	79.5	86	92	99	106	113	121
Zinc										
(Refined consumption forecast annual percent change over previous year)										
USA	-3.3	1.0	5.9	2.0	1.7	2.35	2.1	2.2	4.2	3.8
Canada	3.1	3.95	4.1	4.9	4.7	4.3	4.4	4.3	4.7	4.6
Europe	3.8	4.8	3.9	4.7	4.6	3.5	3.2	3.7	3.6	3.7
Total world	2.3	3.9	4.8	4.2	4.1	3.8	4.0	3.95	4.2	4.2
Forecast Metal Prices										
U.S. producer price (US ¢/lb.)	37	42.5	48	56	61	65	71	75	79	83
LME price (US ¢/lb.)	32	36.5	43	50	54	58	62.5	67	71	75
LME price (1978 US ¢/lb.)	30	32	35	39	40	41	42	42	43	43
Forecast Production Costs										
Total cost new capacity (US ¢/lb.)	47	51	55	58	61	65	71	75	79	83
Variable cost - most efficient producer (US ¢/lb.)	22	24	26	27	28	30	33	35	37	38.5

Table 57 (Continued)

MARKET FORECASTS FOR COPPER, ZINC AND LEAD, 1979-88

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Lead										
(Refined consumption forecast annual percent change over previous year)										
USA	-7.0	-0.03	3.9	3.7	4.6	4.0	3.2	2.9	2.8	2.8
Canada	-1.5	0.1	0.6	2.0	1.6	0.9	1.1	0.8	1.6	1.6
Europe	2.4	2.2	2.4	2.6	2.4	2.3	3.1	3.1	2.9	2.8
Total world	-0.4	2.3	3.7	3.7	4.0	3.5	3.8	3.5	3.0	3.0
Forecast Metal Prices										
U.S. producer price (US ¢/lb.)	37	39	41	43.5	46	48	51	53	56	58.5
LME price (US ¢/lb.)	35	35	38.5	42.5	47.5	49	46	48	51	53
LME price (1978 US ¢/lb.)	32	31	32	33	35	34	31	31	31	30
Forecast Production Costs										
Total cost new capacity (US ¢/lb.)	36.5	39	41	43.5	46	48	51	53	56	58.5
Variable cost - most efficient producer (US ¢/lb.)	15	16	17	18	18	19	19	20	21	21

Source: Chase Econometrics Inc. (1978).

capacity is considerably above the expected U.S. producer price or the London Metal Exchange (LME) price.[8] If copper producers believe this price-cost forecast, it is likely that most will attempt to bring in new capacity after 1983. Of course, any new capacity that can be built at a cost below the expected prices will thus be in a favourable position.

For Newfoundland, as noted before, the period beyond 1983 is more relevant, as we expect no major increase in capacity before then. The outlook for copper is then favourable until the end of 1986. Expected revenue from copper over the period will be between $13.2 million in 1979 and $28 million in 1983 (current dollars).[9]

Zinc

The demand for zinc looks more stable than that for copper over the period, with Canadian demand expected to grow at about 4.3 percent per year and consumption to increase from around 170,000 tons in 1979 to over 250,000 tons in 1988. Newfoundland's zinc is currently sold to either the USA or to Europe, where expected growth rates in consumption average almost 4 percent and under 2.2 percent respectively.[10] If Newfoundland can find a market for its zinc in Canada, e.g. the zinc plant now in the feasibility-study phase in New Brunswick (Brunswick Mining and Smelting), its producers will probably receive a better price and more assured demand for their concentrate than from the USA or Europe. Newfoundland's Department of Mines and Energy will presumably keep abreast of the New Brunswick processing situation, and if the return to Newfoundland for selling the ore to New Brunswick exceeds that of sales abroad, the government should encourage a change in zinc marketing.

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8. Canadian copper metal is generally sold at the Canadian dollar equivalent of the U.S. producer price.
9. All of the expected revenue estimates given are for fairly realistic cases, but could be high because they assume producers receive the metals price. In reality, net smelter returns yield a price less than the metal prices given in table 6.10. It is also assumed that the Canadian producers receive the U.S. producer price. Actual prices received would fluctuate with the exchange rate. The figures are thus quite rough.
10. The U.S. growth rate in demand is quite variable early in the period, ranging from -3.3 percent in 1979 to 5.9 percent in 1981. One of the reasons for this variation is the shutdown of many zinc smelters in the past few years. More smelters are expected to close in the future.

The total costs of installing new capacity are greater than the expected U.S. producer price and substantially above the LME price for the period 1979-82. They are equal for 1983 to 1988. Again, producers are therefore likely to postpone bringing on new capacity until the expected price rises in 1983 and beyond. If prices are as forecast, Newfoundland can expect revenues from zinc production of between $46 million in 1979 and over $76 million in 1983 (current dollars).

Lead

Although world lead consumption is expected to grow at an average rate of 3 percent per year over the next 10 years, the growth rate in consumption for the Canadian market is well below this at about 1.1 percent from 1980-88. Growth rates in Europe and the USA are 2.7 and 3.5 percent respectively over the period 1981-88.[11] The total cost of new capacity and expected U.S. producer price are equivalent over the same period (with the LME price virtually the same). Assuming this is not an error, it would appear that there is no incentive for installing capacity at any particular time over the period.

Lead production from Newfoundland is currently all from Buchans, so potential for increased production over the next ten years is minimal unless a new lead-containing deposit is discovered. Total revenues from lead production could be between $7.4 million in 1979 and $9.6 million (current dollars) in 1983.

In summary, markets for nonferrous base metals appear to have modest expected growth rates in consumption over the next 5 to 10 years, compared to the boom periods of the late 1960s and early 1970s. Expected prices for copper and zinc are less than the expected costs of installing new capacity until after 1983, which should deter development of potential deposits in Newfoundland as well as in other producing areas. Beyond 1983, prices may justify bringing on new capacity. Markets may thus act as a constraint on new capacity until after 1983 but, for existing capacity, prices should be sufficient to cover costs and earn a modest return. Because Newfoundland is a price taker in all these markets, all production should be sold unless unforeseen transportation problems or smelter difficulties arise. This implies that markets should not act as a constraint in the projections made for base metal output and employment (see table 39).

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11. Growth rates are negative for the USA in 1979 and 1980.

Iron Ores

In assessing market conditions for the iron ore produced by IOC and Wabush Mines, it is necessary to recognize that there are several kinds of products, and that Labrador iron mining companies produce specific products for well-defined market regions. After examining these features, we proceed in this section to examine supply-demand relationships and the outlook for iron ore.[12] A myriad of types of iron ore is produced by the world iron ore industry, varying widely in grade (iron content) and quality (chemical composition). For marketing purposes, however, usable iron ores are customarily grouped according to physical structure or degree of processing into the following categories: direct-shipping, lump, fines, concentrates, sinter, and pellets. Direct-shipping ores have a high enough iron content to be merchantable, as the term implies, without any processing (or with minimal screening and washing). Lumps and fines are the coarse and fine products of direct-shipping ores. Lump ore commands a higher price than either direct-shipping ore or fines because it can be charged directly to the blast furnace without further processing. For the same iron content, the price difference is small between lump and direct-shipping ores, since the latter contains a high proportion of lump. Although these products command different prices, the common feature of lumps, fines, and direct-shipping ores is that they have a high iron content in their crude state.

Concentrates are produced from low-grade ores by separating iron ore minerals from the waste (gangue). The upgrading process is called beneficiation. Concentrates are more costly to produce than lumps, fines and direct-shipping ore.

Before being charged into the blast furnace and used in steelmaking, concentrates (and fines) have to be agglomerated to improve permeability of the furnace burden and to prevent loss of ore fines up the stack. Agglomeration is the process of fusing iron ore product particles to produce either sinter or pellets. Sinter is produced by mixing concentrates with coke and firing the mixture on a travelling grate to produce a coarse, porous cinder-like product.

12. The sources used for this section are: Bennett (1978); Brown (1978); Canadian Minerals Yearbook, 1977 (preprints); Gramp (1977); Gramp (1979); Klinger (1978); Mining Journal, April 13, 1979; and U.S. Bureau of Mines (1978).

Pellets (3/8 to 1/2 inch in diameter) are made by mixing a binder (usually bentonite) with finely-ground concentrate, balling the mixture, and hardening the green pellets under high temperature in oil- or gas-fired furnaces or kilns. Typically, sinter is produced near blast furnace sites, whereas most pellets are produced at mine site or shipping port.

IOC produces pellets, concentrates and, to a lesser extent, direct-shipping ores (see table 20). Under full-capacity operations, IOC's annual output would be: pellets, 16 million tons; concentrates, 10 million tons; and direct-shipping ores, 2 million tons. Pellets are sold in North America under long-term contract to the owners of the company; concentrates, under long-term contract to European and Japanese steel interests. Wabush Mines produces pellets only (6 million tons per year capacity), and output is absorbed by the partners in the joint venture in proportion to their equity participation. Thus, most of Wabush Mines output goes to the North American market.

The destinations of the iron ore products of IOC and Wabush Mines correspond to the nature of product demand in these markets. Demand in North America is largely for pellets, whereas concentrates (and lumps and fines) are preferred by iron ore consumers in Europe and Japan. The relevant markets facing IOC and Wabush Mines are therefore the North American market for pellets and offshore markets in Japan and Europe for concentrates. With this emphasis in mind, we consider in turn supply and demand conditions for iron ores.

On the supply side, three features of the post-1950 development of the world's iron ore industry stand out: the radical change in the composition of iron ore products; the rapid growth in world production; and the emergence of iron ore supply areas that are competitive with Canada. Table 58 shows the changing product mix in Canada and, as reflected in the distribution of iron ore consumption, across the world. The shift to pellets has been much more pronounced in Canada (and also in the United States) than in the world as a whole. This reflects the dominance of the North American market for Canadian ores, which is chiefly a market for pellets.

Table 59 shows the world production of iron ore by region for selected years from 1950 to 1976. These data disclose the rapid growth in world output and the emergence of sources of supply competitive with Canada. Canada's

Table 58

PERCENTAGE DISTRIBUTION OF PRODUCT MIX OF IRON ORES PRODUCED IN CANADA AND IN WORLD IRON ORE CONSUMPTION, SELECTED YEARS, 1950-76

	Canadian Production by Type of Product		
	Direct Shipping	Fines and Concentrates	Pellets and Sinter
1950	38	32	30
1960	61	24	15
1965	23	41	36
1970	22	26	52
1975	9	37	54

	World Consumption by Type of Product		
	Lumps	Fines	Pellets
1955	77	23	-
1965	48	45	7
1976	27	53	19

Sources: Bennett (1978), p. 16, Mining Journal, April 13, 1979, p. 281.

- = Less than one percent.

Table 59

PRODUCTION OF IRON ORE BY REGION, SELECTED YEARS, 1950-76
(Million Gross Metric Tons)

Country	1950	1960	1965	1970	1971	1972	1973	1974	1975	1976
North America	101.2	108.6	123.4	139.6	126.1	115.4	136.6	138.2	130.7	140.7
Latin America	5.6	41.9	61.8	85.6	89.0	84.5	102.0	127.0	132.3	111.4
Oceania	2.4	4.7	7.0	51.3	62.2	62.3	87.9	96.7	97.4	92.4
Western Europe	75.7	143.0	136.6	135.7	134.3	129.9	130.7	125.0	114.2	106.1
Africa	7.0	15.1	39.7	59.0	60.4	60.0	62.4	75.4	70.7	72.3
USSR	39.7	106.5	153.0	195.5	203.0	208.1	216.1	224.9	232.8	239.0
Socialist Countries of Eastern Europe	3.6	9.3	12.1	10.6	10.9	10.5	9.6	14.5	14.1	12.5
Far East (excluding China and Korea)	5.3	26.5	35.9	40.1	39.0	39.9	39.0	37.9	43.8	44.3
China and Korea	3.0	43.0	48.9	51.0	52.2	53.0	53.1	59.5	59.7	56.6
World Total	243.6	498.6	618.4	768.4	777.1	763.5	837.0	899.1	895.7	875.3

Source: Bennett (1978), part C, table 2.

principal offshore competitors are Australia (Oceania) in the Japanese market and Brazil (accounting for the bulk of Latin American output) in the European market. In addition, Canadian producers are facing increased competition from U.S. producers in the large North American pellet market, the magnitude of which is indicated by table 60. It is also worth noting here that owner-customer North American steel companies involved in IOC and Wabush Mines also have equity interests in mine-concentrator-pelletizing operations in the United States (Minnesota).[13]

A further perspective on iron ore supply is depicted by the data in table 61. This table shows that considerable excess capacity has emerged in the late 1970s. The 1970s were marked by a sizable growth in production capacity. One indicator of this growth is the increase in pellet production capacity in North America. Just as IOC was completing its major concentrator-pelletizing expansion, a major increase in U.S. pellet capacity got under way in 1974. Pellet capacity stood at 113.2 million tons per year in 1976; in 1978 rated capacity was 127.8 million tons per year; and by 1980 capacity will be 134.4 million tons per year. In 1978, pellet shipments from North American plants amounted to 101.3 million tons, an all-time high. This represented only 80 percent of capacity, however. World pellet capacity in 1978 was about 230 million tons per year, and by 1981 is expected to be 270 million tons per year. The growth in world pellet production by region is shown in table 62 for selected years from 1955 to 1975.

These developments in the pellet market have major implications for IOC and Wabush Mines. Both companies sell most of their pellets in the North American market. In addition, Wabush Mines sells only pellets, and approximately 75 percent of IOC's sales revenues have come from pellet sales.

On the demand side, we focus on three principal markets where iron ores from Labrador mines are sold: the United States, the European Economic Community (EEC), and Japan. Consumption is taken as a proxy for demand. Table 63 presents data on iron ore consumption for these regions for the years 1970 to 1975. A longer time horizon and more up-to-date data are provided in figure 3. This figure relates trends in iron ore consumption by consuming regions from 1950 to 1977. In all three markets consumption has declined from the 1973-1974 peaks, especially in the EEC and the United States.

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13. Skillings (1979).

Table 60

SHIPMENTS OF IRON ORE PELLETS FROM PLANTS IN NORTH AMERICA, 1948-78
(Thousand Gross Tons)

	United States	Canada	Mexico	Total North America
1948	1	-	-	1
1949	3	-	-	3
1950	82	-	-	82
1951	217	-	-	217
1952	163	-	-	163
1953	499	-	-	499
1954	663	-	-	663
1955	868	231	-	1,099
1956	4,461	375	-	4,836
1957	6,254	566	-	6,820
1958	8,452	864	-	9,316
1959	8,364	1,081	-	9,445
1960	11,595	1,351	-	12,946
1961	15,795	1,575	-	17,370
1962	17,398	1,445	-	18,843
1963	23,167	3,773	-	26,940
1964	28,932	7,816	-	36,748
1965	30,955	10,840	-	41,795
1966	36,236	12,915	-	49,151
1967	42,408	16,435	-	58,843
1968	48,274	21,313	-	69,587
1969	54,451	20,032	-	74,483
1970	53,789	24,914	653	79,356
1971	51,100	23,627	859	75,586
1972	55,718	22,161	1,270	79,149
1973	63,974	24,405	1,153	89,532
1974	60,050	23,751	1,577	85,378
1975	60,057	23,035	2,888	85,980
1976	62,286	26,883	3,335	92,504
1977	43,862	29,291	4,658	77,811
1978	72,732	23,937	4,621	101,290

Source: Gramp (1979), p. 11.

Table 61

ESTIMATED WORLD PRODUCTION OF IRON IN ORE, 1977, AND PRODUCTION CAPACITY, 1976, 1977 and 1980
(Million Short Tons of Contained Iron)

	Production	Production Capacity		
	1977	1976	1977	1980
North America				
United States Pellets	31.0	51.0	62.0	69.0
Natural ores	6.7	25.0	24.0	14.0
Canada	38.2	42.0	46.0	49.0
Mexico	3.7	4.5	4.7	5.6
Total	79.6	122.5	136.7	137.6
South America				
Brazil	62.0	75.0	93.0	109.0
Venezuela	9.1	21.0	21.0	22.0
Other	10.4	17.3	17.3	21.0
Total	81.5	113.3	131.3	152.0
Europe				
France	12.3	17.4	16.3	15.9
Sweden	17.4	29.0	29.5	29.5
Other (except USSR)	15.7	23.1	22.8	23.8
Total	45.4	69.5	68.6	69.2
USSR	159.4	160.0	165.0	180.0
Africa				
Liberia	11.9	18.0	17.0	18.0
South Africa, Republic of	16.6	12.0	20.0	23.0
Other	9.7	15.2	14.5	14.2
Total	38.2	45.2	51.5	55.2
Asia				
China, People's Republic of	35.8	36.0	37.0	39.0
India	29.7	34.0	36.0	42.0
Other	7.3	12.0	12.0	12.0
Total	72.8	82.0	85.0	93.0
Oceania				
Australia	64.5	86.0	86.0	97.0
Other	1.6	2.0	2.0	2.0
Total	66.1	88.0	88.0	99.0
Grand Total	543.0	680.5	726.1	786.0

Source: United States, Bureau of Mines (1978), p. 15.

Table 62

WORLD PRODUCTION OF PELLETS BY REGION, SELECTED YEARS, 1955-75
(Million Metric Tons)

Country	1955	1960	1965	1970	1975
North America					
United States	0.9	13.9	32.1	56.3	70.0
Canada	0.2	1.2	10.3	25.3	24.5
Mexico	0.0	0.0	0.0	0.7	1.8
Total North America	1.1	15.1	42.4	82.3	96.3
Australia	0.0	0.0	0.0	6.5	9.5
Brazil	0.0	0.0	0.0	0.8	4.2
Sweden	0.2	0.4	1.0	4.9	8.5
USSR and East Europe	0.0	0.0	0.0	10.6	27.2
Japan	0.1	0.6	1.8	3.4	7.0
Other	0.1	0.0	1.3	9.7	14.4
World Total	1.5	16.1	46.5	118.2	167.1

Source: Bennett (1978), part C, table 5.

Table 63

IRON ORE CONSUMPTION IN THE UNITED STATES, CANADA, THE EUROPEAN ECONOMIC COMMUNITY AND JAPAN, 1970-75
(Million Metric Tons[a])

	United States	Canada[b]	European Economic Community	Japan	Total Selected Countries
1970	125.2	NA	141.2[d]	86.1	605.5
1971	110.7	12.1	159.3[d]	96.4	591.5
1972	121.8	12.5	167.7[d]	98.6	619.7
1973	149.3	14.6	185.6	117.4	718.1
1974	140.4	14.6	200.7	121.5	734.9
1975[e]	115.9	15.7	150.4	118.9	644.6

Source: United States, Department of the Interior, Bureau of Mines, Minerals Yearbook, III, selected years.

[a]Annual data are based on the sum of three categories: iron ore for steelworks, iron ore for agglomerates; and iron ore and concentrates for blast furnaces.
[b]Estimated.
[c]United States, Canada, European Economic Communities, European Free Trade Area, Finland, Spain, USSR and satellites, Turkey.
[d]Excludes the United Kingdom, Ireland and Denmark.
[e]Preliminary.
NA = Not available in data source.

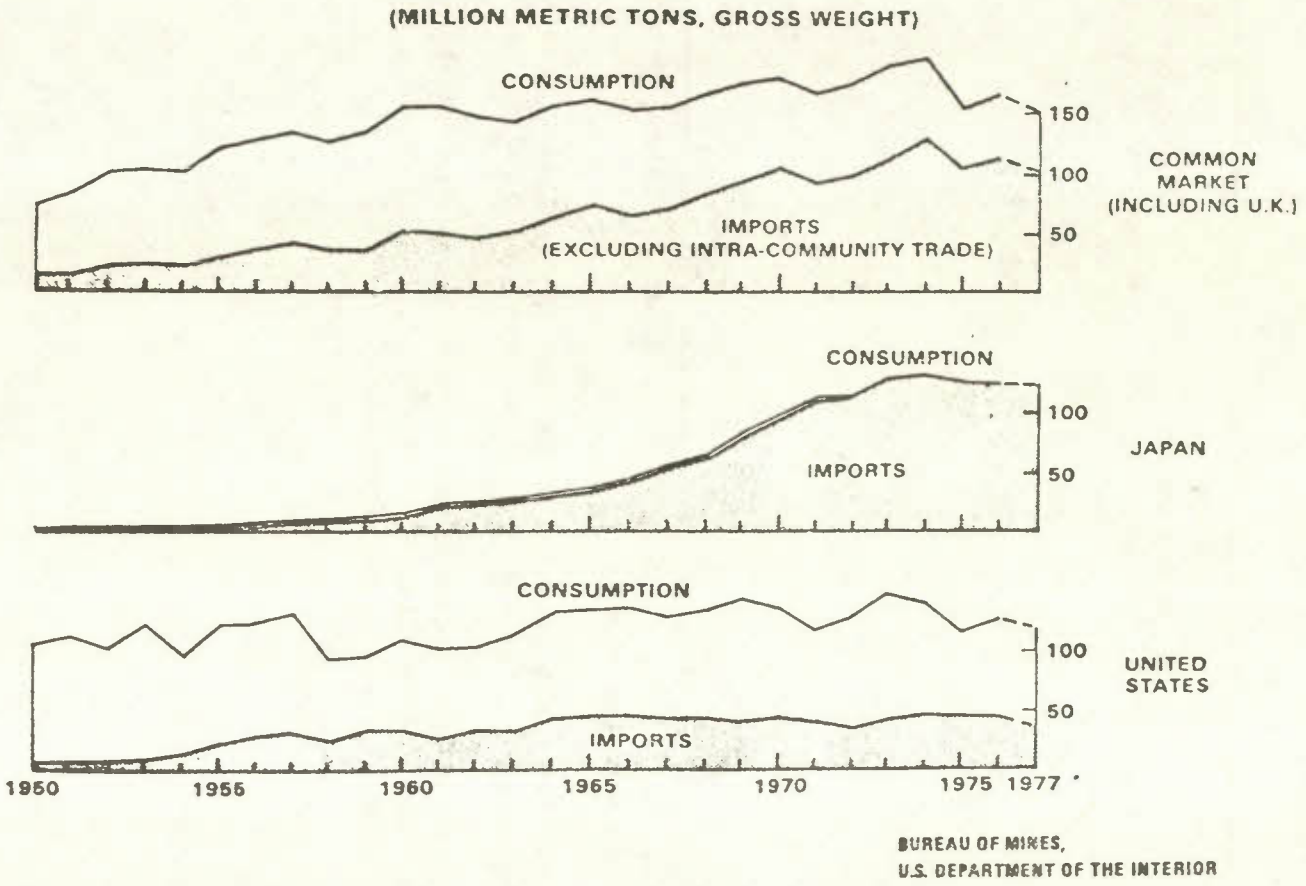

Figure 3. Consumption and imports of iron ore United States, Japan, and The Common Market, 1950-77

Source: F.L Klinger, 'Status of the Iron Ore Industry - 1978,' Skillings' Mining Review (December 9, 1978), p. 11.

Table 63 also shows total iron ore consumption, but this series is truncated and does not encompass all iron ore consuming countries in the world. Another proxy for the demand for iron ore is the production of crude steel, since about 90 percent of iron output is used for steel making. Table 64 shows the world production of crude steel and steel production in the United States (and North America), the EEC and Japan. As with iron ore consumption, the production of raw steel (as expected) in 1975 and 1976 was below the 1974 peak in the three main market areas for Labrador iron ores. Similarly, world steel production fell below the 1974 level. Going beyond the coverage in table 64, world steel production in 1978 totaled about 712 million metric tons, slightly higher than the rate of output for 1974. What is more significant for IOC and Wabush Mines operations, however, is that the combined steel production of the United States, the EEC, and Japan was 47 million metric tons, or 12 percent, lower than the 1974 output of 405 million metric tons. Further, if the anticipated recession in the United States materializes, this will exacerbate the weakness in the steel industry in the near term.

Iron ore supply-demand relationships cannot be deduced from the iron ore production and consumption and crude steel production data outlined above. The data for supply and for demand are not comparable. It is widely recognized, however, that iron ore production has exceeded demand in recent years. The emergence of excess supply has manifested itself in declining prices for iron ore products. Although the price for pellets in North America has held fairly firm, the price was reduced in the international market in 1978. Also, prices for lumps, fines and direct-shipping ores fell in 1978. At the present time, some are anticipating that excess supply will persist in the world iron ore industry until 1985. Given these expectations it is not surprising that no new developments in North America, other than those projects in progress, are envisioned before the late 1980s.[14]

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14. In the previous section market forecasts from Chase Econometrics Inc. were used to evaluate market conditions for copper, zinc, and lead to 1988. Chase does not produce market forecasts for iron ore. Moreover, we canvassed other experts who responded unanimously that they did not know of the existence of any market forecasts for iron ore.

    Forecasts for steel market conditions do exist, however. Since about 95 percent of iron ore production is smelted into pig iron, which is subsequently used to produce steel, we considered the possibility of developing a rough set of iron ore market forecasts by linking iron ore consumption (or production) to steel market forecasts by the application of appropriate conversion factors such as the recent ratios of iron ore consumption (or production) to crude steel production. We concluded, however, that this exercise would be too elaborate and too time-consuming for the present research.

Table 64

CRUDE STEEL PRODUCTION IN THE UNITED STATES, NORTH AMERICA, THE EUROPEAN ECONOMIC COMMUNITY, JAPAN, AND THE WORLD, SELECTED YEARS, 1950-76
(Million Metric Tons)

	United States	North America	European Economic Community	Japan	World
1950	87.8	91.3	48.0	4.8	190
1955	106.2	111.0	73.0	9.4	271
1960	90.1	96.8	97.9	22.1	335
1965	119.0	130.5	113.8	41.2	454
1970	119.1	134.2	138.1	93.3	594
1971	109.1	123.9	128.2	88.6	581
1972	120.8	137.0	139.1	96.9	629
1973	136.5	154.6	150.1	119.3	695
1974	132.0	150.7	155.6	117.1	706
1975	105.9	124.3	125.3	102.3	644
1976	116.3	134.8	134.2	107.4	674

Source: Bennett (1978), part E, table 1.

Nonmetallic Minerals

Four nonmetallic minerals are produced in Newfoundland: asbestos, gypsum, pyrophyllite, and silica. Market conditions are not important constraints to the expansion of these industries in the province, because the minerals are produced either for parent-company manufacturing plants or under long-term supply contracts.[15]

Advocate Mines has contracted with the owner-customer companies Johns-Manville Canada Inc. and Compagnie Financiere Eternit S.A. to purchase all of Advocate's output to the end of 1985, with an option for an additional five-year period.[16]

It is not likely that the prices that Advocate receives will adversely affect the company's operation. Although we do not have details on pricing for the sales contract, it is known that most asbestos sales contracts contain provisions for price variations. And, in recent years, the prices for asbestos fibre have risen consistently and rapidly. Between 1960 and 1971 asbestos prices increased from 2 to 5 percent every year or two. Since 1973, however, price increases have been around 8 percent per year.[17] Two price increases of 8 percent each have gone into effect this year, however, and another similar increase is scheduled for the first of January 1980.[18]

Most of the gypsum produced by Flintkote Company of Canada is shipped to plants of the parent Flintkote Group in the United States. Small quantities are shipped to Atlantic Gypsum and North Star Cement located on the west coast of the Island. Both the export and local markets for crude gypsum are governed by movements in the construction industry.

Pyrophyllite and silica are produced from small mining operations on the Avalon Peninsula. The pyrophyllite operation is a wholly-owned subsidiary of American Olean Tile Company, Inc. in Pennsylvania. All mine production is shipped to the parent's plant for use in producing ceramic tile. The silica mine, owned by Erco Industries Limited, is shipped to the parent's plant at nearby Long Harbour for use in the manufacture of elemental phosphorus. Production from

15. Again, Chase Econometrics Inc. does not produce market forecasts for asbestos or gypsum.
16. Canadian Mines Handbook 1979-80, p. 20.
17. Energy, Mines and Resources (1976d), p. 7.
18. Northern Miner, 6 September 1979.

the silica and pyrophyllite mines will depend upon the respective market conditions for ceramic tiles and phosphorus. In addition, the provincial government plans to renegotiate the power contract with Erco.[19] Under the original (and existing) long-term power contract, the price Erco has paid for power has been below the cost of production. Since electrical energy is an important input in producing elemental phosphorus, the establishment of a new and higher price for power could lead to a curtailment in the rate of production and hence to a reduction in silica requirements.

Structural Materials

Structural materials (sand and gravel, limestone and shale) are produced for the local market. Demand for these materials will depend upon the general level of economic activity in the province and especially on activity in the construction industry.

Uranium

There should be no market constraint for the production from Brinco's planned Kitts-Michelin project. If the marketing arrangements that have been announced are realized, Edison Development Canada, Inc., a partner in the project, will buy up to 18 million pounds of the total estimated recoverable amount of 20 million pounds of uranium oxide.[20]

Labour Supply Characteristics

This study emphasizes the projected demand requirements for labour in the Newfoundland mining industry. In this section, we examine aspects of the labour supply side as a constraint to meeting the projected demands. Thus, labour supply is not investigated as a behavioural construct, and no attempt is made to match supply with demand. Indeed, the demand and supply data are not

19. 'Speech from the Throne,' (12 July 1979), p. 4.
20. Mining Journal, 10 August 1979; Northern Miner, 23 August 1979. Chase Econometrics Inc. does not produce market forecasts for uranium because of uncertainties associated with government intervention. For a discussion of long-term world demand and world reserves see Williams (EMR 1976f).

comparable. What we do is examine age, skill and occupational characteristics of the province's labour supply relating to the mining industry, and look at the problem of labour turnover. A common complaint of mining companies is the difficulty they have in obtaining skilled labour. Accordingly, we will pay particular attention to skill characteristics as a constraint to filling labour demand requirements in the province's mining industry.

We begin by examining attributes of the work force from two bodies of data; the Canadian decennial census and the labour force attitude survey carried out by the Economic Council for the Newfoundland Reference. This is followed by a brief discussion of turnover. Finally, we study features of the mining labour supply in Buchans and St. Lawrence. The St. Lawrence mine closed down in 1978 and the Buchans mine is faced with imminent closure. The issue we want to address with reference to these localized mining labour forces is the mobility of these mine workers.

Age, Skill and Occupational Characteristics

Decennial Census Data

Characteristics of the decennial census labour force in Newfoundland's mining industry in 1951, 1961 and 1971[21] are shown in tables 65 to 67. Table 65 shows, not surprisingly, that the work force is comprised predominantly of males. In fact, there are very few females employed in the province's mining industry, although the number increased considerably in the 1961-71 period.

Tables 66 and 67 show respectively the age composition and educational attainment of the work force. The figures in table 66 indicate that there was little change in age composition in the two decades, although the mining industry work force was slightly younger in 1971 than in 1951 and 1961. This is not unique to mining but rather reflects general demographic trends.

21. The latest census was the 1976 quinquennial census. The documents for the quinquennial census do not provide the detail of the decennial census, however, with respect to the labour force.

Table 65

CENSUS LABOUR FORCE BY SEX IN THE MINING INDUSTRY, NEWFOUNDLAND, 1951, 1961, 1971
(Number)

	Male	Female	Total
1951	3,589	63	3,652
1961	4,209	67	4,276
1971[a]	4,785	160	4,975

Source: Statistics Canada, 1971 Census of Canada; Sepcial Series - Economic Characteristics (SE), Industry Trends, 1951-1971, bulletin SE-2 (94-793).

[a]Figures are rounded in the 1971 census.

Table 66

AGE DISTRIBUTION OF THE CENSUS LABOUR FORCE IN THE MINING INDUSTRY, NEWFOUNDLAND, 1951, 1961, 1971
(Number and Percent)

	1951		1961		1971[a]	
Age Group	Number	Percent	Number	Percent	Number	Percent
15-19	122	3.3	160	3.7	145	2.9
20-24	442	12.1	489	11.4	860	17.4
25-54	2,757	75.4	3,258	76.2	3,640	73.6
55-64	267	7.3	358	8.4	220	4.5
65 plus	64	1.8	11	0.3	5	0.1
Totals	3,652	100.0	4,276	100.0	4,945	100.0

Source: Statistics Canada, 1971 Census of Canada: Special Series - Economic Characteristics (SE) Industry Trends, 1951-1971, bulletin SE-2 (94-793).

[a]Figures are rounded in the 1971 census.

Table 67

EDUCATIONAL ATTAINMENT OF THE CENSUS LABOUR FORCE IN THE MINING INDUSTRY, NEWFOUNDLAND, 1951, 1961, 1971
(Number and Percent)

Educational Level	1951		1961		1971[a]	
	Number	Percent	Number	Percent	Number	Percent
Less than grade 9	2,738	75.0	2,460	57.5	1,450	29.3
Grade 9 to 12	813	22.3	1,537	35.9	2,975	60.2
Grade 13 and higher	101	2.8	279	6.5	500	10.1
Totals	3,652	100.0	4,276	100.0	4,945	100.0

Source: Statistics Canada, 1971 Census of Canada: Special Series - Economic Characteristics (Se) Industry Trends, 1951-1971, bulletin SE-2 (94-793).

[a]Figures are rounded in the 1971 census.

The data in table 67 point toward a dramatic increase in the educational level of the work force between 1951 and 1971.[22] This indicates a general increase in the level of labour skills. This conclusion needs qualification, however. MacMillan, et al. (1977) have drawn attention to the changing structure of employment in mining from production to non-production employees. They point out that the latter group of employees tends to be more highly educated. Hence, the changing level of educational attainment is a mixture of a general increase in the education of the work force and a shift in the structure of employment in mining operations.

The 1961 and 1971 census give greater detail on the age distribution of the work force in the mining industry than is shown in table 66. Table 68 shows greater detail for the male work force,[23] and reveals a younger work force in 1971. In that year, 57 percent of the male workers were under 35 years of age compared to 42 percent in 1961. The average age, was 38 in 1961, 34 in 1971.

22. The census education-level groupings do some violence to the grade levels in the Newfoundland educational system. In Newfoundland, matriculation is grade 11. Thus, the grade 9-12 group includes individuals with some post-secondary education as defined by the Newfoundland educational system.
23. Similar data on the female work force is contained in the census documents. Since the female work force in the mining industry is so small, it is sufficient for our purposes to examine the male work force only. The composition of the female work force will not greatly affect the profile of work-force characteristics that we have described.

Table 68

CENSUS MALE LABOUR FORCE, 15 YEARS AND OVER, BY AGE GROUP, IN THE MINING INDUSTRY, NEWFOUNDLAND, 1961 AND 1971
(Number and Percent)

	1961		1971[a]	
Age Group	Number	Percent	Number	Percent
15-19	149	3.5	170	3.6
20-24	472	11.2	795	16.6
25-34	1,138	26.9	1,775	37.1
35-44	1,160	27.4	1,105	23.1
45-54	940	22.2	700	14.6
55-64	356	8.4	220	4.6
65 plus	11	0.3	5	0.1
Total	4,226	100.0	4,785	100.0

Sources: Dominion Bureau of Statistics, 1961 Census of Canada - Labour Force: Industries, III (Part 2), bulletin 3.2-7 (94-524);
Statistics Canada, 1971 Census of Canada - Labour Force: Industries, III (Part 5), bulletin 3.5-3 (94-750).

[a]Figures are rounded in the 1971 census.

Table 69 shows the 1971 distribution of the mining industry work force by educational attainment. The data indicate that almost 67 percent of the male work force in that year had less than grade 11 education.

To this point, we have described characteristics of the work force from census industry data. A different set of census data deals with occupation. Using occupations data for the mining industry we are able to isolate only those occupational groups which can be unambiguously assigned to mining operations. Hence, the figures in the following tables for occupations in mining are smaller than those for the mining industry.

Table 70 gives census occupations data for the male labour force in mining for 1961 and 1971. Unfortunately, the occupational groupings are not wholly comparable between the two census years. However, both series illustrate that skilled workers comprised a large bulk of the work force in mining (and

Table 69

CENSUS MALE LABOUR FORCE, 15 YEARS AND OVER, BY LEVEL OF SCHOOLING, IN THE MINING INDUSTRY, NEWFOUNDLAND, 1971[a]
(Number)

Educational Level	1971[a]
Less than grade 9	1,435
Grade 9 and 10	1,370
Grade 11	1,360
Grades 12 and 13	180
Some university	325
University degree	110
Total	4,785

Source: Statistics Canada, 1971 Census of Canada - Labour Force: Industries, III (Part 5), bulletin 3-5-3 (94-750).

[a]Figures are rounded in the 1971 census.

Table 70

CENSUS MALE LABOUR FORCE, 15 YEARS AND OVER, BY OCCUPATION IN MINING, NEWFOUNDLAND, 1961 and 1971
(Number)

Occupation	1961	1971[a]
Foremen	175	340
Drillers, well	12	
Drillers, other rock and soil drilling		710
Blasting		110
Cutting, handling and loading		430
Mines, n.e.c.	951	
Timbermen	39	
Millmen (mineral ore treating)	183	325
Labourers	509	390
Mining and quarrying, n.e.c.	337	120
Prospectors	7	
Metal processing		175
Clay, glass and stone processing		240
Totals	2,213	2,855

Sources: Dominion Bureau of Statistics, 1961 Census of Canada - Labour Force: Occupations, III (Part 1), bulletin 3.1-10 (94-510); Statistics Canada, 1971 Census of Canada - Labour Force: Occupations, III (Part 2), bulletin 3.2-10 (94-724).

[a]Figures are rounded in the 1971 census.

milling) activity, if the occupational group labelled 'labourers' is taken as equivalent to the unskilled component of the work force. On this basis, the percentage of skilled workers to the total increased between 1961 and 1971. In 1961 the skilled accounted for 77 percent of the occupation. In 1971, the figure stood at 82 percent (with metal processing and clay, glass and stone processing occupations deducted from the total).

If the group designated 'labourers' consists of the unskilled, this might be expected to show up in a lower level of education. It is clear from tables 71 and 72 that the large majority of labourers have less than grade 9 education, but the same can be said for the skilled occupations. Two reasons can be advanced for the similarity in the education profiles of labourers and skilled occupations. First, it is quite likely that the occupation groups are so broadly defined that some unskilled workers are included with the skilled. Second, workers who are skilled frequently acquire their mining skills through on-the-job training, not by formal schooling. Thus, it is not unusual to find a low level of schooling and a fairly high degree of skill among workers in certain mining occupations. Consequently, we find it difficult to draw inferences about work force skills from data on the level of school by occupation.

Economic Council of Canada Labour Force Survey Data

In April 1979, the Economic Council carried out a sample survey of labour force attitudes in connection with the Newfoundland Reference. The survey compares characteristics of the Newfoundland and Ontario work forces. Our immediate interest is in the survey data for the Newfoundland work force only.

To determine whether these data would provide us with information on characteristics of the mining-industry-related work force in Newfoundland, we obtained an occupational breakdown of the survey results for insular Newfoundland and for Labrador. The survey data for all occupations by sex, by region and by employment status are shown in table 73. The occupational groupings are in accordance with the Census of Canada Occupational Classification Manual (OCM).[24]

24. Statistics Canada (12-536E, 12537).

Table 71

CENSUS MALE LABOUR FORCE, 15 YEARS AND OVER, BY MINING OCCUPATION AND LEVEL OF SCHOOLING, NEWFOUNDLAND, 1961[a]
(Number)

	Level of Schooling							
	Elementary School		Secondary School					
	<5 Years	5+ Years	1-2 Years	3 Years	4-5 Years	Some University	University Degree	Total
Foremen	21	66	47	19	14	8	-	175
Drillers, well	2	3	-	2	-	-	-	12
Miners, n.e.c.	266	424	203	37	16	5	-	951
Timbermen	8	24	7	-	-	-	-	39
Millmen	46	90	36	8	3	-	-	183
Labourers	128	236	91	33	7	14	-	509
Mining and quarrying, n.e.c.	103	145	69	13	5	2	-	337
Prospectors								7
Totals	574	989	458	115	47	30	-	2,213

Source: Dominion Bureau of Statistics, 1961 Census of Canada - Labour Force: Occupations, III (Part 1), bulletin 3.1-10 (94-510).

[a]Figures do not add up in all cross-tabulations.

Table 72

CENSUS MALE LABOUR FORCE, 15 YEARS AND OVER, BY MINING OCCUPATION AND LEVEL OF SCHOOLING, NEWFOUNDLAND, 1971[a] (Number)

	Level of Schooling						
	Grade 9	9 and 10	Grade 11	12 and 13	University	Degree	Total
Foremen	55	90	100	40	45	15	340
Drillers, other rock & soil drilling	420	190	90	-	10	-	710
Blasting	70	30	10	-	-	-	110
Cutting, handling & loading	230	145	45	-	10	-	430
Mineral ore treating	90	100	110	5	20	10	325
Labourers	170	105	90	-	30	-	390
Mining and quarrying, n.e.c.	50	35	15	5	10	-	120
Metal processing	75	70	20	-	5	-	175
Clay, glass & stone processing	135	60	35	-	5	-	240
Totals	1,305	825	505	60	135	30	2,855

Source: Statistics Canada, 1971 Census of Canada - Labour Force: Occupations, III (Part 3), bulletin 3.3-3 (94-730).

[a]Figures are rounded in the 1971 census; cross-tabulations may not always sum to totals.

Table 73

ECONOMIC COUNCIL OF CANADA SAMPLE SURVEY DATA OF THE WORK FORCE BY OCCUPATION, EMPLOYMENT STATUS AND SEX, FOR INSULAR NEWFOUNDLAND AND FOR LABRADOR, 1979
(Number)

	Insular Newfoundland					
	Employed			Unemployed		
Occupational Classification	Male	Female	Total	Male	Female	Total
Managerial and administrative	15	5	20	0	1	1
Natural sciences, engineering and mathematics	6	0	6	2	0	2
Social sciences	1	1	2	0	0	0
Religion	0	0	0	0	0	0
Teaching	9	16	25	0	6	6
Medicine and health	2	11	13	1	2	3
Artistic, literary and recreational	3	0	3	0	0	0
Clerical	3	25	28	2	11	13
Sales	13	13	26	1	4	5
Service	23	18	41	16	12	28
Farming, horticultural and animal husbandry	0	1	1	2	0	2
Fishing, hunting and trapping	12	0	12	11	2	13
Forestry and logging	2	0	2	4	0	4
Mining and quarrying	2	0	2	4	0	4
Processing	15	7	22	11	7	18
Machining	7	0	7	2	1	3
Product fabricating, assembing and repairing	17	0	17	6	1	7
Construction trades	24	0	24	34	1	35
Transport equipment operation	23	0	23	7	0	7
Materials handling	4	1	5	6	1	7
Other crafts and equipment operation	2	0	2	1	0	1
Unclassified[a]	0	0	0	2	8	10
Totals	183	98	281	112	57	169

Source: Economic Council of Canada.

[a]Includes those who have never worked, or last worked more than five years ago.

Table 73 (Continued)

ECONOMIC COUNCIL OF CANADA SAMPLE SURVEY DATA OF THE WORK FORCE BY OCCUPATION, EMPLOYMENT STATUS AND SEX, FOR INSULAR NEWFOUNDLAND AND FOR LABRADOR, 1979
(Number)

	Labrador					
	Employed			Unemployed		
Occupational Classification	Male	Female	Total	Male	Female	Total
Managerial and administrative	9	0	9	1	0	1
Natural sciences, engineering and mathematics	2	0	2	1	0	1
Social sciences	1	0	1	0	0	0
Religion	0	0	0	0	0	0
Teaching	3	5	8	0	1	1
Medicine and health	1	6	7	0	1	1
Artistic, literary and recreational	1	0	1	0	0	0
Clerical	11	20	31	2	4	6
Sales	3	8	11	2	4	6
Service	2	12	17	8	2	10
Farming, horticultural and animal husbandry	0	1	1	2	0	2
Fishing, hunting and trapping	14	0	14	9	0	9
Forestry and logging	1	0	1	0	0	0
Mining and quarrying	1	1	2	0	0	0
Processing	2	0	2	7	4	11
Machining	1	0	1	1	0	1
Product fabricating, assembling and repairing	5	0	5	2	2	4
Construction trades	7	0	7	21	0	21
Transport equipment operation	7	0	7	1	0	1
Materials handling	1	0	1	1	0	1
Other crafts and equipment operation	3	0	3	1	0	1
Unclassified[a]	0	0	0	1	4	5
Totals	78	53	131	60	22	82

Source: Economic Council of Canada.

[a]Never worked.

In the survey data there is a total of only eight persons classified to mining and quarrying occupations. The mining and quarrying group includes the following occupational main sub-groups as specified in the OCM: foremen; rotary well-drilling and related occupations; other rock and soil-drilling occupations; blasting; cutting, handling and loading; labouring and other unskilled occupations. It is apparent from this description that the mining-quarrying occupation classificaton does not include all mining-industry-related occupations. For example, mining companies also employ workers assigned to clerical and processing occupations.

For this reason we also obtained the survey data in a form to show all individuals in the sample who are employed in the mining industry. These figures are set out in table 74 according to the occupational groupings as laid out in table 73. Of the 24 employed in mining, 16 live on the Island and 8 in Labrador; 16 were working, 8 not working (3 classified as retired).

Table 74

OCCUPATIONAL DISTRIBUTION OF THE ECONOMIC COUNCIL OF CANADA SAMPLE SURVEY DATA OF THE WORK FORCE IN THE NEWFOUNDLAND MINING INDUSTRY, 1979
(Number)

Managerial and administrative	2
Natural sciences, engineering and mathematics	3
Clerical	1
Mining and quarrying	8
Processing	2
Machining	1
Product fabricating, assembling and repairing	5
Construction trades	1
Transport equipment operation	1
Total	24

Source: Economic Council of Canada.

We consider this sample to be too small to be useful for making any generalizations about labour supply characteristics relevant to the mining industry. Consequently, we have chosen to examine a broader work force sample, to include those occupation groups which relate to mining in the sense that many of the occupations either are in mining, or if not in mining, would be readily adaptable to the mining industry with limited retraining.

The occupation groups we consider to be mining-related, in the sense of the adaptability criterion defined above, are: managerial and administrative; natural sciences, engineering and mathematics; clerical; mining and quarrying; processing; machining; product fabricating, assembling and repairing; construction trades; transport equipment operation; materials handling.

The educational levels of these ten occupational groups is now described. We confine our discussion to educational characteristics in accordance with our emphasis on the skill composition of the work force. Although it was pointed out in the previous section that there are difficulties in equating level of schooling and degree of skill, we claim here that the education level of the ten occupation groups relevant to mining reveals a kind of base level of skill which can be adapted for employment in the mining industry. We assume that the sample survey data are representative of each of the occupational groups for the Newfoundland economy as a whole, although we recognize that this assumption can be contested for those occupation groups where the numbers in the sample are quite small.

The raw data for these occupations by level of education attainment were made available in the following breakdowns:

i) Insular Newfoundland - employed
ii) Insular Newfoundland - unemployed
iii) Labrador - employed
iv) Labrador - unemployed.

In order to counter the problem of conducting analysis of data where the numbers are small, we organize the data according to the following levels of aggregation:

i) Insular Newfoundland and Labrador, employed and unemployed combined (table 75);

ii) Insular Newfoundland and Labrador combined, for the employed (table 76);
iii) Insular Newfoundland and Labrador combined, for the unemployed (table 77).

Thus, table 75 presents the aggregate survey data for the ten selected occupations, by occupation, while in tables 76 and 77, the data are broken down into the employed and unemployed respectively. This split was made to ascertain whether the base-level education differs between the employed and the unemployed. Presumably, the pool of unemployed are more available for hire by mining companies than are workers already employed elsewhere.

From the viewpoint of educational level, the occupations in table 75 break down into two groups. The managerial and administrative, natural sciences, and clerical groups are more highly educated than the other occupations. The latter occupational groupings are largely made up of blue-collar workers, and they generally have less than high school matriculation.

The data from table 75 are broken down into the employed and unemployed in tables 76 and 77. From this split two observations can be made. First, within the various occupations, the number of unemployed is disproportionately large in processing and in construction trades. These are also occupations for which the mining industry potentially has significant demands and for which labour may be readily available for employment in the mining industry. The percentage of the unemployed in construction trades may be partly illusory, however, since the figures may reflect seasonal unemployment rather than a permanent source of workers for the industry.

Second, the unemployed are heavily weighted towards the lower end of the educational-level spectrum, compared to the employed who are more widely spread across the educational categories. To the extent that education does reflect skill level, it appears that the greatest potential source for new employees (the unemployed) also has a relatively low level of skills.

Table 75

OCCUPATIONAL DISTRIBUTION OF THE ECONOMIC COUNCIL OF CANADA SAMPLE SURVEY DATA OF THE WORK FORCE, BY EDUCATION, SELECTED OCCUPATIONS, INSULAR NEWFOUNDLAND AND LABRADOR, 1979
(Number)

	Education					
	To Grade 8	Some Secondary, No Post-Secondary	Some Post Secondary	Post-Secondary Certificate or Diploma	University Degree	Total
Managerial and administrative	1	10	8	7	5	31
Natural sciences, engineering and mathematics	1	2	2	3	3	11
Clerical	5	32	17	21	3	78
Mining and quarrying	3	4	1	0	0	8
Processing	23	26	1	3	0	53
Machining	1	6	0	5	0	12
Product fabricating, assembling and repairing	8	11	5	7	2	33
Construction trades	37	37	5	7	1	87
Transport equipment operation	20	12	2	4	0	38
Materials handling	3	11	0	0	0	14
Totals	102	151	41	57	14	365

Source: Economic Council of Canada.

Table 76

OCCUPATIONAL DISTRIBUTION OF THE ECONOMIC COUNCIL OF CANADA SAMPLE SURVEY DATA OF THE WORK FORCE BY EDUCATION OF THE EMPLOYED, SELECTED OCCUPATIONS, INSULAR NEWFOUNDLAND AND LABRADOR, 1979
(Number)

	Education					
	To Grade 8	Some Secondary, No Post-Secondary	Some Post Secondary	Post-Secondary Certificate or Diploma	University Degree	Total
Managerial and administrative	1	9	8	6	5	29
Natural sciences, engineering and mathematics	1	0	1	3	3	8
Clerical	4	19	15	18	3	59
Mining and quarrying	1	3	0	0	0	4
Processing	9	13	1	1	0	24
Machining	0	4	0	4	0	8
Product fabricating, assembling and repairing	4	8	4	5	1	22
Construction trades	12	12	3	3	1	31
Transport equipment operation	14	10	2	4	0	30
Materials handling	2	4	0	0	0	6
Totals	48	82	34	44	13	221

Source: Economic Council of Canada.

Table 77

OCCUPATIONAL DISTRIBUTION OF THE ECONOMIC COUNCIL OF CANADA SAMPLE SURVEY DATA OF THE WORK FORCE BY EDUCATION OF THE UNEMPLOYED, SELECTED OCCUPATIONS, INSULAR NEWFOUNDLAND AND LABRADOR, 1979
(Number)

	Education					
	To Grade 8	Some Secondary, No Post-Secondary	Some Post Secondary	Post-Secondary Certificate or Diploma	University Degree	Total
Managerial and administrative	0	1	0	1	0	2
Natural sciences, engineering and mathematics	0	2	1	0	0	3
Clerical	1	13	2	3	0	19
Mining and quarrying	2	1	1	0	0	4
Processing	14	13	0	2	0	29
Machining	1	2	0	1	0	4
Product fabricating, assembling and repairing	4	3	1	2	1	11
Construction trades	25	25	2	4	0	56
Transport equipment operation	6	2	0	0	0	8
Materials handling	1	7	0	0	0	8
Totals	59	69	7	13	1	144

Source: Economic Council of Canada.

Labour Turnover

Canadian mining companies have had signficant problems with labour turnover. Unfortunately, we have not been able to address this problem in any detail for the Newfoundland mining industry, because there is no available body of data that permits direct analysis.

A study of turnover was done by The Mining Association of Canada (1974), based on responses from 80 mining operations in Canada. The study concluded that labour turnover was a widespread problem for the mining industry. The major findings of the survey were:

i) turnover was worse in British Columbia than in the other major mineral producing provinces;
ii) turnover rates decrease with increasing level of worker skill;
iii) turnover was higher among younger workers;
iv) turnover rates were not related to the presence of community services and company-provided services;
v) from the viewpoint of operating managers, turnover was caused, to a significant extent, by welfare and unemployment payments. (The attitudes of workers were not covered by the survey.)

We hesitate to infer that these conclusions pertained to the Newfoundland mining industry, however, because only one Newfoundland mining operation responded to the survey.

Evidence for the current turnover situation in the province's mining industry is also quite sketchy, and we had to rely on contacts in industry and government for rough estimates and for general impressions. We offer two observations, both applying to the iron mining operations in Labrador West. First, over the last five years, turnover in the Labrdor City-Wabush area has dropped sharply, from around 75 percent to around 15 percent. Second, although turnover has fallen in recent years, the turnover rate at IOC differs considerably at the company's three operating locations. For 1979 their turnover rates are expected to be as follows: Schefferville, 22 percent; Labrador City, 15 percent; and Sept-Iles, 7 percent.[25] The high turnover rate

25. Private communication, Iron Ore Company of Canada.

at Schefferville is associated with the seasonal nature of the mining operation there. The turnover rate also appears to be related to the remoteness of the location.

We have not been able to identify clearly why labour turnover in Labrador West has fallen sharply in recent years. It is possible to speculate, however. First, the persistently high rate of employment in Canada may have damped the rate of turnover. Second, and perhaps more important, the mining communities of Labrador City and Wabush are becoming mature, in the sense that the population is developing roots, and a sense of identity with the area.[26]

We have not been able to get information on turnover rates for mining operations on the Island. We suspect, however, that they have been low, since many of the mining operations are located at or near established communities from which the mining companies have historically drawn most of their work force.

The geographic proximity of mining operations to established communities in Newfoundland may imply relatively low turnover rates. However, it also tends to promote immobility of the mining work force, and thereby act as a constraint to the vitality of the province's mining industry by making recruitment difficult for new developments. Moreover, as old deposits become depleted, the new economic deposits in all likelihood will be located in more remote areas. This potential problem is illustrated by the present situations at Buchans and St. Lawrence.

The Mining Work Force at Buchans and St. Lawrence

In February 1978 the Alcan Fluorspar Mines at St. Lawrence closed, and shutdown of the Asarco base metal mine at Buchans is expected, not later than 1980. The reasons for the closure of these mines are quite different. At Buchans it is simply a matter of orebody depletion. At St. Lawrence it was an Alcan corporate policy decision to close the mine and obtain the company's fluorspar from Mexico. The implications for mining at these locations in the future may be different. Although the fluorspar mines have not been depleted, we have not

26. Compare Morgan Report (1972) and Bartlett Report (1977). This change in attitude is reflected in the fact that IOC did not suffer a major loss of skilled workers during the 4-month strike in 1978, while the loss was severe as a result of the 3-month strike in 1972.

been able to ascertain whether the St. Lawrence deposits are at a cost disadvantage with the Mexican sources to which Alcan has switched, or whether St. Lawrence fluorspar could be profitably mined and sold in alternative markets.[27]

What is clear is that the St. Lawrence fluorspar operation has freed, and the Buchans base metal mine will make available, a potential supply of skilled mine labour for hire at other mining operations in the province. The key question, however, is whether these workers will be willing to move to take up mining jobs elsewhere. We have found that there are local forces at work that have dissuaded miners from seeking employment outside the immediate regions where they are living.

As shown in table 40, the mines work force at St. Lawrence had dwindled from 464 to 178 between 1973 and 1977. When the mines closed down early in 1978, the work force totalled 169, comprised of 39 staff, 71 underground crew, and 59 surface crew.[28]

The formal report (Alcan Report) of the Joint Consultative Committee which was set up to investigate the mine closure is rather brief. However, the report contains an informative Canada Manpower Centre (CMC) memorandum (29 January 1979) which briefly describes the events leading up to the mine closure and details sub-sequent attempts to find alternative employment for the displaced mine work force.

In March 1976 a lockout at Alcan ended and about one-half of the previou, work force was recalled. The CMC memorandum observes that by then it was obvious that Alcan was in the process of cleaning up its operations with the intention of a complete shutdown. In September 1977 the Aluminum Company of Canada Limited Joint Consultative Committee was set up under the aegis of the Manpower Consultative Service of the Canada Department of Manpower and Immigration, to

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27. If the fluorspar deposits were viable, we would expect that other corporate interests would have attempted to reactivate them.
28. Alcan Report. The report itemizes the occupations of the underground and surface crew. In addition to gaining information on occupation, the committee enquiring into the St. Lawrence mine closure arranged to have a profile prepared on mine employees showing: age; length of service; marital status; dependents; education; hourly rate; and participation in insurance and pension plans. Information was also gathered regarding retraining requirements and mobility of the work force. We attempted, without success, to get this information in either collated or uncollated form.

analyze the skills of the work force and assess the training and retraining needs of the workers to meet new occupational requirements, study the employ-employment possibilities outside Alcan, and assess the mobility requirements of those workers and their dependents who were available for employment elsewhere.

Several avenues of alternative employment possibilities were explored. The efforts to find alternative employment for the workers included recruitment activities by the mining companies Canadian Gypsum Limited, The Iron Ore Company of Canada Limited (three recruiting trips),[29] Sherritt Gordon Mines Limited and Denison Mines Limited, and also by Canadian Pacific Railway. One hundred and seventy-five referrals were made and 75 jobs were offered. The CMC memorandum does not indicate the number of offers that were accepted. It is clear, however, that the displaced workers have preferred to seek alternative emloyment locally rather than to move. Some senior staff people found permanent local employment with the Marystown Shipyard, Fishery Products Limited, and the Marystown town council. The main deterrent to labour mobility appears to be the prospect for employment at a new fish processing plant in St. Lawrence. In 1977, a committee known as the St. Lawrence Development Committee was established, with the purpose of seeking the development of an alternative industry for St. Lawrence. The committee focused on prospects for new developments in the fishing industry locally, and fixed on the proposal of Fishery Products Limited to build and operate a new fish processing plant. This company is now proceeding with construction, and the plant is expected to be in operation for the start of the spring fishery season in 1980. The plant will provide year-round employment and give some stablity to the community. This has blunted the incentive for the displaced mine work force to seek employment elsewhere in the province and on the mainland. In fact, the Development Committee used every opportunity available to discourage people from relocating to other parts of the province and of Canada.

At Buchans the prospects for labour mobility of the mine work force appear to be no more encouraging. The pending closure of the Buchans mine could, if individuals and their families were willing to move, provide a total of about

29. IOC has a stated policy of giving preference to Newfoundlanders in hiring for its Labrador City operations. The company has a personnel office in St. John's and also advertises in local papers and works through Canada Manpower in its recruitment efforts. Still, IOC has difficulty attracting people from the Island to work in Labrador West.

450 skilled and unskilled workers to any new mine development or significant expansion of existing capacity. The Report of the Buchans Task Force (1976) catalogued the occupations of the residents of the town, in addition to those of all the Asarco employees. The occupation distribution of the Asarco employees in 1976 is summarized in table 78. Unfortunately, the information is out of date because the mine has released several workers since that time. However, the number and skills of existing employees would be sufficient to staff two relatively small mining operations with a mine-mill capacity of 1,200 to 1,500 tons per day, or one larger operation at a capacity of 2,300 to 3,000 tons per day.

The key factor in determining the availability of this labour force is the willingness of the residents of Buchans to move. The Task Force found that a large number of the permanent residents wanted to stay in Buchans even if it meant working in another industry. The Task Force was sympathetic to this position and its list of twenty recommendations are directed to the development of alternative employment opportunities in the region. No proposals to promote labour force mobility were entertained in the Task Force's recommendations.

As noted in chapter 5, the opportunities for alternative employment in the immediate area are few, given the small size of the other sectors and the marginal nature of the ore deposits in the Buchans-Red Indian Lake area. On the other hand, some recent developments in the region have tended to discourage mobility. Work on the Upper Salmon River hydro-electric project has recently started up, and the Minister of Mines and Energy has announced that employment priority will be given to workers from the Baie d'Espoir and Buchans areas. The construction project is expected to take four to five years to complete. Currently 60 to 70 are employed on land-clearing operations. At peak the project will employ about 400. Second, there is the expectation that the road linking Buchans and Howley to the Trans-Canada Highway will proceed, providing additional employment opportunities locally. Third, unemployment insurance benefits and severance pay are further deterrants. Thus, there is little incentive for workers in Buchans to leave the area, at least in the short term.

Table 78

OCCUPATIONAL DISTRIBUTION OF THE WORK FORCE AT ASARCO INC., BUCHANS UNIT, 1976 (Number)

Occupation	
Managerial and administrative	6
Natural sciences, engineering and mathematics	21
Social sciences	1
Clerical	40
Service	11
Mining and quarrying	248
Processing	48
Machinery	38
Product fabricating, assembling and repairing	27
Construction trades	64
Transport equipment operation	53
Materials handling	14
Other crafts and equipment operation	7
Total	578

Source: Newfoundland, Report of the Buchans Task Force (1976), table III-2.

This apparent lack of mobility is reflected in the fact that very few have made an effort to see recruiting teams that visited Buchans after 164 workers were laid off at the mine late in July.[30] Within a few weeks of the layoffs, a mainland-based Canadian mining company sent a recruiting team to Buchans. Its visit was well publicized through the CMC and the union, but nobody showed up for an interview. Since then (August to mid-September) recruiting teams from seven companies have visited Buchans.[31] Twelve workers have been placed and seven mobility grants have been issued to cover transportation of the workers and their families to new places of employment.[32]

30. Private communication, the St. John's office of the Department of Manpower and Immigration.
31. The companies are: Denison Mines, Giant Yellowknife Mines, Rio Algom Mines, Sherritt Gordon Mines, Acres, Newfoundland and Labrador Hydro, and Eastern Catering.
32. No information was obtained on the number of interviews.

Government and Corporate Policies

In this section we identify government and corporate policies that could act as constraints to expansion of Newfoundland's mining industry. We discuss goverment policy constraints first and then corporate policy constraints. Government policy constraints may affect existing and potential mining operations in several areas including: exploration, taxation, availability of factors of production, and conditions pertaining to the marketing of mineral products. In dealing with these constraints it is necessary to distinguish between provincial government, federal government, and inter-governmental policies. We emphasize provincial government policies because, constitutionally, the province has political authority over land-based resources within its jurisdiction.

In Newfoundland, the provincial government has been actively promoting exploration in recent years through legislative changes: further changes in legislation designed to encourage greater exploration effort are in the offing. In addition, a study of the exploration sector is being undertaken by the Department of Mines and Energy. It is apparent that the provincial government is aware of the need for an expanded exploration effort to augment the reserves of mineable ores, especially in the dwindling base metal sector. If anything, the government can be expected to facilitate rather than inhibit exploration in the province. However, there is a revival of government concern that not enough public revenue is being captured from the mining industry. The report of the Newfoundland Royal Commission on Mineral Revenue (1974) led to an increase in mining taxes. It now appears that the provincial government is again planning to increase the rates of taxation levied on mining companies operating in the province.

It is clear from the Blueprint that the provincial government is looking to the further processing of minerals in promoting industrial development. In Canada, government attempts to promote the further processing of resources have generally taken the form of restrictions on the export of unprocessed resource products. We do not see the government of Newfoundland and Labrador moving in this direction, however. The Blueprint has identified the possiblities for further processing of aluminum, zinc, and iron ore, but bauxite and zinc ores and concentrates would have to be imported to feed these plants. The scope for further processing of iron ores is limited and it is highly unlikely that the

government would move to have pelletizing plants that process Labrador ores relocated from Sept-Iles to Newfoundland. Restrictions could be placed on the export of unprocessed uranium from the Brinex Kitts-Michelin project, but this falls under federal, not provincial, jurisdiction. In any case, the main purpose of export restrictions would be to ensure adequate supplies of uranium for domestic use, not to promote further processing.

Provincial government policies tend to affect the availability of labour supplies to mining operations in two ways, both bearing on labour mobility. First, it is a policy of the provincial government that Newfoundlanders be given priority in employment. This has not meant the exclusion of non-Newfoundlanders when Newfoundlanders are not available to fill job openings in mining operations. A system of working permits was considered by the Bartlett Commission (1977), but the Bartlett Report rejected the idea of instituting work permits and the government appears to have concurred.

Second, the government has discouraged mobility of the province's mining work force where mine closures are concerned. The St. Lawrence and Buchans cases testify to this policy stance. Rather than promote relocation, the government has tended to favour finding alternative employment opportunities in the affected mining areas. As we have pointed out, orebody depletion (Buchans) or economic exhaustion (perhaps St. Lawrence) is a fact of life in the mining industry. A policy orientation that immobilizes skilled labour can constrain industry expansion in the long term.

The dispute between Newfoundland and Quebec over Churchill Falls hydro-electric power has implications for the future of mining expansion in Labrador. At issue is the amount of hydro power that the government of Newfoundland and Labrador will be able to recall for sale in Newfoundland. The iron mining operations in the Labrador City-Wabush area obtain their hydro power from the Churchill Falls Labrador Corporation. Any major expansion of mining and processing of Labrador iron ores that might be contemplated for the future will require additional blocks of power which, under the present contractual terms of sale of Churchill Falls power, would not be forthcoming. In chapter 5 we identified the availability of hydro power as one of the reasons behind IOC's decision to locate its concentrator-pelletizing plant at Sept-Iles rather than at Knob Lake-Schefferville.

Turning now to corporate policies, we note first that mining companies are motivated by profit considerations. Particularly important for Newfoundland is the fact that all mining operations located in the province are owned by companies which are based outside the province. Moreover, most of the mines are vertically integrated into the processing and manufacturing operations of the companies that own the mines. This corporate structure is a double-edged sword. On the one hand, since the owners are also the customers, this has meant that the mines have supplied the owner-customers under long-term contracts. This has provided a measure of stability to mining operations in the province. On the other hand, it can pose a threat to the expansion and very existence of the mines. The St. Lawrence mine closure attests to the impact of a corporate policy to substitute an external source of mineral supply for the Newfoundland supplies.

A similar but less dramatic development has occurred recently that will affect the prospects for expansion of the Labrador iron mining industry. Just as the major expansion of the Iron Ore Company of Canada was being completed in the early 1970s, a major expansion in mining and pelletizing capacity got underway in the Minnesota iron ore fields. The significant point here is that the companies that are owners of the IOC and Wabush Mines have turned to Minnesota, through equity participation, for incremental supplies of iron ores.[33] These corporate decisions to expand mining and pelletizing facilities in the United States appear to have spelled a halt to expansion in the Labrador iron mining sector for the foreseeable future.

Mineral Reserves

A fundamental constraint to the expansion of mining is the stock of ore reserves. Reserves are identified ores which can be profitably mined at existing prices and technologies. A broader concept is resources, which encompasses reserves. The Blueprint notes that the full extent of mineral resource endowment in Newfoundland is not yet known, and therefore precise statements cannot be made about mineral reserves in the province. We can indicate, however, where mineral reserves are likely to constrain mining industry expansion.

33. Skillings (1979).

The major reserves constraint to expansion is in the base metal sector where reserves have declined sharply since 1974 (see tables 35 and 36). In addition, the prospects for new mine development are not encouraging (see table 38). In the nonmetal mining sector, asbestos ore reserves declined slightly during the 1970s. At present, no asbestos deposit except that currently being mined at Baie Verte is known to exist. The known potential for expansion is thus limited to the current mining operations. As for other nonmetallic minerals, the greatest prospect for new development appears to be in limestone. The Blueprint is optimistic that the deposits on the west coast of the Island, especially the high-grade deposits on the Port au Port Peninsula, hold promise for development. There are also large reserves of gypsum on the west coast.

Iron ore reserves are abundant. In addition to the known reserves from deposits being mined in the Knob Lake-Schefferville and in the Labrador City-Wabush areas, there are significant iron ore deposits at Julien Lake, Labrador Ridge, and Howell's River. Resource availability is therefore not a constraint to expansion in the iron mining industry in Labrador. Also, the old underground mines at Wabana on Bell Island contain large unexploited deposits, but these are presently uneconomic. The iron mines were shut down in 1966 because of economic exhaustion and there is no prospect in sight for re-opening the mines.

The potential for uranium mining is still unknown. The Kitts-Michelin deposits are scheduled to come into production by 1982. They are small deposits and relatively low grade, especially the larger Michelin deposit.[34] Exploration for uranium continues in the Kaipokok Bay area of Labrador and on the west coast of the Island in the Deer Lake region. Preliminary results indicate that there may well be other economic deposits of uranium to be discovered.

Other Constraints

Finally, we consider briefly two other constraints: transportation, and productivity and costs. We have not examined these constraints in detail because relevant data were not available to us. However, we have identified some issues that should be taken into account in evaluating prospects for expansion in the province's mining industry.

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34. See Mead & Co. (1978).

In examining transportation costs as a constraint to mine expansion in Newfoundland, it is necessary to distinguish between the land-based transportation requirements of mines located on the Island and those in Labrador. Except for Buchans, mines on insular Newfoundland are located close to tidewater. Even for Buchans, the distance from mine to shipping point is only about 90 miles.

By contrast, the exploitation of the iron ore deposits in the Labrador hinterland required the construction of a 357-mile trunk railway line over rugged terrain from Knob Lake-Schefferville to the shipping terminal at Sept-Iles. The Quebec North Shore & Labrador Railway (QNS&L), a wholly-owned subsidiary of IOC, was built in the early 1950s at a cost of $200 million. The line alone cost $127 million.[35]

A key question regarding future expansion of iron mining in the Labrador Trough is the ability of the QNS&L to handle additional traffic. The railway was originally built to handle the direct-shipping ores from Schefferville to Sept-Iles. The early operations of the railway were limited to shipping ores for only eight months of the year, because the extreme temperatures of winter and the moisture content of the direct shipping ores caused the ores to freeze and therefore made winter shipping difficult. Consequently, there was excess capacity in the railway to handle shipments from the year-round operations of IOC at Labrador City and of Wabush Mines when these operations went into production between 1962 and 1965. However, the major IOC expansion in the early 1970s required the doubling of the line's annual capacity, from 20 million tons to 40 million tons, and raised the problem of maintaining the line at that capacity. The problem was solved by employing longer trains, increasing the capacity of ore cars and upgrading the track structure.[36] It is apparent that the railway is now approaching the technological limits of its capacity.

This is presumably one of the factors that makes the Port Labrador concept attractive to the Government of Newfoundland and Labrador. It will be recalled that the Port Labrador idea is that of a deep-water port on Lake Melville,

35. Wallace (1977) pp. 24, 95.
36. Northern Miner, 16 August 1979.

operating year-round to provide the focal point for new industrial development in Labrador. An integral part of the Port Labrador concept is a trans-Labrador railway to haul iron ores from new iron mining operations in Labrador West. (It will not divert traffic from existing iron mines.) These mines would provide feed for a new steel plant, powered by Labrador hydro-electricity.[37]

Critical to the functioning of Port Labrador is the provision of icebreaking services to keep Lake Melville open year-round. If the winter freeze-up cannot be prevented, the Port Labrador concept is dead. When the IOC was planning its mine development and associated railway project, it did not actively consider building a railway to a terminal on Lake Melville. The short shipping season would have entailed very high costs in stockpiling ores at the port. The IOC chose instead the ice-free port Sept-Iles.

The feasibility of maintaining an icebreaking service to keep Lake Melville open is being examined by the provincial government. A proposal is to be sent to the federal government to obtain a federal icebreaker for test operation on Lake Melville for January and February 1980.

The development of Port Labrador would provide a transportation network not only for iron ores from new mines in Labrador West but also for the shipment of uranium, which now shows promise of mine development in the region some one hundred miles north of Goose Bay.

Expansion of mine capacity in Newfoundland will also be constrained by th productivity and costs of Newfoundland mining relative to mine projects elsewhere. We discuss this constraint with particular reference to iron mining in Labrador. Our conclusions are necessarily impressionistic since we do not have data that permit meaningful productivity and cost comparisons.

Productivity and cost per tonne of metal recovered in mining and milling operations are determined by many factors. These include: the grade and other characteristics of ore deposits; location of the deposit and transportation and other infrastructure requirements; the nature of the production technologies used; unit costs of labour, energy, and materials inputs. An overall assessment of the relative cost of Newfoundland mining operations would have to

37. Feasibility of the development schemes associated with Port Labrador are currently being conducted by the Government of Newfoundland and Labrador.

draw all these strands together and compare the results with like mining operations in other parts of the world. Our analysis does not attempt to do this. Rather, we try to give some indication of how iron mining in Newfoundland compares with similar mining operations elsewhere, when each of the determinants of productivity and costs is considered separately.

The centre of the Newfoundland iron mining industry is in south western Labrador where deposits are low grade (30-40 percent). The major sources of supplies that are competitive with these ores are Brazil, and Minnesota in the United States. Brazilian iron ores grade around 65 percent in their natural state and are competitive with IOC concentrates in Europe. Whereas Labrador ores have to be beneficiated to produce an iron ore concentrate with 60 percent iron content, the Brazilian ores are shipped as fines, with minimal washing and screening.

Minnesota taconites are competitive with Labrador iron ores in the North American market for pellets.[38] The Minnesota and Labrador ores are both low-grade, but the similarities end there. The ultimate comparison would be the cost per tonne of pellets containing 66 percent iron, but this information is not available. It is likely, however, that beneficiating costs are higher in Minnesota, where the harder ores require more grinding and hence more energy.

On the other hand, direct wages are somewhat higher in Labrador than in Minnesota, due to the array of subsidies associated with northern living that workers receive from the iron mining companies operating in Labrador. These subsidies include extended vacations, subsidized housing and fuel, and northern living allowances.

Another factor that has put Labrador iron mining at a cost disadvantage with Minnesota mines is the share of municipal costs that mining companies operating in Labrador have had to bear. In Labrador, the mines were developed in unsettled areas and the mining companies had to provide, from scratch, new town sites and associated infrastructure (housing and municipal services). The financial burden on mines operating in Minnesota has been smaller because the mining communities there are long-established.

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38. Private communication, The Iron Ore Company of Canada.

7. POTENTIAL AGGREGATE EMPLOYMENT IN THE NEWFOUNDLAND MINING INDUSTRY

Three Cases in Review

In chapter 5 we produced sector-by-sector projections of labour requirements for the mining industry. We developed three projections for each sector: trend, optimistic, and realistic. Now we proceed to draw these separate sector projections together to yield projections for the total mining industry. We also evaluate our estimates against other available projections of labour requirements and against the employment target set forth in the Blueprint. Finally, we consider policy options available to the Government of Newfoundland and Labrador to raise employment above the probable outcome, without any changes in mineral policy.

Our projections of employment potential in the mining industry to 1983, are summarized in table 79. The table shows the projections for our three cases (trend, optimistic and realistic) for each of the mining sectors, and are summarized as follows:

Iron ore: The optimistic case shows an increase in employment of 12 percent over the five-year period. The trend projection indicates no change to 1983. The realistic case projects a level of employment in 1983 that is lightly lower than employment in 1979.

Base metals: The optimistic projection shows a decline in base metal mining for 1979-81, but a recovery by 1983 to an employment level 30 percent higher than 1979. Trend and realistic cases point to expected declines in the work force, with the realistic case showing the greater drop; the size of the work force in 1983 is anticipated to be about one-half of that for 1979.

Nonmetals: The trend shows a slight increase. The optimistic case projects an increase in employment of about 50 percent. The realistic case indicates a constant level of employment over the period.

Structural Materials: The projections for this sector were quite arbitrary, since we have no knowledge of the large number of small operators that make up this sector. All cases project a constant employment level; the realistic case gives the lowest level.

Table 79

SUMMARY OF EMPLOYMENT POTENTIAL IN THE NEWFOUNDLAND MINING INDUSTRY, 1979-83
(Number)

	1979	1980	1982	1982	1983
Trend					
Iron ore	4,125	4,125	4,125	4,125	4,125
Base metals	650	450	320	320	300
Nonmetals	700	725	725	750	750
Structural materials	1,075	1,075	1,075	1,075	1,075
Uranium	0	50	150	250	275
Total industry	6,550	6,425	6,395	6,520	6,525
Optimistic					
Iron ore	4,250	4,350	4,550	4,750	4,750
Base metals	650	500	500	650	850
Nonmetals	800	1,000	1,100	1,200	1,200
Structural materials	1,350	1,350	1,350	1,350	1,350
Uranium	0	50	150	250	275
Total industry	7,050	7,250	7,650	8,200	8,425
Realistic					
Iron ore	4,125	4,100	4,075	4,050	4,025
Base metals	650	450	350	350	350
Nonmetals	800	800	800	800	800
Structural materials	1,000	1,000	1,000	1,000	1,000
Uranium	0	50	150	250	275
Total industry	6,575	6,400	6,375	6,450	6,450

Source: Centre for Resource Studies estimates.

Uranium: It was not possible to derive three separate projections for uranium mining. There can be no 'trend' projection since there is no uranium mining activity in the province at the present time. We have considered the recent decision of Brinco (Brinex) to proceed with the development of the Kitts and Michelin deposits to be a firm basis for a realistic and an optimistic employment projection to 1983.

Aggregate Projections from Disaggregated Data

The aggregate employment projections for the province's mining industry, also shown in table 79, are obtained by summing the results for the four sectors. The industry totals are, of course, dominated by iron mining. Characteristics of the aggregate industry projections are described below for the three cases.

The optimistic case shows unemployment rising steadily to 8,425 by 1983, an increase of 1,375, or 20 percent, above the 1979 figure. The increase is spread across all sectors, with iron ore accounting for 500 of the increase.

The trend and realistic cases are similar both in level and in change over time. They show little net change in employment between 1979 and 1983. Both projections indicate declines from 1979 to 1981, and then recovery to the 1979 levels by 1983. The realistic case indicates a net decline in employment of about 100 between 1979 and 1983.

Employment Projections in Other Studies

We examined three studies which contain employment projections for the Newfoundland mining industry covering the period dealt with in this report. These are the forecasts prepared by the Atlantic Provinces Economic Council (APEC) (1979), the Department of Regional Economic Expansion (DREE) (1972), and the Department of Energy, Mines and Resources (EMR) (1975).

APEC's forecasts are sketchy, and deal mainly with iron mining in Labrador West. It appears that APEC expects the work force to remain at the 1979 level of 4,800 until the mid-1980s. APEC anticipates another expansion in mining capacity in the mid-1980s, creating employment for an additional 3,000 workers

by 1990. We think this outlook is too optimistic. In addition, APEC sees a small net increase in employment in all other mining activity combined during the 1980s. The increases in employment are expected to come from uranium, gypsum, manganese, and sand and gravel, which are anticipated to offset closures or cutbacks elsewhere. APEC does not provide any employment projections, however.

The DREE forecasts are reproduced as table 80. They cover only part of the time period treated in this report, but the figures are useful for comparison with our projections. The data in table 80 are for man-years of paid employment. Our estimates are for number of employed workers, but these are mainly on an annual-equivalent basis. Therefore, our estimates can be compared directly with DREE's.

The series to be compared are the two realistic projections, and our optimistic projection with DREE's upper estimate. DREE's estimates track higher than ours, mainly as a result of the large increase in employment in metal mining that DREE projected for the first half of the 1970s, but which failed to materialize fully.

Our optimistic projection increases more rapidly than DREE's; theirs is incremental for the years 1975-81. For the realistic case the two projections show flat trends, although DREE's estimates are higher than ours. DREE's realistic projections for 1975 to 1981 are close to the employment figures produced by the Newfoundland Department of Mines and Energy for 1973-77, although the latter are slightly higher than DREE's. Our figures are lower than DREE's and those of the Department of Mines and Energy because, it will be recalled, we have ascribed only 40 percent of IOC's Knob Lake-Schefferville work force to Newfoundland.

The third study is contained in MAPS, a report published by EMR (1975). The forecast labour requirements are to the year 2000 but are broken down into five-year average annual man-year (employment) requirements. EMR's forecasts for Newfoundland are shown in tables 81 and 82. Table 81 gives total man-year requirements, by mining region, per five-year period. Table 82 gives average annual man-year requirements per five-year period and covers all mining except iron mining. EMR's figures show declining average annual employment after 1980. The figures for 1980-84 are about double our realistic estimate for metals (excluding iron ore) and nonmetals combined.

Table 80

DREE PROJECTIONS OF EMPLOYMENT IN THE NEWFOUNDLAND MINING INDUSTRY, 1971-81
(Man-Years of Paid Employment)

	1971	1975	1977	1978	1979	1980	1981
Upper							
Metallics	4,880	9,070	9,620	9,620	9,620	9,620	9,620
Nonmetallics	1,065	1,145	1,145	1,145	1,145	1,145	1,145
Structural materials	25	25	25	25	25	25	25
Other and contingency	40	340	540	640	740	840	940
Total	6,010	10,580	11,330	11,430	11,530	11,630	11,730
Realistic							
Metallics	4,700	7,920	7,800	8,150	8,150	8,150	8,150
Nonmetallics	1,010	1,110	1,110	1,110	1,110	1,110	1,110
Structural materials	20	20	20	20	20	20	20
Other and contingency	30	230	330	380	430	480	530
Total	5,760	9,280	9,260	9,660	9,710	9,760	9,810
Iron	3,400	6,800	7,100	7,150	7,150	7,150	7,150
Lower							
Metallics	4,560	6,630	6,630	6,630	6,630	6,630	6,630
Nonmetallics	965	965	965	965	965	965	965
Structural materials	20	20	20	20	20	20	20
Other and Contingency	20	70	120	120	120	170	170
Total	5,565	7,685	7,735	7,735	7,735	7,785	7,785

Source: Department of Regional Economic Expansion, Mining Industry Employment Forecast, Newfoundland, 1971-1981 (September 1972).

Table 81

FORECAST LABOUR REQUIREMENTS TO THE YEAR 2000 FOR MINING AND MILLING OPERATIONS, KNOWN SOURCES ONLY, BY MINING REGION, NEWFOUNDLAND AND QUEBEC-LABRADOR
(Number of Man-Years per Five-Year Period)

	1975-79	1980-84	1985-89	1990-94	1995-99
Avalon Peninsula	300	300	300	300	300
St. Lawrence	2,200	2,300	2,300	2,400	2,500
Buchans	2,800	2,600	2,400	-	-
Springdale-Baie Verte	2,800	2,600	2,600	2,700	2,800
Stephenville	400	400	400	400	400
Daniel's Harbour	500	1,000	-	800	800
Great Burnt Lake	200	1,100	-	-	-
Labrador Coastal	-	1,700	2,000	2,400	2,100
	9,200	12,000	10,000	9,000	8,900
Quebec-Labrador	34,900	38,700	42,900	47,600	52,800
Total	44,100	50,700	52,900	56,600	61,700

Source: Department of Energy, Mines and Resources, Mineral Area Planning Study (MAPS) (Ottawa, April 1975), figure 28.

Table 82

FORECAST LABOUR REQUIREMENTS TO THE YEAR 2000 FOR MINING AND MILLING OPERATIONS, KNOWN SOURCES ONLY,[a] NEWFOUNDLAND[b]

(Average Annual Man-Years per Five-Year Period, Number)

1975-79	1,840
1980-84	2,400
1985-89	2,000
1990-94	1,800
1995-99	1,780

Source: Department of Energy, Mines and Resources, Mineral Area Planning Study (MAPS) (Ottawa, April 1975), p. 42, table 4.

[a]Existing mines and known undeveloped mines whose development appears likely; for metals, nonmetals, and coal only.
[b]Excludes the Quebec-Labrador iron ore region.

Assessment: The Probable Outcome

In comparing our realistic projections with the DREE and EMR studies, we conclude that our report provides support to the view that employment in the Newfoundland mining industry has levelled off and will likely not experience any appreciable net expansion in the 1980s. Economic conditions appear to rule out consideration of any plans for expanded iron ore capacity until the mid-1980s at the earliest. The base metal sector will probably continue to contract, and little or no offset to the decline in employment in this sector can be anticipated from the nonmetal mining industries. Although the employment estimates for our realistic case are higher than the target figures in the Blueprint, we agree with the Blueprint that the mining industry cannot be counted on to be a source of net employment creation to the mid-1980s.

Our projections have been developed on the assumption that no substantial changes in provincial mining policy would occur during the period. As we assess the situation, the policy options available to the government to raise mining employment above target are quite circumscribed. Two policy areas should be considered. First, as indicated by the declining base metal sector, policies to promote a rapid increase in exploration are warranted. But, of

The second policy option pertains to mining taxation. At the present time the provincial government plans to undertake a review of its mining tax system with the apparent view to collecting more revenue from mine operators. If, however, the government wants to use the mining industry as an instrument for expanding job opportunities in Newfoundland, it is clear that it will have to assess carefully the resource allocation implications of any changes that it may consider, in taxation and other policies bearing on the province's mining industry. It is quite possible that the mining industry, however unreasonably or unjustly, would view changes in taxation or leasing policies as disincentives to investment in Newfoundland.

APPENDIX:

LIST OF CONTACTS

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