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Long Distance Labor Commuting In The Mining Sector
Date of Report: 1988
Author: Keith Storey/mark Shrimpton
Catalogue Number: 6-3-83

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Long Distance Labour Commuting in the Mining Sector.

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January 1988

Report prepared for the Department of Energy, Mines and Resources under the 1987/1988 EMR Research Agreements Program.

Acknowledgements

This research was funded by Energy, Mines and Resources Canada under the 1987/88 Research Agreements Program. We are particularly grateful for the support given to the project by members of the Mineral Policy Sector of EMR and especially Glen Kendall and Bob Keyes.

We would also like to acknowledge the co-operation of the mining companies who completed the questionnaire on LDC mining operations which provided the data base for the report.

While many individuals provided valuable information and advice, the views expressed in this report are those of the authors and not necessarily those of the Department of Energy Mines and Resources or the mining industry.

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Summary

This Report has been prepared for Energy, Mines and Resources Canada. The objectives are to identify and document all current and proposed mining projects using long distance labour commuting (LDC) and to estimate its future use.

LDC is defined as all employment in which the work is so isolated from the workers' homes that food and accommodation are provided for them at the work site, and schedules are established whereby employees spend a fixed number of days at the site, followed by a fixed number of days at home.

LDC, or "fly-in" mining as it is often, but sometimes incorrectly, referred to, is a new variant on the old theme of going away to work in the resource sector. The first Canadian mine to use this system was the Asbestos Hill mine in northern Quebec in 1972. Since then fourteen other mines have gone into production, and two others are scheduled to commence commercial operations in early 1988. As of June 1987 there were nine operating mines in Canada using some form of LDC.

The report is based on a review of literature, key informant interviews and a questionnaire survey of mining companies who use or have used LDC. The Report begins with a discussion of the use of LDC by the mining industry, which is followed by an analysis of data from those mines currently using this system. The issues arising from the use of LDC are then discussed and finally the prospects for its future use are examined.

The traditional approach to developing mineral resources is to build a mining town. In recent years LDC has become an attractive alternative given the economic and social limitations of resource towns, changes that have occurred in the regulatory and policy environments, technological and infrastructural changes in the transportation and mining sectors, and the recent economic restructuring that has occurred in the mining industry.

The survey of mines shows the rapid growth in the use of LDC, and particularly since 1980. Gold, uranium and zinc are the metals sectors that currently use LDC, and the Province of Saskatchewan and the North West Territories are the regions where most LDC mines are found. Fifty-seven percent of all LDC workers work a seven day on, seven day off rotation and 80% of all workers work 12-hour shifts. Rotations and shifts vary considerably both at individual mines and between mines, the shortest rotation is 4/3 and the longest 98/21. Generally speaking those mines in the south with relatively easy access to labour use shorter symmetrical rotations, while remote operations tend to use longer, asymmetrical patterns.

Among the issues arising from the use of LDC are the implications of different rotation cycles and shift systems on labour matters such as health and safety, productivity and efficiency, absenteeism and turnover, unionism, and personnel policies. Related issues include the relative costs of LDC versus the mining town option, and the possible limitations to the use of LDC in terms of the size of the operation, length of commute, or life expectancy of the mine.

The advantages of LDC for workers and their families include the benefits of relatively high wages or salaries plus extended periods of time away from the work site. Against this are the disadvantages of stress and tension caused by partings and reunions, the problems caused by spousal absence, difficulties of role definition and transitions for those with children, and difficulties with maintaining ongoing relationships with friends and other community members. While many are able to cope with these difficulties some will change jobs or end their relationships.

LDC also has important implications for northern regional development policy. The use of non-local labour, the limited involvement of native labour, and the purchase of most goods and services from southern metropolitan centres are some of the perceived disadvantages of LDC. On the other hand the system represents a low-cost approach to mineral development for government, in that there is little need to provide infrastructure or services at remote locations, and most of the economic and social costs normally associated with closure are avoided.

Development of new metal mines in general, and mines using LDC in particular, will depend on future metal prices, mine costs, and continued access to markets - particularly markets in the United States. Not all new mines will need to use LDC, but where the resource is remote from its labour supply and the economics of the project justify development, there is a far greater likelihood that LDC will be used rather than construct a new town. This is not to suggest that all of the socio-economic outcomes of LDC are positive. Questions on such issues as fly-over effects, local training and recruitment, and worker and family effects need to be given serious attention at the policy level if the positive benefits of this approach to mineral development are tobe maximized and the negative outcomes minimized.

1.0 Introduction

This research report has been prepared for the Department of Energy, Mines and Resources under the 1987/88 EMR Research Agreements Program. The objectives of the project were

(i) to identify and document all current and proposed mining projects using long distance labour commuting (LDC) , establishing a range of information including the typeofoperation, year of commencement, projected life, size of labour force, rotation and shift patterns, commuting transportation network (modes and points served) , and the regional distribution of the workers' place of residence; and

(ii) to establish the current, and estimate the future, aggregate levels of use of LDC, by the type and characteristics of operation involved.

Long distance commuting in the mining sector has a relatively short history and to date has not been subject to any systematic analysis. However, recent changes in the structure of the mining industry, financing considerations, and attitudes and aspirations of the mining labour force are among the factors which have led tothisapproach tomineral resource development becoming increasingly important. The reason for undertaking this inventory and analysis of long distance commuting is to provide a baseline for the subsequent systematic study of the implications of LDC for labour economics, management continuity and labour-management relations, and of the psycho-social impacts on workers and their families.

The Report is based on a review of current literature (see Storey and Shrimpton,1986, 1987, and forthcoming, and Shrimpton and Storey 1987 and 1988), a questionnaire survey of mines using LDC[1], and key informant interviews.

The Report is divided into three main sections. The first provides an overview of the history of LDC and a discussion of the factors which have encouraged its use as opposed to the construction of mining towns which represent the more traditional approach to mineral development. Part two provides an inventory and analysis of current and proposed projects that use LDC in terms of the variables noted in the first of the above objectives. The third section is a synthesis of the policy issues arising out of the experience with LDC and the prospects for its future use.

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1. The term 'fly-in' is commonly used to refer to all mining operations using LDC. However, the Hope Brook gold mine in south-west Newfoundland uses a boat to transport the majority of its labour force to and from the mine, while the Star Lake and Emerald Lake gold mines use or will use bus transportation. In this paper fly-in is used only to refer to those LDC mines using air transportation.

2.0 Overview and Literature Review

2.1 Introduction

One of the outstanding characteristics of Canadian geography is the imbalance between the distribution of population and the distribution of its natural resources. Approximately 90% of the population is concentrated along a narrow belt of relatively arable land on the southern edge, while many of the exploitable resources are located to the north or in marine areas.

Given the need to minimise resource production costs and maintain or enhance Canada's international Competitiveness as a resource producer, a question of increasing importance is how these resources can most efficiently be developed. Until relatively recently the traditional response was the development of the "company town" or "resource town", the most recent, and perhaps the last, example of which is the coal town of Tumbler Ridge in British Columbia (Bugden, 1984).

However, following the example set by the offshore oil industry, and starting with the Asbestos Hill operation in northern Quebec in 1972 and the Rabbit Lake, Saskatchewan, uranium operation in 1974 (Nogas, 1976, 1986), there has been an increasing use of "temporary work communities" and "long distance commuting" to "fly-in mines" as an alternative strategy for the development of remote mineral resources.

By way of definition, LDC is all employment in which the work is so isolated from the workers' homes that food and lodging accommodations are provided for them at the work site, and schedules are established whereby employees spend a fixed number of days working at the site, followed by a fixed number of days at home (Hobart, 1979,2) .

LDC is thus a relatively new variant on the old Canadian theme of going away to work in a resource industry. It is, however, a unique form of work organization differing (i) from daily commuting systems in that the workers are away from, and then at, home for extended periods, and (ii) from seasonal or temporary migration-to-work systems by the year-round regularity of the rotational work pattern.

The industrial sectors most likely to utilize LDC are construction, transporta"tion and resource development. It is used when the nature or location of the work makes it impossible, prohibitively expensive, or undesirable to use labour commuting on a daily basis from an existing, or purposely built, community. This occurs when:

(i) the location of the work changes over time, either because the resource itself is mobile (as with deep sea fishing by factory or freezer trawlers) or where work on a transportation system is involved (the Quebec North Shore Labrador railway, for example, uses LDC labour, and there is increasing use of LDC on international-going merchant marine vessels) ;

(ii) the work is situated in harsh and dangerous environments, as in the case of offshore oil and gas exploration and production;

(iii) the activity is of short duration, such as large scale construction projects, and/or:

(iv) the work is at a site remote from existing communities and for economic, social, and/or public policy reasons, LDC is regarded as the preferred option to developing a new resource community.

This Report focuses on the last of these circumstances, and in particular the use of LDC by the Canadian metal mining industry. Use of LDC in the mining industry probably originated in the Soviet Union in the 1960's as a means of developing northern mineral resources (see Armstrong, 1976; Slipchenko, 1979). More recently it has begun to be used in Australia. However, it is in Canada where the system currently appears to enjoy greatest use in the mining sector and where there is likely to be the most significant growth in the near future.

2.2 LDC Use by the Canadian Mining Industry

Table 1 summarizes selected characteristics of commercially producing Canadian mines which use, or have used, LDC. In June 1987 there were eight operating mines using LDC. One has since closed, one has come into production, and two are in the development/construction stage.

Of the mines opened prior to 1987, one no longer uses an LDC system, and five have closed. Several other operations that have also used a rotation system are not included as they did not enter commercial production. For example, the Bullmoose Lake mine (gold) in NWT operated a 28/28 fly in system from 1982 to August 1987, including some shutdown periods. This project employed an average of 120 workers but was a pilot mill project rather than a full commercial operation.

Table 1 - Characteristics of Mines Using LDC

	Mine	Province	Opened/ Closed	LDC Employees	Rotation Days In/Out	Years of Expected Life
1.	Asbestos Hill (asbestos)	Que.	1972-1983	c.400	70/14	
2.	Rabbit Lake (uranium)	Sask.	1975	370	7/7	>20
3.	Nanisivik (lead, zinc)	NWT	1976	194	98/21	4-6
4.	Coal Valley (coal)	Alta.	1978[1]	335[2]	n.a.	n.a.
5.	Cluff Lake (uranium)	Sask.	1980	265	7/7	>20
6.	Camsell River (silver)	NWT	1980-1985[3]	200	28/28[4]	
7.	Baker Mine (gold)	B.C.	1981-1983	5(35	14/7[6] 21/7	
8.	Lupin (gold)	NWT	1982	440	14/147 4/3	15-19
9.	Polaris (zinc,lead)	NWT	1982	275	63/21[8] 42/28 42/21	15-19
10.	Cullaton Lake (gold, silver)	NWT	1983-1985	1409	7/7	
11.	Key Lake (uranium)	Sask.	1983	485	7/7	15-19
12.	Detour Lake (gold)	Ont.	1983	150[10]	7/7[11] 3/4	10-14
13.	Salmita (gold)	NWT	1983-1987	25	14/14[12] 35/21	
14.	Star Lake (gold)	Sask.	1987	50	7/7	1-3
15.	Hope Brook (gold)	Nfld.	1987[13]	370[14]	14/14	10-14
16.	Johnny Mtn. (gold)	B.C.	1988[15]	55	42/21	4-6
17.	Emerald Lake (gold	Ont.	1988[15]	85[16]	4/4	n.a.

Table 1 - Footnotes

1. Workers were bused in 5 days per week for eight hour shifts from 1977-1978. A daily helicopter commuting system was used 1988-1982 with workers rotating on a 4/4, 12-hour shift system. Since 1982 the company has used a daily bus commuting systembutworkers still rotateonthe4/4, 12-hour shift system.

2. 1986 employment which was about 60% capacity.

3. Operations began in 1970 but a rotational system was not adopted until 1980.

4. The original rotation was 54/30 for hourly workers and 36/20 for staff. In 1984 the rotation changed to 28/28 for all employees.

5. November 1983.

6. 1981 rotation for all personnel was 21/7. This changed in 1982 to 14/7 with the exception of administrators who remained on 21/7.

7. Mine workers work 14/14, some department heads work 4/3.

8. Majority of hourly paid staff work 63/21, native workers can opt for 42/28, corporate staff work 42/21.

9. August 1985

10. Currently undergoing expansion.

11. Mine staff work 3 weekdays first week, 4 days second week at mine site except accounting personnel who are located in Timmins.

12. Mill workers worked 14/14, production employees worked 35/21.

13. Production began September 1987.

14. Construction and mine workers, normal operating employment expected to be c.270.

15. Production scheduled for early 1988.

16. Of the total workforce 55 will commute on a daily basis from River Valley and area, the remaining 30 will live on site during their 4/4 rotation or 4/3 rotation in the case of mill operators.

The dates of opening of the mines show how recent the LDC phenomenon is. The first use of LDC in the mining industry was at Asbestos Hill, Quebec in 1972, and twelve of the seventeen operations have only been in production or under development since 1980. Gold and silver (9 mines), uranium (3), zinc/lead (2), asbestos, coal and silver (1 each), are the types of mine with which LDC has been associated to date.

While in an overall sense the use of LDC in the mining sector may be considered relatively limited, the increase in its use has been rapid, and in some regions it has become the dominant approach to development. In October 1986 there were 110 metal mines in Canada, of which eight (7.3%) were LDC operations, but four of the ten mines (40%) in the NWT, and four of the six (67%) mines in Saskatchewan used an LDC rotation system. In terms of employment, LDC is also significant in those regions. Although only 4.8% of all Canadian metal mines workers were employed in LDC operations in October 1986, 48% of all workers in the NWT and 18% in Saskatchewan worked at mines using this system.

Table 1 also indicates a wide range in the length of the rotation used at each mine. The longest rotations (Nanisivik, 98 days on/21 days off and Polaris, 63/21) are the most northerly operations. Rotation patterns and other mine characteristics are discussed in more detail in Part 3, below.

One other characteristic of note is that while most Canadian metal mines are unionized, only three of the current (June 1987) LDC operations are organized. Organized mines are those at Xey Lake and Detour Lake (United Steel Workers of America), and Cluff Lake (Energy and Chemical Workers Union).

2.3 The Decline of Resource Towns and the Growth of LDC

The current preference in resource development is shifting away from the development of new resource towns towards Long Distance Commuting. In the metal mining industry a new calculus has emerged which favours the LDC option. The elements of this new calculus include:

2.3.1 Limitations of Resource Towns

There is a considerable literature on the problems of Company or Resource Towns (see, for example, Robinson, 1984). These problems include:

* lack of economic diversity
* lack of alternative employment opportunities - especially for women
* difficulties of recruiting and retaining top quality labour
* vulnerability to "boom and bust" cycles
* seasonal instability in terms of employment and income levels
* a limited and often unpredictable lifespan of the resource
* socio-demographic imbalances
* social problems associated with remote environments, loneliness, alcoholism, etc.
* communities too small to support many urban services, especially in the areas of education, entertainment, and retailing
* limitations of the physical, social and political environment
* difficulties of town management
* start-up and wind down costs to industry and government
* social and economic problems associated with closure

Many of these problems have been exacerbated over time as Canadian miners and their families have come to expect and demand a greater rangeof recreational and other public facilities, ahigherproportion of children need and wish to attend grade school and participate in higher education, and; demographic, social and economic changes have made two income families the norm.

2.3.2 Changes in the Regulatory and Policy Environment

A number of public policy considerations have affected decisions between the Resource Town and LDC alternatives. Principal among these is the fate of single industry towns when the resource is exhausted or its exploitation becomes uneconomic, thus removing the community's <u>raison d'etre</u>. This common Canadian phenomenon has proved costly to the residents of such towns and to the public purse. Accordingly, alternative development options become more desirable.

At the same time, changes in the regulatory environment have made the construction of mining towns more expensive. The earlier company towns were largely unconstrained by government requirements and controls leading in many cases to a poor quality urban environment. More recent mining towns, such as Tumbler Ridge, are, by contrast, conspicuous fortheplanning efforts and investments that have gone into the community. In the case of Tumbler Ridge the estimated total development cost exceeded $274 million representing a per capita investment in the order of $45,7oo (McGrath, 1986,232) .

Companies contemplating the development of a new town know they are likely to be subject to the impact assessment process which may require the use of costly management and mitigation measures before the development is allowed to proceed. In addition developers are now subject to a much wider range of regulations regarding urban design, accommodation standards, and servicing; all of which tend to add to construction costs.

A further constraint to resource town development is that increasing Federal-Provincial management of resources has tended to transfer much of the decision-making from the private sector context to the political-regulatory context. For example, and as an extreme case, the Alberta Government in the mid 1970's forbad any new town development in the "Coal Branch" area WeSt of Edmonton. In this case developers had no choice but to use a commuting option (Berg,1986,31) .

A second example of the impact of policy is with resPect to affirmative action programs, particularly as they apply to aboriginal peoples. The objective oftheseprograms is to encourage participation in resource development and yet at the same time permit native peoples to maintain elements of their traditional lifestyle. The resource town strategy does not easily allow these twin objectives to be achieved, whereas the commuting option allows for both the separation of home and work place and more flexibility in the actual workcycle (see, for example, the discussions by Nogas, 1986, and Beveridge, 1979 on native employment at Rabbit Lake).

Long distance commuting employment is increasingly being seen as a means of spreading the economic benefits of resource development to a wide range of communities, native and non-native, rural and urban, and northern and southern. The effect of LDC is the opposite of that of a mining town, insofar as incomes generated at the mine are spent in, or from, a large number of communities. This contributes to the diversification of the economic bases of these communities and serves to spread both the benefits of the mine during its operation and the costs of its closure. This is not to suggest that a wider spread of benefits is always beneficial. The problem of 'fly-over', for example, where remote sites are served from distant metropolitan centres rather than nearby urban centres, is a problem associated with LDC and is addressed in more detail later.

In short, government policy now tends to encourage resource developments that address a range of political, economic and social objectives rather than simply economic objectives. As a consequence many of the what, where, when and how questions of development must be evaluated against a wider range of variables; the net result is that in many cases commuting has become the preferred option.

2.3.3 Technological and Infrastructural Changes

A third element in the new calculus is the relative changes in movement, communication, and storage costs that have occurred in recent years. Changing technology, particularly with respect to air transportation, has provided resource developers with the basis for the commuting option which simply was not there in the 1950's and 1960's.

Air transportation is now fast, dependable and relatively safe and cheap, and in conjunction with public policy initiatives of the 1960's and 1970's, which saw the expenditure of considerable public funds to improve road, rail, air and port infrastructure together with terminal and warehousing facilities, the cost equation has changed in favour of LDC.

2.3.4 Restructuring in the Mining Sector

Since 1981 - 1982 there has been a crisis in the mining industry. While mining has always been vulnerable to short term mineral cycles and longer term business cycles, during the recent recession the cyclical vagaries of international mineral markets have coincided with significant structural changes within the industry. This has meant that more attention than ever has been given to improving productivity, rationalizing unproductive operations, and reducing production costs so as to ensure that the industry remains competitive.

Weak mineral prices in recent years are largely attributable to the high real interest rates of 1981-82, a declining world gross national product, world currency re-alignments, environmental regulation, downsizing, new lower cost mining operations in third world countries and metal substitution (Keyes,1986,6).

The implications for the Canadian metals mining industry include:

(i) the increased probability that the search for new mineral reserves will take the industry to more remote locations;

(ii) the development of new reserves will emphasise higher value deposits implying the probability of shorter mine lifetimes; and,

(iii) the need for increased extraction efficiency which implies the likelihood of a smaller workforce.

Each of these favours the use of LDC. Furthermore, recent price fluctuations have caused attention to focus on development options that are more compatible with variability per se. The LDC option presents advantages in that costs of start-up and closure of the mine, whether temporary or permanent, are reduced.

In cases of closure there are no mining town problems, and the saving in commuter transportation costs is immediate. LDC operations are thus both easier to open and to close (and possibly subsequently to re-open), as seems to be indicated by the closure of the Cullaton Lake and Salmita gold mines after only two and four years of operations respectively (see Table 1).

2.3.S *Worker* Preference

Another factor, which may further hasten the decline of the resource town and expand the use of long distance commuting, is that many workers prefer commuting to living in a mining town (see, for example, Rose et al. ,1984,1).

From the company viewpoint it appears that there is less difficulty in attracting workers and retaining them (Nogas, 1976,128; Glass and Lazarovich, 1984,86; Newton, 1986,77). The developers of the Rabbit Lake mine found during the planning phase that were they to adopt the mining town option they could expect anything from a 35-400% annual turnover rate. In fact turnover started at 28% when the mine opened in 1975 and by 1986 was down to 5% (Nogas,1986,20,24) . At Polaris in the first six months of operation the turnover rate was only 12% and subsequently declined. While these low turnover rates may in part be explained by an absence of alternative mining employment opportunities from 1981 to the present, there appears nonetheless to be a fairly high level of satisfaction with the system.

Operators of fly-inmines also indicate that there is less absenteeism (Newton,1986,78) , and it has been argued that there are fewer industrial disputes (Rose et al. ,1984,4).

From the perspective of the workers there is evidence that many of them appreciate being able to live in their home communities, retaining family and friendship ties and taking advantage of facilities and opportunities that might not be available in remote communities (Jackson, 1987,164), and that they enjoy the extended time with their families that the rotation system allows (Storey et al. ,1986, 101) .

3.0 Survey of LDC Mines

In order to achieve a better understanding of past and current LDC mining activities a survey of mines using this system of work organization was carried out. A questionnaire (Appendix 1) was sent to all mines known to use the system. In addition to providing data about their own mine, respondents, usually the Human Resources Supervisor or equivalent, were asked to identify other mines not included in the list of LDC operations provided. In this way what is believed to be a complete list of Canadian LDC mining operations, past and present, was generated, and comparable data collected on each. Of the seventeen mines identified detailed information was obtained on thirteen including all of those currently operating.

3.1 General Mine Characteristics

Table 1 provides an overview of mines that use LDC indicating each mine by province, activity, and date of the beginning, and, where appropriate, the end of operations. Table 2 summarizes the dates of opening of mines by type and clearly indicates the growth in LDC since 1980, and its increased use in gold mining in particular.

This growth can also be seen in the context of total mine openings. The proportion of LDC mines as a percentage of all new gold, uranium and lead/zinc mines has increased steadily, from 9% in 1975-79, to 15% in 1980-84, and to 36% in 1985-87 (Canada,1987).

The "life expectancy" of those mines still in operation, i.e the notional life of the mine based on current known reserves, costs and mineral prices, varies considerably, but typically the gold mines in question have a relatively short life expectancy, the uranium mines are expected to have fifteen or more operating years left while the two lead/zinc mines have 4-6 and 15-19 years of life remaining (Table 3).

Interestingly, LDC mines appear to have a higher survival rate in comparison to non-LDC operations. Between 1975 and 1987 twelve LDC mines were opened, of which 10 (83%) remain open, while, over the same time period, only 32 of 62, or 56%, of all non-LDC gold, uranium and lead/zinc operations are still open (Canada,1987). The underlying reasons for this apparently greater chance of survival are not, however, understood.

All but one of the mines were designed as LDC operations. Camsell River (NWT) switched to an LDC system in 1980, and the Luscar-Sterco mine (Coal Valley, Alberta) has since returned to the more conventional form of work organization where workers commute by bus on a daily basis. The only mines which do not utilize LDC alone are Nanisivik in the NWT and Emerald Lake in Ontario. Some of the work force at Nanisivik is local and commutes on a daily basis from Arctic Bay, and accommodation and schooling facilities are provided for the families of some LDC employees. The

Table 2 - LDC Mines: **Year** of Opening

Year of **Opening**	**Total Mines** Opening in **Period**	Typo of **Mine**			
		Uranium	**Zinc/** Lead	Gold	**Other**
1972-74	1				1
1974-76	2	1	1		
1977-79	1				1
1980-82	4	1	1	2	1
1983-85	4	1		3	
1986-88	4			4	
Total	17	3	2	9	3

Table 3 - LDC: Life Expectancy as of June 1987

Life Expectancy (Years)	Total	Uranium	Zinc/Lead	**Gold**	Other
Closed	5			3	2
1-3	1			1	
4-6	2		1	1	
7-9					
10-14	2	-		2	
15-19	3	1	1	1	
20+	2	2			
Unknown	2			1	1
Total	17	3	2	9	3

organizational system at this mine is discussed in more detail below. At Emerald Lake part **of the work** force will also commute on a daily basis.

3.2 The Workforce

Table 4 gives aggregate **employment** data for **all mines** in production on June 1 1987 by on-site and off-site occupational categories. One hundred and seventy-four or **7.1%** of the total **workforce** are employed off-site, primarily in administrative positions at head-office or other locations. of the remaining 2287 on-site workers, 976 or 43% are employed in mill operations and 836 **(36%)** in mining. The remainder of the **workforce** are **mainly** involved in administration (14. 7%) , and catering, housekeeping and other support activities (6.0%).

Aggregate statistics, however, do hide the considerable variation between mines, even those in the same mineral sector and region. At **Cluff** Lake, for example, only 16% of the on-site **workforce** are miners compared to 44% at Key Lake, while at Rabbit Lake 53% of on-site workers are in the mill compared with **32%** at Key Lake.

Table 5 disaggregates the **workforce** data by mine, **and** by workers per employment category. At the nine mines in **full** operation at the time of the survey and for which data were available, there was a total employment of 2461 of whom 2164 (88%) were males and 297 **(12%)** females.

Uranium mines are the largest single employer (1207 employees, or 49% of the total) and the concentration of uranium mining in Saskatchewan means that this province has the largest proportion of LDC mine employees with 1261 workers or **51%,** followed by the NWT with 1045, or 42%.

3.2.1 Female Workers

There are approximately 300 women employed in LDC mining operations. Of these, 242 (81%) work at the mine site, representing 11% of the total employees working a rotational pattern.

Mines without any female workers at the time of the survey were **Salmita,** which was in the process of suspending operations, and Johnny Mountain, whichwasinthedevelopment/construction phase. The proportion of females in the LDC **workforce** varies between mines, as indicated in Table 6. The overall average is **10.5%** with the lowest female employment rates being found at Detour Lake (6.0%), Lupin (7.2%) and Rabbit Lake (7.5%).

Table 4 - LDC Employment by **Activity** Category:
Operating Mines June 1 1987

Activity	Total Employment	Male (%)	Female (%)
On-site			
1. Administration	336	256 (13)	80 (33)
2. Production			
Mine	836	806 (39)	30 (12)
Mill	976	909 (44)	67 (28)
3. New Construction			
4. Other	139	74 (4)	65 (27)
Sub-total	2287	2045(100)	242(100)
Off-Site			
1. Administration	142	92	50
2. Other	32	27	5
Sub-total	174	119	55
Grand Total	2461	2164	297

These comparatively low rates can be partly explained by the fact that the last two mines noted contract out the catering and cleaning service functions, activities which traditionally employ a high proportion of women. No data were available for contractual employees at these mines.

At other mines the percentage of female workers ranges between 10.5% at Key Lake and 19.7% at Nanisivik. The high percentage of female workers at Nanisivik may be explained by the opportunity for local residents of Arctic Bay to be employed and for married couples from elsewhere to work at the mine.

Compared to men, women on-site are over-represented in administrative functions (80 of the total of 242 female workers, or 33%), and Other Employment (27%), which is primarily cleaning and catering (see Table 4) . Conversely they are under-represented in Mine and Mill production work, though it should be noted that 12.4% of all women on siteareemployed directly in mining itself. The considerable variation in the number and type of jobs performed by women at the different mines should once again be noted (see Table 5).

Table 5 - LDC Employment by Occupation by M

	[1]Rabbit Lake			[2]Cluff Lake			[3]Key Lake			[4]Nanisivik		
	T	M	F	T	M	?	T	M	F	T	M	F
Site												
Admin.	24	16	8	6 2	7 3	9	61	50	11	41	[33]	[21]
Prod.												
Mine	151	148	3	42	42	0	214	231	3	4	(47]	[7]
Mill	197	180	17	9 4	6 8	6	155	135	20	10	[%]	[14]
New Const.	c/o											
Other	c/o			45	26	19	56	39	17			
SUB TOTAL	372	344	2a	263	229	34	486	43S	51	218	[176]	[42]
ff Site												
Admin.				44	31	13	42	30	12	0	[7]	[3]
Other												
SUB TOTAL	9			44	31	13	42	30	12	10	[7]	[3]
GRAND TOTAL	372	344	28	307	260	47	528	465	63	228	183	45
				T	M	F						
LDC Total				(32)	100a	113				LDC Total		
				T	M	F						
Total Uranium				2207	1069	138				Total Lead/Zinc		
							T	M	F			
All Mines LDC Total Employment							2287	2045	24[illegible]			
							2461	2164	29[illegible]			

Includes 'Other'.
In Reorganisation Phase
In 'Wind-Down' Phase
[ ] Estimates
26 On-site workers commute daily from Arctic Bay

Table 6 - Female Workers at LDC Mines

Min.	#Female Workers	% of all LDC Workers at Mine
Rabbit Lake	28	7.5
Cluff Lake	34	12.9
Key Lake	51	10.5
Nanisivik	[42]	[19.7]
Polaris	40	14.4
Lupin	32	7.2
Detour Lake	9	6.0
Star Lake	6	11.3
Salmita	0	

	242	

[] estimate

3.2.2 Native Workers

Of the 2461 LDC workers approximately 443 were native; an average of 19% per mine. (No data are available on the proportion of native workers who are women.) The proportion of native workers per mine varies considerably as Table 7 illustrates. The range is from 42% native workers at Cluff Lake to 2.7% at Detour Lake. In general the uranium operations show a higher proportion of native workers than other mines.

Table 7 - Native Employment at LDC Mines

Mine	# Native Employees	% LDC Workers
1. Rabbit Lake	95	25.5
2. Cluff Lake	110	41.8
3. Key Lake	110	22.6
4. Nanisivik	58	26.6
5. Polaris	26	9.3
6. Lupin	35	7.9
7. Detour. Lake	4	2.7
8. Star Lake	5	9.4
9. Salmita	na	
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Total	443	mean = 19.4

These variations may be explained by several factors of which the following may be the most important:

(i) Available Workforce.

Clearly the location of the mine relative to an available workforce is important. One would expect a higher proportion of native workers in areas where there is a large local native population, all other things being equal. This probably helps explain the higher levels of native employment at, for example, Nanisivik and the mines of northern Saskatchewan, but fails to explain the low proportion of native workers at Star Lake, Saskatchewan.

(ii) Recruitment and Training Policies.

Native recruitment and training agreements reached at individual mines are also important. Such agreements were made in Saskatchewan at Rabbit Lake, Cluff Lake and Key Lake through a mechanism known as the Northern Surface Lease Policy. Employment quotas were set for northern residents, but with the exception of Cluff Lake the targets were never met nor were penalties enforced. More recently the approach appears to have been one of encouraging companies to increase the number of native hires without resort to regulatory measures. In the Saskatchewan uranium industry, for example, training programs are in place and preference is given to native workers for entry level positions. This approach appears to be having some success as native employment as a percentage of total employment at Saskatchewan uranium mines was higher in 1987 than the annual average for 1981-1984.

Similarly at Nanisivik a 1981 agreement saw a quota requirement of 50% native workers at the mine. This was never achieved and when Polaris was developed a different agreement was reached; this was designed to encourage native hiring and training but without specifying quotas.

3.2.3 Marital Status

Table 8 indicates the estimated proportions of the LDC workforce by marital status. The majority of the workforce are married; the weighted mean proportion of married workers is 73% and single workers are estimated at 22%.[1] At Key Lake, for example, the number of married, divorced or separated workers with children at home is estimated at 69% (Storey and Shrimpton, forthcoming), thus the assertion by Douglas (1984,17), that the workforce is made up predominantly of those who are single or married but without children, appears to be incorrect.

Table 8 - Estimated Marital Status of **LDC Mineworkers**

	Mine	single	Percentage Married	Widowed/ Divorced
10	Rabbit Lake	25	75	na
2.	**Cluff** Lake	na	na	na
3.	Key Lake	25	65	10
4.	Nanisivik	na	50	na
5.	Polaris	34	59	7
6.	Lupin	25	70	5
7.	Detour Lake	15	75	10
8.	Star Lake	36	59	5
9.	**Salmita**	na	na	na
		--	--	--
	mean % (1)	22	73	5

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1. weighted by number of LDC workers per mine

Bearing in mind that the data are only estimates and that they are incomplete, it would nonetheless seem that the workforce at Nanisivik and Polaris, the two most isolated mines with the longest rotations, has a larger proportion of single workers than

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1. This is significantly different from the population as a whole. The 1986 census indicates that 64% of all males, 15 years and older, are married and 31% single.

other mines. There appears to be a relationship between length of rotation and the demographic characteristics of the workforce. This issue requires further investigation.

3.2.4 Place of Residence

Table 9 shows the region of residence of LDC workers at each mine. Figure 1 indicates the regions referred to. The four Saskatchewan mines draw almost all of their labour from Saskatchewan itself, particularly from Southern Saskatchewan and especially from the Saskatoon area (62%). Detour Lake also has a relatively localised labour force, drawing its employees from Northern Ontario, and particularly from the Timmins and Cochrane areas.

By contrast the mines in the NWT draw their labour forces from across Canada. Figure 2 illustrates the place of residence of those working at Salmita during its lifetime. As might be expected workers at Nanisivik and Polaris, in the eastern NWT, live mainly in the eastern provinces. Sixty-three percent of the workers at Nanisivik, and 52% at Polaris come from Ontario, Quebec or the Atlantic Provinces. On the other hand, Lupin, in the western NWT, draws 78% of its workforce from Alberta and British Columbia.

Excluding Salmita, for which data are incomplete, only a relatively small percentage of those working in the NWT actually live there. At Nanisivik 26% of the workers live in the NW'T, 45% of whom live locally in Arctic Bay and commute daily to the mine. At Polaris and Lupin the percentage of workers living in the NWT is only 12.6% and 9% respectively.

These differences in large part reflect differences in local labour supply and the commuting arrangements the companies have adopted. The remoteness of the mine site and the associated lack of local labour means that workers have to be brought in over very long distances, the costs of which in turn influence the choice of rotation systems used at these mines. Rotation length is discussed in more detail below.

One aspect of worker place of residence that would bear closer examination is that some northern residents, originally hired in the north, have moved south but continue to commute to the mine site. At Polaris, for example, of 71 'northern-resident" hirings, including both natives and non-natives, 38 now live inthe south. The main reason given for this move is to allow a family to be closer to those who can provide support during the lengthy periods of absence of the spouse. There is also evidence that some Lupin workers, originally from Yellowknife, have moved south to take advantageof cheaper living conditions, and similarly some "northern" employees at Cluff Lake have moved south to Saskatoon.

Table 9 - LDC Employees by Mine and Region of Re

REGION	Rabbit Lake	Cluff Lake	Key Lake	Nanisivik	Pol
1. NWT-Yellowknife					
2. NWT-Other				58	
3. Yukon					
4. British Columbia	2			13	
5. Alberta-Northern					
6. Alberta-Southern	3			5	
7. Saskatchewan -Northern	70	131	85		
8. Saskatchewan -Southern	297	132	392		
9. Manitoba-Northern	-			1	
10. Manitoba-Southern	-			5	
11. Ontario-Northern	-			16	
12. Ontario-Southern	-			46	
13. Quebec-Northern	-			6	
14. Quebec-Southern	-			11	
15. Atlantic Provinces	-			59	
	372	263	477	220	

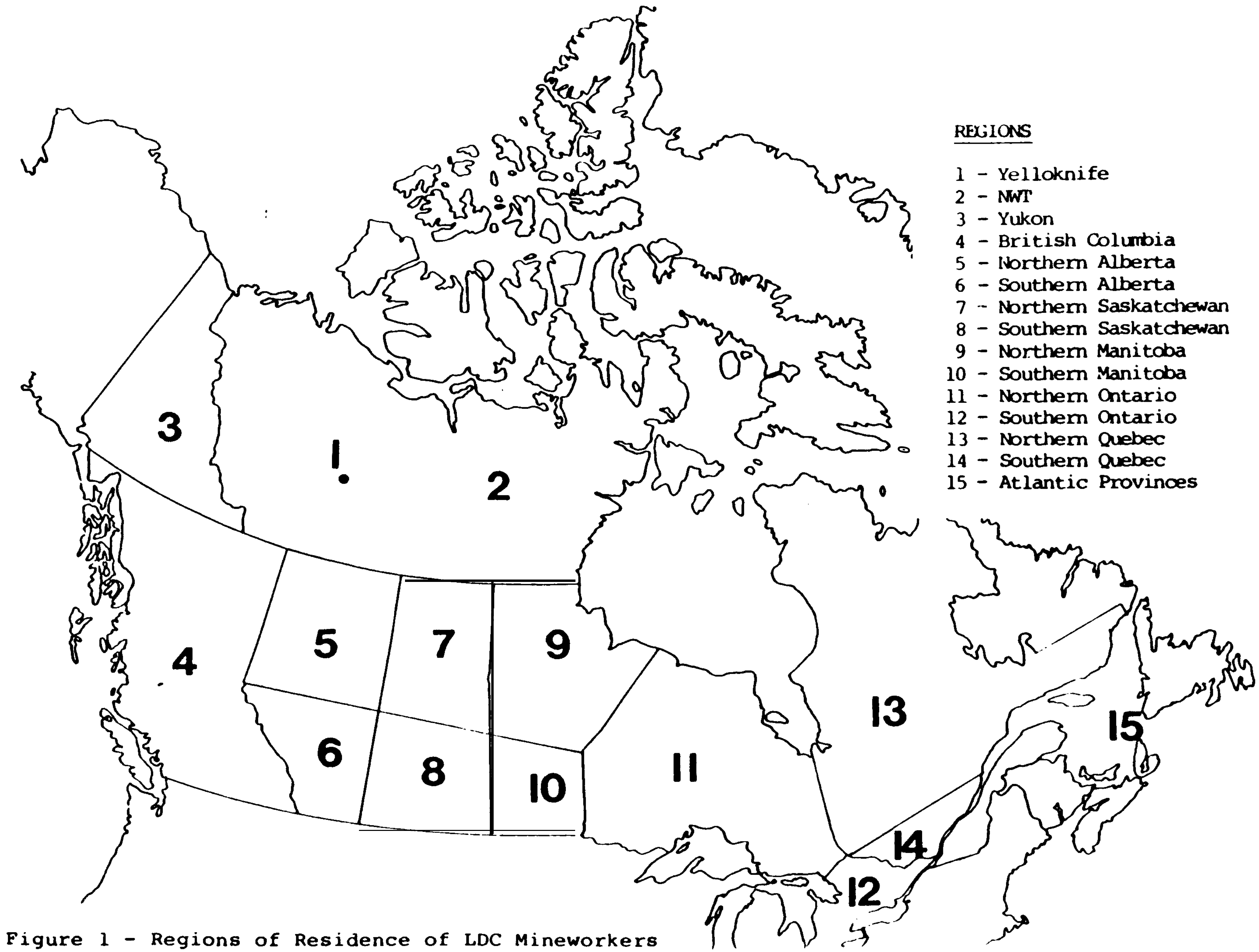

Figure 1 - Regions of Residence of LDC Mineworkers

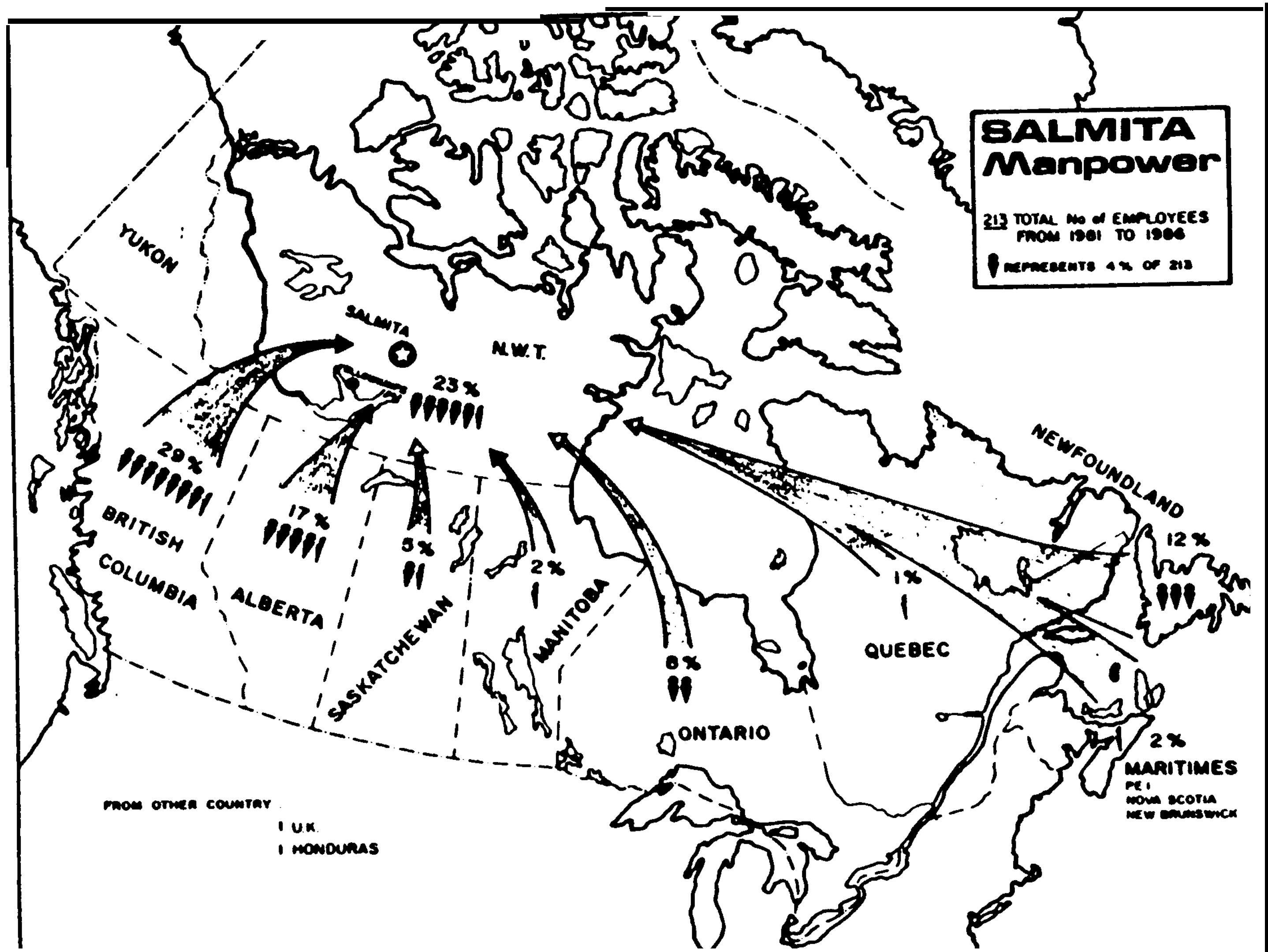

Figure 2 - Reg: ons of Residence of Salmita LDC Mineworkers

Source: Giant Yellowknife Mines Ltd.

3.3 Rotations and Shifts

Table 10 provides a summary of the rotation and shift schedules used at current LDC mines. Rotations vary considerably between mines and in several cases more than one rotation system is used at a single mine. However, the general characteristics of the rotation and shift systems can be summarized as follows:

(i) The majority of workers work a 7/7 rotation.

Fifty-seven percent of all present LDC workers work seven days on followed by seven days off. This includes all uranium workers in Saskatchewan, administration and mill workers at the Star Lake gold mine in Saskatchewan, and all production and related employees at the Detour Lake gold operation in Ontario.

The short rotation is possible where there is a relatively "local" labour force such that worker transportation costs and the time spent traveling between homes and the mine are relatively small. In each of the above cases the workforce is drawn from a relatively small number of centres within a comparatively short distance of the mine site. Detour Lake, for example, draws nearly all of its labour from nearby Timmins and Cochrane, both of which have a long mining-related history. The four Saskatchewan mines draw their labour force primarily from the Saskatoon area (62%). While workers are also flown in to the mines from a total of eighteen other centres, all of these are in Saskatchewan (see Figure 3).

(ii) The more remote mine sites with more widespread sources of labour use longer and asymmetrical rotations.

Mine workers in the NWT travel much greater distances between their homes and the mine sites than workers in Ontario and Saskatchewan. The expense, time and comparative difficulty of moving workers to and from the more remote mine sites are the major factors influencing the length of the rotation.

The longest rotations are those used at Nanisivik (91/21) and Polaris (63/21) both of which are zinc/lead operations in the eastern NWT. As noted earlier Nanisivik is a hybrid case, being part fly-in and part traditional mining community, having on-site accommodation, schooling and other services for those families which choose to live there. Polaris, on the other hand, is a true LDC operation and the 63/21 schedule reflects the lack of locally available labour and the long distances workers must travel to the mine. Figure 4 illustrates the widespread distribution of place of residence of the workforce at this mine.

In the Polaris case the Company pays transportation costs to the place of residence for all employees living in the NWT. For all other workers transportation is paid to the closest major airport to the place of residence. Workers travel via Edmonton or Montreal

Table 10 - LDC Work Rotation Patterns and **Shift Schedules**

Mine		Rotation (days on/off)	**Shift**[1] (hours)	# of Workers
1. Rabbit Lake		7/7	12	372
2. **Cluff** Lake		7/7	12	263
3. Key Lake		7/7	12	486
4. **Nanisivik**	(a)	91/21	8 x **5days**	30
	(b)	91/21	9 x 6days	166
	(c)	91/21	**12** x **5days**	22
5. Polaris	(a)	63/21	**11**	248
	(b)	63/21	**12**	24
	(c)	42/21	**11**	6
6. Lupin	(a)	14/14	**12**	439
	(b)	4/3	**12**	5
7. Detour Lake	(a)	7/7	**12**	124
	(b)	4/3-3/4	**12**	25
8. Star Lake		7/7	**12**	38
9. **Salmita**	(a)	**14/14**	**12**	**n.a.**
	(b)	**35/21**	**10**	**n.a.**

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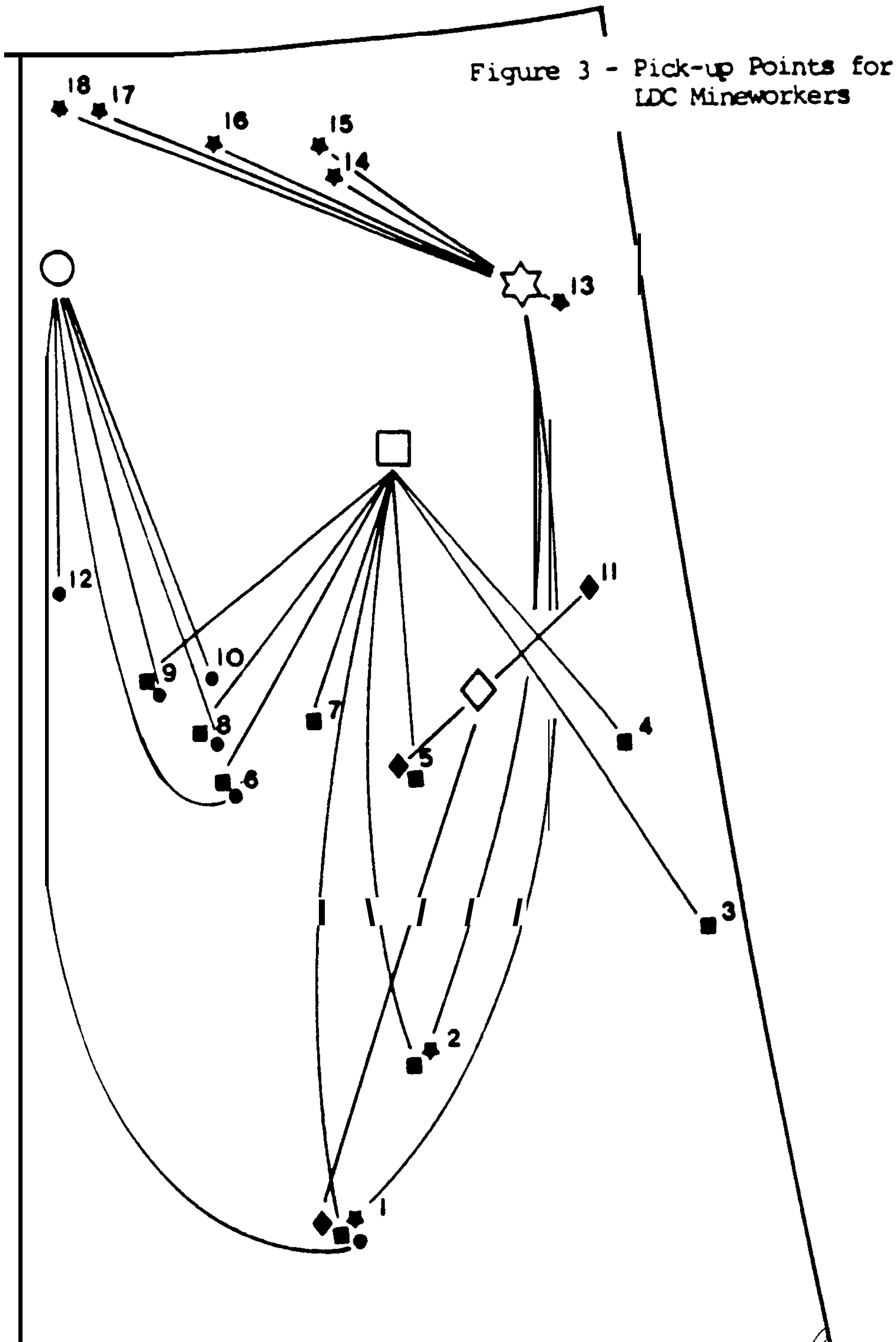
1. Includes all breaks

to Resolute by a twice-weekly commercial **airline service** and from Resolute to the mine site **by** charter aircraft. The asymmetrical rotation. the small number **of** workers **going** in or out at **any** one time, and the nation-wide **labour** shed for the mine, mean that unlike the Saskatchewan and Ontario operations there are few opportunities for transportation scale economies. In addition the small and low density population distribution in the North may mean even higher transportation costs for "local" workers from the **NWT** than for workers from the South. In short transportation costs and difficulties discourage short rotation patterns.

It should be noted, however, that native workers at Polaris have the option of working a shorter, 42/28, rotation. This is an attempt **to** provide Inuit workers with the opportunity to engage in a modern industrial economy, while at the same time leaving sufficient time for traditional hunting, fishing and family activities. However, at the time of the survey none of the **Inuit** workers at **Polaris** were working this rotation.

Figure 3 - Pick-up Points for Saskatch[ewan]
LDC Mineworkers



□● Key Lake
✡● Rabbit Lake
○● Cluff Lake
◇◆ Star Lake

1 - Saskatoon (685)
2 - Prince Albert (1″ 3)
3 - Cumberland House (12)
4 - Pelican Narrows (4)
5 - La Ronge (58)
6 - Beauval (45)
7 - Pinehouse Lake (4)
8 - Ile-à-la Crosse (14)
9 - Buffalo Narrows (15)
10 - Patuanak (5)
11 - Southend (2)
12 - La Loche (3)
13 - Wollaston Post (5)
14 - Black Lake (13)
15 - Stony Rapids (17)
16 - Fond du Lac (24)
17 - Uranium City (5)
18 - Camsell Portage (8)

Majority are Indian Reserve communities

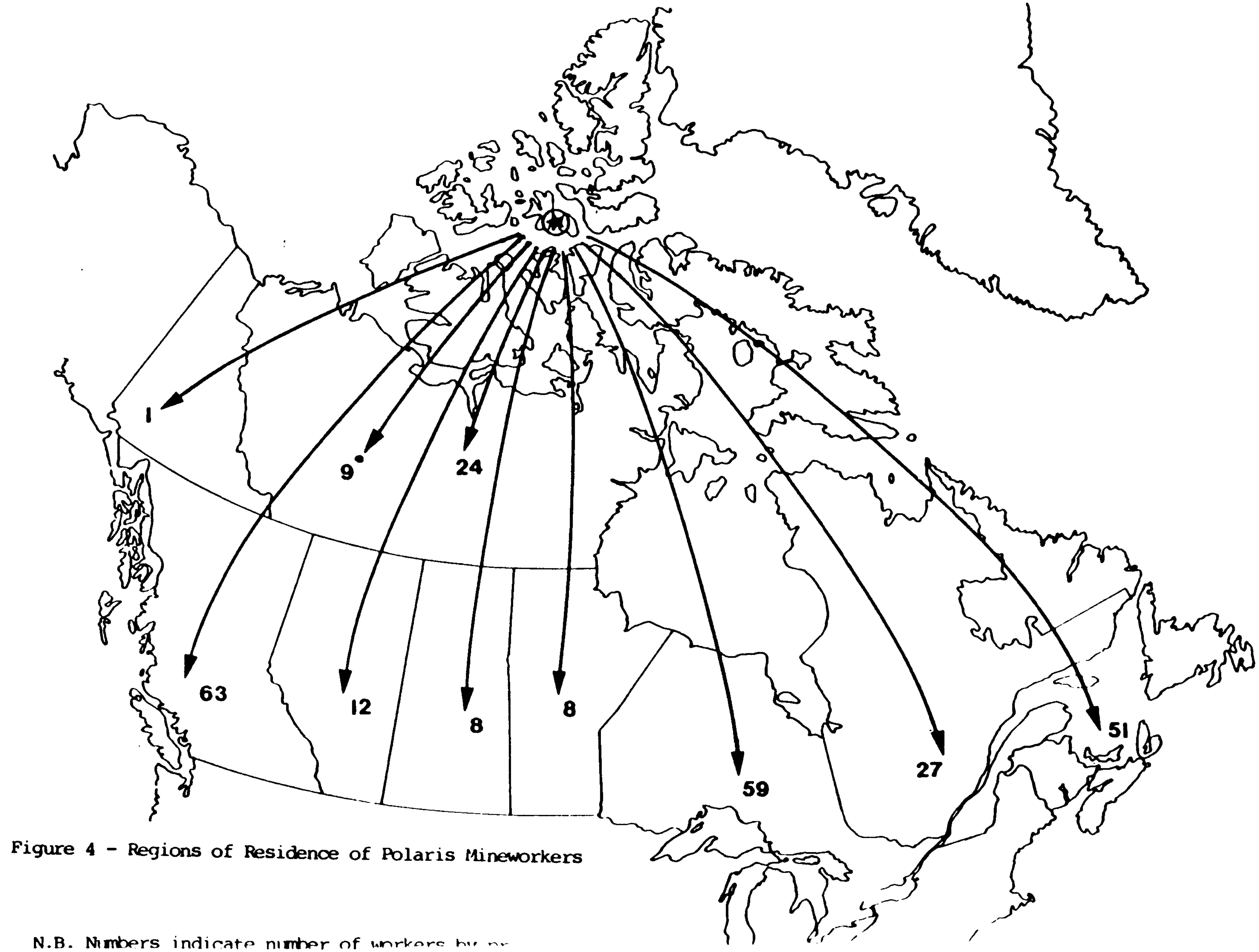


Figure 4 - Regions of Residence of Polaris Mineworkers

N.B. Numbers indicate number of workers by pr

(iii) At most LDC mines management staff work a shorter rotation.

Mine management systems vary considerably among the LDC mines, a major factor being the accessibility of the mine to the head office or the major administrative centre for the operation. At Key Lake, for example, senior management fly in to the mine from head office in Saskatoon for one day each week, but mine supervisory staff work the same 7/7 rotation as the rest of the mine workforce. At Detour Lake, Department Heads, their Assistants and administrative staff work a 4/3-3/4 rotation every two weeks. Similarly at Lupin, senior management work a 4/3 rotation while the remainder of the labour force works 14/14. Rotations for corporate staff at Polaris (i.e. salaried Cominco personnel) are 42/21 compared with the 63/21 for hourly paid employees, but at Nanisivik all employees are reported as working the 98/21 rotation.

In some cases the shorter rotations are a function of the particular job requirements. Where the work of senior or administrative personnel require both a head office and a mine site presence, shorter rotations have been adopted, but this is only possible where the mine and the head office are relatively close. In those situations where the mine is at remote siteandjointheadoffice/mine site functions are not possible, the shorter rotations for senior staff appear to be primarily a benefit of seniority, responsibility, or salaried status.

(iv) Rotation lengths have tended to become shorter overtime.

Three of the mines in the NWT, which tend to have the longest rotations, have reduced the length of the rotation from that originally adopted. At Polaris the original rotation was 70/14 but in practice has been reduced to 63/21 as the travel time often cut into vacation time by three to four days, and this left insufficient time for married workers to spend with their families.

Similarly at Salmita the rotation was cut from 42/14 to 14/14 and 35/21 because employees found that they needed more time to recuperate. At Lupin the rotation has changed from 42/14 to 28/14 to 14/14 since the mine opened in 1982. Workers at Lupin vote annually on the preferred rotation. This is the only known case where this happens.

In all cases changes in rotation patterns have resulted in a shorter work period, and in some cases a longer rest period. Recent wildcat strikes at the Hope Brook mine by construction workers have in part been prompted by the long travel times incurred by the boat-in system and management has reportedly agreed to extend the non-work time by way of compensation for the "lost" vacation time.

(v) The shift length is generally 12 hours.

Eighty percent of all LDC workers work a twelve-hour shift including all breaks. The only exceptions to this pattern are found at Nanisivik and Polaris, which have the longest rotations.

At Nanisivik, production workers, who represent the majority (76%) of the labour force, work nine-hour shifts, six days per week for 91 days. Clerical staff work eight-hour shifts five days per week, and continuous production workers (i.e. those working in the concentrator and power plant), work twelve-hour shifts five days a week. The work week for this latter group was reduced from six to five days as a 72-hour regular work week was found to be too long.

At Polaris mine crews work an eleven-hour shift and cleaning staff work nine hours a day. All workers, however, work seven days a week.

The twelve-hour work day was first introduced to the mining industry at Rabbit Lake in 1975 (Nogas,1986,23). It is now standard practice at LDC operations. The benefits are that it allows the mine to "hot-change" work crews and avoid any downtime, and requires only two crews for a 24 hour operation. From the workers' perspective the extended workday appears to present few short-term health and safety problems, providing the work and the workplace are organized appropriately, but it must be acknowledged that hard data on the subject are limited. This issue has been the subject of review by Kendall (1987) whose findings are discussed in more detail below.

4.0 Issues Arising

Notwithstanding the increase in the use of LDC there are a number of issues about which there are few available data or which need further consideration from a policy perspective. Bearing in mind that many are interrelated the main issues arising relate to labour, family life and development policy.

4.1 Labour Issues

4.1.1 Rotation Cycles

The optimum rotation cycle, or a method by which optimum cycles might be determined in different circumstances is not clear. As discussed earlier a variety of rotations are used from the 7/7 system at Rabbit Lake, the 14/14 cycle at Lupin, to the 98/21 cycle at Nanisivik.

At some mines, management, mill workers and native workers work different rotations from other workers. It has been suggested, on the basis of this, that it may be possible to provide workers with some degree of choice of rotation (W.Fotheringham, Hope Brook, pers.com. ,1987). On the other hand, where particular groups are given the option to work different rotations (for example, native workers at Polaris) , this could be a source of resentment by other workers. This may have been a factor in the decision to adopt a uniform 28/14 rotation for both natives and non-natives at Cominco's Red Dog zinc mine now being developed in Alaska. (Giergerich, 1986, 28).

The length of rotation is often thought to have implications for the safety of workers. For example, in a study of their offshore workforce, Shell, U.K. found that accident rates increased after 10 days, and as a consequence cut back their rotation from 14/14 to 7/7 (Alvarez, 1986,28). However, there is little evidence to indicate that this conclusion is applicable to Canadian LDC mines; this may be because mining companies are more willing to allow employees to "pace" themselves in response to the longer work hours.

4.1.2 Shift Length

The typical work period at LDC mines is a 12 hours on and 12 hours off schedule. The benefits of an extended work day to the company include more efficient use of facilities and equipment, as there are fewer shift changes and little or no downtime, and, in some cases, a significant saving in overtime payments. For the workers it allows a longer block of time to spend with their families and to enjoy non-work activities.

In reviewing the subject of the extended work day Kendall (1987) discusses five impact themes: fatigue; accident rates; productivity and efficiency; worker satisfaction; and, exposure limits.The review of the literature indicates that the information base about all areas is limited and that in many cases the results are conflicting.

Fatigue resulting from the extended workday and the implications for the health and safety for workers has been a matter of concern. The relationship of fatigue to the extended workday is not generally well understood. It may be more of a problem for particular groups, such as older workers, but perhaps of more importance is the nature of the job and the equipment, machines, and processes used to complete that job.

For many workers, however, the longer work day does not present major fatigue problems. Research in non-mining industries offers the explanation that long periods of time off and generally better sleep patterns onthe extended work dayprovidethe opportunity for more rest during non-work time (Stones,1986,2). However, comparison of Saskatchewan uranium (LDC) and potash mining (non-LDC) employees show the former to have more sleep-related problems. Since both industries use 12 hour shifts it has been hypothesized that this is the result of the cumulative effect of shift and rotation pattern (pers. corn. Personnel Performance Consultants, Saskatoon).

Fatigue may also be a problem for those who find it difficult to adjust to a change in sleeping patterns when changing from night to day shifts and vice versa. At Polaris, for example, most mine and mill workers change shifts every two weeks, this means at least four changes in sleep patterns over the course of a single rotation, which for many may not be an easy adjustment.

The conclusions that have been drawn about the relationships between extended shifts and fatigue are summarized by Kendall (1987,4):

(i) fatiguecanbe reduced by improvement ofenvironmental factors such as temperature, humidity and noise in the workplace, and shift starting time;

(ii) fatigue can be reduced by job design, including decreased repetitiveness and increased creativity;

(iii) jobs that are less physically demanding and contain more natural restperiods are better suitedto 12-hour shifts;

(iv) while repetitive jobs are not well suited to the extended work day, neither are those which are mentally or emotionally demanding: and

(v) older workers have relatively greater difficulties adjusting their sleep patterns to accommodate 12-hour shifts.

It is popularly assumed that there is an increased riskof accidents due to fatigue from the extended workday, but the available studies do not show an increase in accident rates (Northrup et al. ,1979; Wynn,1979). Whether these results are slanted by the fear of increased accident rates is unknown. What is suggested is that:

> accidents occur as part ofaprocess involving a combination of personal, technical, behavioral, environmental and work process factors. It is important to consider not only the worker's role, but also how the work environment and work itself affects health and safety. The length of the work day is only one factor in this process (Stones, 1986,4) .

In this context it should be noted that LDC mines are relatively modern and have been designed to take advantage of modern equipment and technology, including changes which allow a greater regard for safety issues.

The number of other intervening variables and the differences in mine characteristics make it difficult to isolate the factors that contribute to accidents. Open pit mines present a different set of risks from underground mines, and the nature of the ore body may significantly affect mining risks. Age and type of equipment will vary among mines, worker and management attitudes may vary, and reporting practices may differ.

For example, workers at Polaris are at least eight hours from the nearest doctor and hospital, and this may well affect their attitude towards safety in the workplace. Furthermore, reported lost time accidents may well be lower because of the relative difficulty in going on Workmen's Compensation and the fact that any small loss of time results either in a period of recovery at the workcamp (where boredom can be an important factor), or extended time away from the mine site and significant loss of income earning opportunity. Whatever the relevant factors, in September 1987, Polaris showed the lowest year-to-date lost time frequency[1] for all of Cominco's North American Operations.

In general, while the evidence does not seem to support a link between extended work hours and accidents, the matter remains controversial due to the complex nature of accident causation (Kendall, 1987,6) .

The effects on productivity and efficiency also appear to be mixed. The 12-hour shift means fewer shift changes, resulting in efficiency gains, though there is evidence that performance can deteriorate in the last hours of the shift, especially where high levels of concentration are required. Absenteeism and turnover are reported to be reduced under the 12-hour system, and there is an apparent improvement in the way that employees discharge their duties.

Difficulties arise, however, in communication, particularly between workers and managers whose hours may overlap less frequently; where extended shifts and rotations mean long breaks between work periods workers may be unaware of what has been happening at the mine or mill in their time away and it may take some time to "get up to speed".

It has been the view of some unions that working long shifts is a retrogressive step in terms of securing improved working conditions for their members (IRPP,1986,44). However, in the remote environment of an LDC mine the potential disadvantages of the long work day must be set against the disadvantages of long periods of leisure time in a place which offers few opportunities to use that time constructively.

In general' 12-hour shifts have found favour among mine workers at LDC mines especially where there is the opportunity to earn overtime. In addition the extended period at home is often regarded as "quality time" spent with family or friends, or uninterrupted time for projects, vacations and even other work.

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1. Frequency = Lost time injuries per 200,000 man-hrs. worked.

The length of the workday presents a number of other concerns particularly regarding the health of workers. Exposure limits on such things as noise, dust or other airborne contaminants are usually based on an eight-hour day. The question has been raised as to whether these limits need to be revised to account for the longer periods of exposure implicit in the extended workday (Kendall, 1987,9-10) .

In Canada most provinces base their exposure limit standards on a weekly (40 hours) rather thana daily basis. Consequently, regardless of shift length, the adequacy of current standards is called into question only where in excess of 40 hours is worked in a week. Another area needing further research has to do with the possible cumulative effects of working long rotations in combination with extended workdays over several years.

The extended workday has become a common feature in the Canadian mining industry. Kendall (1987,18) estimates that there are some 70 mining operations across Canada where at least part of the work force is on shifts ranging from 10 to 12 hours. As Table 10 indicates, 80% of all employees at all of the current LDC operations work 12-hour shifts.

4.1.3 Labour-Management Relations and Unionism

As noted above, there is evidence that LDC reduces labour turnover and absenteeism. Absenteeism is a particular problem if a worker misses the flight into the project site and this may mean that there is a need to overstaff to cover for unplanned absences. Once the workers are on site, however, there are likely to be few absentees.

Rose et al. (1984) suggest that Australian mines using LDC are less subject to industrial disputation than other companies in the same sector. However, the number of Australian mines using LDC is very small and in any event it is not at all clear that this finding is the result of the use of LDC specifically. As noted earlier, in Canada there are proportionately fewer organized LDC mines compared with non-LDC operations.

organizing labour in circumstances where one half of the workforce may rarely meet the other half is extremely difficult, and is exacerbated because even those workers at the mine site at any one time are likely to be on twelve-hour shifts, severely limiting the opportunities for contact. Furthermore there are not the opportunities for establishing consensus and informal exchange that are possible in a mining town setting, and it is nearly impossible to establish the solidarity among workers' families that has been so influential in many labour disputes.

In the event of industrial action at LDC mines even normal practices, such as setting up a picket line, become very difficult to implement. The entire mine site, including the work camp and the air strip, will be company property, with employees often flying in from a number of public airports. Where to set up the picket line and how to get workers to that location may pose insurmountable logistical and economic difficulties for a union.

There are few data on the merits of LDC from the union perspective. Data from Australia suggest that of the five major unions involved in mining the consensus of opinion was that daily commuting followed by a company town option were the preferred alternatives. LDC was the least preferred arrangement. However, the union most directly affected, the one representing workers involved with offshore exploration, indicated that this was the most preferred option, suggesting that familiarity may bring with it a greater degree of acceptance of this arrangement (Newton, 1986,75), or that workers and their families may 'self-select' into work patterns that they find satisfactory. In an analysis of the preferences of workers and their spouses at KeyLake uranium mine, slightly less than 50% expressed an unequivocal preference for the LDC system, but 22% of workers and 25% of spouses still expressed an outright preference to live in a mining town. (Storey and Shrimpton, forthcoming) .

4.1.4 Personnel Policies

Personnel policies and management styles vary from mine to mine. the following represent a range of policies that have been adopted formally or informally at one or more of the mines surveyed, and which represent attempts to improve the workplace and the well-being of the work force.

* open door policy of mine management
* discouragement of any reference to cultural differences
* delegation of responsibility where possible
* avoidanceof regimentation, encouragement of interaction between workers and management, inviting and recognizing employee participation indecision making
* keeping employees informed of company planning
* consistent application of company policies
* flexibility with respect to leave rotations especially in cases of sickness, family problems, etc.
* avoidance of "blue-collar/white collar" divisions by making all workers salaried employees

* positive attitude toward native hiring policies, special training provisions, and recognition of particular cultural values
* positive attitude toward employment of women including hiring of spouses
* special arrangements at Christmas, by minimizing the number of workers on site and/or bringing families on to the site for Christmas
* provision ofgoodquality food, recreation facilities, establishment of workable policies regarding the use of alcohol
* subsidiesor other assistance with telephone communications
* single room accommodation, double rooms for couples
* employee assistance programs for those needing help

These are isolated examples drawn from a number of different LDC mines; there is considerable variability in personnel policies among the companies in question. While different approaches will depend on the particular context and corporate and management styles, there appears to be a need to consolidate information on those policies which are effective.

Another issue is that of whether it is possible to identify those types of individuals who are likely to be most suited to the LDC regime. In the British North Sea individuals with a military background appear best able to cope with the loneliness, monotony and semi-authoritarian regime which characterises work in the offshore oil industry (Alvarez, 1986, 28) . However, attempts in Australia to identify profiles of workers who appear to be best suited to the work and lifestyle in remote communities have so far been unsuccessful (Syme et al. ,1986), and it has been suggested that a better approach may be to provide potential workers with better orientation information so that they can self-select, and to modify some aspects of the industry to meet the needs of workers and their families (Storey et al.,1986). At present the only orientation programs for new workers appear to relate to job tasks or safety issues; there are no attempts to explain the implications of, or potential coping strategies to deal with rotational' work patterns.

4.1.5 Relative Costs

The available data suggest that LDC operations are generally cheaper than their mining town counterparts (Rose et al.,1984; IRPP,1986,46). It also appears easier to attract and retain skilled personnel (Nogas,1986,24) and the absence of outside "distractions" may increase worker and managerial efficiency.

Some writers have suggested that the work-regime may lead to burn-out (Glass and Lazarovich, 1968,84). While there is some indication that this may be true for workers on the longer rotations, there are insufficient data to adequately support this view.

The use of LDC also appears to offer increased flexibility to companies in that it helps to keep debt ratios down by avoiding the large capital "front-end" expenditures required in the construction of a new town, and it represents an incremental style of policy making that avoids the big and expensive once-and-for-all decisions typical of new town construction. In addition the company can proceed independent of any government provision of public infrastructure (Newton,1986,78), although this may still be sought.

However, while there are indications of cost savings there is little documentation. The cost of accommodation at the Polaris mine in 1981 dollars was $12m. while the equivalent townsite was estimated at between $20-30m. exclusive of public infrastructure (IRPP,1986,46) . The transportation costs of fly-in, however, are not available.

4.1.6 Limitations to LDC USe

Anumber of limitationsto the use of LDChave been suggested. Various authors have argued that there is an upper limit to the size of the workforce beyond which LDC is not economic. One Canadian author has suggested that a workforce of 500 represents the upper limit (DePape,1984,88). Against this 1200 workers were flown in to the NWT to the Norman Wells pipeline project and between 3-4000 oil-related workers from Anchorage to Prudhoe Bay, Alaska (IRPP,1986,45) .

It would seem that there is no upper limit <u>per se</u>, but that for any operation townsite and transportation expenses are part of the overall cost equation, with varying impacts on both the capital and operating components. At the Coal Valley Mine in Alberta, for example, workers were flown in by helicopter from the community of Edson, some 20 minutes away. The annual cost of operating two helicopters was in excess of seven million dollars per annum. With an annual production capability of three million tons a year the fly-in costs were affordable. At 50% of capacity they were not, and in 1983 when the mine's production declined, the fly-in system was suspended and a daily bus-in system substituted.

A second possible limitation that has been suggested is the length of the commute. The evidence is incomplete. Workers in the oil industry frequently commute on an international basis, and in Australia workers at the Argyle mine in the Northern Territory commute from perth 2000km. to the south-west (Newton,1986,78). At Polaris a few workers commute from as far away as South America and the United Kingdom. In these cases, however, the Company only pays their transportation costs within Canada.

Other issues that have been suggested as constraints to LDC include the life expectancy of the operation, i.e. the longer the projected lifespan the less viable is LDC (Glass and Lazarovich, 1984,73), and the type of operation in question, i.e. LDC is only effective when you are dealing with high value resources (Newton, 1986,80). Neither of these questions has yet been systematically addressed, but where economically viable, even long-term, relatively low value resources are likely to be developed using an LDC system, with Polaris being a case in point.

4.2 Family Life Issues

Questions often arise as to the potential effects on LDC workers' families. Clearly there are both advantages and disadvantages: however, the negative aspects of the work pattern are ignored by Jackson (1987,164) who maintains that the experience at Kidston in north-eastern Australia shows that LDC has 'radically improved" the family's satisfaction with the wage earner's job. Research in the North Sea and Newfoundland oil industries indicates that times of parting and reunion are in fact extremely stressful for many families. Therearealso potential problems with role definitions and transitions within the family, with parenting, and with maintaining ongoing relationships with friends and other community members. There may also be conflicts between spouses over the use of the non-work time and over money (Clark et al. ,1985a,b,c; Storey et al. ,1986: Lewis et al. 1988).

Douglas (1984,17) asserts that Canadian LDC operations attract a special kind of workforce, married couples without children or singles, and that workers with a family find too many problems associated with absences from home. However, the evidence provided above on 'the demography of the LDC mine workforce appears to refute this view.

On the positive side LDC does allow one member of the family to continue working in the industry in question while the other family metiers enjoy the educational, social and recreational facilities of their home community.-Furthermore LDC allows workers to spend an extended period with their families, which many

no hinky ???

workers regard as ‘quality time”. Finally while partings and reunions may be stressful, for some it can add something to the relationship in the form of “periodic honeymoons" (Storey et al. ,1986) .

For some the lifestyle is unacceptable and the result may be either that the worker leaves the industry or that the relationship fails. For others the work regime may be the glue that holds the relationship together. In general, however, the results suggest that most families involved with LDC in the oil industry at least accept the work cycle and are able to cope with it, though not without incurring what may often be quite considerable personal and family costs. It also appears that many of the stressful aspects of the work pattern can be addressed by relatively minor and inexpensive alterations to personnel policies and practices.

For example, communications are a very important component in maintaining family relationships. Some companies have recognized this by offering free or subsidized telephone communications from the minesite. Some companies allow families to spend Christmas at the minesite, and others encourage occasional family visits so that family members can see where a parent or spouse works and what they do. One company takes this a step further by allocating several temporary, short-term, paid positions on its cleaning staff to wives and girlfriends of mineworkers.

4.3 LDC and Development Policy

Little research has been carried out on the impact or the role that LDC has had or might play in development policy. For example, there are potential negative implications such as “fly-over" effects, where workers and communities close to the project site fail to gain any benefits from the project because the operation is entirely serviced from a larger, more distant centre (DePape,1984,90; Robinson,1985,44) .

In a broader context it has been suggested that exploitation of natural resources in this way, in the shortest time, with the fewest people, amounts to a plundering of the land (Armstrong, 1976,280) or at the very least an abrogation of responsibility to establish permanent occupation of national territory. Against this are the benefits that northern residents enjoy either directly (wages) or indirectly (tax revenues) from LDC mines, and the fact that where-developments are strictly controlled short-term phenomena, the net effect may be one of minimal environmental damage or disruptions to sensitive environments. Both views, however, raise the general question of what or who northern development is for- an issue about which there appears to be little consensus.

A second issue is that where the company pays, no transportation costs accrue to the individual worker, and that person may either chose to move from a small community to a larger one with a greater range of services (as discussed above), or make the reverse move so as to reduce housing costs and live in a smaller community felt to be less stressful and more suitable for raising a family.[1] If this migration is selective, i.e. predominantly the young and the highly motivated, then this may promote demographic imbalances, especially in the case of the drift to larger centres from the north. However, whether LDC would encourage a depopulation of the north or other rural areas over time is a matter for conjecture.

On the other hand LDC permits individuals to live in the communities of their choice and, as has been noted, their local taxes and expenditures may contribute significantly to the continued viability of that community. Similarly if the mine closes and jobs are lost the community impacts will be reduced by being spread over many centres.

5.0 Prospects for LDC and Fly-In Mining

Remote mineral resources can be developed either by constructing a new town or by operating an LDC facility. Two sets of factors have encouraged the growth in the use of LDC and fly-in operations in particular:

(a) changes in absolute and relative cost factors, including:

* improved quality and absolute decline in air travel costs (measured in constant dollars)
* improved quality and relative decline in communications costs
* increase in requirements and costs of developing resource towns
* cost and availability of capital for resource town construction
* increased capital and operating costs of resource towns because of increased demands from residents
* increased costs associated with resource town closure
* increase in the price of gold and greater profitability of developing smaller, more remote, short life-span resources
* increased labour costs associated with high absenteeism and turnover rates

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1. Even where the company pays only the transportation costs from specific centres, workers may still find it cheaper or otherwise preferable to live at the place of their choice and pay the additional transportation costs themselves.

(b) changes in attitudes towards work and well-being, including:

* increased demand for services and facilities (especially education facilities) which cannot be provide in small single industry resource communities
* increased demand for a greater range of employment opportunities as two-income households become the norm
* overall worker and family preference for LDCminingamong thosewhohave experienced both LDC and mine communities
* lower vulnerability of LDC workers and families to boom-bust cycles and mine closures
* opportunities for some LDC workers to be involved in other occupations and leisure activities in their free time

These factors and others, including a regulatory environment which tends to encourage commuting rather than new town development, have contributed to the growth in the use of LDC and a decline in the traditional approach to mineral development which was through the construction of mining communities. Indications are that these factors will increase in importance in the foreseeable future, and thus LDC is likely to increase in importance.

While the future of metals markets is a matter for conjecture, there appear to be particular sectors in which the use of LDC is more likely than others. Six metals (iron ore, copper, zinc, gold, nickel and uranium), accounted for over 85% per cent of the value of Canadian metal mineral production in 1985 (Canada, 1987a, 70.6). Among this group only gold is expected to show significant continued growth in the near future, assuming prices remain high and new capital continues to be made available for new exploration through flow-through shares or similar mechanisms.

Given the present potential high rate of return from gold there is strong possibility that additional LDC mines will be developed in the short term where locational conditions require it. Between 1988 and 1990 most of the new mines that will likely come into production are in Ontario, Quebec and British Columbia (Anon, 1987,48). Many of the new eastern mines are likely to be in the region between Timmins and Val D'Or and thus only a few may need to be developed as LDC operations. In British Columbia and the NWT, however, several of the mines likely to come into production in the near future are in remote locations and will probably be developed using LDC.

Of the other major minerals, uranium perhaps shows the best prospects for future growth over the next decade, but then only if access to the U.S. market continues, together with a growth in nuclear power capacity in Canada. Significant quantities of high value reserves exist at Cigar Lake in north-eastern Saskatchewan, and if a variety of hydrological, geotechnical, and radiological problems can be overcome, and demand for product warrants new development, it is likely that in the 1990's Cigar Lake will become Saskatchewan's fourth uranium fly-in operation.

The zinc industry currently suffers from overcapacity and depressed prices but prospects appear reasonably good over the medium term. Nanisivik has only a short life expectancy remaining, but there are, for example, other prospects near Polaris in the Cornwallis Lead-Zinc District which might eventually result in an expansion of fly-in activities in the area, or extension of operations at Polaris itself beyond the 15-19 years currently projected. However, the opening of Red Dog, Cominco's fly-in zinc operation in Alaska, may have an impact on decisions to bring new Canadian reserves into production.

Iron ore, nickel and copper have all been suffering from over-capacity and slow growth in demand, and while there are signs that nickel and copper may be on the way up, only minimal expansion is forecast in the short term. Given somewhat limited demand prospects and relatively low prices, there is presently little likelihood of any short-term development of LDC mines in the nickel and copper sectors and none in the iron ore sector.

Mineral development prospects for other metals vary considerably. Platinum, for example, has been increasing in demand as an industrial mineral, but Canadian production is mainly as a by-product of nickel output, and unless new resources are discovered there appear to be few prospects for new LDC mines in the short or medium terms.

Similarly the growing variety of uses of rare earths has increased demand, but it is unknown whether any increased output would come from developments at existing sites, such as Elliot Lake in association with uranium production, or new sites requiring a fly-in development, such as the Strange Lake deposits 250km north east of Schefferville, Quebec. Highwood Resources -?

In summary therefore, it would appear that many of the new employment opportunities in metal mining over the next decade might well involve commuting to remote mines, particularly if gold continues to present the most attractive metals investment opportunity. Not all developable resources will require fly-in operations and a greater use of LDC using bus and boat transportation, as in the Star Lake and Hope Brook cases, is likely which will increase the economic feasibility of some developments.

One unknown that could significantly affect the future of the Canadian mining industry in general, and the prospects of several of the mineral sectors discussed above in particular, is the outcome of the current free trade negotiations between Canada and the United States (see the discussion by Steger et al., 1987). The Canadian mineral industry currently exports two-thirds of its total output to the United States and thus security of market access is a primary objective. U.S. protectionism is on the increase, fueled by the current U.S. trade deficit, and increasing numbers of trade actions have been brought against Canadian suppliers. In recent years an anti-dumping case has been launched against eight Canadian potash companies: action has been taken concerning increased Canadian copper exports; and the uranium industry has been fighting the latest of a number of attempts to limit sales to the U.S.

It was argued by the Macdonald Royal Commission on the Economic Union and Development Prospects for Canada, that an agreement is the only real alternative to the threat of escalating U.S. unilateral trade actions and restrictions against Canadian products. The price of such an agreement is likely to be the limitation of the use of government programs that currently directly or indirectly subsidize the mineral resource sector. However, what such an agreement will eventually look like, and what the eventual impacts on the minerals sector will be, is presently unknown.

6.0 Conclusion

LDC has been described as a "trendy" or "quick fix" solution for northern development (IRPP,1986,99). While there are a number of important unresolved questions about mining in the North concerning who benefits and who pays the costs, there is little doubt that from an economic and social perspective there is every indication that LDC will be used more in the future, both in the North and at other remote locations.

This is not to suggest that all of the socio-economic implications of the use of LDC are positive. Questions on such issues as fly-over effects, local training and recruitment, and worker and family effects need serious attention. If, as suggested, the use of LDC will increase over time more thought needs to be given to the policy implications of this approach to mineral development, both at the government and industry levels, if the potential benefits are to be maximized and the negative effects minimized.

This report has provided an overview of LDC in the Canadian metals mining industry and identified a number of important outcomes and issues many of which still need to be systematically addressed. Further analysis of the economics of the LDC option for mineral development is necessary, and the development of a better understanding of its implications for family life and labour-management relations are important areas for future research.

References

Alvarez, A. (1986). Offshore. Houghton Mifflin Company, Boston.

Anon. (1987) "Tomorrow's Gold Mines". Northern Miner Magazine September, supplement, p.48.

Armstrong, T. (1976). "The 'Shift Method' in the Arctic". Polar Record Vol.18, No.14, pp.279-281.

Berg, L. (1986). "From Towns to Wings to Wheels at Stereo". In Towns, Wheels or Wings for Resource Development? Selected Conference Papers from the February 3-4, 1986 Conference, Vancouver, B.C. organised by The Institute for Research on Public Policy (IRPP), Victoria, B.C. pp.30-32.

Beveridge, J. (1979). "The Rabbit Lake Commuting Operation: A Case for Mutual Adaptation?" Proceedings; Conference On Commuting and Northern Development, University of Saskatchewan Institute for Northern Studies, Saskatoon, February 15, 16.

Bugden, M. (1984). "Tumbler Ridge: Planning the Physical and Social Development of a New Community". Habitat, Vol.26, 8-12.

Canada, Department of Energy, Mines and Resources (1987). "Current and Past Producers in Canada, 07/15/87". Unpublished data, National Mineral Inventory.

Canada, Department of Energy, Mines and Resources (1987a). Canadian Minerals Yearbook 1986 Mineral Report 35, Ottawa.

Clark, D., et al. (1985a). "Oil Wives and Intermittent Husbands". British Journal of Psychiatry, 147, 479-483.

Clark, D., et al., (1985b). "The Psycho-Social Consequences of Intermittent Husband Absence: An Epidemiological Study". Social Science and Medicine.

Clark, D., et al., (1985c). "Work and Marriage in the Offshore Oil Industry". International Journal of Social Economics. Vol.12, No.2, 36-47.

DePape, D. (1984). "Alternatives to Single Project Mining Communities: A Critical Assessment". In Mining Communities: Hard Lessons for the Future, Proceedings No.14, Centre for Resource Studies, Queen's University, Kingston, Ontario.

Douglas, R.P. (1984). "The Industry Perspective". In Mining Communities: Hard Lessons for the Future, Proceedings No.14, Centre for Resource Studies, Queen's University, Kingston, Ontario.

Giegerich, Ii. (1986). "Polaris and Red Dog". In Towns, Wheels or Wings for Resource Development? Selected Conference Papers from the February 3-4, 1986 Conference, Vancouver, B.C. organized by The Institute for Research on public Policy (IRPP), Victoria, B.C. pp.25-29.

Glass, R.D. and J.Lazarovich (1984). 'The Government Perspective'. In Mining Communities: Hard Lessons for the Future, Proceedings No.14, Centre for Resource Studies, Queen's University, Kingston, Ontario.

Hobart, C.W. (1979). "Commuting Work in the Canadian North: Some Effects on Native People". Proceedings; Conference on Commuting and Northern Development. University of Saskatchewan, Institute of Northern Studies, Sakatoon, February 15,16.

IRPP (1986). Towns, Wheels or Wings for Resource Development? Selected Conference Papers from the February 3-4, 1986 Conference, Vancouver, B.C. organised by The Institute for Research on Public Policy (IRPP), Victoria, B.C.

Jackson, R.T. (1987). "Commuter Mining and the Kidston Gold Mine: Goodbye to Mining Towns?". Geography Vol.72 Part 2, No.315, pp.162-165.

Kendall, G. (1987). "The Extended Work Day in Canadian Mining". Mineral Policy and Planning Division, Energy, Mines and Resources Canada, Ottawa.

Keyes, R.J. (1986). "Policy Responses and Alternatives for Addressing Mining Community Issues: The Recent Canadian Experience". Proceedings, CSIRO/AUIS Conference on Remote Settlements, Alice Springs, N.T. February 17-19, 1986.

Lewis, J., M.Shrimpton and M.Porter (1988). Women and Oil. Macmillan, London.

McGrath, S. (1986). "Tumbler Ridge: An Assessment of the Local Government Method of Resource Community Development". Impact Assessment Bulletin, Vol.4, No.1-2, 211-236.

Newton, P.W. (1986). "Settlement Options for Resource Development in Australia". In Towns, Wheels or Wings for Resource Development? Selected Conference Papers from the February 3-4, 1986 Conference, Vancouver, B.C. organised by The Institute for Research on Public Policy (IRPP), Victoria, B.C. pp.54-87.

Nogas, F.R. (1976). "Fly-In program at Rabbit Lake". CIM Bulletin 69 (774), October, 125-128.

Nogas, F.R. (1986). "Towns Versus Commuting at the Rabbit Lake Uranium Mine". In Towns, Wheels or Wings for Resource Development? Selected Conference Papers from the February 3-4, 1986 Conference, Vancouver, B.C. organised by The Institute for Researchon Public Policy (IRPP), Victoria, B.C. pp.20-24.

Northrup, H.R., J.T.Wilson and K.M.Rose (1979). "The Twelve Hour Shift in the Petroleum and Chemical Industries of the United States and Canada: A Study of Current Experience". Industrial and Labour Relations Review, Vol.32, No.3, pp.312-326.

Robinson, I.M. (1984). "New Resource Towns on Canada's Frontier: Selected Contempoary Issues". In D. D.DetomasiandJ.W. Gartrell, Resource Communities:A Decade of Disruption, Westview Press, Inc., Boulder, Colorado, pp.1-21.

Robinson, I.M. (1985). "New Towns vs. Wheels or Wings in Resource Settlement planning: The Australian Experience". Paper presentedat The International Association for Impact Assessment, Special North American Conference on Impact Assessment and Resource Development, Calgary, Alberta, September 19-20.

Rose, D. et al. (1984). "Argyle project - The Case for Commuting" Proceedings, of the Australasian Institute of Mining and Metallurgy Conference, Darwin, August,1-8.

Shrimpton, M. and K.Storey (1987). "The Family Life Impacts of Long Distance Commuting Employment in the Canadian Offshore oil and Mining Industries". paPer Presented at the Family Services Canada Conference on Famines and the Economy, Vancouver, B.C., October 29-30.

Shrimpton, M. and K.Storey (1988). "Fly-In: The Benefits and Costs of a New Approach to Developing Mineral Resources". Policy Options, Vol. 9, No. 1, pp. 42-44.

Slipchenko, W. (1979). "The Use of Shift Work Camps: A Relatively New Concept in the Soviet North". proceedings; Conference On Commuting and Northern Development, University of Saskatchewan Institute for Northern Studies, Saskatoon, February 15, 16.

Steger, D.P., et al. (1987). "Free Trade and the Mining Industry". CRS Perspectives. No. 27, June. Centre for Resource Studies, Kingston, Ontario.

Stones, I. (1986). "The Extended Work Day: Health and Safety Issues". Document No. 6161Q, Canadian Centre for Occupational Health and Safety, Hamilton, Ontario.

Storey, K. et al. (1986). Family Life Adaptations to Offshore Oil and Gas Employment. Environmental Studies Revolving Funds Report No. 040, Ottawa.

Storey, K. and M. Shrimpton (1986). "A Review of the Nature and Significance of the Use of Long Distance Commuting by Canadian Resource Industries". Report prepared for Health and Welfare Canada for the Review of Demography and the Implications for Economic and Social Policy. St.John's.

Storey, K. and M.Shrimpton (1987). "The Spatial Impacts of Long Distance Commuting to Employment: An Overview". Paper presented to the Annual Meeting of the Canadian Association of Geographers, Hamilton, Ontario, May 25-31.

Storey, K. and M.Shrimpton (forthcoming). Impacts on Labour of Lena Distance Commuting. Institute for Social and Economic Research, Memorial University, St. John's.

Syme, G.J. et al. (1986). "Environmental Disposition and Length of Stay in Remote Communities". Proceedings, CSIRO/AUIS Conference on Remote Settlements, Alice Springs, N.T. February 17-19, 1986.

Wynn, S. (1979). "The Impact of the Twelve Hour Shift on Petrochemical process Operators". Alberta Workers' Health, Safety, and Compensation, occupational Health and Safety Division (cited by Stones).

APPENDIX

QUESTIONNAIRE: THE USE OF "FLY-IN" EMPLOYMENT BY THE CANADIAN MINING INDUSTRY

THE USE OF 'FLY-IN' EMPLOYMENT BY THE CANADIAN MINING INDUSTRY

1. Name of Mine: ______________________

2. On what date did official production start at this mine?

_ 19 _
month year

3. What is the currently estimated life of this operation?

___ 1-3 yrs.
4-6 yrs.
___ 7-9 yrs.
___ 10-14 yrs.
___ 15-19 yrs.
___ 20 yrs.+

4. Has this mine always used 'fly-in' or rotational labour?

Yes
' No

If 'No', please indicate over what time period it has been used:

From _ 19 to ___19 .
month year month year

5. On June 1st, 1987, how many people were ● mployed by this establishment in each of the following categories? (N.B. these categories correspond to those used in the EMR/Statistics Canada Annual Census of Mines.)

	Males	Females
Employees at this location		
1. Administrative, sales etc. employees	____	____
2. Production and related employees in mining operations		
(a) Mine, quarry, etc.	____	____
(b) Mill, plant, etc.	____	____
3. Employees in new construction	____	____
4. Other production and related workers (e.g. catering, cleaning, etc.)	____	____
Employees ● t other locations		
1. Administrative, sales, ● tc, employees	____	____
2. Other	____	____

6. Have you, over time, relocated any administrative, processing or other functions onto, or away from, the mine?

___Yes ___No

If 'Yes', please indicate what changes have been made, and why.

____

____

____

____

____

____

7. The rotation and shift pattern employees work varies between, and often within, different mines. Some 'fly-in' mine workers have a rotation of 7 days on-site, followed by 7 days off. For others the rotation is 14 days on, 14 days off, or 10 weeks on, 2 weeks off. Similarly, some employees work 8 hour shifts, while others do 12 hour shifts. Please indicate the different work patterns (i.e. combinations of rotation and shift as shown in the example provided) used at this mine, and how many workers normally work each.

PATTERN	Rotation (length of time at site/at home)	Shift Length	Number of workers on this pattern
Example:	14 days/14 days	11 hour shifts	57 workers
Pattern 1	/		
Pattern 2	/		
Pattern 3	/		
Pattern 4	/		

(continue below if necessary)

8. When the employees at a 'fly-in' mine work different patterns it is usually because of differences in the work they do (e.g. mining vs. milling vs. administration), or their life styles (e.g. native vs. non-native workers). For each of the patterns you identified in Question 7, please describe the type(s) of workers involved.

Pattern (from Q.7)	Type(s) of employee who work this pattern
Pattern 1	
Pattern 2	
Pattern 3	
Pattern 4	

(continue on reverse if necessary)

9. Have you, over time, changed the rotation and/or shift pattern used by some or all of the workers?

____Yes ____No

If 'Yes', please indicate what changes have been made and why.

10. From which pick-up points do you collect your workers, how many fly-in from each, and by whom is transportation provided?

Community	Province/Territory	Number of Workers	Transportation (scheduled, charter, or company service)

11. Approximately how many of your ' fly-in' ● mployees live in ● ach of the following regions (see attached map) ?

Region	Number of Employees Living in Region
1. N.W.T. - Yellowknife	
2* N.W.T. - other	
3. Yukon	
4. British Columbia	
5. Alberta - Northern	
6. Alberta - Southern	
7. Saskatchewan - Northern	
8. Saskatchewan - Southern	
9. Maui toba - Northern	
10. Manitoba - Southern	
11. Ontario - Northern	
12. Ontario- Southern	
13. Quebec - Northern	
14. Quebec - Southern	
15. Atlantic Provinces	

12. Over time, have there been any significant changes in the distribution of the places where your 'fly in' workers live (e.g. more or less northerners, or more or less living in major cities)?

____Yea ____No

If 'Yes', please indicate the nature of the change, and why you think it has occurred. (Is it related to recruitment patterns? Have existing workers changed their home communities?)

___

___

___

___

___

13. How many of your 'fly-in' workers are natives? ____ persons

14. How many of your 'fly-in' workers are women? ____ persons

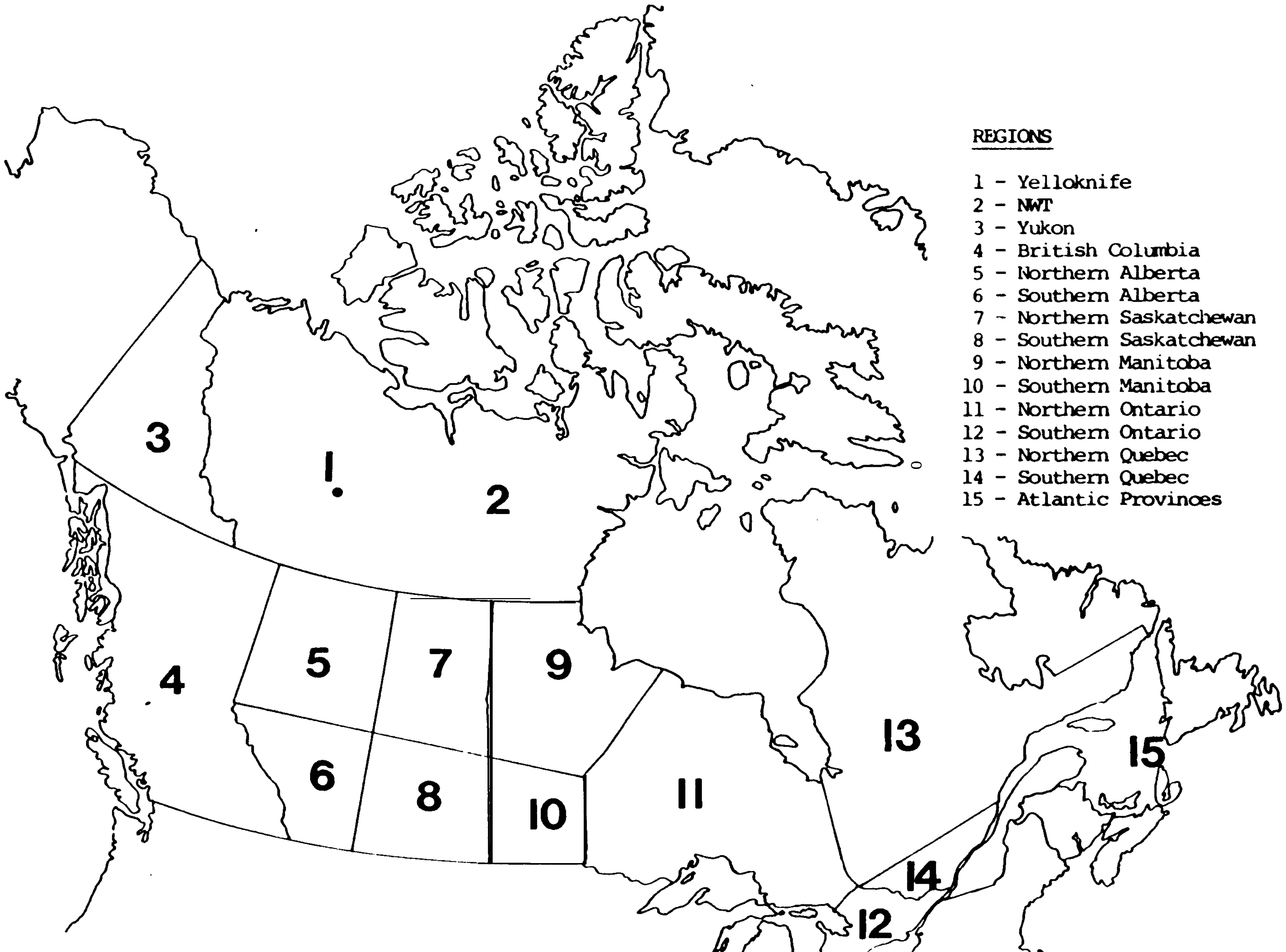

Figure 1 - Regions of Residence of LDC Mineworkers

15. Please describe the facilities ● t the work camp, including the ● ccommodation (including the number and types of rooms) and the dining and recreation facilities.

____

____

____

____

____

____

16. Please estimate the proportions of the 'fly-in' labour force who are:

married ______%

single(never married) ______%

widowed, divorced, separated ______%

17. We are interested in finding out about all Canadian 'fly-in' or rotational mining operations, past, present and proposed. To date we have identified the following:

Present Use	Past Use
Detour Lake, Ont.	Cullaton Lake, N.W.T.
Cluff, Sask.	Salmita, N.W.T.
Rabbit Lake, Sask.	
Key Lake, Sask.	**Proposed/Under Development**
Lupin, N.W.T.	
Nanisivik, N.W.T.	Hope Brook, Nfld.
Polaris, N.W.T.	

Please identify any additional Canadian 'fly-in' or rotational mines you E aware of.

____

____

____

____

18. Who should we contact if we need to clarify any of the responses to this survey?

Name ______________________ Telephone ______________

Position ______________________

Address ______________________

____

____

____

190 Thank you for your cooperation in this survey and for any additional material you are able to provide. The findings will be compiled in a repo which will be provided to the Department of Energy, Mines and Resources. Please let us know if you would like to receive a copy of the report.

____Yes ____No