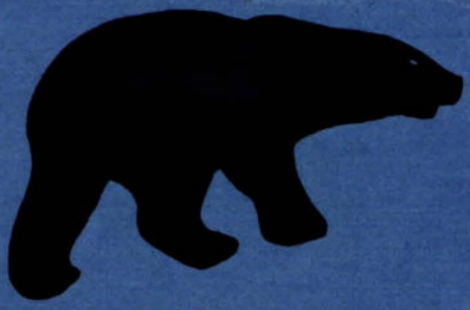
CANADA

TELECOMMISSION STUDY 8(c)



NORTHERN COMMUNICATIONS STUDY

Volume 2: Prospects for Northern Development

OCTOBER 1970

TELECOMMISSION STUDY 8 (C)

(1) NORTHERN COMMUNICATIONS STUDY

VOLUME 2: PROSPECTS FOR NORTHERN DEVELOPMENT

TELECOMMISSION DOCUMENTATION

This is Volume 2 of Contribution No. 4 to Telecommission Study 8(c).

The complete documentation for the Telecommission Study is:

Contribution No. 1 - Report: "Communications in the Canadian North"

Contribution No. 2 - Catalogue: "Communications Systems in Northern Canada"

Contribution No. 3 - Report: "Yellowknife Northern Communications Conference"

Contribution No. 4 - Northern Communications Study

- Vol. 1 - Synopsis
- Vol. 2 - Prospects for Northern Development
- Vol. 3 - Northern Communications Requirements
- Vol. 4 - General Information and Broadcasting Services for the North
- Vol. 5 - Terrestrial Systems
- Vol. 6 - Communication Satellite Systems
- Vol. 7 - Northern Communications Co-ordination and Planning.

D.S. Loftus
Liaison Officer
Telecommission Study 8(c)

SYNOPSIS

This report is intended to give an outline of economic and commercial prospects in the Yukon and Northwest Territories. Present industrial activity is outlined and potential developments indicated.

It is important to recognize that the future of the North will in the long run depend on the pace of industrialization, particularly the extraction and transportation of fuels and minerals to southern markets. The telecommunications facilities to support this industrial development must be planned and implemented.

The Report comprises four chapters

1) *Yukon and Northwest Territories*
   by C.P. Hughes

2) *Economic Assessment of the Eastern Arctic*
   by W.P. Bracuk

3) *Oil and Gas*
   by T.V. Myrick

4) *A Critical Review of Northern Mineral Potential*
   by D.B. Craig and J.A. Kelly

Chapters (1) to (3) are intended to relate industrial development prospects to telecommunications planning. Chapter (4) is a critical review of mineral developments in the North with no attention to telecommunications implications.

Table of Contents

CHAPTER I

YUKON AND NORTHWEST TERRITORIES

by

C. P. Hughes

YUKON AND NORTHWEST TERRITORIES

BY

C.P. HUGHES

In this chapter we will try to avoid the stereotype report with the asterisks and statistical tabulations of the official studies. We do not disparage such reports. They are essential but it will add little if we repeat such minutiae as "Whitehorse, capital of Yukon, population approximately of 10,000, administrative and transportation centre, mining, tourism. Mile 918 Alaska Highway" or "Alaska Highway, built in eight months in World War II by U.S. etc., etc." Instead we will range more loosely with an anthology of opinions on the problems and promise of the north. Perhaps the result will be unpleasing. We hope not.

It is because of this approach that we may seem to deal too abruptly with some aspects. If the reader wishes to know more about northern mineral potential, he will read for himself the review presented by Messrs. Craig and Kelly of the Oil and Mineral Division of Indian Affairs and Northern Development. (Chapter IV of this Volume). To limit ourselves to two extracts from that report is unfair to the authors, the readers and ourselves but because our terms of reference relate to communication needs we have to exercise editorial discipline.

> " Everyone associated with the mineral industry in the two Northern Territories is confident that the present expansion will continue. It must be realized, nevertheless, that many of the deposits discovered in northern Canada are still dormant while equivalent deposits in southern Canada are the sites of producing mines. The costs of exploration, development and transportation still remain a significant barrier to mineral exploration and development."

> " It may be expected that active mining areas will exist in the North within the next one or

> two decades in the central and southern Yukon, the Great Bear and Great Slave Lake regions, the central and southern Keewatin, the Arctic Islands and the Arctic region of northern Baffin Island, and that mines will be established many hundreds of miles closer to the North Pole than has previously been the case. The cold, lonely path of the prospector and the geologist will become the daily route of the engineer, the miner, the truck driver and all their associates in the operating phase of the industry."

These are the estimates of scientists; not the professional euphoria of hucksters or the parochial optimism of municipal soothsayers. The authors offer us the timely reminder of cost, time and distance. The role of communications in the peripheral zones is to ensure survival and, by reducing exploration costs, to increase development possibilities. One may instance the use of telephone lines to transmit seismic information for computer analysis in the south. By speeding up decision-making more ground can be evaluated in a season and so the relative costs come down. It is in such ways that communications are opening the North. If the provision of communications reduces the manpower turn over in northern mines by only ten per cent, then there has been an economic gain which can be measured in thousands of dollars. Some mines have reported 100% turn over in six months among certain categories of employee. Stabilizing work forces is one of the dividends of improved communications. The chief problem for the communicator is to layout a scheme of priorities which are economically feasible and which anticipate needs; to use communications first as an instrument of creation and then as a medium of recreation.

In any assessment of the prospects for economic development of the North as a guide to the optimal planning of communications certain reference points are indispensable. One widely read authoritative reference study is the Carr Report published in 1968 and undertaken under the joint auspices of the Department of Indian Affairs and Northern Development and the Government of the Yukon Territory.

The authors of the Carr Report concentrated on long-term rather than short-term objectives with most projections stepping out to 1985. At an early point in Volume 1, they stated that "the outlook for the Yukon economy by itself and under existing conditions indicated only a very moderate growth but a great deal of volatility and uncertainty unless measures to strengthen the economy could be undertaken." "Moreover," the report continued, "the stage of development of the Yukon, the regional enthusiasm for economic progress and the recent federal contributions to new development had all combined to create a quite favourable climate for consideration of a major new economic advance in the Yukon."

It would be difficult to state the central theme arising out of the studies in words which improve upon the fifth page of the Introduction to the Summary.

> " The central theme arising out of these studies of the Yukon economy has been that its potential for growth is many times greater than its current output and that its potential for stability and continuity can be increased. But to develop both of these potentials major new public and private investments will be necessary. Most of the potential for economic growth lies in mining and much of it can be made available only by the extension of the basic services such as transportation and power. Yet these alone are not sufficient to establish the economic stability and continuity necessary for permanence in the economy. In addition, a substantial improvement in the physical and cultural amenities of the Yukon will be necessary as well as effective planning and co-ordination of Yukon development with that of the northwest region as a whole."

Any statistical information on the North is subject to readjustment and the Carr Report must be tested by reference to more recently published sources such as the Commissioner of the Yukon Territory's Report for the year ended March 31, 1969. In general the Commissioner seems to endorse the Carr assessments, noting that "with the discovery, development and operation of mines throughout the Territory, the economy has become more stabilized and the planning more of a permanent and long range nature including the possibilities of pulp mills, smelters and hydro-electric development."

The Carr Report offered calculations which give dimensions to the general statements of the Commissioner. The gross output was calculated to rise eight or ten times from the 1968 level to some $470 million by 1985. This expansion would require additional investment of private and public capital of about $1,400 million dollars and additional manpower of nearly 17,000 workers with a total population of 57,000 by 1985.

While the Report deals with many long-run objectives such as a standard gauge railway, electric-power production and a smelter feasibility study, it makes few specific references either by way of review or forecast to communications. It is implicit however in the spirit of the report that communications must be part of a creative attack on the economic and social problems of northern development.

ECONOMIC PROSPECTS

From the planners point of view, it may be helpful to divide the 15 year period to 1985 into 3 five-year periods.

What are the mineral expectations for the first lustrum?

In a world of increasing populations and decreasing product life, the need for traditional minerals must increase. The market must continue to present a fairly consistent demand picture. Recent announcements of copper price increases of 4 c. per lb. to 60 c. (a very substantial percentage) by Phelps Dodge and other industry leaders can only support a buoyant Yukon estimate. This view is encouraged by a free price for copper in the high 80 cent bracket.

Examination of silver futures and the well publicized silver shortage and increasing industrial demand shows a general upward thrust. On March 31st London bullion dealers were reported by the Wall St. Journal to have set spot silver at $187\frac{1}{4}$ pence a troy ounce with three month silver at 192 pence, six month silver at 196-3/4 pence and one year silver at $206\frac{1}{4}$ pence.

The varying fortunes of gold are too well known to call for restatement here but it is obvious that any substantial mark-up in price must revitalize the northern gold scene.

Cassiar-Asbestos reports the prospect of 15% to 20% sales gains this year with both Cassiar and Clinton properties at full capacity and an expansion from 75,000 tons to 100,000 tons at Cassiar Mill.

Hudson Bay announce a 600 ton mill and active mining in their Quill Creek nickel mine at the edge of the St. Elias Mountains at the north end of Kluane Lake.

Casino promises a huge ore body which is now being assessed. Venus will go with a 300 ton mill. Adanac shows good molybdenum prospects near Atlin in Northern British Columbia.

Although Professor Lotz of St. Paul's University, Ottawa, wisely counsels against unquestioning acceptance of "booster" doctrines, it is hard to resist the buoyancy of the Yukon when it promises so much. Even harder when it can show such proofs as New Imperial, Dynasty and Clinton.

Where will the communication needs develop?

In the mining field communication needs will be found at the established mines and their supporting townsites with a demand for southern amenities. In the summer there will be the shifting and conflicting demands of highly mobile field groups with emphasis on confidentiality. Some established mines will go underground and work two or three shifts; this could increase night loading on communication circuits. Communication operators will be faced with seasonal changes that complicate staffing. Automatic switching, message storage and other technical devices to balance out inefficient peaking must be high on the list of priorities. It may be necessary to switch through Edmonton in order to take advantage of better staff patterning. With each new mine prospect a swarm of helicopters,

some costing $400.00 an hour, is in the air demanding communication support. A 20 hour day is not unknown and again communication support has to meet the varying demands in difficult terrain and an unpredictable climate.

How many new communities will emerge and how many will grow so significantly that they have to be re-engineered in terms of communications?

One estimate which bears consideration is that Carmacks may become a smeltor point with rail-head facilities and possibly a barge-handling capability if the problems of high volume movement from Clinton, Elsa, and the Peel Plateau justify a resumption of river traffic. Even if such an optimistic view is not entirely fulfilled, there is still good reason to single out Carmacks.

Another townsite with high potential is Carcross with active mining proceeding at Venus and pulp or chip mill possibilities nearby. The activity in the Atlin area suggests this old settlement may change its pace in the near future and volume tonnage might find its way to Carcross by water or by road via Tagish Bridge. The construction of a new bridge at Carcross will open up the country to the west and south-west. Whether economic justification for a road to Skagway will result from the new bridge is a matter of argument at present but the communication planner should include such a possibility in his portfolio of plans for the second five-year period. A presentation by Mr. A. Wright reported in the Whitehorse Star indicates the capital cost of the road is not outside the scale of investment which the North demands.

The Quill Creek activity will probably not generate a new townsite at the mine as the terrain limits successful town development but the pressure of the mine and its manpower must find an outlet nearby on the Alaska Highway.

The settlement of Haines Junction has every prospect for growth as a tourist point and mining base as interest mounts in the Dalton Trail-Kathleen Lake area and along the St. Elias foothills.

The second five-year period is clouded by uncertainty regarding federal, provincial and territorial policy. If the stand taken by British Columbia with its new Mineral Processing Act and the construction of a domestic smelter is supported by federal sources then Canada could witness the growth of a sizable town. But where? At a northern B.C. natural gas point? Wherever it happens, it will involve upheavals in transportation and communication. There is likely to be emphasis on computers, automation, and telemetry. It is doubtful if many new mines will come into operation during this period which may be one of consolidation but increased prices for precious metals may see old properties re-activated. The area will be sensitive to federal tax policies, especially for write-off and depletion allowances.

The Can Tung property may step up activity as demand for its product rises and the molybdenum prospects of Adanac may become an active mine before the end of the second five-year period. In general the Tintina Trench and St. Elias area will continue to attract most interest but if base metals are in short supply, the country off the 60 Mile Road near Dawson could become active. In terms of communication demand, one would expect such activities to focus on Dawson.

The third five-year phase will probably be marked by an increasing demand for sophisticated amenity communication. Somewhere between the second and third phases the picture may be dominated by the emergence of the Peel Plateau iron ore mine. This huge development will require a townsite. Like all northern undertakings, it will be capital intensive and will require a very attractive market climate to encourage development. Smelter facilities in the Yukon can be a decisive factor and the extension of the railroad, preferably on a standard gauge, would accelerate the mine prospects. The Carmacks potential as focal point has already been stressed and perhaps Carmacks growth will be more marked in this third stage.

The use of communication as an instrument of Government has not been exploited very intensively. The present reliance is on voice telephone

with short wave radio for work in forestry. A great gain in efficiency might be achieved by print-out equipment, facsimile units for police identification, central filing of records and claims without the need for outlying offices or expensive journeys to urban points and also for recording, storage and retrieval of land titles, company records, chattel mortgages, etc. Some legislative changes might be needed but the Land Titles Act and Companies Ordinance are long due for overhaul. The federal government could consider the possibility of up-dating Yukon administrative methods as a pilot project in the governmental use of modern computer and communication technology. Car licences, vehicle records, business licences, game licences, fishing licences and all the statistical studies to evaluate the economic and sociological health of the area all involve detailed procedures which should lend themselves to programming.

Any inventory of communication needs in the North has always included provision for defence requirements. Today the special problems of shipping along the Arctic coast and the communication needs of the pipelines compell enquiry into uncharted logistical problems. It is obvious however that the planner must concentrate on these matters immediately as problems arising in the first five-year period. While a certain amount of fly-camp or mobile support must be given to the pipeline crews during the construction work, it would be preferable to establish and use the permanent communication facilities as soon as possible. If the necessary guarantees could be obtained, the permanent communications might be laid out and operating ahead of the actual pipe-laying.

The forecasts of requirements for shipping on the coast and the needs if Herschel Island is developed as a tanker point must be worked out in detail when the major decisions have been taken. A visit to Herschel will quickly demonstrate that a high amenity support is required to make life acceptable for resident staff. Despite the small populations and high costs serious consideration should be given to live television along the pipelines and at Herschel or other shipping points. The dividend in terms of staff retention can be very high. The potential facility already

exists through the Yukon and if the pipeline leads through the Yukon, the communication problem is already half beaten.

In any planning the developers of communications should consider ecological effects. The flight paths of migratory birds should be avoided. The casualties from high towers are the subject of serious concern in many places. Similarly wire systems should not endanger animals in the vicinity. In particular the caribou should be allowed free movement. If old lines are abandoned, they should be cleaned up. The old telephone lines to Norman Wells have claimed many moose and in any arrangement for construction there should be clear understandings regarding clean-up.

Another point which the planner should note is that many people depend very substantially on caribou and moose for their food. Any disturbance of animal balances is of profound importance to them and the cost of meeting claims for loss of income or food sources must be written into the contingencies which may arise. It follows of course that the most stringent conditions must be worked out to safeguard against indiscriminate hunting by crews. Once the routes for pipelines and communications are reasonably firm but before they are indelibly written in, the assistance of the Director of Game for the Yukon and his counterpart for the North West Territory should be sought. It must be remembered that in addition to natives pursuing the traditional way of life in the Yukon and North West Territories, there are many professional big game guides and fishing lodge operators whose livelihood may be affected by injudicious timing of communication construction. A number of recent reports show oil spill problems in such places as the MacKenzie and at Boundary Lake on the B.C.-Yukon border. The communication operators and their construction contractors should be encouraged to seek the advice of such experts as Mr. Innes Taylor of Whitehorse to ensure their plans and methods do not disturb the people or the ecology.

In addition to developing a sensitive liaison with the native interests and game authorities, the planner should try to minimize fire risks. The Forestry Branch should be consulted at an early stage in the

planning not only to ascertain their communication needs but also to secure suggestions for communication routes through low-risk areas.

It is understood that more men will be added to the Fisheries field staff in the Yukon and their communication needs should be evaluated at an early date.

"The wind of change" blows strongly throughout the North. The planner will hear and read of pressures for constitutional changes and greater local autonomy. Even if these changes occur and take the form of regionalization of the Yukon and MacKenzie with a more protected form of administration for the eastern Arctic, it does not appear that these changes would introduce communication problems that would call for drastic reshaping of facilities in the western region. In the eastern region, a change in administrative direction might complicate communication patterns.

As a final attempt to maintain an objective perspective on the explosive growth potential of the Yukon and the MacKenzie area, the objection of Professor Lotz should be noted against using staking rushes as barometers of growth. The communications planner will require more tangible growth evidence before he makes any major commitment.

As the authors of the Carr Report noted reliable, current statistics are difficult to secure and the planner should avail himself of every opportunity to develop a direct personal knowledge of the place, the people, the potential, the problems. Already the Craig/Kelly figures are available to assist the planner and serve to assay the opinions expressed in the Carr Report. The two charts of mining production taken from the Craig/Kelly Report follow the Table 34 of the Carr Report and the Resource comments from the Yukon Northwest Territories Commissioner's Report.

TABLE 34

VALUE OF PRODUCERS' SHIPMENTS OF MINERALS, YUKON TERRITORY, 1950-67[1/]

Year	Asbestos	Cadmium	Coal	Copper	Gold	Lead	Silver	Zinc	Total[2/]	Total as per cent of Canadian production
					(thousand dollars)					(per cent)
1950	-	131	41	-	3,552	1,862	2,588	862	9,036	0.9
1951	-	178	61	-	2,856	2,306	3,255	1,130	9,793[3/]	0.8
1952	-	285	139	-	2,691	2,974	3,365	1,933	11,386	0.9
1953	-	477	170	-	2,274	4,083	5,578	2,156	14,739	1.1
1954	-	430	203	-	2,801	4,501	5,822	2,833	16,589	1.1
1955	-	360	82	-	2,492	3,775	5,037	2,979	14,725	0.8
1956	-	416	114	-	2,480	3,971	5,554	3,124	15,656	0.8
1957	-	316	92	-	2,481	3,488	5,665	2,070	14,112	0.6
1958	-	244	56	-	2,302	2,450	5,569	1,689	12,311	0.6
1959	-	181	58	-	2,248	2,291	6,193	1,621	12,592[4/]	0.5
1960	-	207	97	-	2,652	2,167	6,417	1,789	13,330	0.5
1961	-	228	114	257	2,371	1,712	6,539	1,528	12,750[5/]	0.5
1962	-	231	115	132	2,050	1,616	7,552	1,439	13,138	0.5
1963	-	326	124	-	2,084	1,868	8,451	1,515	14,367	0.5
1964	-	428	98	-	2,184	2,744	7,894	1,856	15,204	0.4
1965	-	386	86	-	1,699	2,767	6,462	2,000	13,401	0.3
1966[6/]	-	306	46	-	1,639	2,387	5,868	1,729	11,976	0.3
1967[6/]	513	150	21	3,496	660	2,092	6,468	1,299	14,700	0.3

1/ General Review of the Mining Industry, Cat. No. 26-201, Preliminary Estimate of Canada's Mineral Production, Cat. No. 26-202, and Preliminary Estimate of the Mineral Production of Canada, by Provinces, 1967, Dominion Bureau of Statistics, Ottawa.

2/ Total may differ from sum of parts because of rounding.

3/ Includes tungsten production valued at seven thousand dollars.

4/ Includes platinum production valued at two thousand dollars.

5/ Includes tungsten production valued at two thousand dollars.

6/ Preliminary data.

Extract from DEVELOPMENT OF RESOURCES COMMISSIONER OF N.W.T. REPORT 1969

MINING Mineral production in the Northwest Territories reached an all time high in 1968 with an estimated value of $121,317,062, exclusive of tungsten production for which figures are not available. Lead and zinc continue to be the leading metals accounting for 79 per cent of the total value. No new mines came into production.

TABLE (a)

MINERAL PRODUCTION

MINERAL	1967 QUANTITY	1967 VALUE	1968* QUANTITY	1968* VALUE
Gold	380,304 ozs.	$ 14,356.476	347,012 ozs.	$ 13,085,822
Silver	1,980,228 ozs.	3,429.755	3,855,967 ozs.	8,938,132
Copper	1,131,126 lbs.	538,077	2,097,800 lbs.	946,108
Lead	254,753,820 lbs.	35,665,535	260,000,000 lbs.	35,152,000
Zinc	419,964,800 lbs.	60,852,900	430,000,000 lbs.	60,630,000
Cadmium	911,400 lbs.	2,551,920	900,000 lbs.	2,565,000
TOTAL		$ 117,394,663		$ 121,317,062

* Preliminary figures.

OIL AND GAS

Expenditures on oil and gas exploration in the Northwest Territories climbed to more than $38,000,000 in 1968, an increase of about 60 per cent over the previous year. A further increase in exploration expenditure of 10 per cent is expected in 1969. Most of the exploration took place in the MacKenzie Delta, in the Beaufort Sea, in the southern region, and the Arctic Islands.

Three gas wells have been completed to date at Pointed Mountain in the southwest corner of the Territories. Construction of a 125-mile-long pipeline to export gas to the United States from Pointed Mountain and Beaver River will get under way in 1970.

The Canadian Government renewed an agreement with Imperial Oil for a further 21 years to produce, refine and market petroleum products produced at Norman Wells.

FORESTRY

Timber production in the MacKenzie District was below average in 1968-69. Forest products operations are presently limited to a few small sawmills on the Lower Slave and MacKenzie Rivers, but increasing interest in the Lower Liard River area by forest industry firms indicates a probable significant increase in production in future years.

In his review of The Political Economy of the Canadian North by Professor K.J. Rea, Mr. R.A.J. Phillips, a former director of the northern administration branch of the Department of Indian Affairs and Northern Development noted that the economic development of the Canadian North invites the use of the future tense. Professor Rea argued that in considering the possibility of establishing a co-ordinated programme for the development of the Arctic and sub-Arctic regions of Canada that it would be appropriate in

terms of economic geography "to create as its area of jurisdiction not only the Yukon and the N.W.T. but also the large Arctic and sub-Arctic northern parts of British Columbia, of the Prairie Provinces, and of Ontario, Quebec and Newfoundland". While this is not the place to explore the constitutional implications of regional grouping, it may be worth emphasizing that communications do not align with any political boundaries. It is important however to ensure that methods and standards are compatible in all areas. We deal more extensively with Professor Rea's approach in another chapter where we offer some suggestions for meeting the problems of the future tense now.

In Science Forum for February 1969 Professor Lotz, in an article entitled "Man must be the Measure of Future Northern Plans - not Material Resources", laid renewed emphasis on the view that "as Canada shifts from a machine-based, industrial society to a knowledge-based nation (characteristic of the post-industrial era), it is essential to link Eskimos and Indians (and other disadvantaged peoples) to careers and opportunities based on science". The opportunity and responsibility of the communication planner to assess and meet the problems of transition must be high-lighted in any northern scheme.

ARCTIC OIL AND SAFE NAVIGATION

Computing Devices of Canada Limited has examined the government's requirements, based on 10 years experience with navigation systems in the Arctic, for an integrated position-fixing system to satisfy both navigation and "ice Pilotage" and has proposed to the Canadian Government the use of the Decca Navigator System in the Canadian section of the Northwest Passage route. This is a continuous position-fixing system which would provide average accuracy of 500 yards to the user on a year-round basis. A total of five Decca transmitting "chains" installed on the Canadian Arctic Islands and coastline would effectively cover the route, and provide a common reference navigational system for seaborne traffic and other users, including aircraft, helicopters, hydrographic survey ships, geophysical investigations and ground

survey parties. Cost for provision of this full coverage would be about $10 million, which is relatively cheap navigational insurance when compared to the $750 million price-tag on 15 ice breaking super-tankers.

In an article by Dr. F.G. Hannell of McMaster the Mary River potential was outlined. It is obvious that with the success of the Manhattan's voyage ore shipping comes closer to being a reality. The role of communications for navigation has been under review and in Exploration Highlights May 1970, the Northern Economic Branch of I.A.N.D. reports at Page 7:

> " During the last few years, prospectors, thoroughly practical men not in the least interested in studying rock formations for their own sake, have been moving further and further into the Arctic. Iron ore has been found on the Belcher Islands in the Hudson Bay, and huge deposits are known to straddle the Mackenzie-Yukon border but by far the most valuable iron find has been located near Mary River in northwestern Baffin Island. The rocks of that area, containing 68% iron ore, constitute the richest deposit in the world. Only one rock series with a comparable percentage has been found, in Brazil. Moreover, the ore of the Baffinland Iron Mines Company contains no water of crystallization as does the Brazilian ore, and it is not only remarkably free of impurities but is especially low in silica content: thus very high grade iron can be produced by direct reduction. At least 150 million tons have been proven in a very small portion of the field, and its potential has been conservatively estimated at a billion tons. However, the lack of markets and the present price of $13-$15 per ton make the mines too risky to operate as yet. The open-water season in Pond Inlet, from which the ore will eventually be shipped, lasts only $2\frac{1}{2}$ to $3\frac{1}{2}$ months each year. Japanese-built ships, each capable of carrying 150,000 to 280,000 tons, will eventually take out as large a tonnage as possible during the short shipping season; but the only port in Europe that can handle ships this big is Rotterdam, and the exploitation of Baffin Island's iron ore must await the enlargement of others".

Dr. McTaggart Cowan in a study of the Ecology of the North for Science Forum pointed out that "the North with its relatively meagre budget of solar energy is a land of low biological productivity". This makes the task of the planner one of infinite delicacy.

Expressed in terms of northern investment, the depletable resources are attractive during a period of high demand and established markets. Once there is a withdrawal of economic support as the result of cheaper sources or alternative materials, the ecology will tend to collapse. The Eskimo and Indian lived within the frame of a survival ecology. Overskill resulted in immediate reduction of the population by starvation. There is no reason to think that the laws of cause and effect will change for the white man. Because of this economic ecology there is in the minds of many justification for limiting population growth and encouraging mobile, technologically skilled work forces. This would tend to put pressure on the technical functions and computer facilities of communication rather than the high channel use of the media for television and pure recreational function which some foresee as the trend in the south.

Dr. McTaggart Cowan especially regrets the damage done to fragile vegetation and the thin organic horizon over the perma frost by vehicles. The northern planner must insist on careful construction methods for towers and lines to minimize the initiation of melting cycles which will do great damage to the environment.

The planner is faced with so many problems - the human, the resource, the technical. How can any statements be valid for the Belcher Islands and Yellowknife, Pond Inlet and Whitehorse? Probably no single statement can be made without qualification for the special needs of the areas and the people. It becomes particularly important therefore to draw upon all disciplines and all levels of interest. The major weapon in planning northern communication is the proper use of communication.

The Commissioner of the N.W.T. in the Report 1969 noted the economic future of the N.W.T. depends largely on the development of its non-renewable resource, minerals, oil and natural gas. The report entered into a brief review of resource activity and commented on the Coppermine staking rush where 22,000 claims were recorded between the summer 1966 and January 1, 1968. The most successful prospect appeared to contain 3,000,000

tons of copper ore grading 3.8% copper. Later it was reported:

> " Coppermine River Limited led the way in mineral exploration in the Coppermine River area. This company carried out an $800,000 program in 1968 and has reported finding new drill targets as a result of the season's work. Surface prospecting, mapping and a combination of geophysical surveys were carried out in addition to diamond drilling. The company has proven an additional tonnage in the 47 zone and reserves are now reported at 4,000,000 tons grading 3% copper".

It is doubtful whether a body of this size and quality can command enough investment interest at this time to make townsite planning necessary. The communication needs are likely to remain tentative during the first five year period of this assessment.

It was noted in "North of 60" for 1968 at page 6:

> " The companies operating in the Coppermine area experienced a number of difficulties in prospecting and evaluating the many properties as the area is large and isolated. The companies have found many mineral showings but the deposits vary as to type, size and grade. The development of mineral deposits will depend not only on the value of the mineral deposits themselves, but also to a large degree on the costs of the transportation that can be provided for shipping copper concentrates or high-grade direct-shipping copper ore to world markets".

Another indicator of pace differential between the two Territories is the extent to which tote road assistance grants have been used. The Yukon tote trail programme has been very active with Table 20 of the Carr Report showing Government grants of $82,700 in 1966-67 and private sector expenditures of $109,600. The Northwest Territories (Commissioner Hodgson's Report) shows that during 1967 one application was received and assistance - the amount of $1250. was granted. This suggests that resource communication

needs in the Yukon will run at a higher level. The 1968 North of 60 Report on Mines and Minerals however showed a marked change which the 1969 N.W.T. Commissioner's Report confirmed as an established trend.

> " During 1968 in the Northwest Territories, twelve applications for tote road assistance were approved covering oil, mining, agriculture and tourist enterprises. Funds allocated under contract amounted to $94,700.00 to construct 835 miles of year-round road and 420 miles of winter roads for a total of 1,255 miles. In the Yukon, 26 applications were approved for the construction of 342 miles of tote roads. Funds allocated under contract were $94,197.00".

In an address to the Fellows and Associates of the Arctic Institute in Washington on 18 April 1967, Dr. McTaggart Cowan reminded his audience that, in the words of Charles Avila, President of Boston Edison Company,

> " . . . we are on the brink of a 'high energy civilization'. Over the next twenty years, the Breeder reactor will produce electric power so cheaply that the cost of billing the consumer and collecting for the power used will be greater than the cost of that power. This means that consumers will pay a flat monthly charge for the amortizing of the capital cost only, regardless of the amount consumed. This will have a dramatic effect on our industry and on our society. We can perhaps get a preview of it if we take a look at the industrial development and community growth in Prince George, British Columbia. This change was foreseeable immediately after the Second World War, but it was twenty-five years before the essential high energy resources became sufficiently abundant".

Dr. McTaggart Cowan stated it was urgent that the humanist and social scientist obtain some measure of control over the electronic environment we are creating and bring at least some of the developments more clearly into focus. He drew attention to the criticisms of D.A.W. Judd, Fellow of the Institute of Current World Affairs, to the piece-meal, spora-

dic and costly attempts to develop the Yukon and Northwest Territories. He urged that "man must be the focus of our concern". He asked that a series of goals be set for the next hundred years. Massive use of nuclear power, satellite communications and all other means to produce the electric environment and the high energy civilization would be required. The statements that a man of Dr. McTaggart Cowan's reputation make are entitled to respect. In his summary of the problems he spells out some of the most important parameters confronting the communication planner who is reminded that today he has not only a technical but moral responsibility.

> " The pressures of northward expansion from the populous areas of the south are inevitable; we must get ready for them. Tourism and recreation will be followed by development of communities -- slowly for the first fifty years, thereafter at an increasing speed. We must learn now how to develop these new communities, so that we can be ready to provide the environment for man where communication is the medium and the message.
>
> As we spread northwards, networks of high energy -- gas and electricity -- will cross with networks of renewable resource transportation -- water flowing south to the parched throats of the unfortunate humans of the midle latitudes.
>
> We must learn how to create the proper environment for these new communities now. If we do not, the Middle North over the next hundred years will be populated with people who are running away from the new society because they cannot adjust to it and we will have a mammoth social problem. If we do, the Middle North will attract the imaginative members of the next generation -- the young and the young at heart. They will have their opportunity to build from the ground up and to create communities to their pattern, and the area will prosper and lead.
>
> We must fill the North with communications and an abundance of energy. These will be practical by the year 2,000".

In the world of northern transportation, the acid test of cost is used in appraising new methods. North for May-June 1969 puts the trans-

portation problems in terms which have direct meaning for communications. At page 70 Messrs. Weick and Merrill set out the pro and con. It requires little effort to translate into terms which apply to communications such arguments as:

> " Today's technology offers many exciting new concepts in transportation. Air cushion vehicles with a capability of skimming over the surface without expensive roads or terminals, giant submarines capable of moving cargo under the arctic ice, have been suggested for the role of 'opening up the north'. The acid test in appraising new methods for any widespread immediate use is the cost attainable using the new system compared to the cost using the available alternatives. To the user the main element in the total cost is the ton-mile cost of transporting goods, but there are, of course, other elements, important in varying degrees in particular situations.
>
> These elements include the speed and reliability of service and the regularity or seasonability of service. A user may find it advantageous to pay a higher transportation cost if he can effect offsetting savings through better timing and lower inventories. The margin can be wide in the North where construction crews have been sent in by air then waited in vain for the boat to arrive with materials. The advantages of safe, prompt delivery of all materials, early in the short construction season, have in particular circumstances far outweighed the cost differential of air transport over a less certain delivery by boat.
>
> The enthusiast for northern development, and the visionary, point to the physical capability of the air cushion vehicles and cargo-carrying submarines. The idea seems to be that if costs are prohibitively high today they may be reduced as improvements are made".

In the same issue of North Professor George Rogers of Alaska makes a valid point which can be applied to the evaluation of any major communication plan. At the conclusion of an informative and thoughtful article, he warns that "premature hardening of the (transportation) sys-

tem in the wrong places can hinder northern development through a misapplication of development capital and imposing higher (transportation) costs upon subsequent development than necessary".

The planner must assess the availability of capital and determine the rate of return which will attract investor support. The policy of Northern Canada Power Commission in planning for local financial capability is one which should be examined for its implications and possible application to communications. Always the planner must equate the desirable with the feasible.

The development of the North calls for such massive investments that the day of the individual is spent. Just as farm units grow bigger in order to survive so probably will northern economic units amalgamate to ensure viability. The demands of these aggressively managed commercial groups will be for the ultimate in communication facilities and as the importance of northern resources increases in the national wealth inventory, the planner may expect to allocate considerably more dollars per capita to northern communication than would be justified elsewhere.

The roads in the Territories are dirt-topped and many arguments have been heard in favour of hard-topping. The Government's view is that the report of the Stanford study must discourage such a major expenditure at this time. If however the Alaska Highway was hard-topped, there would probably be a significant redistribution of population and many smaller communities centered around motel and amenity points might disappear. Thus a motorist heading north from Dawson Creek would develop an entirely different set of stopping places. The 300 miles to Fort Nelson would be replaced by 500 to Liard Hot-Springs or 600 to Watson Lake. The run from Whitehorse to Beavercreek might give way to a one day drive to Anchorage or Fairbanks. These changes would affect communication needs. Similarly as roads spread in N.W.T., there will be a redistribution of population which will affect communication planning.

Many urgent and sincere pleas are heard for a restoration of dignity

and vitality to the native peoples of the North. In particular a strong case is argued by people who ask for native-oriented, native-operated networks. They point to "SCAN" in British Columbia and "RAVEN" as working models. They suggest that only through communication can the native people be given the purpose and energy to repair the damage the (white) intruder has caused.

On the other hand, Kenneth Lavery (The Gazette, Montreal, December 9, 1969) reported that "such business philosophers as Peter Drucker and Marshall McLuhan" assert television is responsible for the mini-state.

> " At the same time that the economy is transcending historical geographical - political boundaries, we are seeing evidence of the decline of the nation state as we know it today and the rise of mini-states. Fragments of the nation state mosaic are themselves becoming small states.
>
> Well known examples are Black Power in the United States and the French Fact in Canada. Geographical boundaries can become incidental in these mini-states, where common purpose or common background is strong.
>
> The large corporation is a type of mini-state -- that exists without regard to frontiers and boundaries. With a head office and no boundaries, each corporation has control over its activities and its personnel over a broad front.
>
> The development of the mini-state can be traced back to the preliterate stage of mankind. In that period, the tribal organization, limited by the range of the human voice, serviced all of man's needs. With the invention and spread of the printed word, the organization of human activity was altered in such a way that large central bureaucracies grew up to serve and maintain government, church and more recently the corporation.
>
> The arrival of the instantaneous media of television and the computer has marked the beginning of the end for the centralized, universal organization, whether it be the nineteenth century nation or the universal church. The nation state is declining by a simple pro-

> cess of alienation. The individual, more concerned with the retribalization of his life, is losing interest in the larger national state. The age in which mythology and tradition supported the nation state is passing away.
>
> Marshall McLuhan, in a recent interview, pointed out that the prevailing drive in human institutions of business, politics and social organizations is toward decentralisation.
>
> 'All over the world,' he said, 'we can see how the electric media are stimulating the rise of mini-states: in Great Britain, Welsh and Scottish nationalists are recrudescing powerfully; in Spain, the Basques are demanding autonomy; in Belgium, the Flemish insist on separation from the Walloons; in my own country the Quebecois are in the first stages of a war of independence; and in Africa, we've witnessed the germination of several mini-states and the collapse of several ambitiously unrealistic schemes for regional confederation'".

It is not our purpose to advance one point of view over the other but to call attention to the fact that the two points of view exist and the planner for northern communications must recognize that these arguments have to be taken into account. Possibly no rigid plan can ever accommodate the demands of both camps and, at the risk of appearing to improvise, a certain amount of ad hoc decision-making will be inevitable. This necessitates a flexible structuring in the policy making authority.

While some urge that communications can restore the individual others take a different stand. Dick MacDonald (Montreal Star, December 6, 1969) reported Harry J. Boyle, Vice-President of C.R.T.C. speaking at Loyola:

> " Mass communications has created a pasteurised homogenized blend of society, an amalgam, and the price has been the disappearance of many individual characteristics".

In the same article Mr. MacDonald quotes U.S. sociologist Paul Goodman as saying:

" That science and technology have become, at least in the advanced countries, the system of mass faith. Yet to some in society they also now are being seen as essentially inhuman, abstract, regimenting, hand-in-glove-with Power, and even diabolical".

Speaking at a conference on satellite problems on January 29, 1970 organized by the Canadian Institute of International Affairs in New York, Mr. A.E. Gotlieb, Deputy Minister of Communications suggested that while satellite transmissions for education offered advantages to developing countries there were certain cautionary statements which should be noted.

" L'utilisation de satellites pour transmettre des émissions de télévision éducatives dans les pays en voie de développement a des avantages indéniables. C'est un investissement à long terme en vue de développer et d'améliorer les conditions de vie de la population de plusieurs pays. C'est aussi un moyen de contribuer à l'intégration nationale dans un pays où l'absence de moyens de communications entre régions est un obstacle au développement de l'unité nationale. Dans l'immédiat, le satellite permet de remédier à la pénurie de matériel audio-visuel, ce qui est particulièrement appréciable dans le cas d'un pays dont la population est dispersée sur un vaste territoire et ne disposant pas d'une infrastructure extensive de télécommunications utilisant les techniques traditionnelles. Non seulement est-ce un moyen de suppléer à l'insuffisance de personnel enseignant mais encore permet-il de faire appel aux enseignants autochtones plutôt que d'importer des étrangers qui, bien souvent, ne sont pas au courant des coutumes du pays.

Néanmoins, il ne faut pas oublier que l'emploi de satellites pour la radiodiffusion est un moyen coûteux qui peut très souvent être remplacé, avec profit, par des moyens audio-visuels conventionnels plus économiques. De plus, les avantages de la radiodiffusion par satellite, moyen par excellence d'offrir le même message

> en même temps à un vaste auditoire ne sont pas, en général, ce que recherche l'éducation où, au contraire, le message a plus de chances d'être reçu s'il s'adapte au destinataire. Il est sûrement plus difficile dans la radiodiffusion par satellite de tenir compte des diversités régionales, culturelles et linguistiques des populations auxquelles l'enseignement s'adresse".

If anything emerges from these cross-tides of opinion and counter-opinion, it is the thought that the planner must not over-commit his resources. With the spate of technological run-off and the erosion of social groups and entrenched ideas, the planner has an almost insuperable navigational problem. Despite the vigour of demands by different interest groups, he must resist the temptation to shift course every five minutes. He must at all costs avoid the solution marked "Made in Ottawa". Inuvik is a sufficient monument to that kind of thinking.

Earlier in this chapter we mentioned the Carr Report as a standard for northern planning. It is a report which takes a realistic view and offers a sharp contrast to the more volatile Rohmer presentation. We have made no reference to the Hedlin-Menzies Report on Churchill and its potential as a port. We should look at it briefly in terms of communication needs.

Even if the Hedlin-Menzies projection of 170% growth potential by 1985 over present shipping tonnage is achieved by year-round use of the port, it is doubtful that this would shift the emphasis of communication planning for the North. The shallow water and relatively small harbour do not encourage the use of super-freighters for grain shipping so that the prospect of year-round operation can hardly be described as immediate. The Hedlin-Menzies Report discounted container shipping but they may not have had the advantage of considering the concept of modular barge-unit shipping which has recently been attracting attention. We have not seen a study of how this technique might be applied at Churchill. From a communications point of view, there would be an increased demand for computer control of freight cars, warehoused inventories, barge movement. Generally speaking it is difficult to regard Churchill as a significant communication demand point in the next five/ten year period.

We cannot hope to cite all the reports which have appeared in recent years. In some cases, the omission will be attributable to our want of learning; in other cases, it is due to a charitable suppression of the author's ignorance.

It would be wrong, however, to overlook the Mauro Report prepared for the Manitoba Government. The author of that report has produced a most wide-ranging and thoughtful report. In Chapter XII we find:

> " Provision of public services is one aspect of the role of government as a positive agent in the development of Northern Manitoba but government must also encourage individual and corporate enterprise. Policy for the northern frontier should not only assist private utilization of extractive resources but facilitate integration and stabilization of a diversified and permanent economy. It is important to note, however, that while the Provincial Government is actively involved in assisting and directing the development of Northern Manitoba it must act within the limitations imposed by revenues and authority. The tax resources and public credit of Manitoba are insufficient to meet the requirements of a comprehensive program of northern development.
>
> The need for federal participation in any effective program for development was emphasized by the Manitoba Economic Consultative Board in its Fifth Annual Report in June, 1968:
>
> '.... Canada may survive (conceivably) as a thin ribbon along the 49th parallel. But its future must surely be broader than this. And, if a broader development pattern is to emerge, a more directed national development policy will be required. For the fact remains that the fuller development of northern areas in Canada requires investments which may be beyond the means of the ordinary revenues of provincial governments; therefore, northern development, as such, is a prime candidate for consideration in terms of national development objectives. At the same time, it is recognized that any plans for northern development must be formulated for the long term and judged in terms of their

effectiveness in serving national objectives. The price tag on any policy is not necessarily a measure of its merits. (Pages 2-3)'".

We will refer again in a later Volume (Volume 7 of Telecommission Study 8(c)) to the Mauro Report in connection with our proposals for the future. We suggest that in this chapter we have adduced enough evidence to indicate that communication in the North is a national concern and must have a national solution.

CHAPTER II

ECONOMIC ASSESSMENT OF THE EASTERN ARCTIC

by

W. P. Bracuk

ECONOMIC ASSESSMENT OF THE EASTERN ARCTIC

by

W.P. Bracuk

SYNOPSIS

The Central and Eastern Arctic are generally less developed than the Western Arctic. Of the 30,000 or so persons living in the North-west Territories only 8,000 or 9,000 live in this area of some 600,000 square miles. This averages out to about one person for every 600 square miles.

Historically, economic development has been confined mainly to the Western Arctic, and for some very good reasons. Living conditions there are not as harsh or severe; the population is larger; the tree line is well above the 60th parallel (while in the east the area above 50 degrees is mainly barren.).

Nevertheless, the central and eastern areas are potentially rich in oil and minerals as indicated by the gradual eastward swing of the resource development companies. Resolute Bay and Frobisher Bay appear to be firmly established as important economic centres; they serve important roles as bases for exploration and development companies, air carriers and others. For some years the tremendous mineral potential of the Mary River area has been acknowledged. It is estimated that the iron ore there needs no refinement - it can go directly into the blast furnaces. What remains to be done is to convert these potentials into economic realities. Once these are done, and costs and risks involved cannot be under-estimated, the development of the area will accelerate rapidly.

ECONOMIC ASSESSMENT OF THE EASTERN ARCTIC

Introduction

This report is intended to provide information on the economic evaluation of the Keewatin and Franklin districts. The assessment falls into two parts: present and future, preceded by a brief background of each district.

KEWATIN DISTRICT

Background

The Keewatin section consists of barren grounds, being very flat south of Chesterfield Inlet, and rugged and hilly to the north. The only apparent reason for the existence of the Keewatin communities is because of the people living there. In addition, a large supporting administrative body exists there, including administrative, health, police and transportation bodies. The main vocations and sources of income in the area are hunting, trapping, fishing, and carving. The population is relatively sparse, with some 3,000 people living mainly along the west coast of Hudson Bay.

Present

Economic Assessment

At the present time there are no known activities of economic significance. Apart from the vocations mentioned, the only other sources of income are from the Federal Government, Hudson Bay Company, University of Saskatchewan Northern Research Institute, and other varied operations. At one time (1957-62) a nickel mine was operated at Rankin Inlet until the ore body was depleted.

Communications

Public telephone communications employing HF radio on a scheduled basis from and to Churchill, Manitoba, the Federal Government administration centre for the region. A local exchange operates in each community, in fact, there is no identified community in Keewatin without telephone communications today. (Other agencies such as the D.O.T., R.C.M.P., Hudson Bay Company, also use HF radio extensively). Outside of the public operating hours, an agreement between Bell Canada and the Federal Government permits official government calling with the "outside world".

Future

Economic Assessment

The main source of economic advancement in this area is mineral resource development. While the potential in this area has been recognized for several years, there are no known plans to extract any minerals. Short of other developments in this district being identified and implemented, the economic prospects appear stagnant, indicating the possible atrophy of a few existing communities, and a concentration in the remaining ones. This restructuring of population concentrations suggests possible changes to the present Federal Government administration set-up, e.g. a re-location of administration centres from Churchill, Manitoba, to a Keewatin community.

Communications

Preliminary investigations of several techniques have been looked into for communities on the west coast of Hudson Bay, from the aspect of potential growth and economic feasibility. These techniques have included (a) HF radio

(b) VHF - UHF

(c) Satellite

Costs of these systems vary considerably, each one perfectly viable in terms of various degrees of growth in this area from an economic, and consequently, a communications standpoint.

FRANKLIN DISTRICT

Background

The communities of Franklin are located close to or above the Arctic circle, environmentally treeless and mountainous. In addition to hunting, trapping and carving, the people derive a large percentage of their income from employment with U.S. military installations, oil exploration, transportation, and federal developments. This large area has a population of some 6,800 people.

Present

Economic Assessment

There are three economically significant factors in this district - the communities of Frobisher Bay, Resolute Bay, and the Mineral Potential.

Frobisher Bay

It is the most important and largest community at the present time, with a population of 1,700. Frobisher is slated to be the Eastern Administration Centre for the Eastern Arctic by the N.W.T. Government. It is also a major service hub for a number of communities, as well as a staging point for resource exploration companies. Both Wheeler Northland and Nordair operate scheduled services as well as charter flights. Nordair also has jet service between Frobisher and Montreal. There is a modern hospital to serve the Eastern Arctic.

This year the Federal Government completed a town centre complex reported to cost in excess of $15,000,000. This complex consists of an office building, an apartment building, a shopping centre, a recreational centre, a hotel, and four row-housing complexes. In addition, a vocational school is now being built and will replace the one presently located in Churchill, Manitoba.

Resolute Bay

This community is considered to be the second most important centre in the Franklin district. It is located about 1,000 miles northwest of Frobisher Bay and 600 miles inside the Arctic circle. Often referred to as the "crossroads of the Arctic" it has a relatively small population of 225 to 325 depending on the seasonal activity.

The airfield is one of the most important in the north with a runway usable throughout the year, and large paved parking areas. Nordair operates commercial jet service to Montreal while Pacific Western Airlines has jet service to Edmonton and Yellowknife. The Joint Arctic Weather Stations at Alert, Eureka, Isachsen and Mould Bay are serviced by U.S.A.F. Hercules airlift from Resolute. Atlas aviation is based here and operates about seven aircraft. About five northern settlements are serviced out of Resolute as well as the Panarctic Oil exploration activities in the Arctic Islands, and a base metal exploration site at Strathcona Sound. The Federal Government is considering making Resolute a sub-regional administration centre for four or five of the northern settlements. Some indication of the activity at Resolute can be seen with the increased fuel tank capacity from 2.8 million to 9 million gallons in 1969, with a further increase to 14 million gallons in 1970.

Recently, Arctic Lifelines Ltd. has been formed to render management, supervisory and other services as well as to carry on the business of transporting materials and supplies. The company intends to centre its activities at Radstock Bay on Devon Island, and to develop an arctic supply depot for marine, air and other services. Some 70 miles from Resolute Bay, Radstock Bay's main advantage over Resolute seems to be more suitable harbour facilities.

It is apparent that the general area here is one of present and future economic significance.

Mineral Resource Development

To date, explorations have been concentrated in the western arctic, however, they are now moving eastward. The finding of major oil reserves (or lack of them) will have a tremendous impact on development in these areas.

Baffinland Iron Mines Ltd. holds property near Mary River containing an extremely high content of iron - 69% pure - with an ore body of at least 184 million tons. Three airstrips have been constructed, one at the Mary River Base camp, one at the Milne Inlet camp, and the third in between the two. A 67 mile temporary road connects Mary River to Milne Inlet. About 80 men are working on the project at the season peak, with well over 1 million dollars having already been spent for exploration and development. With open pit mining being feasible, a rapid start-up is possible.

The main feature of this ore body is its purity; it can be fed directly into blast furnaces without refinement. The main problem or drawback is the high cost of shipping. However, with Milne Inlet being near to the route taken by the S.S.Manhattan, future transportation employing large ore carriers seems a possibility.

There are two other base metal deposits being explored - one at Strathcona Sound near Pond Inlet by Texas Gulf Sulphur, and one on Little Cornwallis Island, near Resolute Bay by Cominco. Very little information on these sites is available at this time.

Communications

Public telephone communications, employing H.F. radios on a scheduled basis servs some eight communities in the Franklin District, all of them "homing" in on the Frobisher Bay radio base station.

With the installation of a H.F. station at Grise Fiord this summer, only four locations in Franklin will remain without public service - Clyde River, Broughton Island, Hall Beach and Lake Harbour. Service to these locations is planned for 1971.

Future

Economic Assessment

The economic futures of Frobisher Bay, Resolute Bay (and its immediate area) appear to be assured. Frobisher is expected to grow because of its designated function as the eastern arctic administration centre, while Resolute is expected to grow rapidly as a base for oil and mineral exploration.
The future is unpredictable. However the potential is known and factors such as transportation, market conditions and tax benefits will and must play a large role in the development of the north.
In the opinion of some experts, the future of Eskimo settlements will probably be one of concentration in a few large settlements, and the atrophy of others.

Communications

Here again, there are several techniques that can be employed - U.H.F.-V.H.F., H.F. radio and Satellite with a wide range of costs involved. In addition, some locations such as Hall Beach, Igloolik and Broughton Island are close to the DEW line and could conceivably access this system via V.H.F. - U.H.F.

CHAPTER III

OIL AND GAS

by

T. V. Myrick

OIL AND GAS

by

T.V. Myrick

There is every indication that Canada's Arctic contains one of the world's important sources of oil and gas. A major find of these fuels anywhere near the scale of Prudhoe Bay discoveries would bring massive changes to the Canadian North. The technology for the extraction and transport of the fuels is well advanced and attests to the confidence that major finds are highly probable. The increasing energy scarcity in North America and instability in the Middle East will guarantee that exploratory activity will intensify in the next few years.

If oil and gas are found they will probably be transported through the Western Arctic to southern markets by pipeline. Plans are being considered for two pipelines for moving oil and gas from the North. The oil and gas pipelines would have their source in the Mackenzie Delta near Inuvik and Tuktoyaktuk. They would run along the Mackenzie River and cross Northern Alberta to Cold Lake. From Cold Lake they would follow a great circle shortest-distance route to Emerson on the Manitoba-North Dakota border. The pipelines would diverge in the Fort Simpson-Fort Liard area so the oil pipeline could terminate at Edmonton. From Edmonton the oil would be sent along existing pipelines towards eastern Canada and cross over to the United States.

Trans-Canada Pipelines have expressed interest in building the gas pipeline while the Mackenzie Valley Pipeline System is pursuing the oil pipeline possibility. A competitor to Trans-Canada Pipelines, Consolidated International, has also expressed interest in constructing pipelines throughout the Mackenzie River area.

The pipelines would have a diameter of 48" and would lie two or three feet underground in most areas. In some areas they might be supported above ground to avoid permafrost

difficulties. The estimated cost for each pipeline is in the order of $1.6 billion. If sufficient reserves of gas were found in the Mackenzie Delta it would be possible to commence construction in 1973. The pipelines could be completed by 1975 and the total complement of pumping stations installed by 1978. These pumping stations would be spaced about 35 miles for the gas line and 50 miles apart for the oil line.

Communications facilities would be required during the construction stage and for control purposes when the pipeline is installed. The ultimate requirement is for about 32 data channels at a transmission rate of 600 bits/second, 5 voice circuits, and some mobile channels along the line.

The permanent communication facility would have to be microwave radio or wide-band cable to satisfy stringent transmission requirements for the long distances involved. If microwave radio is used, it would have to be the large-capacity type to ensure that the data signals are not degraded over the length of the system. This would mean that the system would have spare capacity that could be employed to meet other needs. Since the Mackenzie River poleline system operated by Canadian National Telecommunications from Hay River to Inuvik does not have sufficient capacity to meet anticipated traffic growth, the availability of a trunk system financed by the fuel companies would be fortuitous. It would appear feasible to build a microwave system in about two years if the capital commitment were made.

Specific information on the current oil and gas activity in the Canadian North follows.

OIL AND GAS EXPLORATION NORTH OF 60° 1970

Yukon

Three wells were being drilled in 1970: Toltec, Eagle Plains and Blow River.

A three year seismic survey by a major oil company was in preparation for a major drilling program.

Marine Seismic Programs off-shore were due to commence in early July.

Northwest Territories

Only one significant well was being drilled on the N.W.T. mainlaind as of June, 1970. Another well was expected to be drilled later in the year.

Geophysical programs were planned in the Beaufort Sea, Mackenzie Bay, Liverpool Bay, and as far North as Banks Island and Prince of Wales Strait.

Arctic Islands

It was expected that at the peak of the summer activity in the Arctic Islands more than 1,000 men would be employed by the petroleum and transportation industries. Main areas of activity are Melville Island, Ellesmere Island, King Christian Island, Lougheed Island, Mackenzie King Island, Vanier Island, Emerald Island and Prince Patrick Island. Geological and seismic surveys are scheduled for Vanier, Emerald and Prince Patrick, Ellesmere, Alex Steiberg, Graham and Buckingham Islands.

The economic feasibility of building a $2.5 billion pipeline to tap the natural gas in Alaska's Prudhoe Bay oil fields will be studied by a six company U.S.-Canadian consortium. A $1.5 billion common carrier gas line from Prudhoe Bay through the Yukon, N.W.T. and Northern Alberta to connect with the existing Alberta gas trunk system has been proposed. A 735 mile toll road in the Mackenzie providing access to oil exploration areas of Canada's Arctic has received government approval.

CHAPTER IV

A CRITICAL REVIEW OF NORTHERN MINERAL POTENTIAL

by

D. B. Craig and J. A. Kelly

A CRITICAL REVIEW OF NORTHERN MINERAL POTENTIAL

BY

D. B. CRAIG* AND J. A. KELLY**

Oil and Mineral Division

Department of Indian Affairs and Northern Development

Presented at

Prospectors and Developers Association Convention

Toronto, Ontario.

MARCH 8 - 11, 1970.

* Resident Geologist, I.A. & N.D.,
Whitehorse, Yukon.

** Resident Geologist, I.A. & N.D.,
Yellowknife, N.W.T.
Present Address: Falconbridge Nickel Mines Ltd.,
Timmins, Ontario.

A CRITICAL REVIEW OF NORTHERN MINERAL POTENTIAL

BY

D.B. Craig and J.A. Kelly*

Abstract

During recent years in Northern Canada, there has been a high level of activity in all phases of the mineral industry - exploration, claim staking, property development and mining. This activity is the result of several factors, the most important of which are: the existence of large, geologically favourable areas, attractive prices for products, availability of risk and development capital, applicability of modern equipment and techniques and the successful development of large base metal deposits.

In the Yukon Territory, of the four major producing mines, two (New Imperial and Clinton) achieved their first full year's production in 1968. A third, Anvil, began production in September of 1969. The value of production for the Yukon in 1969, being in excess of $37 million, was thus more than twice the 1967 figure of $15 million. The Northwest Territories production remained fairly constant (during this two year period) at $115 million annually.

Deposits presently under development promise to increase further the value of mineral output of northern Canada during the coming few years.

Exploration and development costs will remain high in the north and deposits will have to be more attractive in respect of grade and tonnage than corresponding deposits further south.

To assist in the reduction of costs, the Federal Government participates directly by providing the infrastructure necessary to development -

---

* Department of Indian Affairs and Northern Development

roads, townsites, schools and power systems, and indirectly by sharing costs of exploration programs and by providing maps, reports and counsel.

Introduction

The metallic and industrial mineral deposits and prospects of the Northern Canadian Shielf, the Northern Plain and the Northern Cordillera form the basis of this paper. Formerly, precious metals were the products of this area. High costs of exploration, development, production and, particularly, transportation, prevented economic exploitation of iron, base metal, or industrial mineral deposits. The completion of a railroad to Hay River and Pine Point in 1964 allowed transportation to smelter of the high grade lead-zinc ore of this area. These shipments marked the beginning of the trend from essentially precious metal products to those of lower unit value.

Northern Canada, consisting of the Yukon and Northwest Territories, makes up 40 per cent of the land area of Canada. The main geological divisions represented in this one and one-half million square mile area are the Canadian Shield in the east; the Northern Plain, extending from the Shield to the eastern Cordillera; the Cordillera, underlying the Yukon Territory; the Arctic Lowlands and the Innuition Region to the north; and the Arctic Coastal Plain to the Northwest (Fig. 2).

The rocks of the Precambrian Shield host, for example, the gold ore mined in the Yellowknife area, the uranium and silver of the Port Radium area and many other mineral occurrences in which occur gold, silver, copper, nickel, uranium, lead and zinc to name a few.

The sediments contain the important Snake Rivew iron deposits in the Yukon and in the Northwest Territories, the large lead-zinc deposits of the Pine Point area and the lead-zinc showings on Little Cornwallis Island and on Baffin Island.

The Cordillera is an important and productive source of minerals in British Columbia and there are no indications to date that this would not be equally true in the Yukon portion.

Mineral Production (Table 1)

The cumulative value of mineral production of the Yukon to 1969 amounts to 556 million dollars. Gold, mostly from placer mining, accounts for slightly less than half this figure. During the period 1960 to 1967, production increased sharply to 21 million dollars in 1968 and to 37 million dollars in 1969 (Fig. 4) of which only 350,000 dollars resulted from placer mining. Asbestos, lead, zinc and copper accounted for the increase. Expected 1970 production, reflecting the first full year of production for Anvil Mine, is 70 million dollars.

The Northwest Territories' value of production ranged from 15 to 25 million dollars per year between 1960 and 1965, with the major contribution being from lode gold mining. With the commencement of shipments from Pine Point in 1965, production rose to 70 million dollars and has been at 115 million dollars since (Fig. 3). Pine Point contributes nearly 100 million dollars per year of this total.

Producing Mines* - Yukon Territory (Table 2)

The Clinton Mine of Cassiar Asbestos Corporation, Limited is situated 48 miles northwest of Dawson City, Yukon Territory and 5 miles east of the Alaskan border. The property was staked in 1957, initially explored in 1957 and 1958, then lay dormant until 1963 when exploration was intensified with a production decision being announced in 1965. Production began in late 1967 and by the end of 1969 the mining rate was 3,100 tons per day with an ore grade of 7% asbestos fibre. Output of the mill is 90,000 tons of fibre per year and stated ore reserves are 23 million tons. The ore occurs in a serpentinite body about 4,500 feet long and 1,000 feet wide.

The Keno-Galena Hills properties of United Keno Hill Mines Limited, Yukon Territory, date to 1906 with production almost continuous since 1919 except for the period 1942 - 1946. In 1948 the present United Keno Hill

---

* See Figure 1 for property locations

Mines was organized. Following a reduction in mining rate in 1967 from 500 to 200 tons per day, the three main camps, Elsa, Calumet and Keno Hill were consolidated into one at Elsa and production has been from the Elsa, Calumet and Sadie Ladue Mines. During 1969 the Husky Mine was readied for production. Reserves are quoted at approximately 120,000 tons with a grade of 35 ounces per ton silver, 6 per cent lead, 5 per cent zinc and a small but significant amount of cadmium.

The ore on these properties occurs in erratic shoots and lenses lying in vein-faults that cut quartzites containing greenstone sills and lenses and schistose rocks.

The Anvil Mine of Anvil Mining Corporation Limited is 45 miles northwest of Ross River and 130 miles northeast of Whitehorse in the Yukon Territory. The deposit, called Faro after the nearby Creek of that name, was discovered in 1965 as a result of a combined geochemical, geophysical and diamond drilling exploration programme. The ore bodies contain 63 million tons grading 9 per cent combined lead and zinc and 1.2 ounces per ton silver. A program involving surface diamong drilling, 2,650 feet of underground workings and a feasibility study was completed in 1966 and a production decision announced in 1967. During 1968 the company carried out open pit preparation and mill erection, as well as townsite and auxiliary services construction. The Government completed the road from Carmacks to Ross River and constructed a power transmission line to the new townsite of Faro and the mill site. White Pass and Yukon Route expanded their stockpiling and transshipment facilities at Skagway, and upgraded sections of the railway between Whitehorse and Skagway. Preparations were completed for all phases on schedule; the first truck load of concentrates left the mine in September of 1969 and the first shipment left Skagway for Japan early in December.

The initial production rate calls for mining 5,500 tons per day from the open pit and shipping 240,000 tons per year of zinc concentrates and 130,000 tons per year of lead concentrates. Prior to the commencement of production, an expansion was announced, costing an additional 3.5 million

dollars. This will increase the milling rate to 7,500 tons per day. The resulting bulk concentrate of 90,000 tons per year will be shipped to Germany. The initial production rate of 460,000 tons per year total concentrates should be achieved by the summer of 1970.

The ore is massive pyrite-pyrrhotite-galena-sphalerite and occurs in three zones over a total length of about 4,000 feet. The main zone, Faro No. 1, is a gently southwest-dipping lens 2,400 feet long by 1,200 feet wide. The lenses occur within quartzose laminated phyllites believed to be Cambrian in age.

The Tantalus Butte Coal Mine is located at Carmacks, Yukon Territory, 100 miles north of Whitehorse. The Yukon Coal Company produced for the local market and shipped coal to United Keno Hill Mines from 1948 to 1967. Anvil Mine purchased the property and, after extensive improvements to the loading facilities, commenced production in July 1969. Coal is back hauled to the Anvil Mine by the concentrate trucks returning from Whitehorse and is used as the source of heat for the lead-zinc concentrate dryers at the Anvil Mine. Expected production is 80 tons per day, however over the last 6 months of 1969, an average of 48 tons per day were shipped.

New Imperial Mines began production in the Yukon in 1967 from the Little Chief open pit, one of numerous deposits along the 3 miles by 17 miles Whitehorse Copper Belt lying west of the city of Whitehorse. By early 1969 some 1.1 million tons of ore containing slightly more than 1 per cent copper were mined from the Little Chief open pit and 240,000 tons of 1.2 per cent ore from the two, small Arctic Chief pits 3 miles away. In July 1969, the War Eagle deposit containing 1.2 million tons of 1.29 per cent copper was brought into production. The 2,500 tons per day of ore is hauled 10 miles by company road to the mill near the Little Chief pit. Ore reserves are approximately 3 million tons of 1.14 per cent open pit ore in several deposits and 5 million tons of underground ore at the Little Chief.

The ore deposits consist of irregular lenses and patches of bornite-chalcopyrite-magnetite near the margins of a large skarn zone

in Triassic limestone adjacent to Coast Range intrusions of granodiorite.

Mount Nansen Mines Limited from their property on Mount Nansen, 30 miles west of Carmacks, Yukon Territory, produced at the rate of 70 tons per day from September to December 1968 and at 100 tons per day until the mine closed in April of 1969. Mill heads ran approximately 0.2 ounces gold, 5 ounces silver and 8 per cent lead. Ore is found in sulphide bearing quartz lenses, veins and stockworks in three systems cutting highly altered quartz feldspar porphyry.

Arctic Gold and Silver Mines Limited produced from the Arctic Caribou (Big Thing) Mine 8 miles south of Carcross, Yukon Territory, at 150 tons per day during May to December, 1968 and at 100 tons per day from March to October, 1969. Mill heads in 1968 averaged 0.28 ounces of gold and 10.5 ounces of silver per ton of ore. A system of northeast-striking quartz veins, which cut altered granodiorite, contain pyrite, arsenopyrite, sphalerite, galena and rare chalcopyrite. These vein structures are commonly bordered by a zone of intensely altered granodiorite.

Gold placer operators produced 9,200 crude ounces of gold in 1969, a decline of 2,500 ounces from the 1968 total of 11,700 ounces. Production from the Klondike area was 5,700 ounces, Mayo area 2,500 and Kluane Lake area 1,000 ounces.

Producing Mines* - Northwest Territories (Table 2)

The Giant Mine of Giant Yellowknife Mines Limited, on Yellowknife Bay, Great Slave Lake, N.W.T. has been in continuous production since 1948. Production is roughly 1,100 tons per day of ore grading 0.7 ounces gold per ton. Reserves, including 330,000 tons in the Lolor Zone and 280,000 tons in the Supercrest, total 1,690,000 tons.

The orebodies are contained in a folded shear zone 100 to 300 feet thick which cuts the basic volcanic rocks of the Yellowknife Group and the gabbro masses intruded into these volcanics. Ore consists of chlorite-sericite schists containing abundant quartz, mineralized with

---

* See Figure 1 for property locations

pyrite, arsenopyrite, chalcopyrite, pyrrhotite and stibnite.

The Con-Rycon-Vol Mine of Cominco Limited at Yellowknife, N.W.T. produces roughly 500 tons per day of ore containing 0.7 ounces of gold per ton. Reserves are given as 450,000 tons grading 0.71 ounces per ton.

The property of Pine Point Mines Limited, controlled by Cominco Limited, is south of Great Slave Lake and 60 miles east of Hay River. Direct shipment of 1,350,000 tons of high-grade ore was made from November of 1964 until mid-December, 1968, 353,000 tons of this being shipped in 1968. A 5,000 ton per day mill started operations in November, 1965 and was expanded to 8,000 tons per day in December of 1968. Ore reserves are quoted at 37,300,000 tons, (January, 1969), grading 2.6 per cent lead and 6.8 per cent zinc. All mining is by open-pit method.

The orebodies occur in vuggy dolomites along a belt 22 miles long and 2 to 4 miles wide in the Presqu'ile Formation of Middle Devonian age.

The Echo Bay Mines Limited property is one mile northeast of Port Radium on Great Bear Lake, N.W.T. The mill and housing facilities of Eldorado Mining and Refining Company, a former uranium producer, are being used. Production from this underground mine started in October, 1964 and during 1968 and 1969 was approximately 100 tons per day. Reserves are quoted as being sufficient for two years production. The ore grade averages 70 ounces per ton silver and 2.2 per cent copper.

Canada Tungsten Mining Corporation Limited operates the Cantung Mine near the headwaters of Flat River, N.W.T. about 130 miles north of Watson Lake, Yukon Territory. This mine came into production in 1962, closed from September, 1963 until May of 1964 because of low tungsten prices and again from January to November, 1967 while the mill, destroyed by fire, was being re-built. The mill has a 350 ton per day capacity. Mining, all by open-pit method, is restricted to the summer months, during which time sufficient ore is stock piled to provide mill-feed during the winter months. During 1968, 131,000 tons were mined and 116,500 tons milled. Quoted reser-

ves (end 1968) are approximately 813,893 tons grading 1.61 per cent WO_3.

The ore deposit is a shallowly southwest dipping lens 300 feet wide and up to 65 feet thick in a diopside-garnet-epidote skarn in lower Cambrian limestone. Ore occurs either as fine scheelite disseminated in a massive to heavily disseminated pyrrhotite-chalcopyrite matrix or as coarse quartz-calcite-scheelite veins and lenses cutting the massive sulphides.

Mining Development* - Yukon Territory

United Keno Hill Mines Limited is bringing a new silver-lead-zinc property into production adjacent to the Elsa property. The shaft for this Husky Mine is complete and cross-cuts are being driven towards the ore body on three levels.

The property of Venus Mines Limited is located on the west side of Windy Arm, Tagish Lake, 10 miles southeast of Carcross. A feasibility study, completed in 1968, recommended bringing the property into production at 300 tons per day. With the completion of financial arrangements, production plans were announced in the fall of 1969. Construction of the mill was commenced before the end of the year. Underground development work continues with start-up scheduled for July of 1970. Reserves of proven, probable and inferred ore were stated in March of 1969 to be 550,000 tons having a net smelter value of approximately 36 dollars per ton. Development work, performed between March 1969 and the end of the year, moved much of the probable and inferred ore into the proven category.

The gold and silver ores, with significant amounts of lead, zinc and cadmium, occur in a series of quartz veins which cut Cretaceous volcanic rocks of the Hutshi Group. The Venus vein ranges from a few inches to 5 to 6 feet thick and contains quartz and carbonate with lenses of pyrite, arsenopyrite, galena, sphalerite and minor-chalcopyrite.

The Wellgreen property of Hudson's Bay Exploration and Development Company is situated south of the Shadwak Trench, 20 miles northwest of Burwash Landing on Kluane Lake and 8 miles from the Alaska Highway. Discovered in 1952

---

* See Figure 1 for property locations

and explored with 14,000 feet of underground workings and 65,000 feet of diamond drilling by 1956, the property was inactive until 1968. Approximately 730,000 tons of ore grading 2.04 per cent nickel, 1.42 per cent copper and minor cobalt, platinum and paladium have been delineated. In 1968 ground geophysical surveys were made and in 1969 several thousand feet of additional diamond drilling were completed in a re-evaluation of the property.

The Hart River Mines property is 80 miles northeast of Dawson City at the headwaters of Marc Creek, a tributary of the Hart River. After discovery in 1966,. preliminary work was done in 1967. During 1968, geological mapping, geochemical and geophysical surveys and 6,400 feet of diamond drilling were completed. During 1969, approximately 2,000 feet of underground workings on one level explored the main mineralized zone and 46,600 feet of underground diamond drilling and 2,000 feet of surface drilling were completed. Reserves were announced as 580,000 tons containing 1.45 ounces of silver, 0.041 ounces gold, 1.45 per cent copper, 0.87 per cent lead and 3.65 per cent zinc. A probable additional tonnage of 600,000 tons of similar grade is quoted. A feasibility study, based on the available w-rk and information, was made by Kaiser Engineers during the last four months of 1969. Further development work is planned for this year.

Hudson's Bay Exploration and Development Company has continued exploration of the Tom Claims near MacMillan Pass on the Yukon-Mackenzie Territory border, some 240 miles northeast of Whitehorse. Discovered in 1951, and explored between then and 1953 with 17,000 feet of diamond drilling, the deposit was estimated to contain 10 million tons of low grade ore. Exploration was resumed in 1967 with 5,500 feet of diamond drilling and a further 10,000 feet in 1968, and high grade reserves grading 8 per cent lead, 8 per cent zinc and 2.73 ounces silver were announced. In 1969, the company lengthened the airstrip beside the Canol Road, 2 miles north of the property, and, before closing for the winter, an adit was collared and driven 50 feet. Plans for 1970 include 6,000 feet of underground work and 20,000 feet of underground diamond drilling as the basis for a feasibility study.

The two ore zones of sphalerite and barite occur as replacements

in a limestone band in a cherty slate-chert grit sequence.

The Casino Silver Mines Limited property, 190 miles northwest of Whitehorse, has had a long history as a mineral prospect. Gold placers, discovered in 1911, were found in 1915 also to carry tungsten. 1,200 feet of underground work done between 1964 and 1966 tested it as a silver lead prospect. A geochemical survey in 1966 revealed anomalous values in copper and zinc and in 1968 a copper-molybdenum anomaly was established. During 1969, 22,000 feet of diamond drilling showed large mineralized zones with copper and molybdenum values. Statements quote an indicated tonnage of greater than one billion tons, grading 0.38 per cent copper equivalent with a contained metal value of $4.00 per ton. A feasibility study will be conducted during the coming year.

Mineralization occurs as disseminated copper sulphides, largely chalcopyrite, and molybdenite in quartz-feldspar porphyry or porphyritic quartz monzonite.

Mining Development* - Northwest Territories

Cadillac Explorations Limited has a property on Prairie Creek in the Nahanni Mining District of the N.W.T. Exploration on this silver, lead-zinc occurrence commenced four years ago and $2,000,000 has been spent to date. Surface exposures, diamond drill results and underground sampling have indicated persistent mineralization with widths averaging 7 feet and with grades in the order of 5 - 10 ozs. silver and 34% combined lead-zinc.

Texas Gulf Sulphur has a lead-zinc property located on Strathcona Sound, Northern Baffin Island, N.W.T. In 1969 this company drove a 1,500 foot exploration adit to ex-lore a mineral deposit outlined by surface diamond drilling. From the adit a bulk sample was obtained. The previous drilling outlined 12,000,000 tons of ore containing approximately 8.8% zinc, 1.3 ounces silver and 1% lead. Studies are now being conducted to determine the feasibility of bringing this property into production.

---

* See Figure 1 for property locations

Prospects for Future Development

Numerous mineral deposits in northern Canada have been explored, particularly over the past few years. These prospects range widely in their size, grade and state of development. Some of the more important are referred to below.

Yukon Territory

The Swin Lakes and Vangorda properties of Kerr Addison Mines, Limited are located 12 miles southeast of the Anvil mine. These deposits contain respectively 5 million tons grading 9.5 per cent combined lead and zinc with 1.5 ounces per ton of silver, & 9,400,000 tons grading 8.1 per cent combined lead & zinc with 1.76 ounces per ton of silver.

The Canalask property near Kluane Lake, like the Wellgreen deposit, is associated with an ultrabasic sill and consists of nickel bearing pyrrhotite lenses in volvanic rocks 200 feet from the sill. The deposit contains 550,000 tons grading 1.68 per cent nickel.

The Snake River iron deposits of Crest Explorations Limited, near the Yukon - Northwest Territories border, contain several billion tons with an average grade of 40 to 50 per cent iron.

Northwest Territories

The Coppermine River Limited prospect contains an estimated 4 million tons of 3 per cent copper in the basalts of the Lower Coppermine River series. Bernack Coppermine Exploration have demonstrated one million tons of 2.5 per cent copper in a similar setting 45 miles to the east of the Coppermine River property.

Kennarctic Limited have discovered a copper-zinc deposit in the James River area in altered greenstones of 4 to 5 million tons grading 3 to 4 per cent copper and 2.5 per cent zinc.

Baffinland Iron Mines, in the early 1960's, located and staked an

extensive iron bearing formation on northern Baffin Island at Mary River. Diamond drilling has revealed a direct shipping iron ore deposit grading 68 per cent iron and reserves are estimated at 130 million tons or better.

Low-grade iron ore has also been found in large quantities on the Melville Peninsula by Borealis Explorations Limited.

Two deposits near Pine Point, each containing greater than one million tons of 12 per cent combined lead and zinc are owned by Conwest Explorations and Coronet Mines Limited.

Current Exploration in the Territories

In addition to those activities discussed, other companies (see appendixes A and B) carried out programs in Yukon and Northwest Territories in 1969. Many of these were small but significant operations involving the exploration of known deposits by geophysics, soil geochemistry, trenching and diamond drilling. Some programs consisted of geological reconnaissance and "grass roots" exploration over several thousand square miles and included extensive stream sediment geochemistry.

A significant development in 1969 was the granting of 15 million acres in prospecting permits in the eastern part of the Northwest Territories. These permits were issued, in the main, to oil companies, indicative of the increasing trend for oil companies to engage in exploration for metals and in particular, for uranium fuels. Extensive airborne radiometric surveys were carried out on most of the permit areas.

Claim staking activity also continued at a high level. Prior to 1964, less than 6,000 fifty-acre claims were recorded annually in the two Territories. In the five year period since 1964, five major staking rushes have occurred, including the Pine Point area - 27,000 claims, Vangorda Creek - Anvil area, 10,000 claims, Coppermine River area - 39,000 claims, Artillery Lake area - 8,000 claims and Casino Creek area - 10,000 claims. In 1968, 52,000 claims were recorded and although the number declined again in 1969, it remains significantly above the pre-1964 figures (Figures 5 and 6).

Discussion

The Yukon and Northwest Territories comprise approximately 40 per cent of the land area of Canada and contain large extensions of the Precambrian Shield and the Cordillera areas which are favourable for mineral exploration. Current mineral production in the two Territories, however, is only 3 per cent of that of the whole of Canada. This comparison suggests that the mineral resources of northern Canada are much less developed than those of southern Canada and the low ratio of developed deposits to possible deposits makes northern Canada a promising area for mineral exploration.

In recent years many, as yet undeveloped, mineral deposits have been located. There are several known lead-zinc deposits in the Yukon and Northwest Territories that are in this category. Two lead-zinc deposits in the Anvil area of the Yukon are estimated to contain 15,000,000 tons of 9 per cent combined lead-zinc metal. Another deposit 120 miles northeast of Anvil is reported to be higher grade, but lower tonnage. In the Pine Point area of the Northwest Territories there are two known deposits of lead-zinc of sufficient grade and tonnage to be brought into production.

Significant deposits of lead-zinc have been found in the Arctic Islands, on Little Cornwallis Island and northern Baffin Island. Underground development of the Baffin Island deposit has commenced. The full potential of all these lead-zinc areas has yet to be determined and there is little doubt that lead-zinc deposits offer the best promise for additional production in the near future.

A number of extensive iron deposits have been located in the North. The Mary River deposit on north central Baffin Island and the extensive Snake River deposits of the northern Yukon, have undergone a series of studies to determine the feasibility of bringing them to production. Problems of transportation, beneficiation and a need for long term contracts at stable prices deter development. Additional sources of low grade iron-ore are being explored on Melville Peninsula and central Baffin Island.

The exploration for gold and silver continues throughout the

North and, although a number of small underground mines have had intermittent production, it seems that only high grade silver deposits such as those of the Mayo District in the Yukon and the occurrences near Great Bear Lake are rich enough to support an underground operation. The prospects for discovery of additional economic gold deposits appear to be best in the region north of Yellowknife.

Exploration for copper in the Northwest Territories has centred on the Coppermine River, the Bathurst Inlet area, Victoria Island and the east arm of Great Slave Lake. As a result, several deposits grading 2 - 4 per cent copper and estimated to contain from 2 million to 5 million tons have been located.

In the Dawson Range of the Yukon a porphyry type copper-molybdenum deposit is reported to contain a billion tons of low grade mineral.

Several other similar deposits have been or are being developed in the United States and British Columbia and this latest discovery raises hopes of similar development in the Yukon Territory. It is evident that the North American Cordillera is a very favourable area for deposits of this nature.

Nickel has not been mined in the northern territories since 1962 when the mine at Rankin Inlet on the west shore of Hudson Bay closed. However, the Wellgreen nickel-copper property in the Kluane Range of the Yukon is under development. Recent exploration to the northeast of Artillery Lake in the Northwest Territories has, so far, not given indication of any deposits, however, this area and the Great Slave Lake East Arm area, where two small high-grade deposits are known, continue to receive attention. The Selwyn Mountain region of southern Yukon is known to contain at least one deposit of tungsten in excess of one million tons and it is likely that several further deposits may be outlined.

A belt highly favourable for asbestos deposits crosses the central Yukon in a northwesterly direction. The Clinton Creek mine near Dawson and the Cassiar mine in British Columbia just south of the Yukon Border are in

this belt. Prospects of finding additional deposits in the belt are considered to be excellent.

Uranium exploration activity has been accelerated in areas containing geological features similar to those of the Elliott Lake area of Ontario and the Wollaston Lake area of Saskatchewan, and activity remains high in the areas to the east of Great Bear Lake and to the southeast of Great Slave Lake. Discovery of uranium mineralization in the central Keewatin district will undoubtedly further encourage exploration on the 10 million acres of prospecting permit rights that were granted in 1969.

Everyone associated with the mineral industry in the two Northern Territories is confident that the present expansion will continue. It must be realized, nevertheless, that many of the deposits discovered in northern Canada are still dormant while equivalent deposits in southern Canada are the sites of producing mines. The costs of exploration, development and transportation still remain a significant barrier to mineral exploration and development.

The pattern of mining development that began in 1964 and now dominates the industry in the North demonstrates that the cost factor can be overcome. In that year, Cominco Limited began shipments of lead-zinc ore from its open-pit mines at Pine Point, Great Slave Lake. To encourage this development, the Federal Government co-operated in providing transportation facilities, a townsite and hydro-electric power from a site southeast of Pine Point on the Talston River. Similar co-operation has been extended in later developments.

Not all deposits can be mined by open-pit methods and underground mining will continue in importance. It is, nonetheless, encouraging that many of the deposits being discovered can be developed as large open-pit mines operating on a low cost per ton basis. Developments in the transportation field, particularly the possible lengthening of the shipping season in Arctic waters will assist both the exploration and development arms of the industry and, while the Yukon Territory and the western provinces of Canada

supply markets on the Pacific rim, the future markets for the mineral resources of the eastern and high Arctic regions may be the many-fold industries of Europe.

It may be expected that active mining areas will exist in the North within the next one or two decades in the central and southern Yukon, the Great Bear and Great Slave Lake regions, the central and southern Keewatin, the Arctic Islands and the Arctic region of northern Baffin Island, and that mines will be established many hundreds of miles closer to the North Pole than has previously been the case. The cold, lonely path of the prospector and the geologist will become the daily route of the engineer, the miner, the truck driver and all their associates in the operating phase of the industry.

APPENDIX "A"

(Fig. 1)

The following conducted exploration programmes in the Yukon Territory during 1969:

Areas of Activity

44	Amax Exploration Inc.
56, 57	Arrow Inter-America Corp.
49, 44	Atlas Explorations Ltd.
34	Bonnet Plume River Mines Ltd.
45	Boswell River Mines Ltd.
60	Canada Tungsten Mining Corp. Ltd.
53	Canol Mines Ltd.
44	Casino Silver Mines Ltd.
45	Cassiar Asbestos Corp. Ltd.
44	Cominco Ltd.
52	Connaught Mines Ltd.
57	Conwest Exploration Co. Ltd.
51	Cro-Mur Mining and Exploration Co. Ltd.
47	Cyprus Exploration Corp. Ltd.
44	Dawson Range Syndicate
59	Duke River Mines Ltd.
54	Emperor Mines Ltd.
51	Foley Silver Mines Ltd.
49	Geophoto Services Ltd.
44	Glenlyon Mines Ltd.
48	Golden Gate Exploration Ltd.
59, 46	Hudson's Bay Exploration and Development Co. Ltd.
50	Hyland River Mines Ltd.
44	International Mine Services Ltd.
58	Jack Pot Copper Mines Ltd.

APPENDIX "A" (cont'd)

(Fig. 1)

51	Jersey Consolidated Mines Ltd.
55	Lewis River Mines Ltd.
50	Matt Berry Mines Ltd.
47	Mercury Explorations Ltd.
57	Mitsubishi Metal Mining Co. Ltd.
55	New Imperial Mines Ltd.
44	Newmont Mining Corp. Ltd.
57	Silver Christal Mines Ltd.
56	Silver City Mines Ltd.
53	Silver Key Mines Ltd.
51	Silver Spring Mines Ltd.
53	Stump Mines Ltd.
55	Topazios Mining and Exploration Ltd.
51	United Keno Hill Mines Ltd.
56	White River Mines Ltd.
44	Yukon Revenue Mines Ltd.

APPENDIX "B"

(Fig. 1)

The following conducted exploration programmes in the Northwest Territories during 1969:

Areas of Activity

38	Amadjuak Syndicate
24	Anglo Celtic Explorations Ltd.
29	Aquitaine Ltd.
15	Arlington Silver Mines Ltd.
41	Baffinland Iron Mines
35	Barringer Research Ltd.
22, 39	Bathurst Inlet Mining Corp.
14	Bernack Explorations Ltd.
39	Black Giant Mines Ltd.
38, 42	Borealist Explorations Ltd.
32	Canadian Superior Exploration Ltd.
32	Canex Aerial Explorations Ltd.
32	Capillano Explorations Ltd.
24	Ceasar Silver Mines Ltd.
39, 20	Cominco Ltd.
14	Conwest Exploration Co. Ltd.
14	Coppermine River Ltd.
24, 40	Copper Pass Mines Ltd.
24	Coronation Gul Mines Ltd.
31	Dennison Mines Ltd.
39	Discovery Mines Ltd.
27	Duke Mining Ltd.
14	East Coppermine Explorations Ltd.
32	Eldorado Nuclear Corp. Ltd.
29	Ensign Oils Ltd.

APPENDIX "B" (cont'd)

(Fig. 1)

39	Falconbridge Nickel Mines Ltd.
16	Fidelity Mines Ltd.
39	Flagstone Mines Ltd.
39	Geoterrex Ltd.
39	Giant Mascot Explorations Ltd.
14, 18, 39, 43.	Giant Yellowknife Mines Ltd.
16	Grandroy Mines Ltd.
24	Great Bear Silver Mines Ltd.
39	Hanbury Syndicate
14	Hearne Coppermine Ltd.
27	Hidden Lake Mines Ltd.
25	Hope Bay Syndicate
31	Iso Mines Ltd.
40, 24	Jason Explorers Ltd.
24	Jim Rock Mines Ltd.
14	Keevil Mining Ltd.
19	Kennarctic Ltd.
36	King Resources Ltd.
24	Klyceptor International Surveys Ltd.
39	Largo Mines Ltd.
24	Louanna Gold Mines Ltd.
24	Mariner Mines Ltd.
24	Moresby Mines Ltd.
16	Muskox Mines Ltd.
24	Mylandex Mines Ltd.
	New Athona Mines Ltd.
29	New Continental Oil & Gas Ltd.
39	Newmont Mining Corp. Ltd.
22	Norsemines Explorations Ltd.

APPENDIX "B" (cont'd)

(Fig. 1)

26	Northbelt Yellowknife Mines Ltd.
42	Patino Mining Corporation
14	Pickle Crow Explorations Ltd.
14	Precambrian Mine Services Ltd.
24	Republic Mining Co. Ltd.
14	Rose Pass Mines Ltd.
16	September Mountain Mines Ltd.
17	Shield Resources Ltd.
14	Silver Arrow Explorations Ltd.
24	Silver Bay Mines Ltd.
27	Spectrum Resources Ltd.
15	Territory Mining Co. Ltd.
16	Teshierpi Mines Ltd.
24	Ulster Petroleums Ltd.