Northern Housing: Perspectives on Design and Construction

Winter Communities No. 4

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edited by Robert Robson
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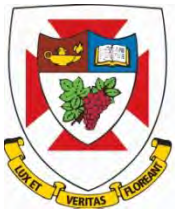

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The Institute of Urban Studies is an independent research arm of the University of Winnipeg. Since 1969, the IUS has been both an academic and an applied research centre, committed to examining urban development issues in a broad, non-partisan manner. The Institute examines inner city, environmental, Aboriginal and community development issues. In addition to its ongoing involvement in research, IUS brings in visiting scholars, hosts workshops, seminars and conferences, and acts in partnership with other organizations in the community to effect positive change.

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PREFACE

This volume is one of two publications appearing in the Institute of Urban Studies' Winter Communities Series that features selected papers from the **Northern Housing Conference.** Recognizing the unique quality of the "northern" community, the Institute of Urban Studies in May 1987 hosted the conference in Saskatoon, Saskatchewan, to address the issues of housing and related topics. Drawing together a wide cross section of participants, the conference helped to further underscore the distinct nature of northern settlement. Through the course of the two day event, it became apparent that there is a need for a continuing discussion of issues related to the problems of northern settlement. As a result, selected papers presented at the conference were chosen for publication as a two volume set of conference proceedings. This particular volume addresses the topic of the design and construction of northern housing. The papers are included without revisions, and therefore offer a verbatim text of the proceedings.

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INTRODUCTION

Robert Robson

In the Canadian north or that geographical area defined by the Institute of Urban Studies' northern initiative, it is possible to distinguish both a unique sense of northern community and a distinctly northern form of housing.[1] Characterized in part by the specific design and construction methods employed in the north, northern housing has traditionally had to confront a very complex set of housing and housing related issues. Stretching well beyond the actual design and construction process, the variables impacting on northern housing range from storage and transportation problems to societal and cultural factors. Most succinctly defined by the Canada Mortgage and Housing Corporation publication Development Strategy for Guideline Documents for Northern Residential Construction, the list of variables include: organization and timing for construction; transportation issues; costs and economics; design in the northern context; and, general design considerations.[2] As suggested by Dickens and Platts, however, in a paper entitled "Housing in Northern Canada: Some Recent Developments," the unique quality of northern housing is essentially a by-product of the "peculiar economic and logistic factors of the north."[3]

The organization or timing of construction in the north is crucial to the building process. In many locations this is directly related to the options available for the shipment of construction materials. It is also tied to the availability of storage or warehouse space and, more importantly, the presence of a skilled labour force. Given the rather limited "window" of construction, it is essential that the sequence of construction be well established. Whether this includes transportation, storage, delivery, assembly or the actual finishing of the product, the northern construction industry has been forced to refine its trade in an effort to overcome the so-called "constraints" of the north.[4]

While transportation scheduling is important to the timing of construction, the issue of transportation affects almost all aspects of building in the north. Cost efficient routing, mode of transportation options, durability of

material in transit, on- and off-loading practices, and even security arrangements are all factors of the transportation conundrum. With the continued reliance on manufactured or prefabricated building materials, these variables are often the key to an efficient northern building program.

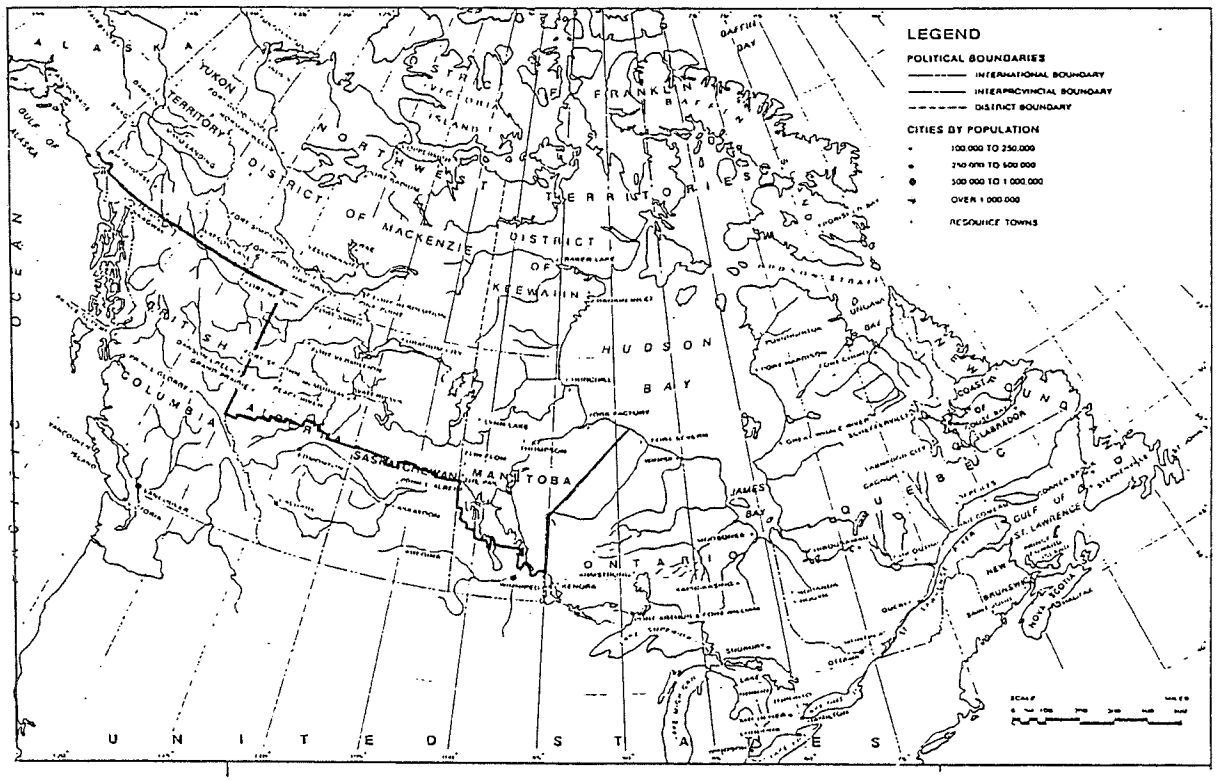
The economics of housing in the north include the capital, operating and life cycle costs of dwelling units. Commencing with the initial capital investment in the structure, through maintenance costs and eventually concluding with rehabilitation or replacement costs, the economics of northern housing has clearly impacted on the design and construction process. It is, however, only recently that maintenance and life-cycle costs have been considered in the housing equation. With the greater efficiency of housing units in the north, operational costs have been reduced and as a result, maintenance schedules greatly refined. In this fashion, for example, the elaborate ventilation systems as incorporated in modern northern housing have not only reduced operational costs but have also encouraged design and construction innovations. Life cycle costs, too, have impacted on the building of northern houses. Largely as a response to the fast-track housing programs initially implemented in the north and the rehabilitation costs encountered therein, northern housing has become more of a long term proposition.

The northern design context of the construction process is what sets the northern house apart from its southern counterpart. In consideration of environmental factors, societal-cultural variables and economics issues, the northern component has stamped a unique form on northern housing. The northern climate, for example, has forced both designers and builders to incorporate distinctly northern techniques or features in the house building process. Removable skirting, air lock porches and gravel pad construction are all typical of this northern construction process. The cultural factors of the north apply most directly to the indigenous peoples and the manner in which they have influenced the design or construction of housing in the north. Although it is only recently that this has impacted on the shape of housing, the design of large all-purpose living areas, smaller sleeping quarters and additional storage space, are all in part a response to cultural needs. The

economy of the north, whether it is the traditional pursuits of hunting and trapping or the industrial activities of resource production, has also forced design innovation. The cold storage porches, outside access changing facilities, "mud-rooms" and a variety of other design features, are all in part a response to the needs of the northern economy.

MAP 1

Map Showing the Approximate Location of the Northern Census Division Demarcation Line and the Focus of the IUS Northern Housing Study



Finally, general design considerations, which are not so very different from the southern experience, also provide a unique quality to northern housing. Issues such as housing density, unit orientation or even landscaping have all helped to create a distinctly northern house type. Housing density,

for example, has seen the development of horizontal, multi-family units which although duplicated elsewhere, are most successful in the north.

While organization, transportation, housing economics, factors of northern design and general design considerations are clearly important in the building of northern houses, they do not necessarily acknowledge the constraints of the north. The particulars of the northern environment often force designers and builders into a confrontation situation where the real thrust of the housing initiative is lost in a struggle to overcome obstacles. As argued elsewhere, the key to developing northern housing is to incorporate a flexibility in design and construction that allows the project to capitalize on the northern component.[5] Rather than attempting to overcome climatic or environmental hurdles, northern housing design should accentuate the attributes of the same. It should recognize the tradition of the Inuit or the native peoples in the design process. It should enhance the long winter season with design niceties that make winter a more enjoyable phenomenon. It should allow for the comfortable pursuit of outdoor activities. It should in the end, appeal to residents. Whether through self-help programs, the consultative process or monitoring procedures, it is the people that live in the houses that are best suited to comment on their appropriateness.

The five papers included in the volume, while varying in scope and direction, all address the issue of building houses geared to the needs of the occupant. The central theme in each case is building for people. Whether in consideration of program monitoring, traditional life styles or regional variations, the design and construction of northern housing is, according to the authors, a process that must take place from the bottom up.

Nils Larsson's paper makes a good case for program monitoring. Reflecting the author's research background, the study is essentially a plea for information dissemination. In calling for a comprehensive discussion of housing and related issues, Larsson clearly strikes out at the ad hoc, isolated nature of the northern housing process. Program monitoring, he argues, would not only eliminate costly errors in design but it would also produce a more responsive housing industry.

Dick Bushell's paper is a valuable case study of the activity of the Northwest Territories Housing Corporation. Arguing that northern design and construction is a series of "compromises," Bushell underscores the flexibility of design concept. Indeed, in stressing the principle of "Form Following Function," he clearly articulates the sense of northern housing.

Glen Wither's paper like Bushell's, is something of a case study. Wither, however, describes the Canada Mortgage and Housing Corporation northern design initiative and focusses his analysis on the northern prairie region on western Canada. Documenting everything from overcrowding to moisture problems, the author presents a sound overview of the Corporation's "design directions." Particular attention is directed towards the problems associated with ventilating the northern unit and a number of innovative design techniques are presented as possible solutions.

The fourth paper discusses the general circumstances of housing in the Northwest Territories. McCann draws a close connection between community planning and housing design and, like the other contributors, underlines the unique environment of the north. Citing a series of physical, social and economic "challenges" as central to the housing process, the author calls for the greater simplification of northern housing programs.

Finally, Richard Roberts' contribution focusses specifically on the issue of housing in the resource sector. In attempting to define a housing program for the Canstar oil sands project in northern Alberta, Roberts provides a most detailed comparative study of the resource town phenomenon. Like the other contributors, however, he articulates a major role for local residents in the provision of housing services. Whether in terms of housing preference, program planning or continuing maintenance, Roberts argues for the greater participation of the local citizenry in the housing process.

Notes

1. In conjunction with an on-going research project, the Institute of Urban Studies has attempted to establish a boundary of nordicity for the three prairie provinces. Roughly corresponding to the northern census divisions as defined by Statistics Canada, the north-south distinction form the basis for the analysis of the unique quality of the northern community.

2. Larsson Consulting, Development Strategy for Guideline Documents for Northern Residential Construction (Ottawa: Canada Mortgage and Housing Corporation, 1985), 9-10.

3. H.B. Dickens and R.E. Platts, "Housing in Northern Canada" Some Recent Developments," The Polar Record 10 (September 1960): 223.

4. C. Bent, "Mobility and Flexibility in Northern Communities," Environments 15, 2 (1983): 39.

5. N. Pressman and X. Zepic, Planning in Cold Climates: A Critical Overview of Canadian Settlement Patterns and Policies, Winter Communities Series No. 1 (Winnipeg: Institute of Urban Studies, 1986).

REMOTE HOUSING AND THE NEED FOR MONITORING

Nils Larsson

My comments on northern housing are based on my relatively short experience with housing in parts of the Northwest Territories, Yukon and the northern parts of several provinces. Although I have designed buildings, I am now doing research on other peoples's buildings, and I hope that this will provide a different perspective that may be useful.

My overall impression is that northern housing has come a long way in a very short time. Even ten years ago, housing was being built that had a life expectancy of only 10 years and energy operating costs in the order of $5,000 to $8,000 per year. We now see new houses being built in the Northwest Territories Housing Corporation, the Yukon and parts of northern provinces that meet the very stringent energy performance standards of Energy, Mines and Resource's R2000 program, or are coming very close to it. We do not yet know how long these houses will last, but preliminary indications are that many of the problems that shortened lifespans are a thing of the past.

These gains have not come cheaply. Many relatively new houses have been rehabbed or torn down in the process of developing better solutions, and a lot of money has been spent in doing so. In effect, much of the construction in the north during the last decade has been a large-scale and well-funded experiment. The improvements we see could have come more quickly and at less cost if there had been more feedback on northern programs and projects, and better communication of the lessons that were learned.

At the minimum, I hope to leave you with the thought that it is important to transmit what has been learned in one region to housing designers and builders in other parts of the country. I also feel that a consistent approach to gathering information is important in ensuring that one party knows what the other is talking about.

First, it may be useful to relate what we have learned from monitoring that is relevant to a northern and remote context.

1. **Involving homeowners in the construction of their own houses appears to work well.**

We recently completed a national monitoring study for Canada Mortgage and Housing Corporation (CMHC) on their Rural and Native Housing Demonstration Program (RNHDP). The results are very encouraging. Despite a very late start, in some cases as late as November, almost all projects were finished before March 31 at costs far lower than contractor-built RNH housing, and at a satisfactory level of quality. Although it is too early to tell, we assume that the homeowners will maintain their houses at a high level, due to their investment of time and energy.

2. **There is a clear need for homeowner training and education on the operation and maintenance of housing.**

"Post-occupancy counselling," as it is also known, is essential if we hope to reduce the incidence of arrears and poor maintenance among people who are unused to the responsibilities of home ownership. Even for those who can cope with the problem of handling sophisticated heating systems and, even more important, the crucial need to provide proper ventilation in air-tight houses.

3. **Unproven designs systems or techniques should not be tested on homeowners or tenants in remote areas.**

Designs that change drastically every year mean that the lessons learned from one generation of units are not applied to the next. It is also expensive in terms of design and approval time, and creates problems for construction crews who are working under tight deadlines in difficult conditions. A gradual evolution in design is a better approach; this implies sticking to the same designers, whether in-house or consultants, so that they can share in the learning process.

4. There is a case to be made for a higher degree of standardization in the design of northern and remote housing.

A great variety in designs means higher costs if materials are being purchased in bulk, more design overheads, more administration, a longer period for design and construction approvals. The most important drawback, of course, is the greater number of bugs in design and construction that occur and the resulting problems in maintenance and operation.

Standardization does not have to mean a single design for province, territory or region. It can mean a set of house designs (ie., half a dozen), available for families of various sizes and circumstances, but with a limited range of optional features such as window sizes, roof configurations, basement versus crawl space configurations, and so on.

Designs available within one region may have to be different from those in another region with other characteristics; for example, areas with difficult materials delivery, areas with different climatic conditions or occupants with different technical skills.

5. The extent to which sophisticated mechanical and ventilation systems can be used in remote areas is still an open issue.

It appears to be working in the Northwest Territories, but the Northwest Territories Housing Corporation's approach of providing trained service people in each community may not be an option in other areas. Specific concerns include: maintenance on high-tech furnace or hrv's; lack of training; and lack of parts.

I would now like to discuss some of the background that makes it important to improve feedback on northern housing design. One is the shift in responsibility for design and construction of publicly-financed housing from a central or federal level to provincial or territorial governments and to non-profit groups and native bands.

This decentralization has had very positive effects, the main one being the creation of housing organizations that have a more comprehensive knowledge of the special problems in their jurisdictions. The smaller scale of such organizations also allows the design, construction and management functions to be integrated, with obvious benefits to everyone concerned.

In housing corporations such as the Northwest Territories Housing Corporation and the Quebec Housing Corporation, being close to the problem means that designers are able, or even better, are forced to learn from their mistakes. In this kind of environment, problems occurring in one house type can be remedied in next years' designs. This is far better than a situation where much of the design work is handled by consultants far removed from the scene. You can always stop using a poor design consultant, of course, but next years' consultant then has an opportunity to repeat the mistakes made two or three years ago.

The shift in responsibilities for housing delivery from a central and remote level, to local and hands-on organizations, has created some problems of its own. Even though smaller housing organizations may have better internal communications, their staff tend to know less about what other housing organizations have done to improve their designs. This is because there are so many more organizations now and, since they are smaller, they can not afford to spend too much time or money to keep abreast of things.

How many of you, for example, are familiar with the work done in Quebec on the design of insulated floors, Northwest Territories Housing Corporation's trials with foam-core wall panels, or the delivery problems that are likely to occur in a program like HAP? And are they aware of how your designs and delivery methods have evolved? Conferences are a very useful way of exchanging information, but they are sporadic. Technical journals are useful but when was the last time you saw an article in a trade journal that was really relevant to your northern design concerns? My point is that all of us who design and build northern housing need to learn from the successes and failures of others in an on-going way. This is not happening.

Designers and builders are not the only ones who need feedback - program administrators also need feedback. Most of the money funding northern housing programs comes from the provincial or territorial governments, and in many cases from the federal government, through CHMC or Department of Indian Affairs and Northern Development (DIAND). Each of these funding agencies has to act in a financially responsible manner, and this means that they must know that their money is being reasonably well spent. They have a problem on their hands if the programs are being delivered in a decentralized way and if there is no systematic feedback on the program's successes and failures.

A final factor to consider is that the more decentralized a program, the more variation there will be in the way it is delivered in various areas of the country and in the kind of houses produced. Decentralization has increased along with variety, so the need to exchange information is crucial. How should housing organizations obtain feedback to ensure that their designers are on top of things and to convince the funding agencies that their money is being well spent? Feedback activity is already taking place, but it does not occur within an overall framework.

One type of feedback might be called operational feedback; the kind that comes in the form of memos from staff in local offices, or in letters from clients. While feedback on collapsing walls of malfunctioning furnaces have to be dealt with, it is often crisis management, and therefore not very useful for drawing conclusions about a program as a whole.

Limited inspections and physical tests provide another form of feedback and this has a long history, but these are traditionally done for very specific and limited purposes. CHMC inspectors safeguard their investment, while municipal inspectors are concerned about public health and safety.

A "heavy-duty" means of obtaining feedback is to carry out an evaluation of the program. An evaluation is carried out after several years of a program's operation, and involves relating what has happened in the field to the objectives of the program. After an evaluation you can establish what was right or wrong about the program and what impact it had; but the program may

be finished, or at least the problems that occur may have had time to create a lot of damage before they could be corrected. Another problem is that an evaluation is expensive and cumbersome.

Full-blown evaluations are necessary for a global view, but they may have to be complemented by some other form of quicker and less expensive feedback. The type of framework for feedback that is most useful and economical is program monitoring. By program monitoring I mean the observation and assessment of the delivery process and of the resulting houses, carried out according to a carefully considered plan. Ideally, monitoring should begin the same day a program begins, and should continue during the delivery of the program.

Program monitoring is: finding out what is going on; finding out where things are going right and wrong; and placing it all in a consistent framework. Program monitoring does not have the rigorous linkages to program objectives that would be necessary for an evaluation, but if the process is well designed, the data gathered can also be used as the basis for a subsequent evaluation.

Monitoring provides fewer answers, but it can be more immediate, and can provide the basis for quick corrections. For this to work, those delivering the program must believe in the importance of the monitoring process so that they will be receptive to using results as they become available.

This underlines another important difference between monitoring and evaluation; monitoring absolutely requires the close involvement of those who deliver the program, since they have to help in developing the monitoring plan and since they will have to modify the program as it is being delivered.

The evaluation of a program, on the other hand, should never be carried out or controlled by those delivering the program, since the essence of an evaluation is to obtain an impartial outside viewpoint which inevitably passes judgement on those who delivered the program.

In a housing program context, there are two main elements to monitor; the delivery process and the product (usually a house). "Product" monitoring focusses on the house and its performance. It can include a description and analysis of the design and the quality of construction. It may also include direct measures of performance, such as air tightness, the performance of the heating and ventilation systems.

Monitoring of the process involves tracing the delivery process from its origin to the building site. In a housing program, one starts with a set of policy guidelines or program conditions, but it would be a mistake to assume that these guidelines are necessarily applicable on the building site. As guidelines pass through various people's hands, they have a tendency to pick up various deletions or additions en route.

Another point that must be considered is that participants in the process have their own interests to pursue, and this will affect their viewpoints. Program managers, who may have designed the program, have a vision of how the program should operate. This vision may have to be disturbed by the realities that are brought back from the field. Local delivery officials have to be more concerned with making the program work, even if some of the theoretical niceties of the program have to be bent or forgotten in the process.

The people on the building site, ie. contractors and homeowners, have, quite sensibly, no regard whatsoever for the intent of the program. Contractors want to do their work with a minimum of fuss and a maximum of profit. In the case of programs that call for a lot of sweat equity by the homeowners, such as the RHN demo, RHAP and HAP programs, homeowners actually want to get the maximum house for a minimum of cost and effort.

I am not trying to be cynical but merely pointing out that all actors in the process have their own interests, which affect their actions and their views of the results. This underlines the importance of a monitoring plan, so that all the diverse viewpoints can be put into an overall context.

Finally, a few words on exchanging the information that is picked up through monitoring and other sources. Monitoring is much more useful if people outside your own organization can also benefit from your experiences. Our national trade journals do not carry much material on northern or remote housing and I do not see them catering to such a small market in the future. CMHC and NRC put out a number of useful technical publications which should be required reading, but again, most of their content relates to southern housing.

There is no easy solution, but one possible approach is to encourage the birth of low-cost newsletters. Another promising development is the forthcoming Canadian Construction Information Service, which theoretically will provide us with an easy way of exchanging information by computer as soon as 1988.

In conclusion, I would like to re-emphasize the importance of a good program of monitoring for any organization that has the primary responsibility for delivering housing. This is especially applicable in northern and remote regions, where building sites are scattered and mistakes can create a lot of grief and extra costs. Agencies providing funds for a program rightly expect to have feedback on its effectiveness, and the tradeoff for greater local control in delivering the program may well be to monitor its progress in a way that is acceptable to those who pay most of the bills.

HOUSING DESIGN AND CONSTRUCTION IN THE NORTHWEST TERRITORIES

Richard Bushell

Introduction

The Northwest Territories Housing Corporation is a territorial crown corporation charged with the responsibility to assist residents of the Northwest Territories, in accordance with need to secure and maintain adequate, suitable and affordable shelter. It is hard to imagine a single organization, government or otherwise, which exercises a more pervasive, constant influence over the lives of so many northerners than the Northwest Territories (NWT) Housing Corporation. Formed in 1974, the NWT Housing Corporation now provides social housing for more than 4,800 families - almost half the population of the Territories.

The area of the NWT is 1.3 million square miles; 51,000 square miles of which is water. This vastness of area contributes greatly to logistical difficulties such as remoteness of administration, responsibilities, policy planning, financing functions and supervision of construction.

The NWT consists of two major climatic zones:

1) Arctic

- is that area which the average daily temperature of the warmest month of the year does not exceed 10°C.

2) Sub-Arctic

- is that area in which the temperature falls below 0°C for seven months of the year - generally October to April.

The Arctic Circle, as one might suspect, does not separate these zones: it is generally accepted that the tree line is the boundary of the Arctic and the Sub-Arctic. The Arctic Circle defines that part of the earth north of which

the sun does not rise above the horizon for more than one or more days during the winter and does not set for one or more days during the summer.

The problems that arise in designing heated buildings in the Canadian north, other than those imposed by permafrost, differ in degree rather than in kind from those encountered in the warmer, more densely populated regions of the south. However, it is this difference of degree that magnifies the importance of "Form Following Function" as a prime architectural ideal, making the adherence to basic principles of the functional design of space and structure a top priority. The length and severity of winter conditions, together with a very limited summer environment intensify the utilization of the interior, and to some extent, the exterior spaces. The functional space requirements reflect this intensified need to encourage the multi-functional aspects of combined or enlarged spaces.

Apart from the importance of functional design, we must be cognizant of the importance of cost effectiveness and energy efficiency. Housing costs are high; in the Yellowknife District (1986) $83.00 per square foot to $123.00 per square foot in the Baffin District. Household operation, particularly water, fuel and electricity, accounts for much of the difference in living costs between north and south.

For instance, in 1982 the Corporation had in its inventory 4,134 units. Power costs for the year were 8.6 million dollars; heating costs were 8.1 million dollars. Cambridge Bay (900 air miles north of Yellowknife), in 1982 averaged 8,000 L per house or $6,000.00 per annum in heating costs.

In the past, these costs have acted as a deterrent to homeownership in the smaller, less accessible settlements. Recently, however, better design and construction technologies have created a new generation of energy efficient homes.

Response To Climate

In responding to the climate, a comprehensive understanding of permafrost and discontinuous permafrost areas and their effect on buildings and foundations, plus the local climatological conditions is an essential prerequisite for planning in a given location. An analysis of the sun, wind, rain, snowfall, temperature and duration, with details of their characteristics and interactive behaviour, should form the basis of preliminary planning studies.

A knowledge of the major winter winds, particularly as they pertain to heat loss and drifting patterns are often the prime determinants of a building's siting. Buildings should not be orientated to expose large wall areas to the prevailing winter winds suggested a linear placement of units parallel to the winds prime direction. This placement invariably coincides with the optimum positioning of the unit to minimize the effects of snow drifting.

The exploitation of southern exposure maximizes the effect of available sunlight. Internal open planning enables the building to accommodate as much natural light as possible and in addition, provides for natural cross ventilation during the summer. The decision must be taken with regard to the importance of summer prevailing winds versus winter prevailing winds, as to which winds have precedent in the orientation of the building.

Building Form

The cube is among the most thermally efficient, practical building forms using traditional construction materials and methods. It exposes the smallest external surface area for a specific interior space. To minimize the cooling effects of prevailing winds and to maximize the heat gain of solar radiation, the cube shape is often distorted to provide an optimum building solution rendering the lowest active heat requirement. Irrespective of the type of housing form chosen, emphasis must be placed on simplicity of form.

Siting

As is the case in any area, siting is of prime importance: siting in the Territories is critical. Not only are the basic considerations of orientation, grade treatment, permafrost, lot utilization, servicing, vehicular parking (komatiks, A.T.V.'s, snowmachines, etc.) and exterior storage to be considered, but one must be aware of the different life style of the native people.

Although houses should be orientated to take advantage of our minimal winter sun, this is not always possible. Prevailing winds and existing snow patterns also play a critical role in determining the orientation of a house. In those communities which offer a view, southern exposure may prove to be a secondary consideration. In such cases, it is possible that orientating the units in this fashion will result in building forms that aggravate rather than alleviate snow buildup. In situations where the view is of such high priority, the resultant snow problems should be tolerated by means of building massing (elevating buildings), utilization of snow deflectors and by locating entries and windows in areas of wind scouring.

Although not all communities have the same service vehicles, four service trucks must be considered; sewage, water, oil and garbage. Service trucks provide services on a regular basis and, therefore, the location of service hook-ups is a prime consideration when locating a house on a lot. If units are located to facilitate ease of access for service vehicles, then access for fire trucks is assured.

With regard to setbacks, relative to native lifestyles, many activities must be considered. Apart from minimum clearances for fire separation between buildings, one must design setbacks accordingly; setbacks must be able to accommodate a myriad of activities. They must be able to accommodate children playing, carcasses waiting to be skinned, komatiks, snowmobiles, gas storage, garbage drums, oil tanks, boats and carvers. Apart from these activities, setbacks must also accommodate snow removal and dumping.

Foundations

In order to avoid movement of a structure in areas where seasonal freezing occurs, the building foundation must be founded below the active layer where freeze-thaw cycles occur to ensure the building is founded on permanently frozen material. As conditions vary considerably from district to district, especially in the discontinuous permafrost zone, from point to point on a given site, the best insurance against problems is careful site selection and sub-surface investigation.

There are a number of approaches to foundation design in areas of permafrost; the first is to avoid permafrost by building on bedrock or on a well drained granular pad. The second method is to preserve the permafrost by ventilation, raising the building a minimum of two feet above the pad and/or adding ventilation pipes (culvert). In areas of discontinuous permafrost, frozen material may be excavated and replaced with well drained non-frost-susceptible granular soil.

In areas where the active layer is relatively shallow, where the soils have low frost-susceptibility, surface foundations are suitable. The gravel pad is the most commonly used surface foundation; simple pressure treated timber bearing pads and wedges are utilized.

In areas where the active layer is deep and the soil is highly susceptible to frost, buried foundations are required. As timber piles are not available in the eastern Arctic, steel piles are used. Steel piles are generally set in pre-drilled holes backfilled with a sand/water slurry. In the Western Arctic where wood piles are used, they are also installed in pre-drilled holes, butt-end down, and backfilled with a sand/water slurry. In both cases, that portion of the pile founded in the active layer must be coated with a bond breaker (generally drillers grease) to resist the uplift force as the active layer refreezes.

Generally speaking, basements are not practical in the far north where the sub-grade is rock and/or permafrost as excavation would be cost prohibitive.

Not only would the excavation be costly, but the insulation required to prevent degradation of the permafrost would also be extremely costly.

Interior Planning

As is generally the case in architecture, northern design is a series of compromises. Some planning ideas solve one problem while creating or compounding another. The optimum solution of all the problems simultaneously is not easily found.

Since the NWT Housing Corporation is primarily responsible for social housing, minimum spatial requirements are utilized. However, every attempt is made to accommodate the intensified use of interior spaces as well as to encourage the multi-functional use of combined or enlarged interior spaces to be used as multiactivity areas during periods of severe weather and long periods of darkness.

As the NWT Housing Corporation provides, on an average, three hundred units, per year (Public Housing and HAP), it is not possible to review site specific information. Designs are, therefore, standardized for obvious reasons, however, one should still locate rooms requiring cooler temperatures against exterior walls and strive to determine the optimum solar impact for each interior space in order to achieve the desired condition during the period in which it is occupied. Where possible, one should plan for an intensified winter use through the use of multi-functional areas.

Building Envelope

The building envelope being used by the NWT Housing Corporation is a result of many years of experience and research by many individuals and research agencies. Industry today has developed many new materials and components which in turn enable designers to achieve better results, not only from a

performance point of view, but also with respect to cost and erection. Design simplicity is required to attain effective sealing against air infiltration.

Apart from steel piles and the use of metal roofing, wood is the conventional material being used for northern housing. It provides versatility, flexibility, ease of fabrication, opportunities for semi-skilled labour, and has satisfactory insulation qualities with respect to thermal bridging.

Heat loss and condensation are interrelated problems since latent heat is carried on moisture which moves with the air according to temperature gradients. Moisture within walls or roofs damages the materials and lowers thermal resistance. It is, therefore, extremely important that a continuous, unbroken polyethylene vapour barrier and increased insulation be provided in order to control heat loss and condensation.

The NWT Housing Corporation no longer utilizes vented attic spaces due to numerous problems encountered over the years. Today, non-vented ceilings are used. A typical section through the roof would be as follows:

- 1/2" gypsum board
- 6 mil polyethylene
- 1/2" gypsum board
- 1 layer R-20 batt insulation
- 1 layer R12 batt insulation
- 2" x 10" joists @ 2'-0" o/c
- 2" x 2" cross bridging
- 3/8" ply. sheathing
- R-7 semi-rigid insulation
- Air barrier
- 24 ga. performed prepainted sheet steel.

In order to provide a continuous vapour barrier, penetrations must be reduced. Where interior partitions intersect exterior walls, vapour barriers must be continuous and not broken. All doors and windows should be pre-bagged with polyethylene, sealed and taped to the vapour barrier. Any and all other penetrations should be properly sealed to ensure the integrity of the vapour barrier. A typical wall section is as follows:

- 1/2" gypsum board
- 6 mil polyethylene vapour barrier

- 3/8" ply. sheathing
- 2" x 6" studs @ 2'-0" o/c
- R-20 batt insulation
- 2" x 2" strapping @ 2'-0" c/w
- R-7 semi-rigid insulation
- Air barrier
- 5/8" prefinished plywood siding.

As all housing units are raised a minimum of two feet off the ground, double floor systems have proven to be effective in minimizing heat loss. Apart from being energy efficient, false floors also provide a warm comfortable living surface. A typical section through the floor is as follows:

- vinyl composition tile
- 3/8" ply. underlay
- 5/8" T. & G. ply. sheathing
- 2" x 2" false floor framing @ 165" o/c
- 1" x 3" strapping @ 16" o/c
- Foil backed vapour barrier
- 5/8" T. & G. ply. sheathing
- 2" x 10" joists @ 2'-0" o/c
- 2" x 2" cross bracing
- R-12 batt insulation
- R-20 batt insulation
- Air barrier
- 5/16" ply. soffit.

Logistics

Northern construction is affected by factors which, in southern situations, would be regarded as organizational and within the control of a reasonably efficient contractor. The same factors encountered in the north, may require the designer to recognize the need for increased standards in order that the end product meet a basic standard.

Timing, shipping and availability are logistical matters of prime importance in northern construction. Work carried out in winter conditions of darkness and extreme cold greatly reduced the level of efficiency and workmanship. In view of the high cost of winter construction and inferior workmanship, the NWT Housing Corporation does not allow any new construction to take place after August 1 in the Eastern and High Arctic.

Unfortunately the summer season does not coincide with the shipping season. Barges and ships carrying building materials arrive in northern waters in late summer or early fall. For this reason, the Housing Corporation has chosen to ship materials one season, store them over the winter and begin building the following spring taking advantage of the long hours of sunlight. This arrangement allows for site work and piles to be carried out and installed one year in advance.

Storage of building materials can be a serious problem. Materials stored over the winter need to be protected from the ravages of weather, blowing snow, melting snow, extremes of temperature and pilferage. Damaged or lost materials from building sites or storage compounds in remote settlements are costly in both time and money as replacement materials must be flown in, often interrupting critical construction schedules. Many Eastern Arctic settlements are visited by only one ship per season; building packages and materials not marshalled in Montreal or Churchill in time to be loaded on the barges, result in construction being delayed for a full year unless the high price for air freight is paid. In the Western Arctic, those areas served by the MacKenzie River, there is a bit more leeway in that barges move down the MacKenzie River from Hay River continuously from early June to October. From Tuktoyaktuk, goods are taken by sea barge as far east as Spence Bay.

Shipping itself takes its toll on materials. Each bundle must be handled many times along its journey from mill or factory to dockside to ship to beach to building site. The simpler the bundle, the less susceptible it is to damage.

The most important factor in northern building is good workmanship. The best design means little if a tenant finds the wind whistles through his dwelling. Perhaps by northern standards, the best design is one which is least susceptible to faulty workmanship. Simplicity is the key to a successful project.

Summary

From its meager beginnings, the Housing Corporation's budget has grown to $127 million in 1986/87. Its programs include Public Housing, Retrofit and a Warehouse program to assist the local Housing Associations. Despite these programs, there was an apparent shortfall in the programs being delivered. Policy review led to a fuller realization of the importance of private homeownership as a more permanent and self-sustaining solution to the mounting crisis that the north was facing.

Increased private homeownership is emerging, leading to increased homeownership funding and a policy to develop a program for the training of homeownership clients in log house construction. Thus, record levels of HAP grants have been disbursed, public housing construction has been reduced and the HAP program has been stepped up to meet an enthusiastic response from the public.

The NWT Housing Corporation, which is responsible for social housing in NWT in the form of single family detached, semi-detached and multiple family dwellings, monitors and assists 48 Housing Associations, who manage over 4800 rental units across the Territories, as well as ten senior citizens accommodation facilities. The cumulative effect of these programs has sparked a new sense of optimism and enthusiasm within the Corporation and a belief that the Corporation and housing in the north are coming of age. Over the past few years we have made significant improvements in the quality of housing we are able to provide and we have managed to produce quality housing in one of the most difficult and demanding physical environments in the world. Seen in this way, the history of the NWT Housing Corporation might be viewed as an expression of the northern people who are themselves in transition, in a period of growth and development.

PATTERNS AND BUILDING BLOCKS

Glen Wither

Designers of housing, be they architects, engineers, or contractors, cannot solve housing problems alone. What we build rarely changes society, but often mirrors its beliefs and aspirations. Housing cannot break the cycle of poverty alone. But housing - good housing - is one way to the solution. I want to quote a passage from a book called the Place of Houses.

> Anyone who cares enough can create a house of great worth - no anointment is required. If you care enough you just do it. You bind the goods and trappings of your life together with your desire to make a place that is uniquely your own. In doing so you build a semblance of the world you know, adding it to the community that surrounds you.

A good house, one which enriches the occupant's exchange with his surroundings shapes his life and is important to the occupants well being. Good houses usually are based on understood principles and patterns of design. But often, patterns are misused, misunderstood and people are offered limited choices which substitute stereotype for personality. Patterns should help clarify choices and focus energy to bring personal choice to bear.

The benefits of personal choices are difficult to capture through the process of northern housing delivery through government programs. Somewhere there lies a means of doing so to everyone's satisfaction, and if people care enough, it will be found. The patterns found in houses already built are building blocks from which houses more suitable to their inhabitants and to their specific sites can be built. This presentation talks about patterns and building blocks.

Housing Design and Construction

This paper provides an overview of the housing design directions being taken by Canada Mortgage and Housing Corporation (CMHC) in the north. The location focussed upon is the northern prairies and the area where the precambrian shield meets the prairies, primarily in Northern Manitoba.

The main issues facing us are:

1. The high number of houses suffering from moisture related problems and damage.
2. Overcrowding.
3. Housing design appropriateness as it relates to life style and cultural factors.
4. Poor construction practices and poor homeowner understanding of maintenance procedures.

This area is similar to the area south of the tree line in the Northwest Territories. Soil conditions vary widely and design for foundations is usually considered on a site specific basis. In many cases the soils consist of peat moss overlay and forest litter over a tan coloured, non-consolidated silty clay. The bearing capacity is often very low and designs for spread footings often assume a soil bearing pressure of 830 PSF (40 KPA) which is the lowest allowable for spread footings. In comparison, the average soil bearing pressure for southern regions varies between 2000 PSF and 5000 PSF. Water tables are high.

The problems we face are significant but not as severe as compared to the Northwest Territories with respect to material delivery logistics, permafrost and climate.

Overcrowding is a function of both family size, the housing shortage in the north and mobility patterns. Overcrowding will persist in the foreseeable future. Housing design cannot yet solve the problem given the restrictions facing the designer. But design can ease the effects of overcrowding and can make the house more livable under these conditions. Increasing the size helps somewhat, but redefining space usage and selection of the housing form can also help ease the problem.

One response method to this problem is to offer units with more bedrooms and larger living space. Septic systems now are provided at maximized capacities. In the future, I foresee discreet rooms being abandoned in favour of interperatable, flowing space, particularly for bedrooms, which become simply bed alcoves with built-in drawers in clusters off a large main space. Communal living space becomes larger and use possibilities expand.

Change must occur with the input of the client and the house must change in small, incremental ways over time. This is because the client does not like radical change nor do people who deliver housing. The three bedroom bungalow is still the workhorse of the rural programs, but it has been transformed. This three bedroom bungalow is now 12 per cent larger with a large country kitchen and expanded living area. Interior storage is reduced with bulk storage provided largely in a shed on site.

This bungalow design also responds in small ways to rural and remote living needs. The transitional space or air lock entry is still provided but it has been brought back into the building envelope rather than being tacked on. In other designs we are showing a wind screen porch, hung on the side of the building and left without the second door. A high quality wood stove is provided to act as the main source of heating. As well, the chimney helps alleviate some humidity buildup. A deck is provided, usually with a full sheltering roof. Bedrooms are split to gain more privacy for the household members and to reduce hall space. The kitchen is large and faces the street.

Poor Construction Practices

The skill of trades people in rural areas is improving, slowly. However, there will continue to be people whose attitudes toward their work result in deficient workmanship. CMHC will be concentrating its efforts to improve the quality of housing in rural areas and the improvement in construction practises is an important factor in qualitative improvement. Inspection services, seminars and literature availability are vehicles with which we hope to improve construction practices. However, the lack of a housing market in many northern communities results in no local construction industry. Out-of-town contractors often do not have a vested interest in ensuring quality construction in rural communities, and many will not return willingly to fix small deficiencies. Increasing the level of sophistication of dwelling design often results in poorer workmanship or dis-interest in bidding.

We have observed through the RHN Demonstration Program how unskilled, caring people, under good supervision, can build good quality houses. Our assessment of what constitutes good trade practises and good quality is often coloured by urban values. Community norms should and are now being considered in the quality equation but we should endeavour to educate tradespeople and teach through example. This will continue to place considerable demands on inspectors, in particular. Poor maintenance, as we have heard, is a problem generated by a variety of factors and affects our choices of materials and equipment. Our approach is "keep it simple," and reduce costs where possible.

Material Availability/Equipment

Availability, quality and cost are often a problem in the north. Some methods of constructing foundations are impractical due to the lack of equipment, particularly piling rigs. Wood construction and light foundations are often used. Moisture related problems in northern housing are significant and affect a higher than acceptable percentage of dwellings.

The following conditions, either combined or singly, lead to severe problems:

- Poor site drainage
- Spring flooding
- High water tables
- Cooking and washing habits
- Poor maintenance
- Overcrowding.

Problems Common to Moisture-Troubled Houses

High levels of moisture in the living area and in the crawl space may lead to:

- Mould and mildew on the interior surface of exterior walls, particulary at the junction of two walls, the walls and ceiling, and inside closets on exterior walls; and on objects stored in the crawl space and in closets on exterior walls.
- Lifting of sheet and tile floors.

- Rotting of wooden window frames.
- Deterioration of doors (particularly at the edges) due to moist air exfiltration, water condensation and the freeze/thaw cycle.
- Odour from mould and mildew.
- Deterioration of studs and floor joists due to rot.
- General uncomfortable feeling of dampness in the dwelling.

This spring, the results of a study of moisture plagued houses in Norway House, Manitoba was completed. We suspected that evaporation of moisture from the soil was the main cause of moisture in crawl spaces and basements and in the living area. From the evidence gathered, it has been concluded that moisture damage in the living area is not directly caused by moisture conditions in the substructure. However, it was shown that wood members in the crawl space or basement contained moisture levels which would lead to deterioration quickly. The expected useful life of a dwelling in many cases can be shortened to five to ten years under severe conditions.

We must deal with the problems of the above grade space and the foundation space separately. To minimize the damage above grade we have skinned the exterior walls with rigid insulation to keep the stud inner surface temperature closer to that of the drywall surface. Water vapour will not condense as rapidly on wall surfaces.

Thermostatically controlled fans exhaust moist air without heat recovery devices in place and the presence of wood stoves and chimneys also help to exhaust air. The costs of repair and replacement of dwellings have been assessed against the cost and maintenance probabilities of energy conserving devices. Energy conservation is not an overriding consideration in our newer designs although triple glazed windows remain a standard and insulation levels are at national norms.

The significant changes we have made occur in the crawl space/basement area. The first change is that we no longer build basements under our programs in Manitoba, although we have been doing this in several areas for sometime now. The strongest argument for basements is they can be finished and captured as usable space. The reality is that homeowners/renters do not have the financial resources to finish basement areas into habitable space.

It costs money to heat these spaces. We also find that reducing the volume of air heated reduced operating costs. Given the income levels of the majority of our clients and the cost to the government of heating allowances, reduced air volumes make sense. This is also a form of energy conservation without added capital costs and likelihood of maintenance problems. In many areas, the building of a basement invites flooding and foundation damage. We also find that our clients do not have strong preferences for basements and their elimination has not been an issue.

How do you prevent moisture problems? First of all, the obvious:

1. Select well drained sites. In the north, this is difficult to achieve, so we assume high ground moisture levels. The ground elevation inside the crawl space is brought up to the level of the soil outside or higher. This prevents flooding. The sump pump, a constant source of maintenance problems is eliminated, as are the weeping tiles.

2. Wicking action along a foundation wall will contribute to rotting of sill plates and joist ends. Footings are placed on top of heavy poly and water-resistant membranes are placed on both sides of the foundation wall. The sill plate is separated from the foundation wall with building paper.

3. The crawl space is heated. You would expect this to be the norm, but occupants often turn the heat down or off in a crawl space to conserve energy or do not replace a rusted and non-functioning heater. We cannot assume the crawl space will be heated to lower the relative humidity in the space.

4. Insulate the foundation - preferably on the outside. This is a normal given but is often poorly executed.

5. Drain the crawl space using a sump pump and apply a heavy vapour barrier. Sump pumps are often turned off or burn out.

6. Ventilate using big vents in the summer, (not fall and spring). Temperatures should be equal to the outside.

7. Educate the homeowner.

If we were looking for a more realistic way of doing things, examples of it can be found in the NWT and the swamps of Louisiana. Crawl spaces should be separated from the ground and from the space above. There are no guarantees that by doing all the proper construction and operating items above, that the

crawl space will work. The problem is the contact point of house and soil. It may be necessary to divorce the house from the soil: treat the house and crawl space as one, or the crawl space as an insulated, horizontal plane and lift it all above the problem soil. Nothing is radical about this, but it is difficult to accept because of our conventional thinking. As it works elsewhere, it will work in Northern Manitoba.

This method of thinking about foundations, the envelope and the floor plan are the building blocks that we are now using to create a logical and functional house; a pattern found in all good houses.

NORTHERN HOUSING DESIGN AND CONSTRUCTION

David McCann

Introduction

Good design must respect the environment in which it proposes to operate. In small remote settlements - simple "operation and maintenance" is the bottom line. A tremendous design is of relatively little use if it requires outside servicing to remain viable, or if it cannot be largely maintained with local practical skills. Innovative design responds to these circumstances.

In larger northern communities and/or resource communities, there is greater scope for variation in design. Resource towns especially can handle more intensive development densities and sophisticated systems because:

a) they often have a single organizing force behind them (for example a mining company)
b) they have certain economies of scale going for them
c) they possess, in their resident populations, some of the knowledge and skills needed for complex maintenance and operation
d) the new residents often have mainstream aptitudes suited to close-quarter living.

The Northern Lifestyles

Lifestyles create the needs satisfied by housing design. The north has a number of lifestyles and associated economic activities spanning resource harvesting (hunting, trapping, fishing), trading, seasonal wage employment, and transfer payments (welfare, family allowance) from government. Each community presents its own unique mix of these activities.

Communities can be classified into three principal groups:

a) Predominant non-native and southern-oriented communities within the wage economy. Examples: Yellowknife, Pine Point
b) Mixed community economy of wage employment, renewable resource activities, and social assistance. Example: Rae-Edzo
c) Predominantly native subsistence economy community. Example: Snare Lake

All communities in the north are unique. Each has evolved under a special set of circumstances which explain a particular course of development. The wise designer is one who acquaints himself with these before committing ideas to paper.

Prior to addressing design features, however, let us consider the working environment facing the northern housing industry.

The Challenging Factors

The problems that have traditionally faced home builders and operators in northern Canada can be categorized under three conventional headings: Physical, Social and Economic. These challenges are particularly true for the smaller communities.

The Physical challenges are:

a) **Difficult terrain:**

Permafrost conditions contribute to a high incidence of foundation failure. Poor drainage conditions cause seasonal ponding of water which in turn become the root cause of health problems for the residents.

b) **Difficult servicing:**

Solid rock, permafrost conditions and interruptable power conditions make piped water-sewer servicing exceedingly difficult and/or expensive.

c) **Difficult climate:**

High degree day ratings (degree days below 18^{O}C: Fort Smith 7852, Yellowknife 8593, Iqualuit 9845, Inuvik 10174, Rankin Inlet 10600, Resolute Bay 12549, [compared to Saskatoon 6077, and Winnipeg 5889]) place great strain on heating systems and require large amounts of fuel. Climate shortens an already abbreviated building season, lowers on-site productivity and raises development costs.

d) **Distance:**

The expenses and difficulty of communication and co-ordination of time and position during all phases of housing administration present unique problems; and this often conflicts with the "time is money" business philosophy. Design specifications for buildings in a given community should consider the most cost-effective mode and timing of transport available. If an item is found to be missing or damaged on arrival in the community, replacement of the component by expensive air freight may be required.

The Social Factors are:

a) **Cultural differences:**

Survivalist attitudes (seasonally-oriented and flexibly scheduled) of the native majority population are in contrast to the (longer-term and rigidly-scheduled) view of the mainstream society minority. These differing tendencies are at the root of many misunderstandings and difficulties in the northern housing industry, and in the northern administration generally.

b) **Skill Levels:**

There are relatively few northern-resident design-building-management skills, and a lack of training occasions. A continuous flow of people from the south is brought to the north in order to maintain activity, administration, and training. This need will probably continue for some years. The never-ending flowthrough of individuals contributes to a "treadmill" effect. From the perspective of a northern resident, you are always educating an outsider who moves elsewhere when you have got him/her trained.

c) **Linguistic differences:**

The many languages of the northern native majority, while culturally enriching, complicate easy communication and the transfer of knowledge

and skills in the housing industry. These must be taken into account in the implementation of any program.

The Economic Factors are:

a) **Economic baselessness:**

The lack of sustained multi-year revenue sources, and the presence of boom-busy cycles (Schefferville, Quebec; Uranium City, Saskatchewan; Pine Point, NWT) often re-inforce the frontier notions of northern residents and southern "hi-graders." The boom-busy wobble discourages residents from developing the longer-term confidence required for successful housing investment.

b) **Building economics:**

The reduced volumes of building in scattered communities means that few economies of scale can be had. The production of standardized manufactured housing is the natural response to this problem. Housing agencies moving too quickly in this direction, however, do so at the risk of losing touch with the ultimate consumer client groups.

c) **Massive subsidy:**

While allowing quick delivery of needed housing, high levels of subsidy have undercut ownership potential by removing incentive. The generosity of staff and social housing arrangements have had the effect of discouraging marginally-capable homeownership candidates. These people would rather enjoy the responsibility-free relationship of tenant-to-government, that take on the risks and uncertainties of personal tenure. And so the status quo is reinforced.

Observations on the Evolving Situation in the NWT

Large and small communities have experienced dramatic life style and shelter changes over the last 25 years, some moving from tents and packing-

crate shacks to safe and comfortable multi-bedroom homes. The statement emerging from the 1972 Housing Task Force for the Northwest Territories read as follows:

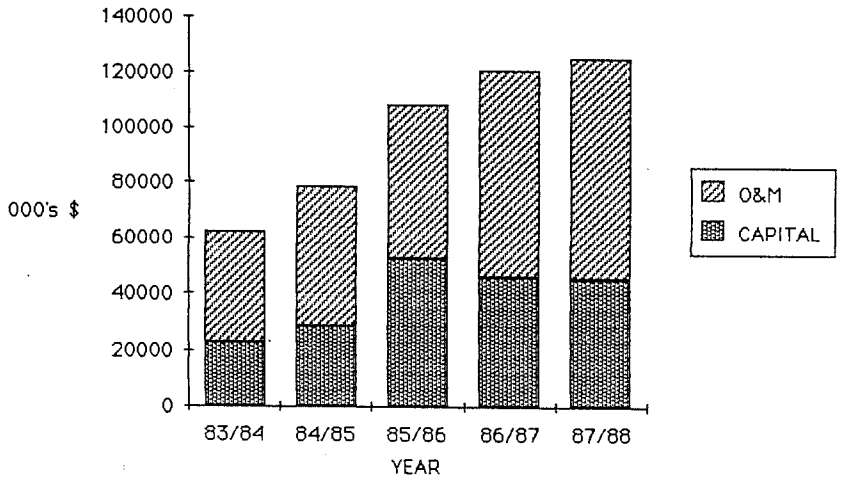
> The North is a frontier. It is a frontier for both men and ideas. The first priority for government in the north should be to enable its citizens to shelter their families and themselves in safety, comfort and dignity.

In response to this position, the NWT Housing Corporation (NWTHC) was formed, and the large-scale dollar flows from southern Canada began, largely via the government of the NWT and CMHC. Housing quality and quantity has improved, but this has been achieved at considerable cost to the taxpayer.

To illustrate this, growth in NWTHC budgets for the years 1984-1988 are summarized in the accompanying chart. The Corporation is the largest identifiable owner of housing in the NWT. In 1987-88, the NWTHC will spend in the neighbourhood of $125 million for all programs. About half of the O & M monies passed to local housing associations, or $25.5 million, will be spent on energy (average combined fuel and electricity costs of $6,000/unit). The NWTHC controls some 4,200 units of housing across the Territories.

Federal and Territorial governments control approximately another 3,500 staff units. Programs offering incentives to save energy in staff and social housing are still some way from making occupants truly accountable for the energy and utilities they use.

NWTHC
Expenditure Levels

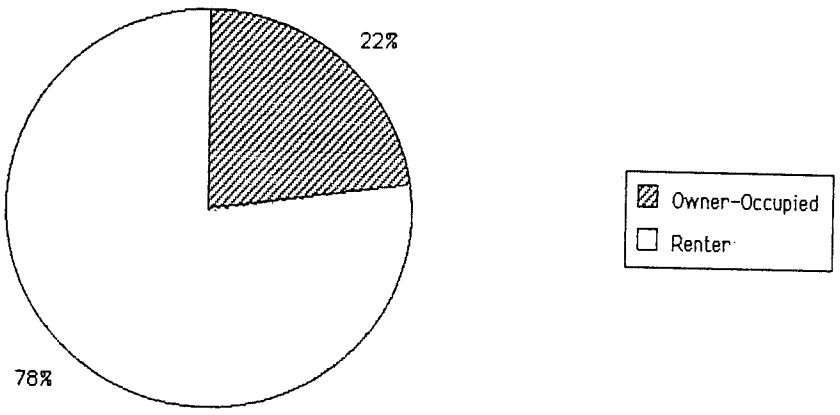


High costs coupled with a lack of occupant incentives in northern housing is creating a financial "black hole" for governments. Without the careful implementation of selected private market mechanisms, it is difficult to see how the system can be rationalized for the benefit of all.

1981 Census figures indicate that about 22% of Territorial units were occupied by their owners. The similar figure for Canada as a whole is 62%. See the accompanying charts. Virtually all northern renters (staff and social housing) are subsidized in both rent and utilities.

The NWTHC Homeownership Assistance Program has enjoyed some success in the last few years. Recent analysis suggests that it may be advantageous, from the life-cycle public expenditure point of view, to provide a $46,000 package to an owner-builder who will be fully accountable for all fuel/maintenance; rather than to build and manage a public housing unit.

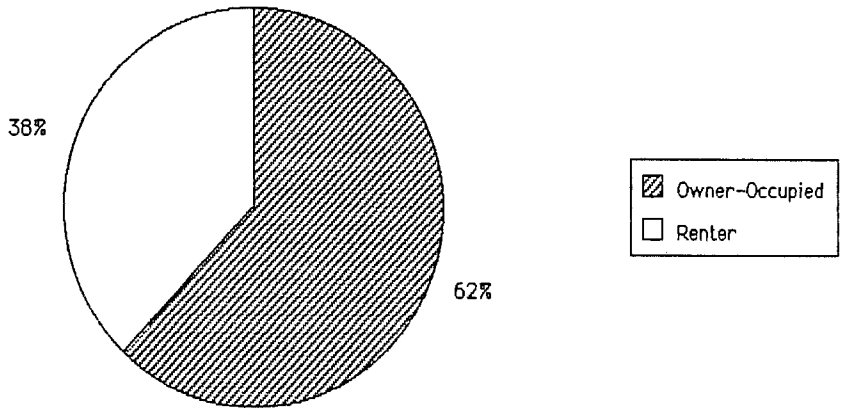
N.W.T. Dwelling Tenure



Source: 1981 Census of Canada

The above is provided to illustrate the significant resource levels required to sustain a reasonable quality of housing in a northern context. It also indicates that any hope for efficiency and self-sufficiency must be built on an ability to control O & M costs.

Canada Dwelling Tenure



Source: 1981 Census of Canada

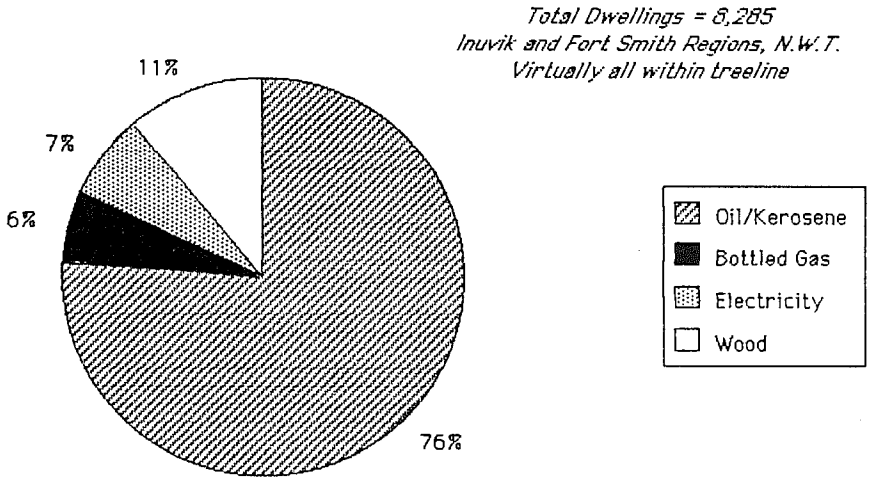
Energy-Related Suggestions to Designers

With long heating seasons, high fuel prices and electrical rates, energy conservation must be a prime concern of the northern housing designer. The bulk of the following suggestions relate to smaller settlements, rather than the larger resource wage-earning communities:

- Seriously consider the use of wood-burning appliances as principal heating devices south of the treeline. See the accompanying chart. Almost two thirds of the total NWT population, and virtually all provincial populations live within the treeline. This is an opportunity to use a local resource, promote self-sufficiency, and create

employment. The 1986 HAP units in the S-W NWT are equipped with both hot air oil furnaces and wood stoves. Some fully accountable owner-occupants state that they intend to burn wood as the principal fuel, and keep oil furnaces for unattended operation situations.

Western Arctic Dwellings by Principal Heating Fuel



Source: 1981 Census of Canada

- Ensure that the building design has relatively heavy insulation. Whether or not the designer wishes to use the R2000 standards depends upon site-specific economic analysis, but these are certainly worth considering. High insulation values also help to create comfort, and counter the settlement criticism that a wood-heated home cannot hold overnight heat.

- Ensure that the building envelope has a fairly tight seal, but include a mechanical ventilation system as an integral part of the package. Airlock arrangements should be used for prime entry points.

- Ensure that building living space windows are given a southern orientation to pick up available solar insolation. Additional natural light helps to minimize the need for electric lights.

- Operable windows are desirable, especially when required for cooling ventilation in summers. The recommended window type is a wood framed, triple glazed, casement variety that is operable with a lever type mechanism.

- Diesel-generated electrical energy is expensive in smaller, more remote communities. The use of fluorescent fixtures contributes to the minimization of electrical cost during long periods of darkness.

- Ensure that all utility flows are metered or are meterable, as the careful measurement of utilities will set the stage for serious management.

- In larger communities of wage earners, housing density can be increased with semi-detached units and row housing to lower land costs and per-unit average fuel consumptions.

Other Design Suggestions

- Thorough community consultation is critical to the designer's understanding of the priorities and perceptions of local residents. While some might consider this to be superfluous in the interests of moving the project along, in the longer term, it is a good opportunity to avoid "Mainstream/Survivalist" value clashes. Specific community provisions (preservation of a favourable site near the shore or river) may have priority. On some occasions, the designer may accommodate a house on a site that might not meet ideal requirements.

- Select a site for your housing which takes into account the microclimate. Natural land forms and southern slopes may provide wind

breaks, as well as optimizing the benefits of a southern exposure. This can be of significance in those locations where the emergence of the spring sun may provide heat gain benefits in a building, even though the outside air temperature is cold.

- Ensure that quality foundation work is done. Foundation failure has been the root cause of many house problems in the NWT. Detailed site information is necessary in order to determine the settlement characteristics of the soil at a specific location. Once done, it is possible to derive a foundation design suitable for the site. Otherwise lay down a gravel pad which insulates the active layer of the soil and provides a well drained structural pad to bear the building load. It is possible in more southerly locations to build wood or concrete basements.

- Use simple designs that the uninitiated can contribute to, possibly in construction and certainly in maintenance.

- Housing should have two entries, one as the principal entry, and the other as service/fire exit. All entries should be designed after due consideration of snow-drifting patterns and prevailing winds. There should ideally be two (one airlock, one vestibule) zones between the outside and the heated living space of the building envelope.

- To counter snow drifting, place entrances so that the prevailing winter winds blow across them. Community streets running parallel to prevailing winds tend to be swept clear, and this can be very useful for the approach of servicing vehicles.

- Exterior materials should be durable, easily repairable, and where possible, sourced in the community.

- There is a range of home storage situations required. The amount of space required is a function of the distance from the source of supplies, and the frequency of supply. For on-road communities, little

more storage is required than is supplied for a normal urban home in mainstream Canada. At the other end of the scale, an annual re-supply community with a wage economy must have homes with about 8 square meters of cool-temperature food storage, as well as some supplementary freezer space.

- In the smaller subsistence communities where country food represents a significant part of the diet, a utility area set aside for the preparation of "country food" is a necessity.

- Some flexibility in internal layout within the unit can be a fulfilling vehicle of self-expression for the occupant.

- Exterior spaces vary by community type. In the larger centres where the lifestyle is more wage-oriented, less exterior space is required. Smaller subsistence communities may wish more exterior space for hunting equipment, although there can also be family sharing of some areas on a pooled basis.

- For communities with interruptable power supplies you may wish to consider power-out design features [i) super-insulated building envelope, ii) gravity water systems, and iii) drainable plumbing systems].

Conclusion

It is the nature of the end-user community (survivalist, mainstreamer, or some mix of the two) that determines the successful housing type and density. Design that ignores this reality in the North, does so at the risk of poor cost-effectiveness and serious socio-economic consequences.

The design challenge is to deliver the best possible housing while ensuring the long-term cost-effectiveness of the product at a community level. This direction should cause designers to provide modest space allocations,

low-demand utility fixtures, and situations which maximize the use of local resources in operation.

CANADIAN RESOURCE COMMUNITIES: THE RESIDENTS' PERSPECTIVE IN THE 1980s

Richard Roberts

Introduction

It has been almost 20 years since comprehensive and in-depth research has been undertaken on Canadian resource towns. Yet, many of the findings of these dated studies are still in current use and often form the basis for policy decisions for resource towns being planned today. Resource towns have undergone many significant changes during the last 20 years, and what may have been fact then has, unfortunately, formed the basis for the myths of today.

In February, 1982, Praxis, A Social Planning Company,[1] was commissioned by Canstar Oil Sands Limited (Canstar) to undertake The Resource Community Study (RCS).[2] The Study was to assist Canstar in developing its housing policy and other corporate community policies and practices. Ultimately, Canstar wanted to learn what would be critical for the attraction and retention of workers.

In order to achieve the study goals, Praxis sought to establish an up-to-date data base from which subsequent policy formulation could occur.

Canstar in discussion with the consultants selected five western Canadian resource communities to be studied. These include Fort McMurray, Alberta; Leaf Rapids, Manitoba; and Sparwood, Elkford and Kitimat in British Columbia (Figure 1).

In an attempt to obtain an in-depth understanding of the trends, patterns and changes which have occurred in resource towns during these two decades, a unique, grassroots approach was undertaken. The extent of involvement of government, industry and community residents in this study has seldom been achieved over such a range of communities. The involvement of the client group throughout the study was also unique in terms of its commitment to an

open information policy. While the end product is paramount, the process utilized here allowed all those initially involved in the process to see the outcome and understand how their contribution was used. The rewards achieved through feeding back the data to those residents who initially provided it cannot be underestimated. The result was a wealth of data that will be useful for years to come.

FIGURE 1

Study Communities

TABLE 1

Characteristics of the Study Communities

Community	Population (1982)	Resource Base	Age of Community (years)	State of the Local Economy
Fort McMurray	31,000	Oil Sands	20	Recent decision to cancel Alsands plant is causing economic downturn.
Leaf Rapids	2,500	Copper, Zinc	10	One-third of workforce laid-off during study with one month shut down planned during summer due to lack of markets.
Kitimat	14,900	Aluminum Forestry Methanol	27	Alcan expansion underway, Eurocan expansion underway. Ocelot methanol plant nearing completion with proposed expansion to petrochemical project.
Sparwood	5,600	Coal	20	B.C. Coal expanding with opening of Greenhills mine scheduled for 1983.
Elkford	3,500	Coal	10	Fording and Crows Nest Resources expanding. Some of Greenhills workers will also reside in Elkford.

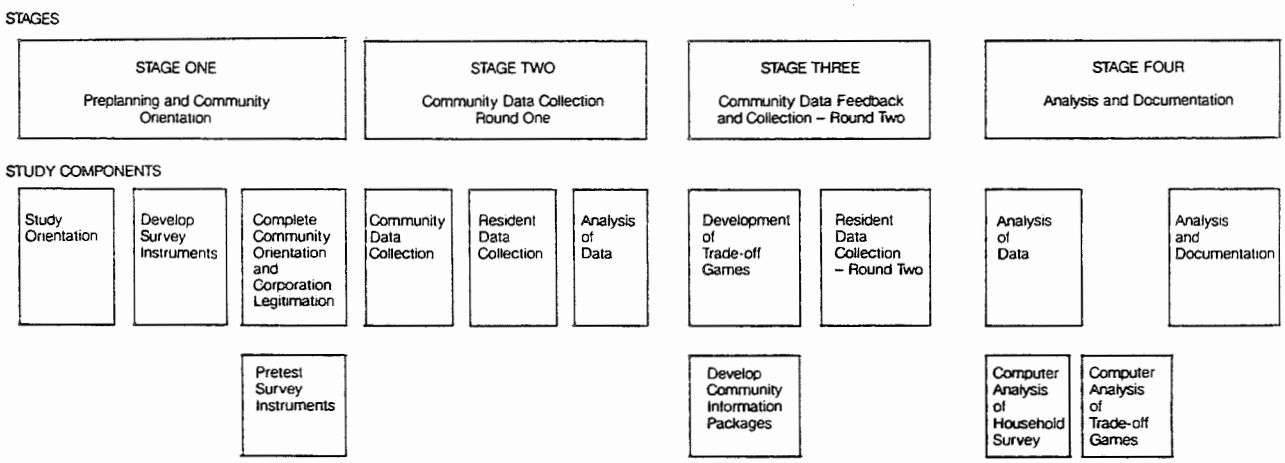
Study Process

To achieve the information previously outlined, an innovative four-phase research approach was developed (Figure 2).

- **Stage One:** Preplanning and Community Orientation, included meetings with government, industry and community leaders. Over 75 interviews were completed.
- **Stage Two:** Community Data Collection, involved hiring of 24 local interviewers who completed 632 two-hour household interviews.
- **Stage Three:** Community Feedback, included a series of workshops in each community where the survey results were presented. In addition, housing and cultural/recreational trade-off games were played with all participants.
- **Stage Four:** Analysis and Documentation.

FIGURE 2

Study Process



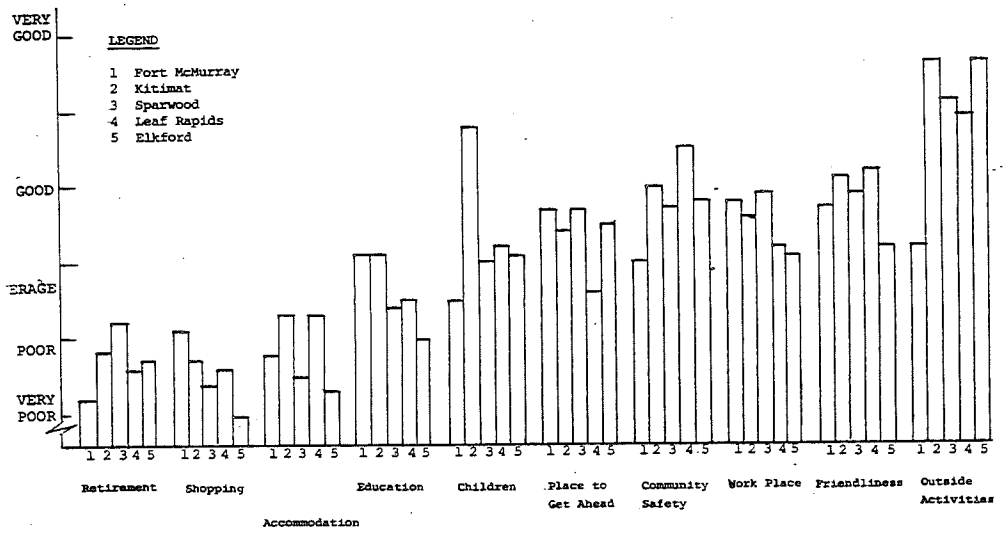
Quality of Life in Communities

In all five communities the ratings were extremely high for most of the quality of life indicators. The only exceptions were education, shopping and retirement. Of the five communities, Kitimat residents rated their community by far the best. Residents rated the community highly on all indicators, even education, shopping and retirement. While the latter two were low, they were still higher than any other community.

Sparwood, then Elkford were the next most highly rated followed by Leaf Rapids and Fort McMurray. Fort McMurray was not rated as highly as the other communities but it must be remembered that all community ratings were higher than anticipated. The situation in Fort McMurray resulted as residents felt it was a poor place to raise children and the variety, type and access to out-of-doors recreational opportunities was limited. The community rated highly on workplace indicators but less positively on social/community indicators.

Figure 3

Comparison of Quality of Life Indicators



In all cases, residents saw their communities as becoming even better places to live. They saw their communities maturing rapidly over the next five years. The major request was for improved commercial and recreational services.

Some major changes have occurred in resource communities during the past decade, more particularly in the last few years. The fact is, people are staying in the communities. While employment and economic opportunities attracted the majority of residents to the community, major reasons that they are staying relate to the quality of life available in a smaller town. People have established roots even in the current, rapid growth situations. The response in Kitimat was "...the leave town syndrome is over. People are returning first to the town, then looking for jobs." It can be seen that the communities are stabilizing. The older communities such as Sparwood and Kitimat have certainly seen this change; the unique situation seems to be that the new, growth communities are also stabilizing more quickly than has previously been the situation. This can be observed in Elkford and Fort

McMurray. A variety of suppositions can be made. Municipal and provincial government intervention, the early establishment of local, autonomous government, greater participation in community activities and the growing awareness that small town lifestyles can be preferable to those of the big city; these all have resulted in increasing stability in the communities.

The study supports the premise that it is inappropriate to use provincial standards when identifying the needs of a resource community. Activities and services differ from a large, urban community and for that matter, even smaller non-resource communities. Quality of life is measured by small town atmosphere, family ties, availability and access to services and, in particular, outdoor recreational activities and facilities. Access to community and recreational services is seen as one of the coping mechanisms which make a resource community into a place that can be called home.

Resident Characteristics

The population and employment characteristics across all five communities is very homogeneous. This leads one to surmise that by using this study population to make projections related to housing or transportation, the likelihood is excellent that the projection will be accurate. One must always be aware of such factors as the age of the community and when the peak growth periods occur when making such projections, however.

Generally, a significant group has remained in each of the communities from initial start-up or following each of the major growth periods. The median length of residency was 7.3 years, ranging from 5.3 (Elkford) to 13.1 (Kitimat) years.

Between 60% and 90% of residents came from job/communities within the same province as the particular community. A total of 83% of the residents from all five communities came from locations **within** western Canada. The residents generally came from relatively small communities, usually of less than 10,000 population. Very few came from large, urban centres.

The average family contains 3.6 people. The families are younger than the Canadian average, with a generally higher level of education than has been seen previously, and have an average household income of approximately $35,000, high compared to the Canadian norm.

Approximately 60% of the jobs were in the basic industry with the remaining 40% devoted to service sector employment. Job tenure was longer than expected and turnover lower than expected. This was partially due to the maturing of the communities as well as a concentrated effort to reduce turnover which recently has been initiated by some of the companies in these towns.

Community Services

It became obvious that community services play a vital role in the real and perceived well-being of the residents. Respondents were very careful and selective when discussing community services. Residents gave extensive thought to the issue of needs and priorities for community services both in their own community as well as the requirements in a new town.

Time, and the stage of community development are key factors in the need for services. As the community matures the need for service changes. For the initial development of high quality health and education services was essential. The high priorities and ratings for these services bears out this statement. A second level of priority included commercial, public, recreation and justice services. A tertiary level of service priority indicates the need for entertainment, human resources and other services.

The residents emphasized that a broad range of community services are essential to a town's success. What is equally critical is the timing and quality of the services. As seen from the responses and priorities in Elkford, for the town currently in a growth situation, planning in advance of need is essential. Education and health programs and facilities should not lag behind need. Frustration sets in, people worry about the health and education of their children.

Residents responded almost unanimously regarding the lack of commercial services. There is a failure to meet the consumers' needs for lower prices, sales, selection and variety. Travel became one of the most common methods to meet the needs, however, this further impedes the development of an adequate commercial centre in a town.

When reviewing major resident variables, some valuable insights become apparent. When residents first arrive in a new town their concerns relate closely to the needs for housing and caring for the health and education needs of their family. As time passes, residents begin to look outward; they look to their neighbourhood and to the community. Community activities and services begin to take on much more meaning.

A very important indicator is that of marital status. Respondents who were married rated health and education as critical over all else. Singles, on the other hand, rated health as important (not education) followed by entertainment, commercial and public services. Single status individuals rated housing somewhat higher than married respondents. This is probably due to the dispersed emphasis of those with families towards housing, health and education, all of which are important.

Finally, age is a key indicator. Younger residents place greater emphasis on recreation, public, and commercial services than residents in their thirties; they place less on health and education. During the thirties primarily due to the fact that these are the child rearing years, heavy priority is given to health, education and housing. The focus becomes the family. Almost all other services are considered absolutely low priority in comparison. Older age groups place greater emphasis on health care and commercial services in the community. Entertainment and recreation priorities begin to increase as well.

While some of these indicators seem very practical and common sense, the employment and recruitment programs established by the company and/or government should consider the implications of differing demographic characteristics on the types of housing, housing programs and need for various

community services. Without an emphasis on health care, education and commercial services, personal and family stress could develop. In turn, this may increase resident dissatisfaction resulting in decisions to leave the community.

Existing Housing

Most residents re-inforced the commonly held belief that accommodation was difficult to obtain in resource communities. Three basic reasons were provided; lack of availability, lack of appropriateness for their lifestyle or stage of life and affordability. Housing for the service sector presented even greater problems of availability and affordability.

Housing was seen as most critical for residents first moving into the community and for young couples with children. Housing was important in retaining residents, but not as important as expected. The longer one remained in the community the less important housing became and the more important became location, friends and community services. Other factors such as good community services were also essential along with outdoor recreation, friendship and family ties, and the small town atmosphere. All respondents were adamant that company housing not be "ghettoized," rather it should be mixed and dispersed throughout the community.

Single family housing predominated in the communities, ranging from 50% to 70% depending on the community. A definite housing ladder was noted when tracing housing type and tenure patterns. The progression seems to be much faster than expected with most residents moving from multiple family, rental accommodation to single family, home ownership within one or two moves. One-half of the respondents had been in their current residence for three years or less; a further one-third had been in their homes for more than six years. A pattern developed when comparing length of residency with the major boom periods in each community. Many people moved into a home during the boom and have never left that home. Primarily, they were young and of child bearing

age. They raised their young in that home, probably held some form of housing subsidy and have remained in the home even after the children have left home.

Housing size was not excessive, averaging approximately 1200 square feet. However, averages are deceiving. Over one-third lived in houses in excess of 1200 square feet while a similar proportion lived in housing of less than 1000 square feet. Most residents indicated that they chose their housing because it was affordable or that it was all that was available. Extensive comments were made on lack of housing choice, and that housing types were inappropriate to resident lifestyles.

Over one-half of the residents have completed extensive upgrading of their homes. Of those who had not completed renovations, there was a strong desire to do so but regulations did not allow renovations or the costs were too high. Renovations were undertaken for three major reasons; to add space to the home, to upgrade the home including finishing the basement or garage, and to conserve energy.

New housing costs ranged from $65,000 to $135,000 across the five communities, averaging $90,000 to $100,000. When asking respondents what their monthly housing costs were, responses varied from $350 per month in Kitimat to $750 per month in Fort McMurray, resulting in a median housing cost of $525 per month.

Average interest rates ranged from 11% in Kitimat and Sparwood to 16% in Elkford. Over the next two years, many mortgages must be renegotiated. Many residents indicated extreme concern about their ability to renew their mortgage if interest rates did not decrease substantially.[3] While many felt they would have to save or could cope in other ways, some indicated they must sell their homes or obtain better arrangements through their employer. With the poor financial condition of several of the resource companies, this could present some very serious problems both for the employees and the companies. This says nothing about the service sector employees whose problems may be that much more severe. It is a distinct possibility that many resource communities may lose a substantial portion of their service sector in the next

few years unless the situation changes dramatically or some form of additional assistance can be provided.

This leads into a discussion of subsidies in these communities. Approximately 40% of the households noted that they received one or more subsidies. This varied from a high of 68% in Leaf Rapids to only 17% of the households in Kitimat. The majority of subsidies are for interest free loans, assistance on the first and second mortgages, or utility subsidies. Most people in the latter situation have resided in their house for such a long period they are no longer eligible for subsidies. A similar situation also exists in Sparwood.

Rental accommodation ranges from a median of $277 per month in Sparwood to $540 in Fort McMurray averaging $417 per month across all communities. In those communities where some form of rental subsidy exists, such as in Leaf Rapids, many residents are unaware that these built-in, rental subsidies even exist.

Housing Preferences

Almost total unanimity existed regarding the preference for single family housing; over ninety per cent of residents wanted single family homes. Privacy, the ability of the residence to best meet their needs, and spaciousness were given as major reasons for this choice. Almost all of the younger people of child bearing age desired single family homes in which they could raise their families. Only the younger or newer arrivals and older or longer term residents indicated slightly less need or desire for single family homes.

Single people and those who were divorced, widowed or separated also indicated a slightly lower preference toward single family homes; a slightly greater proportion preferring attached and mobile home options. Service sector employees also noted slightly greater preference toward attached and

mobile homes which may be the result of a real or perceived inability to pay for single family housing.

Location of residence within the community was considered important to many of the residents. Almost one-third indicated a desire to live in a rural subdivision option if available. Again, privacy was given as the greatest reason. Those choosing to live in town desired this option so that they could be close to various community services. People were very conservative in their expressed requirements for future homes. People seemed to build in their own constraints. Whether this was conditioned by economic reality, interest rates, or other reasons is unknown.

Newly arrived residents and the younger residents wanted larger homes probably as they had families, or were preparing to raise families, hence increased size was seen as important. The older and more long-term residents were satisfied with smaller homes. Children had left or were leaving home, so there was less need for the larger space. While the company employees indicated average housing size was adequate, the service sector was split, some wanting very small homes, others wanting large homes. The reason for this split was unclear.

Residents wanted to pay only slightly more for future housing than they are paying in their existing homes. This is not unexpected as they wanted a similar increase in unit size; both relatively small increases considering this may be the home in which they spend much of their life.

Fort McMurray and Leaf Rapids residents both wanted substantial reductions in housing costs. As Fort McMurray residents spent the greatest amount of money on housing this could be seen as justifiable, although probably not realistic. Kitimat, Sparwood and Elkford all indicated housing prices would increase substantially showing a more realistic view of the housing market.

Leaf Rapids deserves special attention as it is the most subsidized of all the communities. While paying the lowest housing costs, residents still wanted larger, future homes while still desiring to pay substantially less

than their present payments. It seems that the sheltering effect of the subsidies has a reverse, negative effect as residents have developed unrealistic demands for housing (and maybe other needs and services) related to what they are willing to pay. It may be that a point exists beyond which subsidization begins to have a negative effect. People become too isolated from the "real world" and demand more than the system can provide.

This certainly will create problems for the residents, the employer and all levels of government which provide various subsidization programs. To reinforce this point, in Sparwood, housing subsidies were increased substantially. Residents in the community workshops indicated that housing costs rose comparably within a very short time, negating the effect of the increased interest free loan. It seems that little could be done to avoid this situation except if housing and land had been "banked" in order to buffer this effect.

Most respondents indicated that they would be able to provide a substantial down payment for their new home. In many cases, this depended on the sale of their existing home. In the more settled communities, the residents had a greater ability to provide large down payments; in all likelihood due to the longer residency, therefore greater equity, of residents who now own their homes. The quandary was Elkford. Even though it is a "growth" community, many of the residents indicated they could provide substantial down payments. It is not understood where these residents would obtain this money. It does not fit the image of the new resident who may arrive with little, if any, money, and may possibly be in debt in their former community. Further work needs to be completed to understand the significance of this situation and the implications on policy formulation.

Almost everyone wanted to reduce housing costs. One way in which residents felt they could reduce housing costs in these communities was through the concept of "sweat equity." Contributions ranged from building the homes themselves, completing framing and carpentry work to completing the interior and exterior of the homes, the latter two by far the most popular suggestions.

A broad range of priorities became apparent when residents were asked about community, neighbourhood and housing needs. A housing trade-off game was developed and used in all the community workshops in an attempt to identify residents' real needs and what they were willing to give up in order to obtain these desired amenities. Participants scored their existing housing attributes, then established what they would like in their next home with no constraints applied. Finally, they were required to constrain their overall requirements approximately ten per cent below their current housing costs. Surprisingly, participants increased their housing costs by only 20% when comparing existing housing with their unconstrained choice, a relatively conservative increase when realizing they could have increased their housing costs by over 100%. The most important changes occur when comparing existing homes with the financially constrained choice. Overall, participants had to reduce their housing attributes to a level below that in which they currently live. However, residents would not reduce the size of home, their size of lot, nor their desire for privacy. Also, they substantially increased the amount of money they would pay for higher levels of energy efficiency in their home as well as for a more uniquely designed home.

As participants were being forced to spend less than in their existing housing, they had to reduce substantially some attributes to retain others. To accomplish this, they substantially decreased the level of lot servicing by giving up the need for underground services, street lighting and curbs and gutters. They also reduced the level of dwelling completion stating that they could complete the painting and finishing, the basement and garage, and the landscaping themselves. Also, they saw less need to be close to most community services.

Finally, after completing a regression analysis of the data, it was clear that attributes which increased residents' level of satisfaction were privacy, the size of housing unit, access to schools and parks and view. However, it must be noted that other factors not included in the trade-off game such as housing price, interest rates and other factors could affect satisfaction to a much greater degree.

Transportation

Transportation and the private vehicle play a very pivotal role in resource communities. Vehicle ownership is high, with some communities averaging two vehicles per family **excluding** recreational vehicles. Almost all adults have drivers' licenses including both men and women.

Residents spend extensive periods of time in their vehicles either for work and business, entertainment, shopping, or vacation. People use their vehicles for work much more than expected. Even in communities such as Elkford and Fort McMurray where company transportation is provided, one-half to two-thirds of the respondents drive their own vehicle to work. It would be even higher if those who carpool are included. Non-business travel patterns indicate that people will use their automobile for almost any reason especially for shopping, entertainment and to obtain medical services. Many trips are multiple purpose accomplishing many activities with a single trip.

Residents of communities close to other centres drive twice the amount of those in more isolated locations. There is also higher reported car ownership in those communities where people can make greater use of their vehicles. Sparwood and Elkford have twice as many major trips per year as the average four times as many as residents of Fort McMurray or Leaf Rapids.

Residents do not travel to Hawaii, Las Vegas or the Bahamas for vacations. Rather, they go to the closest major centre, complete their essential tasks and then go to small towns across Canada. This occurs because many residents come from or have family and friends in these small communities.

In conclusion, people in resource towns travel, and travel extensively, whether as a means to escape, to obtain needed goods and services, or to see family and friends. Travel is a way of life in these communities.

Residents Recommendations for Community Planning

Resident responses were prolific regarding a whole range of issues. Residents feel that the main features which would retain people in the communities include employment; good medical, dental and other health services; education; housing, particularly affordable, quality housing; and comprehensive benefit packages. There is a general feeling that if an employer is a good corporate citizen, people would be more willing to support the company. For the first time in any resident survey, a large proportion of the employees state there is nothing which would make them leave their employer. Sparwood residents show the most positive response to B.C. Coal (now called Westcan). Some of the accomplishments of B.C. Coal include positive community relations, awards for length of service, community banquets/parties sponsored by the company, to name but a few. These are greatly appreciated by the residents. Residents provide a wide range of responses to planners of a new town. Responses fall into several major categories:

- anticipatory rather than reactive planning;
- appropriate, affordable housing designed for the local winter and snow conditions;
- resident involvement in the planning process at the community and housing levels;
- planners and consultants who have spent time in the community and in the region so they are aware of the problems;
- no high density housing;
- draw on experience of other communities/situations/residents to plan a new community; and
- have health, education and commercial services available in the community before residents arrive.

Summary of Recommendations

The policy recommendations are extensive, complex and highly interrelated. Of particular concern is the fact that while many recommendations may become the responsibility of the Company, many are also the direct or joint responsibility of the various levels of government and the community. A matrix which summarizes the recommendations and responsibilities is outlined in Table 2.

TABLE 2

Page 1

1	LEGEND Primary ● Secondary ○	RESPONSIBILITY				
		IMPLEMENTATION	ADVOCACY	COOPERATIVE DEVELOPMENT		
OBJECTIVE	POLICY RECOMMENDATION	CORPORATION	GOVERNMENT	CORPORATION/ FEDERAL PROVINCIAL GOVERNMENT	CORPORATION/ MUNICIPAL GOVERNMENT	CORPORATION COMMUNITY
Housing Types, Tenure and Preferences (9.4.2)	. Guarantee for housing sales.	●				
	. Don't get into housing market. Use developer proposal calls.	●				
	. Provide housing information to new recruits.	●				
	. Develop transitional housing program for incoming employees.	●				
	. Develop transitional housing program for native people.	●		○		
	. Develop housing options and housing packages appropriate to incoming residents.	●				
	. Develop housing expansion packages.	●				
	. Develop housing supplies store.				○	●
	. Expand housing package "options" program to all housing in community.		●	○	○	
	. Develop program to include service sector.			●	○	
	. Develop range of developer housing proposal calls.	●				
	. Design housing, neighbourhood and community sensitive to northern conditions.	●		○		
	. Develop rural subdivisions.			○	●	
	. Review housing/servicing standards appropriate to housing needs of residents.	●				
	. Develop non-segmented housing market and disperse company housing throughout town.	●		○	○	
	. Build housing subsidy into the land.	○		○	●	
	. Remain competitive with other resource company housing subsidies.	●				
	. Develop housing/information office for incoming residents.	●			○	
	. Develop some housing appropriate to needs of special groups.	●		○		
	Transient Housing					
	. Develop camping and trailer campground for transients, to be upgraded in future as part of recreation system.	○			●	
	. Develop hostel for company employees.	●				
	. Develop hostel for other single status employees.			○	●	
	Mobile Homes					
	. Develop sensitive, permanent mobile home parks.	○			●	
	. Design unique, double wide, permanent trailer units.	●				
	. Provide adequate storage and parking.	●				
	. Develop park(s) with large, private, well landscaped lots.	●				
	. Engage management company to operate.	●				

TABLE 2

Page 2

2	LEGEND Primary ● Secondary ○	RESPONSIBILITY				
		IMPLEMENTATION	ADVOCACY	COOPERATIVE DEVELOPMENT		
OBJECTIVE	POLICY RECOMMENDATION	CORPORATION	GOVERNMENT	CORPORATION/ FEDERAL PROVINCIAL GOVERNMENT	CORPORATION/ MUNICIPAL GOVERNMENT	CORPORATION COMMUNITY
	Attached Housing					
	. Provide good range of attached housing types.	●				
	. Watch residential mix.	●			○	
	. Provide adequate parking, outdoor private spaces, good landscaping.	●				
	. Provide additional indoor/ outdoor storage.	●				
	. Engage management company to operate.	●				
Community Services (9.4.3)	. Development Agreement contain specific commitments of government service delivery.		●			
	. Basic services include high quality health, education and justice services.		●			
	. Develop information office and hire community development worker to assist residents.			●		
	. Assist with interim financing of community services if required.	●		○		
	. Develop more family oriented recreation and cultural programs.		●			
	. Support community development.	●				
	. Support development of community daycare services.		●			
	. Support adult education and community education programs.		●			
	. Develop school education program to increase awareness of company and employment opportunities.	●		○		
	. Develop coordinated health, social services programs especially related to emergency services			●	●	●
	. Develop and implement comprehensive recreation master plan.		●	○	○	○
Commercial Services (9.4.4)	. Support development of viable/ competitive commercial services.				●	●
	. Preference to purchase of Canadian goods.	●				
	. Preference to western Canadian goods.	●				
	. Attempt local purchase wherever possible. This should apply to contractors as well.	●				
	. Assign business development person to assist local enterprise.	●				●
	. Provide quota guarantees for purchase of local goods and services.	●				●
	. Develop cooperative, year-round community greenhouse.			●	○	○

TABLE 2

Page 3

3	LEGEND Primary ● Secondary ○	RESPONSIBILITY				
		IMPLEMENTATION	ADVOCACY	COOPERATIVE DEVELOPMENT		
OBJECTIVE	POLICY RECOMMENDATION	CORPORATION	GOVERNMENT	CORPORATION/ FEDERAL PROVINCIAL GOVERNMENT	CORPORATION/ MUNICIPAL GOVERNMENT	CORPORATION COMMUNITY
Employee Profiles (9.4.5)	. Develop labour force profiles.	●				
	. Base recruitment on labour force profiles.	●				
Labour Force Planning (9.4.6)	. Recruit in rural and resource communities.	●				
	. Use informal resident network.	●				
	. Recruit extended families.	●				
	. Develop skills inventory.	●				
	. Identify positive aspects of north.	●		○		
	. Screen employees: - community visitation - develop information package - information officer - community development worker - orientation programs	●				
	. Review alternatives to training.	●		○		
	. Monitor employment supply and demand.	●				
	. Discuss labour force needs with federal, provincial and various organizations.	●	○	○	○	
	. Support local/regional hire.	●		○		○
	. Require contractors/subcontractor to meet same local/regional hire.	●				○
	. Develop trade apprenticeship program.	●		○		
	. Review other manpower training programs.	●				
Employment, Training and Advancement of Target Groups (9.4.7)	. Develop comprehensive program to recruit, hire and train the target groups.	●		○		○
	. Develop program to advance competent target groups in the company.	●		○		
	. Advance target groups in the non-traditional jobs.	●		○		
	. Implement bridge positions to advance target group individuals	●		○		
	. Communicate programs to public.	●				○
	. Develop sensitizing program for managers.	●		○		
	. Require contractors to meet all corporate policies.	●				
	. Reduce artificial barriers to recruitment.	●		○		
	. Develop in-house training programs. Special focus should be placed on training for the target groups.	●		○		
	. Develop hiring goals for native people.	●		○		○
	. Bring native employees on slowly to adapt to work environment.	●		○		○
	. Hire native people throughout the corporate structure.	●		○		
	. Develop special native education upgrading programs.	●		○		
	. Establish native affairs component within the Company.	●				
	. Assist in development of women and native advisory group within the Company.	●				

TABLE 2

Page 4

4	LEGEND Primary ● Secondary ○	RESPONSIBILITY				
		IMPLEMENTATION	ADVOCACY	COOPERATIVE DEVELOPMENT		
OBJECTIVE	POLICY RECOMMENDATION	CORPORATION	GOVERNMENT	CORPORATION/ FEDERAL PROVINCIAL GOVERNMENT	CORPORATION/ MUNICIPAL GOVERNMENT	CORPORATION COMMUNITY
Contributions and Donations (9.4.8)	. Develop contributions and donations policy.	●				
	. Establish guidelines as to amount, type and extent of community support.	●				
	. Provide both financial and non-financial support.	●				
	. Develop social affairs fund as part of contributions and donations policy.	●				
	. Acknowledge non-financial contributions of employees.	●				
	. Develop scholarship program.	●				
Respondents' Advice for Community Planning (9.4.9)	. Develop local/regional social services delivery council.		●			
	. Develop local autonomy and local government from outset.		●			
	. Appoint company personnel for liaison regarding changing labour force requirements.	●		○	○	○
	. Provide warnings of potential decreases or shut downs.	●				
	. Support concept of resident involvement in design and planning.	●				○

Conclusion

The development of a new town will be a complex task requiring extensive cooperation between all levels of government, the community and the Company. It is essential that all responsibilities are identified and assigned to the various participants well in advance of the actual development and construction of the town. The failure to clearly establish responsibilities and channels of communication ahead of time can lead to confusion, uncertainty, stress and increased costs for all participants.

A master development agreement coupled with a community development agreement is one of the best methods to identify and develop the requirements including establishment of the time schedule, the costs and the responsibilities of all the participants in the process. Many of the recommendations require cooperation between various levels of government and the Company. Based on this and other input and direction obtained from other sources and within the Company, the corporate position can be developed in each of the policy areas. The government, of course, will have their own position(s). A negotiating process will have to be completed. If both sides have their positions well established, it will provide a good basis for completion of successful negotiations. It is hoped that in this manner, a cooperative, negotiated master development agreement and a community development agreement will lead to the creation of a viable, healthy and cohesive community at the earliest point in time. This study indicates that development of the five resource communities contains many examples of how new resource communities can be successfully built in the future. There is enough knowledge and resources to do an excellent job given a reasonable time frame and resources.

The recommendations were approved in principle by Canstar's Management Committee. To facilitate implementation, a series of "action matrices" were developed. These presented the recommendations, a description of the stage of policy approval achieved, further research required or company/government negotiations to be undertaken. Also identified were activities that should be undertaken immediately, followed by actions that could be delayed or were

classed as "contingency actions" - those activities necessary in the event of significant change.[4]

The Resource Community Study provided a rare opportunity to take an in-depth look at resource towns in Canada. The study process of focusing on direct resident input; using local interviewers, developing and administering the housing and recreational/cultural trade-off games, all contributed to new insights into the needs of resource community residents and their quality of life.

Many previous assumptions about resource towns were clarified. Most residents were actually quite happy with their community; their expectations were realistic and a growing proportion of residents were choosing to remain.

By taking a detailed look at resident needs, it was learned that priorities change over time; depending on the age and lifestyle of the residents and on the age and maturity of the community. This information can be valuable to planners in determining what services are most important, based on the demographic characteristics of projected residents.

It became possible to pinpoint specific housing features that were more critical than others, through the housing trade-off game. This information can have significance on housing policies for current and future resource towns.

The data base has only begun to be explored. Canstar has used it to formulate its housing and Local Benefits policies for a variety of development options. It has been used by Petro-Canada to develop a series of potential employee profiles. These profiles include requirements for recruitment, housing and community services for their Monkman Coal Project. Finally, the Aluminum Company of Canada recently commissioned a study elaborating on the history of Kitimat using the Resource Community Study data base.

Many other facets and areas of work have yet to be analyzed. A variety of other companies, governments and community organizations have expressed

interest in various aspects of the data base to assist in the development of their own policy or to better understand their own community. The public availability of the study has generated great interest.

The Resource Community Study presents a significant contribution to the study of resource towns in Canada, both in its capacity as a planning tool and in the wealth of contemporary data it produced. It signals a new era in resource town planning.

Notes

1. The study team consisted of Richard Roberts (project director), Mary Ann Murphy, Peter Seto, Rob McManus, all from Praxis; Dr. George Kupfer, Fresh Start Consultants and Dr. Ira Robinson as advisor to the team. Messrs David Stuart and Maddy Trelearne represented Canstar on the study team.

2. Canstar Oil Sands Ltd., is a joint venture between Nova, an Alberta Corporation and Petro Canada. The joint venture was established about two years ago in order to plan and construct an oil sands plant in the Athabasca oil sands region in northeastern Alberta.

3. Data collection occurred during 1982, just prior to the decline in interest rates.

4. This approach is based on The Analysis of Policy Options in Structure Plan Preparation: Strategic Choice Approach, by Alan Sutton, Allan Hickling and John Friend (1977).

CONTRIBUTORS

Robert Robson

As a CMHC Research Fellow, Robert Robson is preparing a study of northern housing concentrating specifically on the northern prairies and to a lesser extent the Yukon and the Northwest Territories. He is analyzing features such as housing supply and demand, community structure and quality of life. Prior to joining Institute of Urban Studies, Dr. Robson worked with the Rural and Small Town Research and Studies Programme at Mount Allison University in the preparation of a literature review/policy statement on Canadian single industry towns. He has held several sessional teaching appointments and has worked in a number of research positions. Dr. Robson's areas of expertise include Canadian history, urban history, social history, resource communities, frontier settlements and resource development policy.

Nils Larsson

Nils Larsson is an architect specializing in research. After graduating from McGill University in 1965, he worked in Montreal, Rome and Ottawa, in a variety of design and planning jobs. This was followed by eight years with Canada Mortgage and Housing Corporation (CMHC). In 1981, Larsson left CMHC and established his own consulting firm. Most of the firm's work involves northern or remote housing, in the form of design, energy analysis or program monitoring studies.

Richard Bushell

Richard Bushell is the Manager of Design and Development with the Northwest Territories (NWT) Housing Corporation. Currently responsible for the design and products of tender documentation for social housing in the NWT, Bushell has been active in the construction of northern housing for the past twenty years. He is a graduate of the Southern Alberta Institute of Technology and has been employed by both government and the private sector. Prior to joining the Housing Corporation, Bushell was the Senior Architectural Technologist for the Department of Public Works, Government of Alberta.

Glen Wither

Glen Wither is a graduate of the University of Toronto's architectural program. For the past six years Wither has worked with the Prairie and Northwest Territories Region of Canada Mortgage and Housing Corporation. He has extensive experience in the design of public housing, as well as consultation to private industry in market housing design. More recently, Wither has been involved in housing delivery in rural and northern locations. He also acts as the coordinator for the Rural and Native Demonstration Program, a self-help program delivered by CMHC.

David McCann

David McCann is the principal member in the consulting firm of Treeline Planning Services, Yellowknife, Northwest Territories. McCann holds a masters' in Regional Planning and for the past thirteen years has specialized in the planning of facilities for northern communities. Working at various times on resource proposal impact studies, housing need assessment and capital funding proposals, McCann has developed a well-rounded expertise in the development of the northern community. More recently, he has conducted research into energy, housing, community planning, small systems and business development.

Richard Roberts

Roberts is the President of Praxis, a Calgary consulting firm that has prepared a number of studies on northern communities. Concentrating specifically on planning and socio-economic assessment, Roberts has participated in designing development strategies for Tumbler Ridge, British Columbia, Banff, Alberta, the Canstar project as well as for the Beaufort Sea development and the Sarcee Nation. The report, Resource Community Study from which this particular paper evolved, is a major contribution to the further understanding of housing in the resource sector.