AN EXAMINATION OF SUBSIDY-RELATED HOME OPERATING COST FACTORS IN SELECTED RURAL AND NORTHERN COMMUNITIES IN MANITOBA

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AN EXAMINATION OF SUBSIDY-RELATED HOME OPERATING COST FACTORS IN SELECTED RURAL AND NORTHERN COMMUNITIES IN MANITOBA

BY

FREDERICK GEORGE STEPHEN WINNIK

A dissertation submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF CITY PLANNING

THIS THESIS IS DEDICATED TO MY WIFE IRMA, MY SON COLIN, AND OUR SECOND CHILD SOON TO BE

ACKNOWLEDGEMENTS

Special thanks is due to my advisor, Professor Basil Rotoff for his direction and guidance, and to my readers, Professor Peter Forster, Professor Samuel Trachtenberg, and Mr. Marvin Eyolfson for their advice and kind consideration.

My research was assisted by Mr. Julian Isitt, Mr. Gordon Haggerty, Mr. Joseph Zemcak and the staff of The Manitoba Housing and Renewal Corporation, the staff of Manitoba Hydro, and the Department of Northern Affairs.

Finally, thanks to my wife Irma for her patience and understanding, as always, and to Mrs. Shirley Dech for typing the final manuscript.

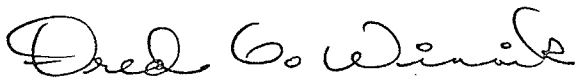
PREFACE

> "What we need . . . is . . . research . . . designed to evaluate the consequences of what we have done, what we are now doing, and what we intend to do. As a responsible citizen I cannot advocate a program of socially assisted housing at any price merely because I am aware that there is a tremendous human need. I want to know what evidence there is that I have really been helping to meet human need, and I cannot restrict my view simply to the physical shelter I am helping to provide. In many families there are deep set physical, social and emotional problems that cannot be met merely by putting a roof over the heads of the members of the family. At the same time, we must know whether we are in fact attaining our objectives of social integration - of enabling families to re-enter the mainstream of economic and social life in this country - by helping to provide them with decent housing accommodation in an adequate environment. If we believe the only question is 'How many dwelling units do we make available?' then I fear that we are merely bequeathing the most difficult questions to those who will succeed us by 1980 and thereafter."
>
> ALBERT ROSE

This thesis attempts to take an objective, apolitical approach to examining some of the problems which are currently characteristic of the socially assisted housing which has been provided in recent years for rural and northern residents in Manitoba.

The subsidized housing which we have provided as a Province in rural and northern areas has had a considerable impact upon the lives and social functioning of those residents who have chosen, for a variety of reasons, to live in them. But the thoughts and questions of Albert Rose are now mine, and 1980 is a very near tomorrow.

This thesis is an attempt to contribute some assistance to the many problems which currently plague low-income families in rural and northern communities, and this assistance will, perhaps, make life just that much more enjoyable, and just that much more worth the living for them.



FRED G. WINNIK

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INTRODUCTION

The purpose of this thesis is to define and analyze the home operating cost factors which currently affect or potentially will affect the disposable income of residents operating provincially subsidized housing units in selected rural and northern communities in Manitoba, and if necessary, to propose a method of alleviating such affects.

The hypothesis which this thesis examines is as follows:

I. As the various cost impacts to rural and northern residents are incorporated into Provincial Housing Programs, the need for viable cost-reduction alternatives increases.

SUBPROBLEMS

1. To establish the Manitoba provincial objectives which guided past rural and northern housing assistance.
2. To define and analyze the home-operating cost factors which actually affect or potentially will affect the disposable income of residents living in subsidized housing units in selected communities in Manitoba.
3. To define and evaluate the problematic cost impacts in terms of the Manitoba provincial objectives.

II. It is advantageous to both the affected residents and Government, to utilize cost-reducing self-help program alternatives on a community-specific basis to minimize actual and potential cost impacts while at the same time provide needed and/or desired amenities for residents.

This thesis has been organized into four chapters corresponding to the logical development of the author's research. The steps of this research are as follows:

1. To establish, through an examination of relevant literature, the general importance of subsidized housing to society as a whole, and to discover what Manitoba provincial objectives have been established to recognize this fact.

2. A case study approach is applied to the various Manitoba communities containing subsidized housing in order to discover those aspects of the assisted housing already provided which are consistent or inconsistent with these provincial objectives. These are viewed primarily from the occupant's perspective. The analysis carried out is essentially from a cost viewpoint, since actual monetary expenditures on behalf of subsidized housing residents are the most tangible of those costs experienced by occupants of assisted housing units within the Province.

3. The various problems accruing from this cost-oriented research are analyzed in terms of the stated provincial housing objectives.

4. An attempt is made to define and subsequently discuss a means by which some of the cost effects upon subsidized unit residents in rural and northern communities may possibly be alleviated or eliminated through a viable alternative.

CHAPTER I

CHAPTER I

AN INTRODUCTION TO PUBLIC HOUSING

The existence of publicly assisted housing within our cities and rural and northern areas is a perceived fact, but is often misunderstood. This chapter attempts to give the reader an introduction into what public housing is, why it exists and what it attempts to accomplish.

The chapter does not review the major criticism leveled against public housing (i.e. why it should not exist), but accepts the fact that it does, and works within this framework in its approach to the subject. The chapter also presents a brief overview of the various objectives of public housing programs administered by the Manitoba Provincial Government through The Manitoba Housing and Renewal Corporation.

I. AN INTRODUCTION TO PUBLIC HOUSING

In attempting to provide a comprehensive definition of the term 'public housing', a literature search was conducted in the hope that such a definition would be revealed. It was felt that a discussion of public housing would be facilitated if a clear, well-defined or well-established meaning for the term could be outlined for the reader. A review of the existing literature on public housing and subsidization, however, did not yield such a definition.

A review of the works of Robert Moore Fisher, who has contributed extensively to the subject of public housing, related that housing experts have disagreed among themselves for some time with respect to a comprehensive definition for the term. In his book 20 Years of Public Housing, Fisher does, however, point out that the term most often refers to all the housing units owned by governments or other public bodies at any given time. He also adds that to some, the term also refers to dwelling units which have been financed by government agencies or other public bodies.[1]

The Federal Government has had a crucial role to play in the provision of this financing for public housing. It was the Federal Government which had the borrowing and tax-raising capacity to make funds available to provincial

governments, so that public housing could be provided to our society.

It is also important at this point to outline just who public housing attempts to serve directly. The basic criteria which exist to select those who will live in public housing can be outlined as follows:

1. on the basis of income;

2. on the basis of the inadequacy of the accommodation the persons in question inhabit at the time of application;

3. by virtue of family size;

4. by virtue of social and physical disabilities;

5. by virtue of certain emergencies which families face from time to time which result from fire, natural disaster, or eviction.[2]

By understanding what publicly assisted housing is, and who it attempts to serve, one can begin to understand why it is considered by Canadians to be a necessary, and generally accepted aspect of our society.

A. THE GENERAL IMPORTANCE TO SOCIETY

It is a generally accepted tenet that the government's intervention in the housing market can be rationalized

for the most part on the basis of human and social responsibility:

> "Although it can be demonstrated that government intervention in housing will often serve a most important economic objective, the fundamental requirement remains the meeting of human need. When an important proportion of a national community's population is unable, through its own resources, to satisfy one of the three basic elements of the living standard (food, clothing or housing), there is a prima facie case for government action in what has been a personal or private matter for hundreds of years."[3]

Within our own Province of Manitoba there exists in both rural and urban areas, poor, blighted areas where indecent, unsafe or unsanitary housing can be found.[4] This situation is often aggravated by a shortage of decent, safe, sanitary housing which can be afforded by families living on a low wage. It should be noted, however, that ". . . what is regarded as an adequate standard of comfort will be determined according to local customs and local levels of income, and in response to long-term increases in real income and changes in taste and social conscience"[5]. In other words, the inherent meaning of "decent", "safe", or "sanitary" may change over time, and with alterations in cultural attitudes, situations and demands.

Catherin Bauer, in her book, A Citizen's Guide to Public Housing, points out three major reasons why there is a need for public housing, and why the public should be concerned about a shortage of it. Her reasons are:

1. Public housing is created and generated because the community recognizes it has a housing problem.

2. Primarily because of problems associated with existing unemployment and low wage conditions, good housing is no longer only an individual responsibility, it is also a public one.

3. Bad housing is not only harmful to the social functioning and physical health of individuals, but to society as a whole.[6]

In 1937, the original Wagner-Steagall Bill introduced in the House of Representatives in the United States pointed out that poor quality housing was a direct concern to the public interest, and is inimical to it because:

1. it tends to encourage the spread of disease and lower the level of health, morale and vitality for large groups of people;

2. It can increase fire hazards, the risks of accident and other natural and unnatural calamaties;

3. it subjects the moral standards of the young to a variety of bad or otherwise negative influences;

4. it tends to increase the violation of criminal laws;

5. it tends to impair industrial and agricultural productive efficiency;

6. it tends to lower the standards of living for large portions of people;

7. it necessitates a vast and extraordinary expenditure of public funds.[7]

The criticisms levelled against poor quality housing portray a bleak picture of it, to say the least. The struggles a person goes through to achieve a better standard of living for himself and his family in our highly competitive society seem endless when one attempts to visualize the sum-total of disadvantages acting upon residents of blighted areas, forced by various circumstances to reside in poor quality housing.

The abilities of these people to improve themselves in terms of social status, economic advantage or educational status are severely hampered indeed. Individuals who perhaps could potentially make valuable contributions to society are prevented from doing so because of circumstances inherent in their living environment which they are most often unable to control.

The provision of public housing for individuals in such circumstances not only attempts to provide a boon for society as a whole, but attempts to correct many of the ills which directly relate to the social functioning and physical health of these individuals.

If society can take an active role in raising an individual's feelings of dignity, this can have a benign effect on the way he functions within our society. Through the action of building public housing for the less fortunate individual within our social makeup, society directly conveys to this individual that he is deserving of something better than inadequate, dilapitated or otherwise insufficient housing.

Public housing attempts to achieve the basic value of a good, safe, decent home and living environment for those families who cannot provide adequate housing for themselves. It is an attempt to protect the family unit, and to ensure that it endures within society.

B. MANITOBA'S PROVINCIAL RURAL AND NORTHERN HOUSING OBJECTIVES

Background

Public housing projects are a fairly recent phenomenon in Canada. Canada's first public housing project began to be constructed in 1948 at a forty-two acre site in downtown Toronto known as Regent Park North. The National Housing Act of 1944 had provided grants towards slum clearance for this area totalling $1,150,000.00. Toronto used its own resources to finance the costs of construction and to subsidize rents for low income families.

The Housing Act of 1949 contained an amendment which paved the way for the Federal/Provincial cost sharing arrangements which would allow public housing to be constructed and rent subsidies to be paid for future developments. The Housing Act of 1949 also established that rectifying the social ills of Canadian communities would be carried out as a joint effort of the Federal government in collaboration with the provinces.[8]

A literature review of publications relating to public housing programs in Canada reveals no clear, well-defined set of objectives relating to the provisions of public housing since 1949. One possible explanation for this is as follows:

> "In rather low-key language, the National Housing Act simply refers to the purpose of 'improving housing and living conditions' and then offers a variety of means to assist in this direction. It has been the Canadian tradition to extend the legislation in a pragmatic way, by adding amendments step by step, rather than by making statements of principle and philosophy. Perhaps this is why there have been many discussions about the details of housing legislation, but rarely has there been a debate about principles and objectives."[9]

It has been the direct responsibility of the provinces to formulate, co-ordinate and implement programs within their own jurisdictions, providing that funding arrangements could obtain the approval of the Federal government through the Central Mortgage and Housing Corporation. The original Federal/Provincial partnership was designed

to "form a buffer between the municipalities (with whom the Federal government had dealt directly in the past and from whom the demand for more units would come) and the Federal government (which would bear the major cost burden)".[10]

It can be readily seen, therefore, that the provincial governments operate independently from each other, and also from the Federal government. Because of the differing nature of needs from province to province, each province has defined programs for itself in an attempt to satisfy its own public housing needs.

The belief of the Manitoba provincial government with respect to its public housing, and subsidies related to the provision of same, is that assistance through various subsidy programs is warranted when private net benefits of a project are less than the social net benefits which can be expected to accrue from such a project.[11] Because of this, a major intent on its behalf has been to maximize those social benefits which can be expected to develop from its programs.

It should be pointed out that currently, the majority of low-income housing is located either in city centres, or in rural areas where both community facilities and services are most often lacking. In cities, particularly, these households are frequently located in industrial or

commercial areas where various types of pollution are generally high. Newer government low-income projects have often been located on the edges of developing areas which are, for the most part, devoid of community facilities.[12]

Unfortunately, this observation is not completely untrue when viewing the public housing which has been provided by the Government of Manitoba under its programs in the past. Hopefully, with improved land acquisition and renovation programs many more favourable properties previously unavailable for public housing will be utilized to serve this end.

An Outline of Objectives

To determine the specific major objectives of the Province of Manitoba with respect to the provision of its publicly assisted housing through The Manitoba Housing and Renewal Corporation, this author had to conduct a search of the most likely documents to contain such information. News releases and various other public documents of differing types were consulted in an attempt to arrive at the definition of such major objectives.

The resulting list of objectives falls into four major areas of concern as pointed out below:

1. Direct Cost Reduction Assistance Objectives -

a) To provide for the production of reasonably costed units.

b) To minimize ongoing operating and maintenance costs to purchasers through design innovation and product improvements.

c) To provide for the satisfaction of need, and reduce current costs to the individual by providing as optimum a number of units to the various communities throughout the province as is feasibly possible.

d) In keeping with c) above, to be able to swiftly identify interest and need in provincial housing programs at the individual applicant level.

e) Generally, then, to shorten the length of time between expressed needs of people and the delivery of assistance.

2. Resource Related Objectives -

a) To train and employ local residents wherever possible.

b) To use local raw materials wherever possible.

3. Housing Stock Improvement Objectives -

a) To minimize ongoing operating and maintenance costs to purchasers through design innovation and product improvements (see 1 b) above).

b) To assume an active role in the rehabilitation of existing units which can be utilized for public housing.

c) To offer wider housing alternatives than are presently available to urban and rural areas.

4. Community Related Objectives -

a) To involve communities more closely in the fulfilling of their housing requirements.

b) To foster greater responsibility on the part of communities in the management and maintenance of their housing.

No references, however, were found with respect to the following environmental and planning oriented concerns:

1. To carry out provincial public housing programs while at the same time minimizing negative environmental impacts.

2. To carry out these programs with a minimum of interference to the surrounding neighborhoods and their lifestyles.

3. That proper planning and design principles will be a high priority in the provision of publicly assisted housing.

It should be pointed out, however, that a tour of thirty-three Manitoba communities under the jurisdiction of The Manitoba Housing and Renewal Corporation by this author in September, 1977, indicated that sincere attempts were being made to achieve all three of these omitted objec-

tives. In other words, the fact that these items were omitted from M.H.R.C. public documents does not necessarily imply that no attention is being paid to them currently. However, this also does not imply that a greater concentration on the above items is not necessary.

C. SUMMARY AND CONCLUSION

Although most housing experts disagree about a comprehensive definition for the term "public housing", they do agree on the crucial financial role which government plays in the provision of same to society. Not only does government attempt to secure a most important economic objective, but it does so on the basis of human and social responsibility.

Various contributors to the existing knowledge in the field of "public housing" believe strongly in the tenet that the provision of public housing results in a net benefit to society in terms of improved social functioning for the good of all parties concerned. It is on the basis of this tenet that government must clearly spell out and attempt to attain a high degree of achievement with respect to its housing objectives. These housing objectives should relate closely and directly to possible social net benefits accrued from displayed concern for the welfare of the individual.

Although the provision of public housing is a relatively recent phenomenon in Canada, it has made significant achievements with respect to improved social functioning and certainly has the potential to achieve much more if the existing problems are approached conscientiously and intelligently.

Existing evidence indicates that sincere attempts have been made to outline the various Manitoba provincial public housing objectives, but that in the areas of environmental impacts and planning concerns, there is still the opportunity to improve policies and statements of intent.

The following chapter presents a scenario of the various home-operating cost factors which actually affect or potentially may affect rural and northern residents living in subsidized housing units. These factors are necessary considerations when developing any programs which attempt to achieve any of the various Manitoba provincial rural and northern housing objectives.

By understanding the nature and complexity of the various home-operating cost factors, therefore, problem areas may come to light which may help to channel future directions in housing policy formulation.

CHAPTER II

CHAPTER II

SUBSIDY-RELATED HOME-OPERATING COST FACTORS

The intent of this chapter is to define and analyze the home-operating cost factors which actually affect or potentially will affect the disposable income of residents living in subsidized housing units in selected communities in Manitoba. The chapter uses a case study approach where necessary, to analyze these various cost factors.

The research conducted and personal experience gained by the author in the rural and northern housing field through The Manitoba Housing and Renewal Corporation, has indicated that this chapter need concentrate upon the areas of concern which are consistent with the physical operation of a dwelling unit:

1. Home operating costs: heat and utilities.

2. Sewage and water servicing costs.

3. Costs associated with rental and home-ownership programs. Included in this section will be:
   - means of payment;
   - maintenance costs;

- interest costs;
- tax costs.

Each of these concerns is analyzed with the intention of determining actual or potential problem areas for rural and northern residents. It should be noted by the reader before proceeding further into this thesis, that the residents of M.H.R.C. remote units earn an average income in the range of $4,000.00 to $5,000.00 annually, according to a yearly income review conducted by The Manitoba Housing and Renewal Corporation.

A. HOME OPERATING COST ANALYSIS: HEAT AND UTILITIES

1. Introduction

Currently, the resident living under a rental arrangement in remote subsidized housing units constructed by M.H.R.C. is primarily responsible for paying the costs incurred while heating and operating utilities within his home. It is because of concern for this situation, that the author sets out to define what the actual costs impacted upon these residents have been.

2. Scope of Analysis

Given the large number of communities in Manitoba which are under the jurisdiction of The Manitoba Housing and Renewal Corporation, any attempt to analyze the home operating costs (especially those costs relating to actual energy consumption for heat and/or utilities) experienced by rural and northern residents, would necessarily have to be conducted as a case study approach.

After some investigation, it became evident that community profiles compiled by the Department of Northern Affairs, Province of Manitoba, were the most complete reference to community information which could be obtained for the purposes of this research. Profiles had been completed on twenty-two of the communities under the jurisdiction of M.H.R.C. Therefore, the primary concerns at this

point were:

a) to select communities for study from these twenty-two which did not present extreme difficulties in obtaining needed information;

b) to select communities which had fairly current information available (within the last five years);

c) to select communities which represented locational diversity within the province -- a blend of communities located in the north, south, east, and west sections of the province was considered to be highly desirable;

d) to select communities differing in overall size;

e) to select communities which used different primary heat sources.

On the basis of the above concerns and with considerable consultation with various departments within the provincial government, several communities were selected for study. (Table 1 and Figure 1).

3. Heat and Utility Cost Analysis for the Selected All-Electric Communities

The All-Electric Communities Defined

The all-electric units selected for study were located in:

TABLE 1

COMMUNITY CHARACTERISTICS FOR SELECTED SAMPLE

Community	Modes of Household Energy	Pop. 1971 Census	Means of Access	Location
Bloodvein	wood & oil	*373	air, float plane, winter road	Eastern Man. 49-52 parallels
Camperville	all elec.	546	all-weather road	Western Man. 49-52 parallels
Manigotogan	all elec.	147	all-weather road, float plane	Eastern Man. 49-52 parallels
Berens River	wood & oil	224	air, winter road, barge	Eastern Man. 52-53 parallels
Pelican Rapids	all elec.	217	all-weather road, winter road, float plane	Western Man. 52-53 parallels
Wabowden	all elec.	809	all-weather road, rail & float plane	Central Man. 54-55 parallels
Nelson House	all elec.	*1363	all-weather road, air	Central Man. 55-56 parallels
Thicket Portage	wood & oil	318	rail, air	Central Man. 55-56 parallels
Ilford	elec. & oil	232	rail, air & winter road	Eastern Man. 56-57 parallels
Brochet	wood & oil	**160	air, winter road	Western Man. 57-58 parallels

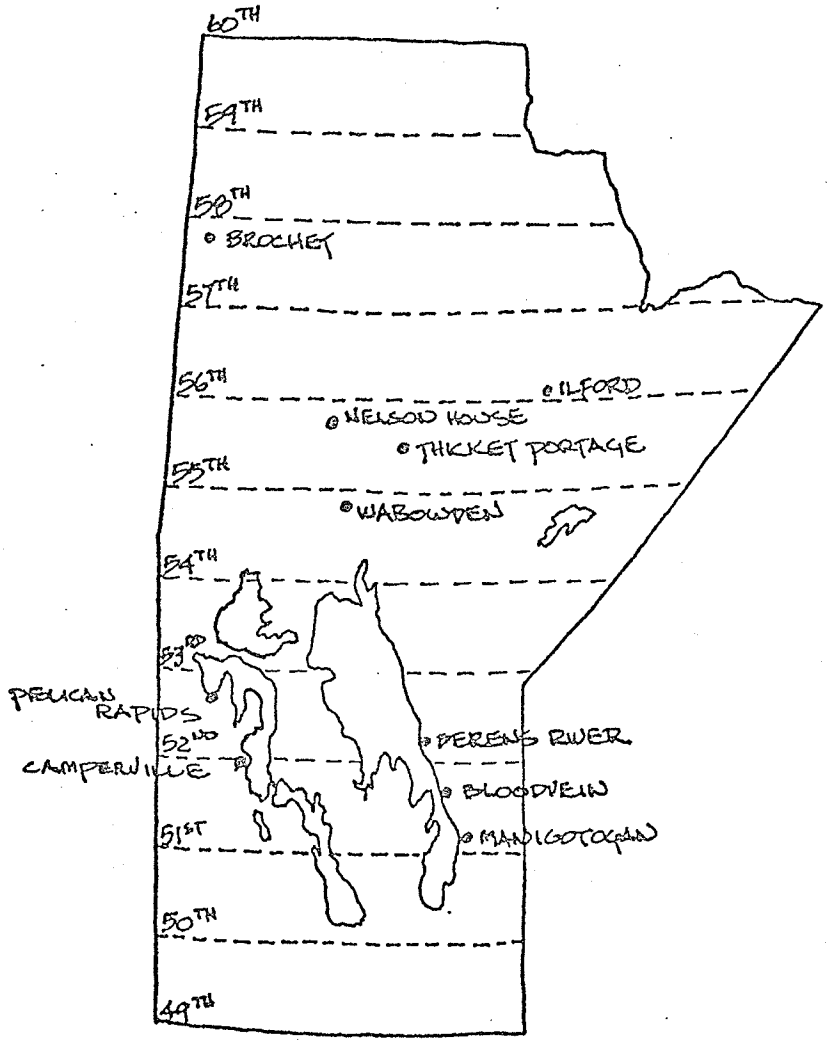
No Asterisk: Census Unincorporated Places Printouts, 1971.

* Research and Planning, Department of Northern Affairs, 1971 MHSC (Treaty and Non-Treaty)

** Research and Planning, Department of Northern Affairs, 1971 Statistics Canada (Non-Treaty)

FIGURE 1

MAP OF SELECTED COMMUNITIES



Camperville	Wabowden
Manigotogan	Nelson House
Pelican Rapids	Ilford*

It was self-evident that for low-income families living in subsidized housing units, a major expenditure on their part would be heating their homes, and operating various utilities within it. Because information on all-electric communities was the most easily accessible initially, it was decided that the first focal point of this study would be to establish, as accurately as possible, what actual total electrical consumptions were for people in all-electric communities, discover some form of allocation of this total consumption into utility and heat percentages, and so provide a basis upon which to decide whether actual heat costs were too high or too low relative to some bench mark cost. This bench mark cost will be referred to as the "theoretical cost" and a more detailed discussion of its application will be provided later in this paper.

Procedure of Analysis

The first step in the analysis was to determine the predominant housing type existing in these communities.

---

*Ilford was originally thought to be an all-electric community but as this paper later points out, most residents actually supplement their electrical consumption with the use of fuel oil. Therefore, Ilford was examined as both an all-electric and a non all-electric community.

Information collected indicated that only the R3 housing type would be of concern to any of the selected communities in Table 1.

The R3 house is, generally, an unserviced three-bedroom bungalow housing type without a basement. Instead, the house is built upon concrete walls from ground level to main floor level and are insulated. In those homes which have electric heat, a heat duct runs below the main floor level in the crawl space. This duct heats the crawl space somewhat and provides a much warmer floor than in those homes where the heat duct does not exist. A heat duct does not exist where oil or wood is used as the source of heat. Apart from this one exception of the effect of the heat duct in the crawl space, all the R3 homes constructed to date by The Manitoba Housing and Renewal Corporation are essentially the same, and conform to National Building Code standards as, of course, would be expected.

In attempting to wrestle with the question of how to establish theoretical costs and obtain actual heat and utility cost information on the all-electric communities selected, two separate methods of deriving a theoretical cost for heating R3 homes were found to be available. It is necessary to point out that these two methods are distinctly different in their approaches. A method of selection was then determined. This researcher decided

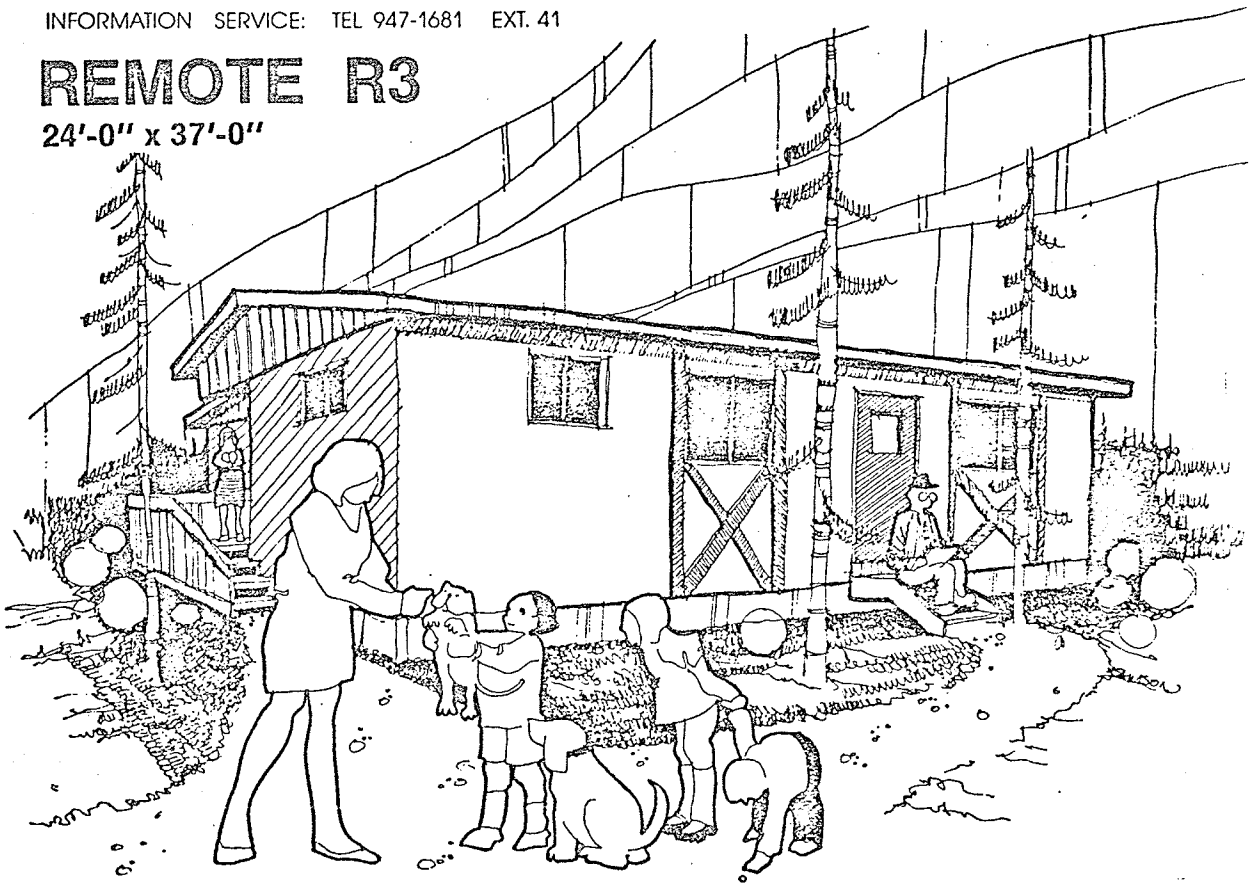
FIGURE 2

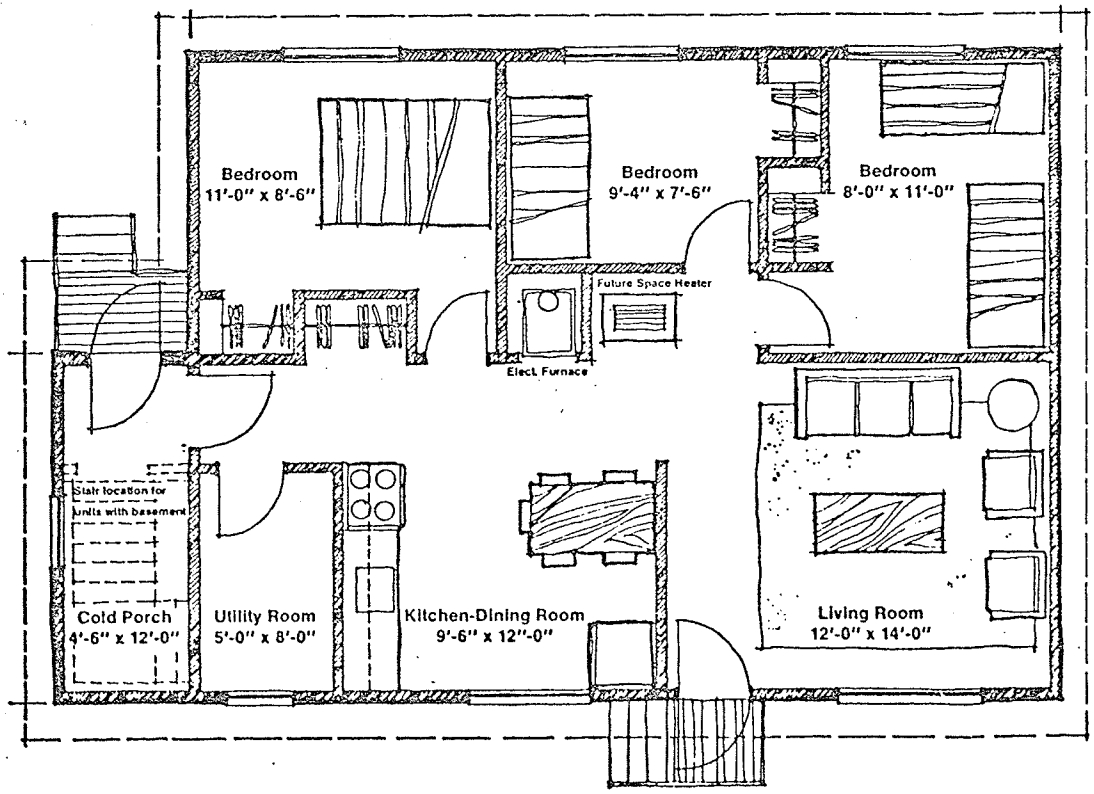
MANITOBA HOUSING

AND RENEWAL CORPORATION, 2100—ONE EIGHTY-FIVE SMITH STREET, WINNIPEG, MANITOBA R3C 3G4
INFORMATION SERVICE: TEL 947-1681 EXT. 41

REMOTE R3

24'-0" x 37'-0"





FLOOR PLAN

NOVEMBER 1976

to select the method which:

a) would allow for an optimum of consistent and reliable data;

b) had been tested for accuracy through actual application, and could provide information as to its own reliability;

c) was flexible enough to allow application to housing types other than R3, or at least could be modified easily to analyse an R3 home which had been altered to reduce heating costs;

d) seemed to best take into account the relationship between a theoretical heating cost and the diversity throughout the province concerning winter severity and daily mean (mid-point) temperatures;

e) would provide a means of separating energy consumption for utilities from energy consumption for heat, actually and theoretically, in an all-electric home;

f) would provide "realistic" theoretical costs.

At this point in time, some information had been collected on the lifestyles and habits of the people in the communities selected. These lifestyles and habits could be expected to have the effect of providing an actual heating cost in excess of an established theoretical cost in a majority of homes.

Suffice it to say, therefore, that if either method were to provide theoretical costs consistently in excess of actual heating costs, it would be looked upon with suspicion. A conclusion such as this would not have seemed logical, and certainly would be difficult, if possible, to explain.

Though it was anticipated that neither method could fulfill all of the above, the method which accomplished most of the above "decision criteria" would be selected.

The two methods of establishing theoretical costs for an R3 dwelling are as follows:

1. A study sponsored by The Manitoba Housing and Renewal Corporation entitled "Heat Losses from a MHRC 1972 R3 (Modified House)" by R. Patterson and G. Proskiw outlined one method.

2. The second method of deriving a theoretical heat cost was provided by Manitoba Hydro's Marketing Division in a publication entitled "Electric Heating: Application in Various Types of Building Construction"[13].

Both methods were then analysed so that one could be selected for the purposes of study. This analysis revealed the following:

a) By this point in time, actual heat and utility consumption figures for residents living in subsidized units

in the all-electric selected communities had been obtained from Manitoba Hydro. This had been achieved by consulting Manitoba Hydro records with the names of various rural residents on several occasions, obtaining the relevant file numbers, and subsequently receiving computer printouts outlining actual monthly kilowatt consumptions for each of these residents for the one-year sample period May 1975 to April 1976. (Appendix: Section 1.) On the basis of this information, and applying the then current hydro rates and heat versus utility ratios, actual heating costs for those residents with electricity in their homes were calculated. Because hydro rates for rural residents are consistent throughout the entire Province of Manitoba, a sound means of comparing costs from area to area had been achieved.

It was found, however, that after calculating sample theoretical costs using both of the above-stated methods and comparing these to actual heating costs, one very obvious difference between the two methods revealed itself. Patterson and Proskiw's method displayed theoretical costs most often far in excess of actual heat cost figures, while Manitoba Hydro's method showed actual heat cost figures to be most often in excess of theoretical ones. A method of interpolation had been used with Manitoba Hydro's method, in order

to attempt to equate the design temperatures of the two methods. This researcher was informed that the most plausible explanation was that a twenty-four hour/day operating time for the heating system had been assumed with Patterson and Proskiw's method, whereas Hydro's method assumes a fourteen hour/day operating time. Further calculations showed that theoretical heat cost figures based on Patterson and Proskiw's method were indeed approximately a factor of 10/24 higher than those obtained by applying Hydro's method.

b) The method proposed by Manitoba Hydro had been in use for some ten years, had been extensively field tested throughout this period, and had consistently rendered results which were within ±5 percent of actual heat costs barring any exceptional variables which seriously affect energy consumption.

c) In this researcher's estimation, Manitoba Hydro's method could be more easily applied to housing types other than the R3 house, and could also be utilized to render calculations on R3 houses with increased insulation, and various window types.

On the basis of the information as described above, Manitoba Hydro's method for calculating theoretical heating costs was selected.

The Manitoba Hydro Method of Calculating Theoretical Heating Costs

The intent is not to burden the reader with technical phraseology and formulae, but to describe those aspects necessary to understand the conclusions drawn. The primary reason for this approach is that any adaptation of the Manitoba Hydro method should be conducted in consultation with Manitoba Hydro engineers in order to ensure accuracy of interpolation.

According to this method, it was important to divide the province into eight distinct zones. These zones were:

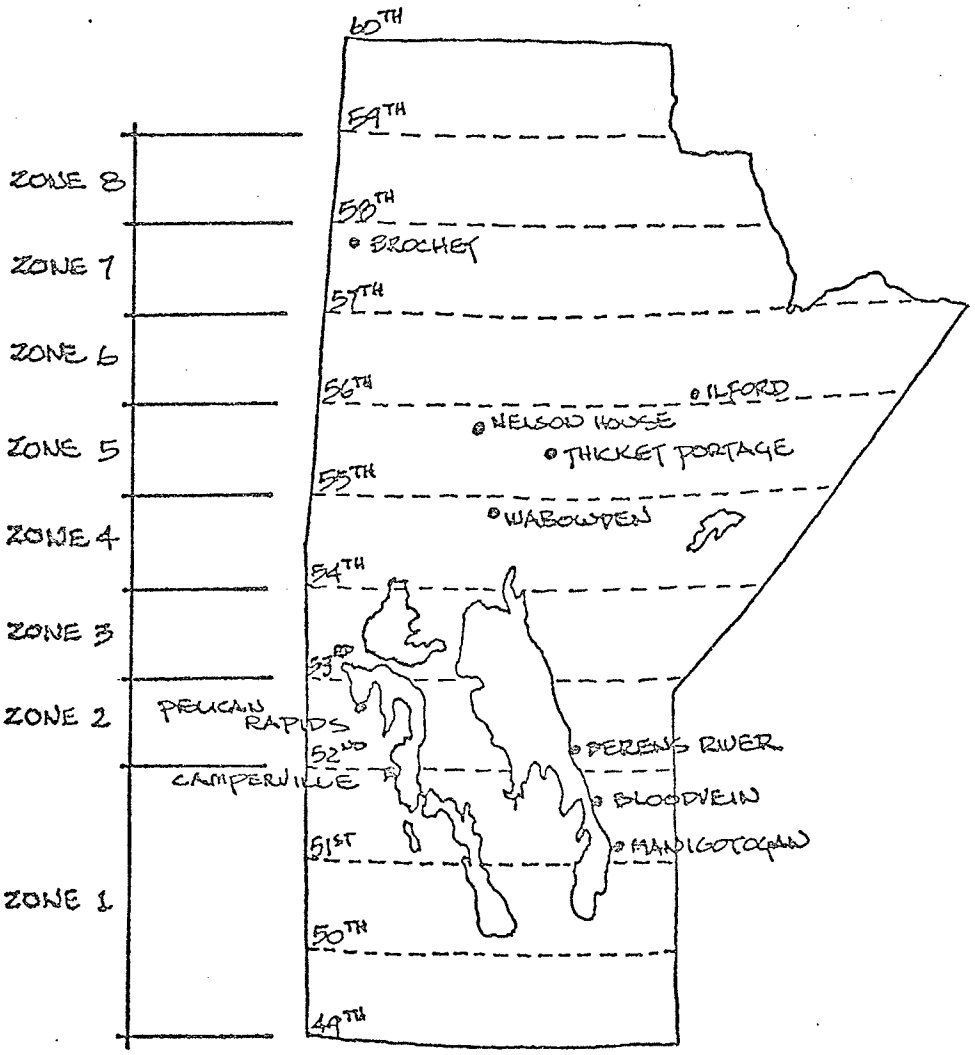
The 49th to 52nd Parallels	Zone 1
The 52nd to 53rd Parallels	Zone 2
The 53rd to 54th Parallels	Zone 3
The 54th to 55th Parallels	Zone 4
The 55th to 56th Parallels	Zone 5
The 56th to 57th Parallels	Zone 6
The 57th to 58th Parallels	Zone 7
The 58th to 59th Parallels	Zone 8

The 59th to 60th Parallels of latitude were omitted as Zone 9 because none of the selected communities fell within these parallels.

The reason for dividing the province into these zones was, according to Manitoba Hydro engineers, that heating costs are directly related to "degree days". This is a term

FIGURE 3

PROVINCIAL ZONE DIVISIONS



commonly used to refer to winter severity, and its calculation is dependant upon the mean temperature, or midpoint between the highest and lowest temperature for one day. Dividing the province into these zones, therefore, would allow the application of the relevant theoretical heat cost formula to any particular community situated in any one of the zones.

It then became necessary to locate the selected communities for study on a map of Manitoba to determine the respective zones in which each was located. After this was completed, the method as outlined in "Electric Heating: Application in Various Types of Building Construction"[15] was applied to determine theoretical heating costs for the standard R3 type house and, for the sake of comparison, the proposed new modified R3 house with increased heat retention characteristics has also been included. The heat loss calculation worksheets describing total heat loss in watts are presented in the Appendix: Section 2. The latter portion of this same section presents the results of theoretical heat cost calculations for the various zones in the province.

After these theoretical heat costs were calculated, it then became necessary to determine the actual heat costs in the various all-electric communities.

As mentioned earlier, actual monthly consumptions for the one-year period May 1975 to April 1976 were obtained, and are recorded in the Appendix: Section 1. On the basis of these consumption figures, total energy consumption per household in any selected community could be obtained.

It is meaningless, however, to consider total energy consumption in relation to a theoretical heat cost unless some means is available to separate total electrical energy consumption into its two basic components. These are:

1. Consumption associated with heating the home.

2. Consumption associated with operating the various utilities in the home -- i.e., toaster, stove, refrigerator, automobile and snowmobile block heaters.

In the subsidized units in the all-electric communities, however, only one reading is used to record total electrical consumption. Therefore it was necessary to use the only method known to this researcher to separate the two components. Table 2 presents the information used to obtain the needed proportions of heat consumption and utility consumption to total energy consumption. The information presented in Table 2 was obtained from Manitoba Hydro's Rates and Economics Department, Winnipeg, and was compiled by them in May 1975.

With the aid of Manitoba Hydro, the ratios of "Standard" (Utility Consumption) to "All Electric" (Heat Consumption) for rural areas has been calculated for 1973-74 and 1974-75, and are expressed in terms of percentages. These percentages were then averaged and the resulting figure determined as follows:

$$688/2601 \times 100 = 26.45\% \text{ (1973-74)}$$

$$711/2609 \times 100 = 27.25\% \text{ (1974-75)}$$

$$\text{Average} = \frac{26.45 + 27.25}{2} = 26.85\%$$

This average of 26.58 percent, therefore, represents the proportion of total energy consumption which, as a two-year average, would be used in rural areas just for operating utilities within any one household. It was hoped that over a two-year period of time a more reliable basis had been provided to calculate an average figure than would be provided by using a one-year average calculation. The remainder of total energy consumption would represent the portion used only for heating a dwelling unit. Estimated utility costs representing 26.85 percent of total energy consumption were also calculated and noted.

With the aid of Table 2 an analysis of actual heat costs and theoretical heat costs could then be undertaken, ratios determined and inconsistencies noted as described in the Appendix: Sections 3 and 4. (Table 2).

TABLE 2

SUMMARY OF ALL ELECTRIC AND STANDARD RESIDENTIAL

(Separately Metered) CONSUMERS 1973/74 - 1974/75

	Number of Services			Average Monthly kWh/Service		
	1973/74	1974/75	% Change	1973/74	1974/75	% Change
System (Separately Metered)						
All Electric	10,862	13,428	23.6	2,638	2,635	(.1)
Standard	160,171	164,970	2.9	697	697	-
Total	171,033	178,398	4.3	820	843	2.8
Suburban (Separately Metered) (Winnipeg)						
All Electric	849	1,097	17.4	3,069	2,927	(4.6)
Standard	86,655	89,310	3.0	704	685	(2.7)
Total	87,504	90,407	3.2	727	712	(2.1)
Rural (Separately Metered)						
All Electric	10.013	12,331	23.1	2,601	2,609	.3
Standard	73,516	75,660	2.9	688	711	3.3
Total	83,529	87,991	5.3	915	977	6.5

Notes:

(1) Yearly average number of services used in this comparison.

(2) Residential Flat Rate water heating kWh included in standard residential service average monthly kWh.

Rates and Economics Department,
Manitoba Hydro, Winnipeg.
May, 1975

4. Heat and Utility Cost Analysis for the Selected Non All-Electric Communities

The Non All-Electric Communities Defined: Primary Energy Source of Oil or Wood

The non all-electric units chosen for study were located in:

Bloodvein

Berens River

Thicket Portage

Ilford

Brochet

During the course of these investigations, information was accumulated on the two other primary sources of fuel used to heat rural and northern homes in Manitoba besides electricity. These two sources of fuel are fuel oil, which is purchased by the residents living in subsidized housing units, and wood, which is secured by residents through their own labour with chainsaw or axe. This chapter provides a method for estimating actual heat and utility consumptions in communities using either of these two sources of fuel as a primary heat source.

Procedure of Analysis

For the communities selected, it was found that within a specific community, the major type of fuel used tends

to be consistent from household to household. However, when looking at a number of communities, the primary source of fuel and mode of heating change from community to community.

Each community must, therefore, be looked at independent of the others in order to understand the particular set of difficulties each community undergoes in securing its fuel and in heating the various homes within it.

It would appear, at the present time, that the major criteria determining the primary source of fuel in any one community are:

a) type of fuel most abundant;

b) the cost of securing the fuel (monetary cost of fuel oil or electricity, or labour involved on the part of the residents to obtain wood) and the means of access available (i.e., winter road, all-weather road, airstrip, float plane, barge);

c) type of heating system installed in the house -- is there the option to burn wood for heat as well as oil or are such facilities not provided?

In looking at the communities where the primary fuel source is not electricity, a great diversity of fuel oil prices and other community-specific aspects were dis-

covered. The information presented below outlines these aspects. It was obtained from local residents, bulk oil agents, delivery agents and regional housing authorities. Prices are current to mid-1976.

Bloodvein

The primary source of fuel for heating homes in Bloodvein is wood. It is harvested on a week-to-week basis around the community. Wood is most often easily obtained. Apparently oil heat is used only for the school, R.C.M.P. detachment building, and local garage. Oil was then brought into the community in 45-gallon drums at a price of 50.7¢ per gallon. It is purchased from an Imperial Esso bulk oil dealer in Lundar. The community is, however, presently considering bringing in oil in 2500-gallon drums in order to increase savings because the price of heating fuel is expected to rise in the near future. Regular gasoline for machines sold for $1.10 per gallon and is obtained from the same dealer in Lundar.

Berens River

Shell Canada Limited presently holds a two-year contract to supply Berens River with heating oil. The August 1976 price of this oil in Berens River was 66¢ per gallon. The price of regular gas was $1.07 per gallon.

Although no average consumption figure per annum could be obtained for permanent residents, civil servants in the community have an average consumption of 1800 - 2000 gallons per year. This costs in the neighborhood of $1,188.00 to $1,320.00 per year. The heating period length per annum is six months.

Both oil and wood are used to heat the subsidized homes in Berens River.

Thicket Portage

The August 1976 price of heating fuel in Thicket Portage was 65¢ per gallon. The required length/annum of fuel heat is approximately six months. The fuel is shipped into the community by Canadian National Railways through the bulk fuel agent in Wabowden.

Ilford

As mentioned earlier, this researcher originally assumed Ilford to be an all-electric community. Several of the Ilford residents in the subsidized housing units use heating oil as a supplementary form of heat. This lowers their total electrical consumption figures (see Appendix: Section 4) but does not necessarily lower their total heating costs per annum.

The heating oil price in Ilford, as of August 1976, was

54¢ per gallon. Gasoline, on the other hand, could only be obtained in 45-gallon drums at a price of 95¢ per gallon.

Brochet

Although the primary source of heat for subsidized homes in Brochet is wood, a secondary heat source is provided by burning oil. Because oil is very expensive in this community (98¢ per gallon for August 1976), oil burners are turned off again first thing in the morning. Therefore, average oil consumptions are in the range of 50 - 75 gallons per month. In Brochet, the annual heating period is approximately nine months of the year, causing annual oil costs to range from $440.00 to $660.00.

The wood which residents use as their primary heat source is obtained from areas along the river at distances of up to twenty miles from the community. The wood is secured in this manner so a minimum of manual labour is necessary. The wood is transported by ski-doo in winter and power boat in summer, and is obtained on a week-to-week basis. However, it is important to note that the cost of regular gasoline in Brochet was over $2.00 per gallon; in addition, large amounts of labour were involved to harvest the firewood.

Costs for gasoline and fuel oil tended to be very high because shipping charges by barge are extreme (i.e.,

47¢ to 57¢ per gallon for fuel oil). Flying the oil and gasoline into the community made the price of fuel even higher (i.e., flying fuel oil into Brochet would cause shipping charges to be 5¢ per pound).

In addition to the above costs incurred by residents, utilities are electrically operated in the community. There is a 20-amp powerline with 15-amp breakers in the subsidized homes.

Civil servants (i.e., teachers) living in Brochet use an average of 200 gallons per month of heating fuel, causing annual heating bills of between $1,500.00 and $1,750.00.

After the above analysis, it is this author's impression that in the communities where wood is used as the primary source of fuel, as in Bloodvein and Brochet, some appropriate formula which takes into account the value of the labour involved in harvesting wood should be applied to any total costs incurred by these residents in the course of operating their homes within that specific community.

Fuel commodities spatial indexes have been calculated and included to help clarify the price relationships between communities. (Table 3).

TABLE 3

FUEL COMMODITIES SPATIAL INDEXES

(Winnipeg = 100)*

Community	Regular Gasoline	August 1976 Heating Fuel Oil
Bloodvein	141.20	127.38
Berens River	137.36	165.82
Thicket Portage	N/A	163.31
Ilford	121.95	135.67
Brochet	256.74	246.23

*Winnipeg City Retail Prices, August 1976 (Statistics Canada)

Gasoline Regular	Fuel Oil #2
77.9¢/gal.	39.8¢

Because actual heat and utility cost information for non all-electric communities was inaccessible, an attempt was made to arrive at the best possible estimate for these by using a weighted average determined from the known all-electric communities.

The weighted average was calculated by determining the actual versus theoretical heat cost ratios for each of the following communities:

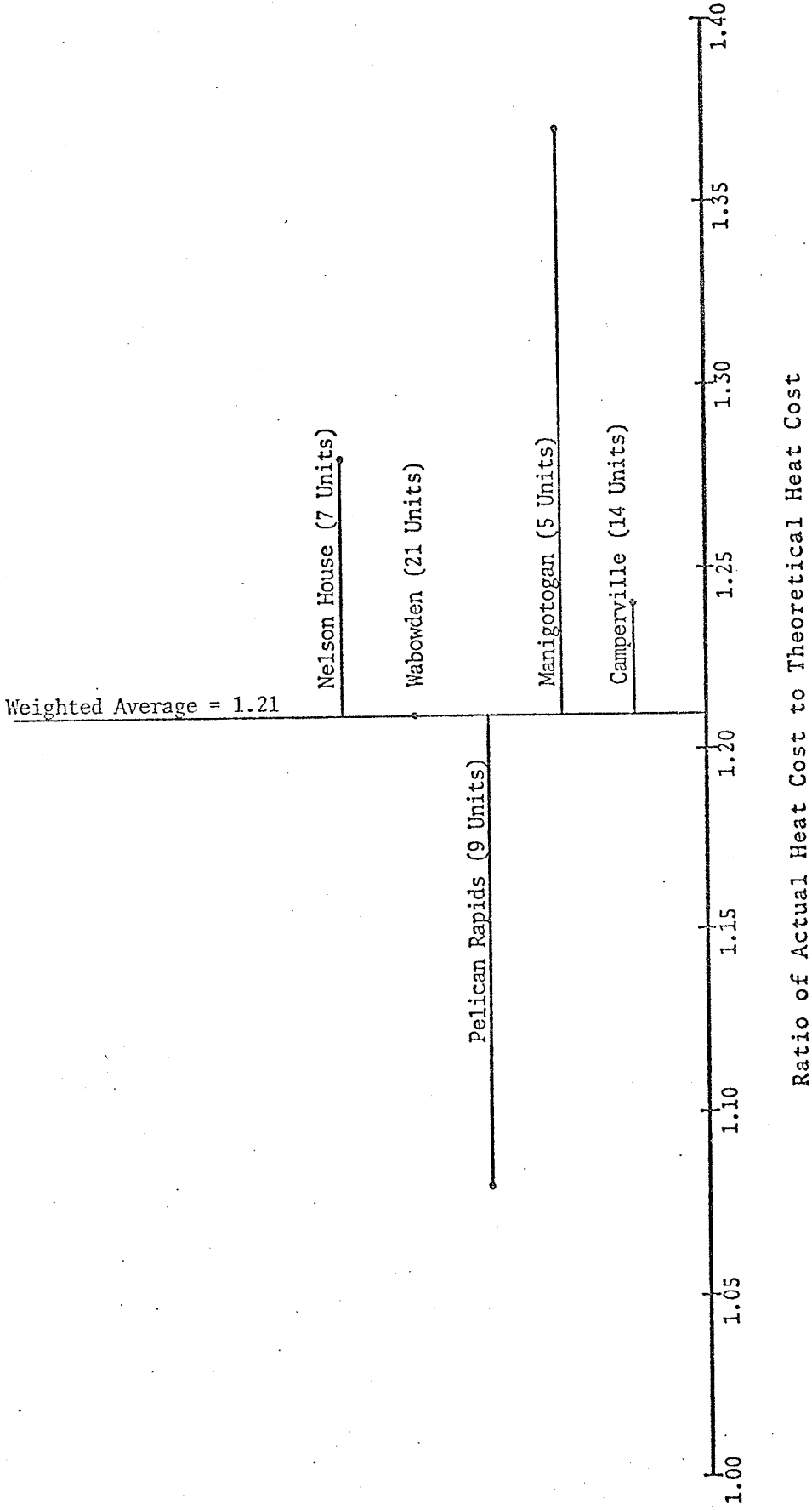
Camperville	Pelican Rapids	Wabowden
Manigotogan		Nelson House

Ilford was eliminated from the calculations because, as noted, part of its heat energy is supply by oil. For fifty-six subsidized units in the above five communities, the weighted average per household ratio of actual to theoretical heat cost was found to be 1:21. (Figure 4).

This calculation of 1:21 was then used to interpolate into communities where actual and theoretical heat and utility costs were impossible to determine due to the various combinations of energy types used, or because of the complete inaccessibility of actual heat cost information.

FIGURE 4

ACTUAL TO THEORETICAL HEAT COST RELATIONSHIP



What was necessary then, was to choose one energy mode (i.e., heating oil) and calculate an estimated total theoretical consumption per annum. This was done so that some idea of actual costs could be realized for any specified community in the province which had R3 houses within it, but where no actual consumption figures were accessible. The current price of heating oil, however, must be known for the community. It was assumed, by following this method, that in the communities where wood is used as a heat source, the residents would be compensated for their labour in harvesting the wood they require. In other words, a total heating oil consumption figure is provided for each of the eight zones in the province. This consumption figure represents the total amount of heating oil which would be consumed by a particular household in a specific community within one of the eight zones, if no other mode of operating heat services were available to it.

The procedure which was used to derive these heating oil consumption figures for each of the eight zones is as follows:

a) The theoretical electric kilowatt hour consumptions for heating a unit per annum for each of the eight

zones were determined for an R3 dwelling unit:

Zone 1	14217.72 kWh
Zone 2	15069.62 kWh
Zone 3	16710.13 kWh
Zone 4	17387.34 kWh
Zone 5	18581.01 kWh
Zone 6	19405.06 kWh
Zone 7	20571.52 kWh
Zone 8	22118.35 kWh

b) Assuming that:

i) 1 kWh = 3413 BTU's;

ii) thermal efficiency of heating oil -- .60 as compared to electricity;

iii) 1 gallon of heating oil -- 168,000 BTU's;

then the following formula applies:

$$\frac{\text{weighted average (1.21)} \times \text{theoretical electric kWh consumption for respective zone} \times \text{3413 BTU/kWh} \times \text{fuel equivalence gal./1 BTU (.00000595)}}{\text{.60 heating oil efficiency}} = \text{Estimated heating oil requirement in gallons for respective zone}$$

Therefore, the estimated total heating oil quantity per annum for those communities whose primary source of fuel

is wood or heating oil is:

Zones	Total Heating Oil per Annum
1	582.49 gallons
2	617.40 gallons
3	684.61 gallons
4	712.35 gallons
5	761.26 gallons
6	795.02 gallons
7	842.81 gallons
8	906.18 gallons

By utilizing these total heating oil figures and with a known price for heating oil in a specific community, an estimate of total heat cost per annum for a specific household could be calculated easily. As shown below, the non all-electric communities selected for study in this paper have been used as examples:

Bloodvein (Zone 1)

Heating oil price = 50.7¢/gallon.

Estimated heat cost per annum = $295.32.

Berens River (Zone 2)

Heating oil price = 66¢/gallon.

Estimated heat cost per annum = $407.48.

Thicket Portage (Zone 3)

Heating oil price = 65¢/gallon.

Estimated heat cost per annum = $494.82.

Ilford (Zone 6)

Heating oil price = 54¢/gallon.

Estimated heat cost per annum = $429.31.

Brochet (Zone 7)

Heating oil price = 98¢/gallon.

Estimated heat cost per annum = $825.95.

For calculating the cost of operating utilities within communities where wood or oil is the primary source of energy used to produce heat, the following procedure applies:

1) Average electrical consumption figures for utilities only in rural areas throughout Manitoba were provided in Table 2 of this paper. An average consumption figure then could be calculated for the two-year period 1973 to 1975.

$$\frac{688 + 711}{2} = 699.5 \text{ kWh/month}$$

2) The then current rural hydro rates (consistent throughout the province for all rural areas) were:

first 100 kWh = 8.50¢/kWh

next 175 kWh = 3.00¢/kWh

remainder = 1.58¢/kWh

3) For a one-year period, therefore, the annual utility costs can be estimated throughout the province at $142.03.

Though there are shortcomings inherent in applying an overall utility figure to all of rural Manitoba, it was the best possible estimate which could be derived given the information available.

5. An Examination of the Inconsistencies Relating to the Heat and Utility Cost Analysis for the All-Electric Units

Introduction

When initiating this investigation, it was kept in mind that some social factors such as family size (causing high degree in-out traffic, high humidity), and lifestyle (fishing, trapping) could introduce a certain amount of distortion into the research. This became apparent when the yearly energy consumptions (the actual heating costs per individual units) were calculated. Some of these figures were, as a result, found to be below the calculated theoretical figures.

Almost every one of the selected all-electric communities appeared to have some units showing such inconsistencies. The communities of Camperville, Pelican Rapids, Wabowden and Ilford accounted for most of these inconsistencies and, therefore, in order to obtain a viable explanation, it was decided than an on-the-spot investigation should be undertaken.

Procedure

During this investigation this author questioned, where possible, the occupants of the units showing inconsistencies and/or the particular housing authorities, in order to gain any necessary clarifications, i.e., establish determining factors for these inconsistencies.

The communities and the specific reasons discovered to be causing the various inconsistencies are listed following:

I CAMPERVILLE - Total of 2 units showing slight inconsistencies.

Household	Reasons for Inconsistencies
K	No explanation available, other than that of low consumption of energy due to the efforts of economy-minded occupants.
L	

II PELICAN RAPIDS - Total of 4 units showing inconsistencies.

Household	Reasons for Inconsistencies
C	Owns and operates a wood cookstove which significantly reduces his energy consumption.
D	Information not available.
G	Takes frequent leave of the premises due to his employment as a taxi driver in Mafeking.
H	Very economy-minded occupant.

III WABOWDEN - Total of 7 units showing inconsistencies.

Household	Reasons for Inconsistencies
A	Uses an oil stove in his residence and has had extra insulation added to his home.
B	Owns and operates a wood cookstove which significantly reduced his energy consumption.
C	Takes leave of the premises throughout the summer months.
I	Takes leave of the premises throughout the summer months.
O	Takes frequent leave of the premises -- trapping is his occupation.
S	Takes frequent leave of the premises -- trapping and fishing are his occupations.
U	Experienced a late changeover from oil heating to electric heat.

IV NELSON HOUSE - Only 1 unit showing an inconsistency.

Household	Reasons for Inconsistencies
O	Had to leave the community involuntarily. This was caused by "the pressure tactics of fellow residents".

V ILFORD - Total of 8 units showing inconsistencies.

Household	Reasons for Inconsistencies
K	Takes frequent leave of the premises due to his employment as a road hauler and fisherman. In addition, he uses oil heat for part of the year.
L	Takes frequent leave of the premises due to his occupation as a fisherman. He also uses oil heat for part of the year.

V ILFORD (continued)

Household	Reasons for Inconsistencies
M	Takes frequent leave of the premises due to his occupation as a fisherman. He also uses oil heat for part of the year.
N	Takes frequent leave of the premises due to his occupation as a fisherman. He also uses oil heat for part of the year.
O	He uses oil heat for part of the year.
P	Takes frequent leave of the premises due to his occupation as a trapper. He also uses oil heat for part of the year.
Q	He uses oil heat for part of the year.
T	Takes frequent leave of the premises due to his employment as a winter road hauler. He also uses oil heat for part of the year.

Note: Ilford was originally assumed by this researcher to be all-electric, as mentioned.

The on-the-spot investigations revealed that some social factors, such as those mentioned at the beginning of this chapter, severely influence the actual heating cost figure; one of them being the high humidity which is caused by the residents drying their clothes inside the unit during the winter. As a result of this, the inhabitants experience fatigue and also a feeling of being cold at normal interior temperatures (65^{o} F. to 72^{o} F.). This, in turn, forces them to set the thermostats at even higher temperatures and tends to increase their total energy consumption and, consequently, their actual heating costs. It should also be

noted that the volume of humidity within a home often is a factor of family size.

The second social factor playing an important role in increasing the actual heating costs appears to be the high degree of in-out traffic in the homes. The intensity of this factor is obviously influenced by the family size. The high degree of in-out traffic causes a rapid decrease of the interior temperature, which results in the tendency of the residents to turn their thermostats up and thus increase the actual heating costs.

B. SEWAGE AND WATER SERVICING COST ANALYSIS

1. Introduction

This section attempts to grapple with the potential cost impacts associated with water and sewage servicing for M.H.R.C.'s subsidized housing in selected rural and northern areas. Though specific costs relating to the various total community servicing methods cannot be established without intensive investigation and research by professional engineers on a community-specific basis, pertinent information does exist which can be useful in determining the potentially viable and non-viable servicing options available to small communities such as those presented herein.

Background

The provision of sewage and water servicing for M.H.R.C.'s public housing units in rural and northern areas is without doubt one of the primary planning considerations determining a home's location and total cost in virtually any rural and northern community which has been designated as an M.H.R.C. responsibility.

Concerned with these rural and northern communities, The Manitoba Housing and Renewal Corporation established a Remote Housing Program in 1969 in an attempt to remedy the unsafe, indecent and unsanitary housing existing in remote and unserviced communities. During a five-year period from 1969 to 1974 and a transitional stage thereafter from the Remote Housing Program to the Rural and Native Housing Program, a total of 491 remote houses were constructed. However, 13 of the homes were destroyed by fire, sold by M.H.R.C., or removed from this total by other means, leaving a remaining total of 478 units. No in-house servicing was delivered with these homes at the time they were constructed. Instead, basic housing, desperately required by so many rural and northern residents, was provided with an emphasis on quantity of units, speed of delivery, and quality of product.

Currently, however, the provincial government, through The Manitoba Housing and Renewal Corporation, is seriously considering the costs and options available to it with

respect to the provision of (a) single home, and/or (b) total community sewage and water servicing for these remote units. The Manitoba Housing and Renewal Corporation is currently intending to convert the units built under the Remote Program from rental agreements to home ownership with subsequent mortgages, in keeping with the original intent of the Remote Program at the time it was established. The first few units, in fact, have just recently been converted. Costs associated with the provision of servicing to these units would be incorporated into the mortgage total for which prospective purchasers could be responsible.

2. The Necessity of Higher Water and Sewage Servicing Levels for Rural and Northern Communities

Introduction

Why should we be concerned about the provision of higher servicing levels in the first place, if potential costs can be very high and, subsequently, the possible negative cost impacts upon rural and northern residents can be so potentially severe?

The wastes to be removed by an in-house servicing method and which are produced by a community, consist of sewage and liquid household wastes -- the former is liquid, generally made up of the used water supply and containing bodily discharges or excreta, the latter is often refer-

red to as grey water -- used wash water containing food particles, lint and soil. The prompt, continuous and sanitary removal of these wastes to suitable places for disposal, usually situated at some distance from the residences themselves, is essential to the health and convenience of these residences.

Sewage is extremely putrescible, its decomposition produces large quantities of malodorous gases, and it may contain numerous pathogenic or disease-producing bacteria. Therefore, its immediate and unobtrusive removal from its source in residences to a point sufficiently remote from them to permit its discharge or suitable treatment without offense, is most desirable.

Attempting to find an optimum level of servicing should not, however, be attempted by way of a conventional cost-benefit analysis. Although certain factors can be subjected to conventional analysis, such as initial capital costs, operating and maintenance costs, others must be assessed in a more subjective manner.[16] The following represents a discussion of three major factors which necessitate a concern for the provision of higher levels of servicing:

Major Selection Criteria for Various Servicing Options

(1) Public Health Considerations

In Manitoba, a good percentage of the population

lives in small communities of 2,500 persons or less. Many of the residences in these communities lack in-house water and sewage servicing and still resort to the practice of digging individual wells for water and building dry outhouses for sewage. Household grey water is most often merely thrown out on the ground or disposed of in a nearby stream, river or lake, if one exists in the area.

Severe problems have been known to result, however, in several communities where these types of waste disposal methods are used.[17] Ground water conditions (such as an extremely high water table, for example) and improper natural filtration, have led to contaminated ground water and water wells, and subsequently to diseases such as infectious hepatitis, typhoid fever, bacillary dysentery and diarrhoea.[18] In addition, it should be pointed out that health care is often nowhere near the level which is easily obtained in larger urban centers. This, therefore, only serves to complicate an already complex problem.

(2) Firefighting Capabilities

Municipalities which already have a high level of servicing,

". . .rely heavily on piped water supply mains to provide the water flow pressure and capacity required to fight fires. In order to satisfy fire flow peak

> demand requirements, the water mains which are installed are considerably larger than would be required to meet the normal domestic demand for water. In regions where water is plentiful and engineers are not plagued by problems of perma-frost, this is relatively easy although the over-sizing of the water delivery system does represent a substantial cost."[15]

In many small communities, however, such as those selected in this paper, the problem is substantially different. Water is either obtained for firefighting purposes from water sources in the immediate area (from a lake, stream, river or local well), or it is trucked into the community and held in storage tanks. Firefighting capabilities, therefore, are at an extremely low level. In addition, personal home insurance on contents often carries an extremely high premium in such communities, or simply cannot be obtained.

(3) Environmental Impacts

Suffice it to say, that improper disposal of human wastes and household wastes can have a very negative impact on the environment surrounding human settlements, if these wastes are disposed of in a way which can be potentially or directly damaging to wildlife and plant life. Figure 5 displays the components of waste management systems as they currently exist in most rural and northern communities in which The Manitoba Housing and Renewal Corporation has housing units.

Figures 5 and 6 point out the obvious necessity of concentrated efforts towards minimizing the quantity and type of pollutants which are imparted upon the surrounding environments of any rural and northern community.

One tragedy inherent is that although sewage and grey water disposal without treatment most often occurs without any malicious intent on the part of the residents, one cannot escape the fact that such actions, where left unchecked, have often resulted in serious consequences for the families living in such areas. Conscientious planning and implementation of viable low-cost waste treatment systems offers much future potential in alleviating negative impacts associated with improper waste disposal.

It is important to note, however, that what is the depository for waste disposal is, generally, the source for the water supply. (Figures 5 and 6).

3. Big Eddy: A Case in Point

Introduction

Big Eddy Settlement, a Metis community located 3.2 miles north of the townsite of The Pas, Manitoba, has proved to be one test-case situation in the whole question of whether or not the private sector within the province is

FIGURE 5

COMPONENTS OF WASTE MANAGEMENT SYSTEMS[20]

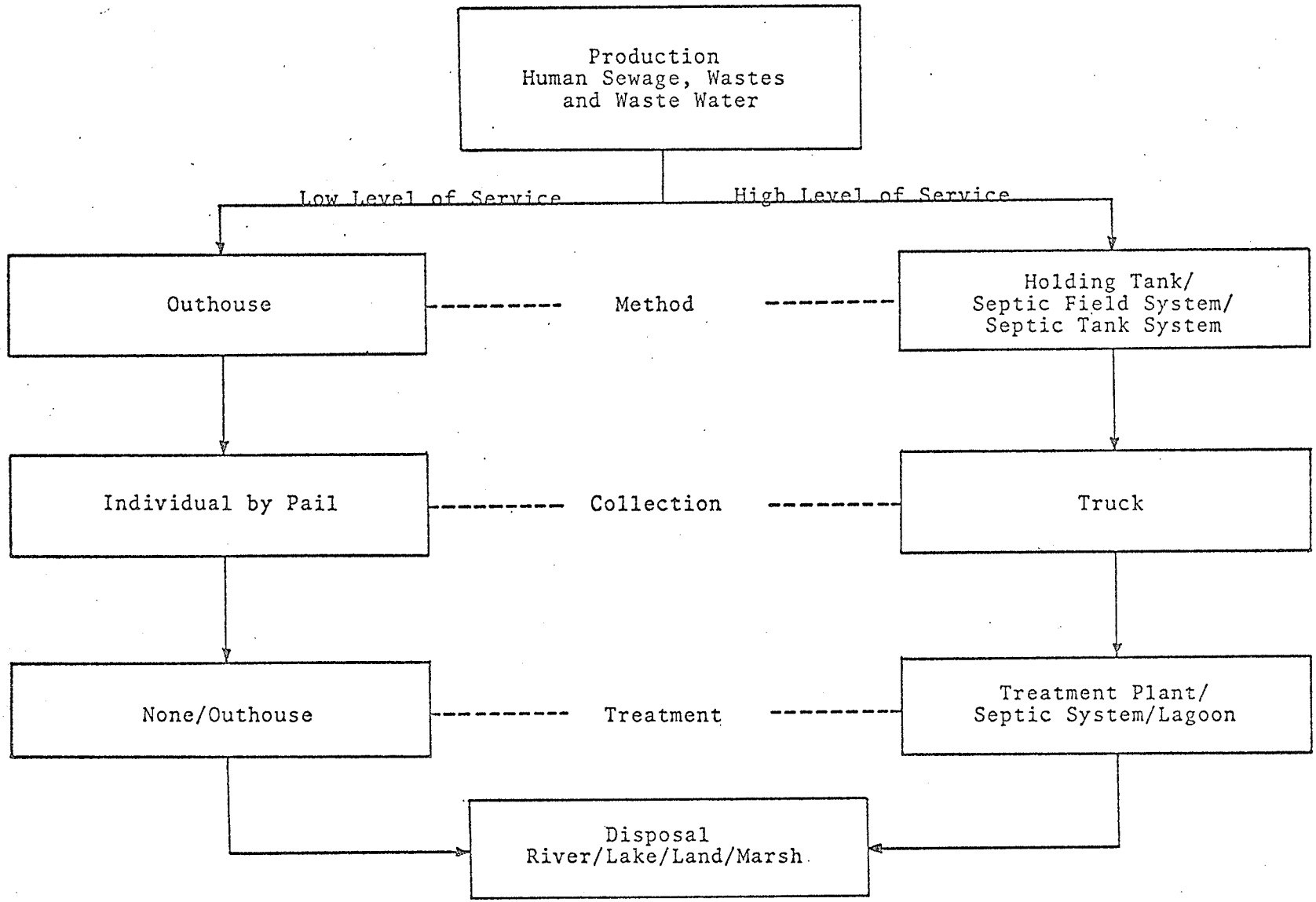
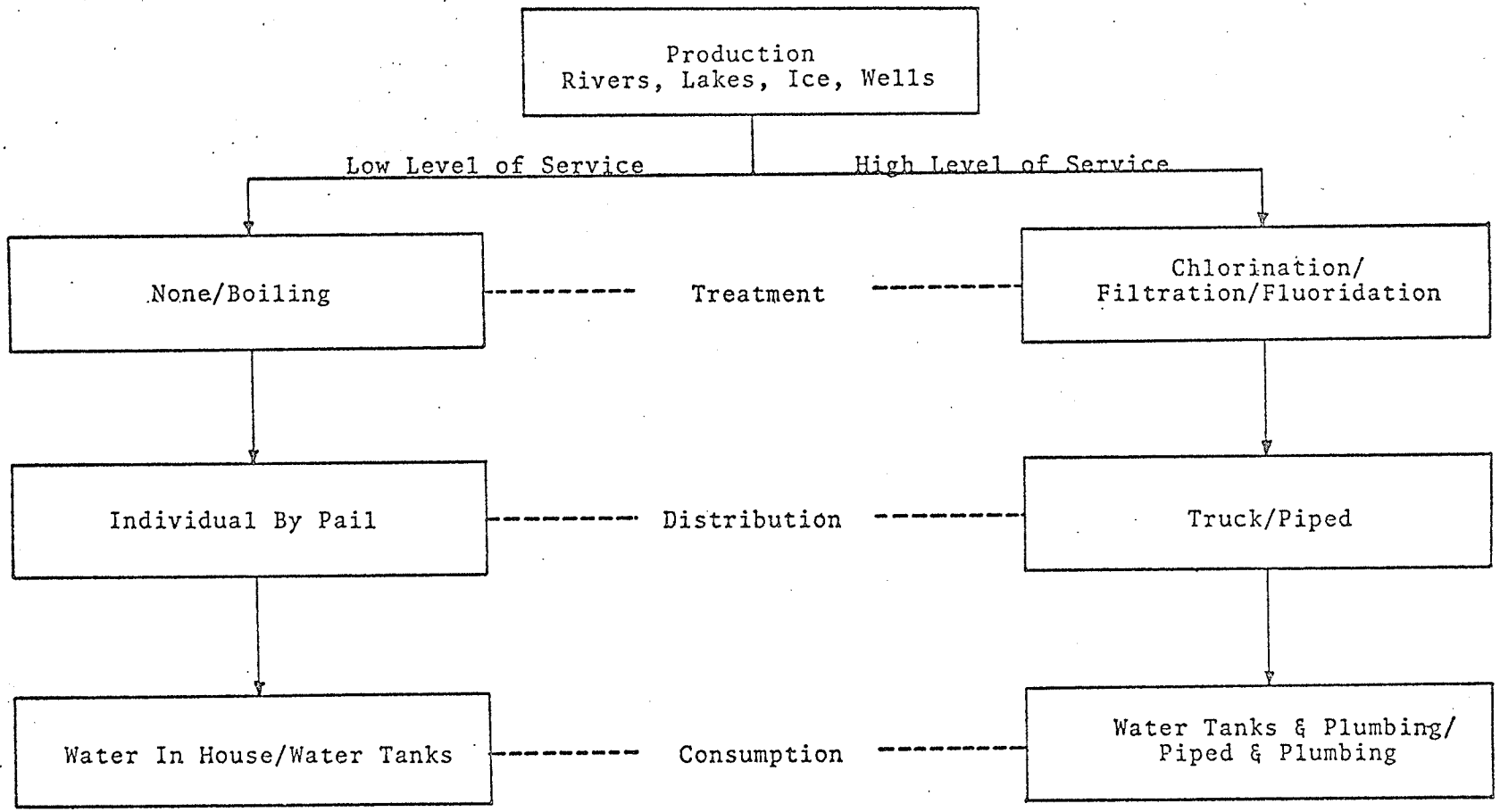


FIGURE 6

WATER SANITATION SYSTEM SCHEMATIC[21]



prepared to respond quickly and effectively in providing a low-cost servicing method for an existing small community which currently has low-level water and sewage servicing within it.

Though a single private firm's response to an extremely difficult issue is not necessarily reflective of the abilities of other such firms to respond to the same situation, the case sample selected for presentation does bring to light the possible positive aspects of closely investigating all potentially low-cost servicing alternatives which, at the present time, appear to offer a viable solution to servicing problems in rural and northern communities.

Big Eddy: Presentation of Alternatives

A private consulting firm was contracted by The Pas Indian Band to present, as part of their agreement, servicing proposals for the homes located in Big Eddy Settlement. General background information pertinent to this examination on behalf of this firm was as follows:

a) The density of housing in Big Eddy Settlement is .5 units per acre.

b) Currently there are 17 public homes in the area but further construction on behalf of The Manitoba Housing and Renewal Corporation in the near future should pro-

vide a total of 26 public housing units in Big Eddy by 1982. Approximately 30 other homes exist in the community but are not public housing units.

c) The required fresh water demand per household has been estimated by the firm to be 40 gallons per capita per day.

d) The depth at which buried pipe would have to be located in the area of the settlement would be minimum 9 feet due to the depth of anticipated frost penetration.

e) Buried rock is not an excavation problem in the area of Big Eddy Settlement and excavation, therefore, is greatly simplified.

f) The water table in the area is approximately two feet below the finished grade lots.

The following represents the servicing proposal alternative presented by the private firm to the residents of Big Eddy Settlement:

Water servicing alternatives presented for Big Eddy Settlement

Alternative 1

This proposal is for a piped system similar to the one located on the Reserve. Average costs are anticipated to be $11,000.00 per unit for water servicing alone. Additionally, the cost of connecting the watermain to each

unit's meter would be $750.00 to $1,000.00 per unit. This system has firefighting capabilities. Annual projected costs per unit are anticipated to be $1,700.00 per unit if financed over 25 years at 10% interest. Peripheral units would be served by a 2-inch pipe system or storage tanks. These units would not have firefighting capabilities. The installation of a water treatment plant with respect to this system is anticipated to cost in the range of $100,000.00.

Alternative 2

Because of the scattered nature of the existing housing in the area of Big Eddy Settlement (the Corporation's housing excepted), groups of 5 - 10 houses would share one water well, the housing being inter-connected to a 2-inch watermain pipe. The anticipated costs would be approximately $5,000.00 per unit. Annual projected costs would be $700.00 per year but these costs would be subject to continual annual increases.

Alternative 3

This proposal considers individual storage tanks attached to each house. Projected costs would be $2,500.00 per tank. The system would have a low initial capital cost but high operating and maintenance costs. This is primarily due to the fact that because the system utilized a trucked water system, projections are that three water trucks would be required as well as operators and equipment garage. Maintenance costs for a mechanic and the garage would cost in the range of $45 - $50,000.00 per year. The system would not have firefighting capabilities, and annual projected costs are in the range of $1,200.00 per year.

Sewage servicing alternatives presented for Big Eddy Settlement

Alternative 1

The proposal suggested a piped system with a treatment plant. A sewage treatment plant to service this type of system is anticipated to cost in the range of $150,000.00 for initial installation. This system is expected to cost a total of approximately $1,000,000.00. The cost effect per unit would be in the area of $13,000.00 with private hook-ups provided for each unit.

Alternative 2

Suggested here is that groups of houses (perhaps 5 - 10 units) be placed on one septic tank and field system per group. Maintenance and cleaning would be required once per year. Anticipated costs are $8,000.00 per unit for initial installation and $5,000.00 per year per tank for maintenance costs.

Alternative 3

Holding tanks are suggested for each house. These tanks would be buried, and manhole access would be provided to each one. Initial costs would be high here, however, for they would be similar to water servicing Alternative 3 as discussed above.

Alternative 4

This proposal suggested a piped system with holding tanks. Projected costs suggested that this alternative would tend to be as costly as sewage servicing Alternative 1 outlined above.

The costs outlined for the various alternatives pointed out above are considering the houses in Big Eddy Settlement as they are presently located. The firm suggested if the houses are to remain sited as they are at present, then it is believed that water servicing Alternative 2 and sewage servicing Alternative 2, as outlined above, would make the best combination to provide for the servicing needs of the settlement.

The firm suggested also that as an alternative attendant to the above, the settlement seriously consider moving housing units in the area so as to create a housing density similar to that presently experienced on the Reserve. By doing so, a piped water and sewage system utilizing a lagoon and gravity flow sewage disposal could be provided for approximately $13,000.00 per unit rather than $24,000.00 per unit as combinations of Alternative 1 for sewage and water outlined above would suggest. This would lower the total combined costs from a proposed $2,000,000.00 to $9,000.00.

The above example of Big Eddy Settlement points out that any of these presented alternatives would have serious

repercussions upon the total selling price of the subsidized housing units in the area.

In fact, projecting such costs for total community servicing into any of the communities previously selected for study in this paper, even if substantial savings could be realized in installing any of the proposed alternatives into the selected communities (i.e., even 25% per unit), the cost effects on the total selling prices under home ownership proposals would, nevertheless, still have severe negative impacts upon low income residents attempting to purchase socially assisted housing. It should be pointed out, for example, that several of the first homes built under the Remote Housing Program showed total delivery costs in the neighborhood of $8,000.00 per unit. Even though, in these instances, basic housing was delivered (no in-house servicing, no basements), there is no combined sewer and water servicing method which was proposed for Big Eddy Settlement which does not exceed the total delivery price of many of the existing units.

It is for this reason, primarily, that this author conducted an investigation into the subject of servicing alternatives, in order to ascertain whether or not other options presently exist, which were not presented by the consultants to The Pas Indian Band, which may hold any potential for future cost reductions.

4. Other Options to Conventional Servicing Methods: Viable Cost Reduction Alternatives

Though it is not consistent with the overall intent of this thesis to present an in-depth discussion of all potentially viable cost-reducing servicing options (which indeed could become the subject of a thesis in itself), this author believes that currently there does exist a multi-home sewage servicing method (servicing several homes with one inter-connected system) which not only has great potential for reducing high sewage servicing system costs in Big Eddy, but also for many other rural and northern communities as well.

It is important to note at this point, also, that no water servicing alternatives which could potentially reduce costs to rural and northern residents presented themselves to this author during the course of the research conducted. The various alternatives presented by the consulting firm involved in Big Eddy represent, in the opinion of this author, the major viable alternatives presently available for use in small communities where upgrading of water servicing levels are required. It is hoped, however, that as technology advances, such options will present themselves.

A Multi-Home Sewage Servicing Alternative

Introduction

The multi-home sewage servicing alternative selected for presentation within this section is commonly known as "the low-pressure sewer system". Though professionals in Manitoba are not generally acquainted with the system, it was already implemented and extensively field tested in seventy-six communities in the Province of Saskatchewan as of August, 1975. Investigations on behalf of the Water Resources Division of the Department of Mines, Resources and Environmental Management in Manitoba have determined the system to be reliable and that it can provide sewage services to rural and northern communities at a relatively low capital cost.[22] Furthermore, contacts with several provincial government departments in Manitoba by the author presented a very convincing case for an increased emphasis on behalf of the Manitoba government to encourage the testing of low-pressure systems for applied use in rural and northern communities in Manitoba, and to better educate the various pertinent inter-governmental departments with respect to the system's abilities and possible future applications. In short, it seemed surprising that a system originally conceived in 1963[2], and used so extensively with great success in our sister province of Saskatchewan, has received relatively little

attention in Manitoba. During the three-month period in which this author was directly involved with the question of servicing alternatives for rural and northern communities, one significant explanation advanced was that, because of the very small profit incentive that this system was able to offer the private sector, the system was not a viable one from that point of view. There is an inconsistency inherent here, however, in that private sector involvement has had much to do with the system's success in Saskatchewan.

Another plausible explanation, however, is that no private firm wishes to be the first to implement a new system. Not only are new systems difficult to "sell" to prospective users, but capital losses can be experienced by a private firm in attempting to implement a new system. Since the profit motive is not strong enough with low-pressure systems to begin with, it is not too surprising that although all sources contacted believe low-pressure systems to be a viable low cost alternative for rural and northern communities in Manitoba, the private sector in Manitoba has not become involved in implementing them to date.

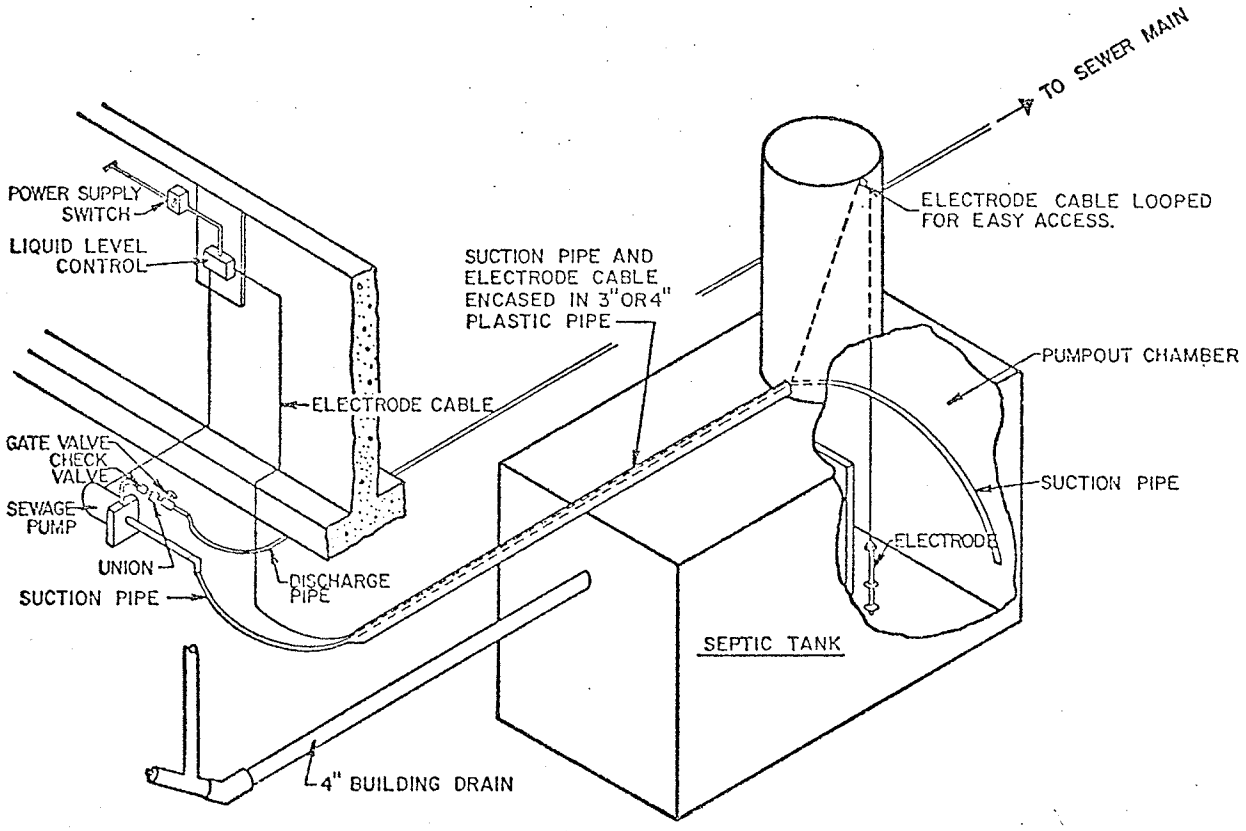
Furthermore, it should be pointed out that it is not correct to assume that low-pressure sewer systems are not being used in Manitoba at all. The Department of Agricul-

ture is currently testing and researching a low-pressure system for application in Manitoba. In addition, the Department was responsible for "selling", designing and implementing a low-pressure system for one of the Hutterite colonies in southern Manitoba. This system has worked extremely well now for over two years. Essentially then, the low-pressure system is an in-house system for the provincial government in Manitoba, and consequently private firms in the province have had little exposure to it.

How the Low-Pressure System Works

Diagram of Low-Pressure Residential System

FIGURE 7



The preceding diagram[24] depicts the basic components and residential hook-ups for the low-pressure system. The wastes from a residence serviced by this system flow into a conventional two-compartment septic tank. The solids settle out and remain in the first compartment and the liquids overflow and collect in the second compartment. When the liquids in this second compartment reach a level sufficiently high enough to stimulate the electrode contained in this compartment, the sewage pump located in the basement of the residence is activated, drawing off the liquid in the tank, and then automatically turning off.

While the pump is in operation, it forces the effluent on its way to the treatment facility. Two check valves (one-way valves) are provided so that the system cannot back up, and a gate valve (faucet type valve) is provided in the line so that the system can be cleaned.[25]

How Cost Savings are Achieved with Low-Pressure

There are three basic areas in which low-pressure can potentially provide assistance:

1. Many small communities are finding that because of the lack of municipal water and sewer services, new developments with full in-house servicing are almost impossible to initiate.

2. The problem of ground water pollution, as discussed earlier in this chapter, is often inevitable when septic fields are used for sewage disposal.

3. Many communities cannot afford conventional municipal sewer systems because of the high costs of labour and materials.

The major cost-reducing advantages that low-pressure sewer systems have are as follows:

1. The polyurethane pipe which the low-pressure system uses (commonly series 60 polyurethane pipe) has an expected life span of fifty to sixty years, will not crack like concrete pipe with shifting ground conditions, is not porous like concrete so that ground water is not added to the effluent as with concrete, and can be installed in a road right away with a telephone trencher at up to 400 feet per hour.

2. The depth of installation remains constant at eight and one-half feet. Also, the pipe will allow for contouring with changing sub-surface conditions unlike concrete, and is not as subject to freezing (primarily because it is pressurized).

3. Both the labour involved and the materials required to implement a low-pressure sewer system are much less than other conventional systems.

Although low-pressure systems have not been used widely enough within the Province of Manitoba to do in-depth cost comparisons or low-pressure with conventional servicing, it should be noted that where low-pressure has been implemented, total cost savings have been approximately fifty percent of the projected costs for a conventional gravity flow system designed to service the same locations.[26]

Essentially then, the low-pressure system offers a similar level of quality of service to conventional gravity flow systems at a substantially reduced total cost. Recent discussions concerning Big Eddy with Department of Agriculture officials have indicated that a low-pressure sewer system could possibly be installed in that community for as little as $2,500.00 per unit.

It is important to point out, that although this discussion has attempted to show that the low-pressure sewer system is considered a viable low cost alternative at the present time, and could potentially offer significant cost reductions to the residents of Big Eddy, there are dangers inherent in attempting to apply such a system universally. Situations also exist where the application of a low-pressure system can actually mean higher costs than other systems. For example, if the location pattern of dwelling units in a community is such that there are large tracts of land between each dwelling unit, the use

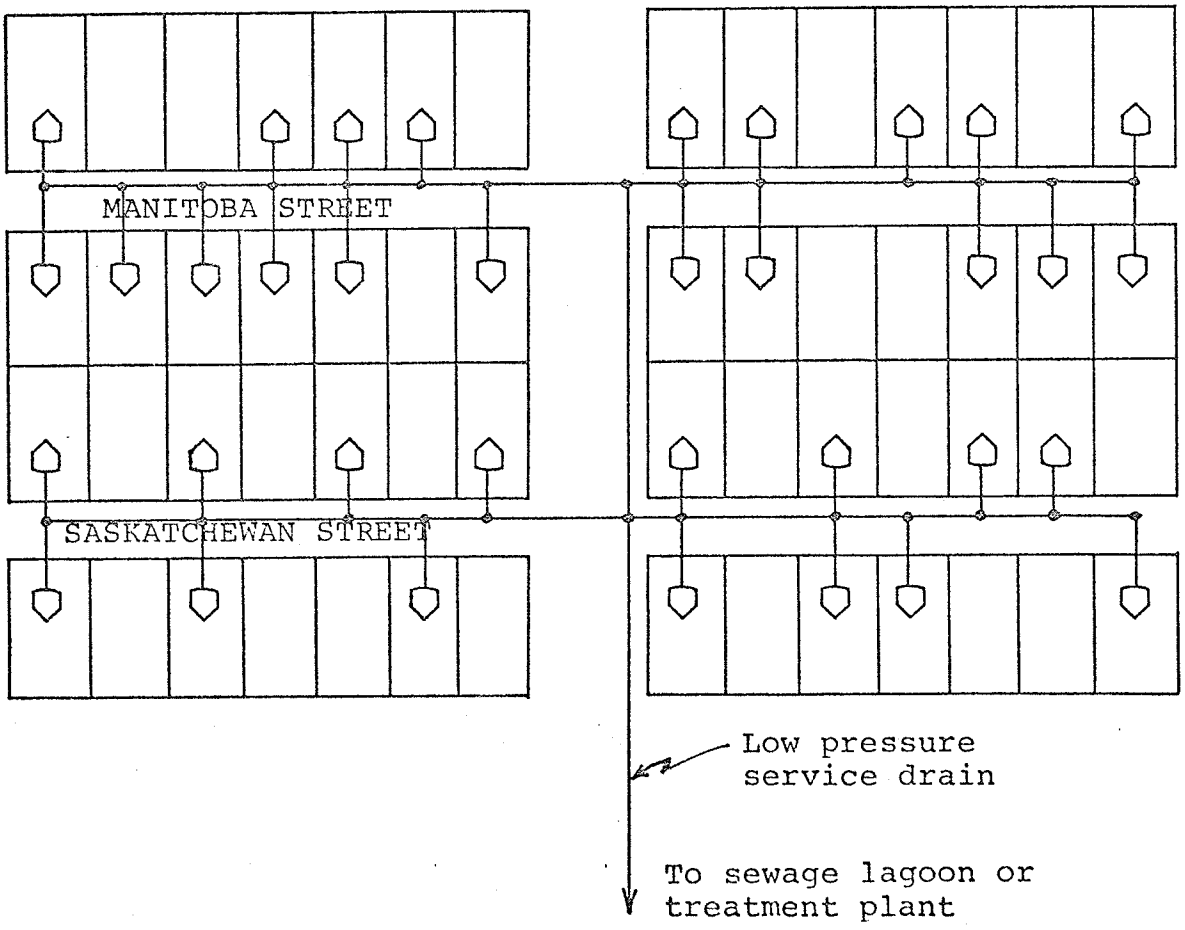
of some other alternative, such as the conventional septic tank system with field, might prove to be more economical and just as safe in terms of sanitation related considerations. Each community must have its own needs and characteristics analysed on a community specific basis before any discussion of system application can be undertaken.

Future Applications of Low-Pressure

There is still much research and investigation to be conducted in order to discover the full range of applications for the low-pressure sewage system. The following diagram depicts the low-pressure system as it is currently applied:

FIGURE 8

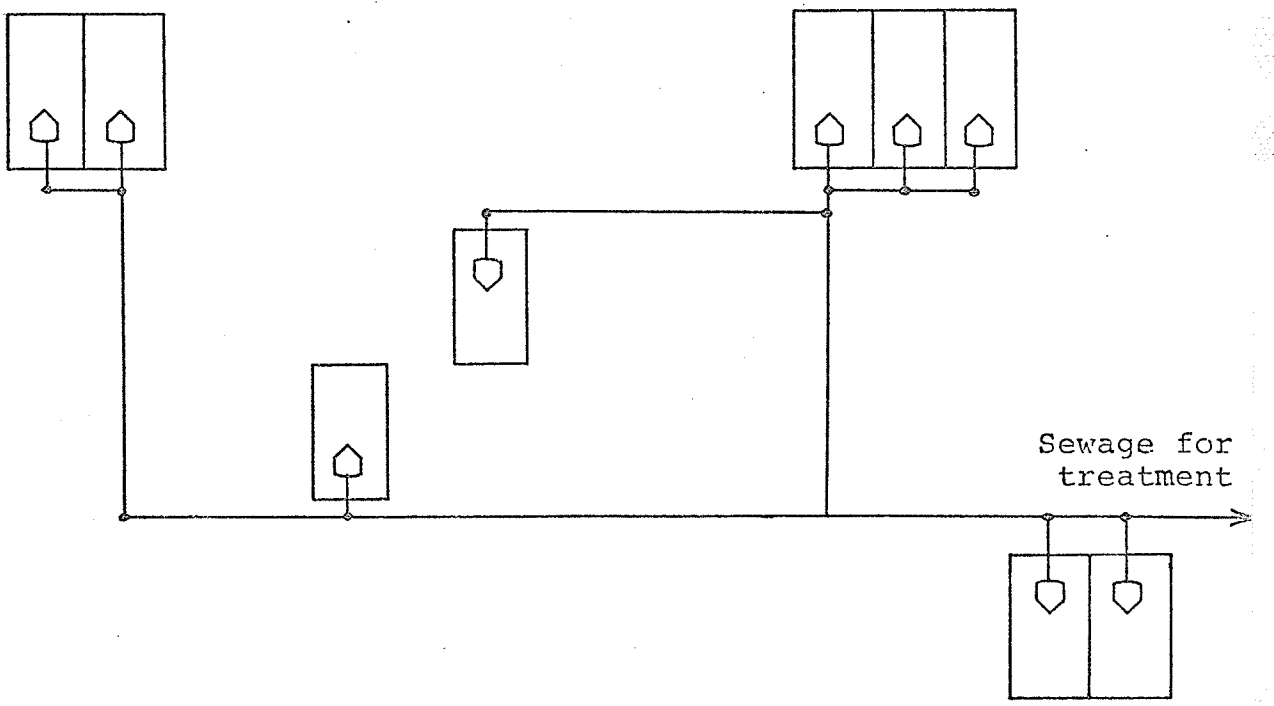
STANDARD SERVICING APPLICATION OF LOW PRESSURE SEWER SYSTEM



There is, however, much that can yet be done in researching the application of low-pressure to situations requiring cluster and/or single home servicing as depicted in the following diagram:

FIGURE 9

CLUSTER/SINGLE UNIT SERVICING APPLICATION OF LOW PRESSURE SEWER SYSTEM



The cost-savings economics, ease of installation, and quality of service are aspects of such applications which currently are in need of further research. Hopefully,

the low-pressure system can offer higher levels of sewage servicing for many rural and northern communities and prove adaptable to a wide variety of in-community situations.

C. THE COST EFFECTS OF RENTAL AND HOME OWNERSHIP PROGRAMS TO RURAL AND NORTHERN RESIDENTS

1. Introduction

This section does not attempt to outline all of the advantages and disadvantages of rental versus home ownership which could very well be the subject of a thesis in itself. What it does, however, is point out those aspects of the rental to home ownership conversion process which have the greatest potential to impact costs upon rural and northern residents living in subsidized housing, constructed under M.H.R.C.'s Remote Housing Program.

The first phase of such home ownership conversions is currently underway by M.H.R.C. Since the original intent on behalf of M.H.R.C. under the Remote Housing Program was to have the units supplied to be eventually owned by the residents, the home ownership conversion process is completely consistent with this original intent. The possibility currently exists that, given time, all the units supplied under the Remote Housing Program will be converted to home ownership.

2. The Direction of the Past: The Provision of Subsidized Rental Units: Advantages and Disadvantages

When referring to M.H.R.C. rental units it is important to point out that the remote units have been under a rent-to-purchase agreement. This means that occupants are currently renting the remote units under a Lease Agreement. The rents which they have paid will be credited to the occupant's mortgage if the home is converted, with the understanding that the occupant has the first right of refusal of the sales offer. Any necessary adjustments to the mortgage are made at the time the unit is converted from rental to sale.

Under the terms of the rental agreement, M.H.R.C. is responsible for both rent collection and property maintenance. Rents geared to income are applied according to the following scale. (Table 4).

From the inception of the Remote Housing Program, the repayment scale has remained the same for residents. It is only the maximum "rental" charge which has changed from 1969 to 1978. Currently the maximum payable is $125.00, whereas in 1969 the maximum payable was $85.00. Therefore, the scale remains sensitive to money income but is insensitive to the value of current dollars.

It is not surprising then that communities exert pressure upon M.H.R.C. to provide local improvements. Since im-

TABLE 4

REMOTE HOUSING SCALE

APRIL 1, 1973

1. In this Schedule:

(a) "Family income" means the aggregate income in whatever form received of all members of a family, whether earned income or transfer payments, except family allowances.

(b) "Family" means a natural family consisting of a family head and one or more persons related by blood, marriage or adoption and in addition to a natural family may include other persons known to have lived regularly as an inherent part of the family group and whose earnings and resources are available for use in meeting the living expenses of the group, but shall not include a group of unrelated persons living together, lodgers or persons living alone.

2. Each "family" occupying each of the houses will be charged in accordance with their "family income" as listed below:

Repayment Scale

Family Income	Monthly Payment	Family Income	Monthly Payment	Family Income	Monthly Payment	Family Income	Monthly Payment
Up to $192	$22	$266	$46	$340	$70	$416	$94
195	23	269	47	343	71	420	95
198	24	272	48	346	72	424	96
201	25	275	49	349	73	428	97
204	26	278	50	352	74	432	98
207	27	281	51	355	75	436	99
210	28	284	52	358	76	440	100
213	29	287	53	361	77	444	101
216	30	290	54	364	78	448	102
220	31	293	55	367	79	452	103
223	32	296	56	370	80	456	104
226	33	300	57	373	81	460	105
229	34	303	58	376	82	464	106
232	35	306	59	380	83	468	107
235	36	309	60	383	84	472	108
238	37	312	61	386	85	476	109
241	38	315	62	389	86	480	110
244	39	318	63	392	87	484	111
247	40	321	64	395	88	488	112
250	41	324	65	398	89	492	113
253	42	327	66	401	90	496	114
256	43	330	67	404	91	500	115
260	44	333	68	408	92	504	116
263	45	336	69	412	93	508 & up	(25% less $10)

REDUCTIONS FOR CHILDREN

The above scale provides the monthly payment for a family or individual with no children. A reduction in this payment of $2 per month is allowable for each child with a minimum payment of $18 a month regardless of the number of children.

* 3. In no case will a "family" be required to pay more than that required to meet the full operating costs of the house occupied by it.

4. In order to provide for families receiving income at irregular intervals, adjustment will be made annually at December 31st to ensure payments are related to total annual income.

* NOTE WELL

The maximum "rental" charge during the "Tenancy" period is as follows:

1969-70 Program: $85.00
1970-71 " : $85.00
1971-72 " : 3-BR - $90.00; 4-BR - $95.00
1972-73 " : $105.00
1973-74 " : $125.00

Adjustments to the maximum cost figure may have to be made at the occasion of signing the Purchase Agreement, once all capital costs figures will have been finalized.

provements do not affect total rent paid on behalf of residents and will be incorporated into the total worth of an existing dwelling unit in terms of today's value of current dollars, it is a distinct advantage for residents to desire such improvements. These improvements can include roadwork, street lighting, and servicing, and have proved to be very costly for M.H.R.C. to undertake. Money which is used by M.H.R.C. for remote units is cost-shared on a 75% Federal, 25% Provincial basis. The 75 percent, however, is not forgiven to the province but is a loan which is repayable with interest over a term of fifty years.

A further advantage to residents in terms of cost impacts is that maintenance costs under the "rental" program are most often borne by the Province. It is important at this point to indicate that there are three separate situations in which maintenance costs can be incurred by the Province:

a) Normal wear and tear -- Since everything within a home has a life expectancy, parts of the dwelling unit will require repair or replacement when their life expectancy is reached. One of the major ways in which the life expectancy of the various parts of the home is shortened is by increasing the family size within the home. The wear and tear to a dwelling unit is most often directly proportional to the

number of people inhabiting it.

b) Preventable but unintended damage -- The maintenance of a home for minimum cost requires a conscientious effort on the part of the resident to continually strive to minimize wear and tear. Where such a conscientious effort is not made, wear and tear takes place which could otherwise have been prevented.

c) Malicious damage -- This is damage done to the unit which is totally the result of irresponsibility on behalf of the residents living in the home. Malicious damage to a dwelling unit is most often the result of serious family conflicts or the result of the excessive use of alcohol on behalf of one or several persons in the family, or guests within the subject unit.

Average maintenance costs per unit incurred by M.H.R.C. under the rental program were approximately $1,000.00 for 1977. Projected maintenance costs for 1978 could very likely be in the vicinity of $1,600.00 per unit, given expected increases in labour and material costs.[27] Although M.H.R.C. has attempted to recover the associated costs of malicious damage from the unit residents where such damage has occurred, there are situations where M.H.R.C. has borne the brunt of the costs simply because the family could not pay the repair costs, and if repairs

were not made, the unit would be uninhabitable. An example of this would be where the livingroom window has been completely destroyed in sub-zero weather, and family income is such that the costs of repair cannot be borne by the residents. One can easily see, then, that in terms of the total costs to be incurred by residents, it is a distinct advantage to the resident for maintenance costs to be borne by the Province.

A further advantage to residents under the rental program is that interest charges and tax charges do not have an impact upon the amount residents are expected to pay because of the rent-geared-to-income nature of the repayment scale.

With respect to disadvantages associated with the Remote Housing Rental Program, this author has discovered no cost disadvantages to residents. The disadvantages which residents incur under rental are directly associated with the degree of personal freedom they are able to exercise with respect to the dwelling unit in which they reside. A resident, for example, cannot always paint a dwelling unit in the color of his own choosing. Rural and northern residents have often expressed a desire to use much brighter, more intense colors than one usually sees. If M.H.R.C. objects to such a choice, the color cannot be put on the home. Also, a resident may wish to modify the

unit itself so that it better suits his style and way of life. Such a change may be a necessary and/or desired amenity, but could be disallowed under the rental program.

Since the dwelling unit is the property of the Province of Manitoba until it is sold and fully paid for by the resident, the Province has an obligation to protect its investment in the home. What cannot be ignored, however, is that any restricted freedom of the resident can restrict the feeling of pride he has for the home, and the degree of initiative he is willing to exercise towards its upkeep and maintenance. It is, perhaps, in the area of preventable but unintended damage that the negative effects upon pride and initiative would have their greatest impact.

3. The Direction of the Future: The Provision of Resident-Owned Units: Advantages and Disadvantages

The home ownership program which is currently being applied to the remote units in rural and northern areas is a subsidized purchase program which provides mortgage assistance to families in the units. Briefly stated, the family residing in a unit is approached by M.H.R.C. and the intention to convert the unit to home ownership is discussed with the family. If the family decides not to purchase the dwelling unit it may remain on the rental program under certain circumstances, or the family may be asked to vacate the unit.

If the family decides to purchase the unit, the full recovery costs to the Province are determined and subsequently become the mortgage amount. The family signs a mortgage agreement with M.H.R.C. and agrees to repay the mortgage in monthly installments. The maximum monthly payment becomes the sum of the full costs of the mortgage plus the associated insurance upon the mortgage, and taxes. As the home ownership program is currently constructed, in no case will the family be expected to pay more than 25 percent of its gross income. In other words, the family is expected to pay for the entire principal/interest/taxes amount or 25 percent of its gross income, whichever is less. If the family's monthly payment does not cover the full cost of the mortgage payment, a government subsidy is provided to absorb the difference. The ability to pay, therefore, is a direct function of the family's disposable income.

The home ownership program can be a distinct advantage to a family in terms of restrictions which are removed from its personal freedom, such as those examples mentioned above, and advantage can possibly be gained by the resident in terms of pride and initiative associated with ownership.

For the resident who is primarily concerned with the potential cost impacts upon his disposable income, however, the disadvantages far outweigh the advantages. There can

be a situation which develops for certain residents where, for example:

Rise in resident's gross income from $500.00 to $700.00 per month.

Total recovery costs of unit = $175.00

25% of gross income = $175.00/month.

∴ Minimum acceptable payment = total recovery costs = $175.00/month.

Such a situation can develop where sudden rises in income correspond with the timing of the conversion of the unit from rental to home ownership. In the example above, the resident would be faced with an additional $50.00 per month expense over the $125.00 maximum under the rental program. Furthermore, since the gross annual income of residents is to be assessed every year, rises in income can potentially have an affect on the amount the resident is responsible for in the future.

An additional and significant disadvantage to the resident in terms of negative cost impacts is the added responsibility to the resident of maintenance costs associated with the upkeep and proper functioning of the dwelling unit. It has already been pointed out that average maintenance costs are high. One might expect that the added financial responsibility of maintenance costs will force residents to become more conscientious with respect to

the proper ongoing maintenance of their dwelling unit in order to minimize associated costs. However, it cannot be doubted that the maintenance bill for some residents can have serious cost implications.

Taxes and interest charges may affect a resident only in that situation where 25 percent of the gross family income is greater than the full recovery level of the unit. Expected payments can then rise with an increase in taxes or an increase in interest charges upon the mortgage.

D. SUMMARY AND CONCLUSIONS

This chapter has reviewed the major potential cost impact areas upon residents of units constructed under M.H.R.C.'s Remote Housing Program. The conclusions which one may draw from such a review are as follows:

a) under the previous rental arrangements, the major cost concerns of the resident were:
   i) the total monthly payment for which he would be responsible according to the repayment scale;
   ii) the costs of heat and utility payments incurred in the physical operation of the dwelling unit.

b) under the home ownership conversion arrangements, the major cost concerns of the resident will be:
   i) the total payment for which he will be responsible after total recovery costs are calculated

and compared to 25 percent of his gross monthly income.

ii) the total cost of improvements to his dwelling unit, such as the installation of a higher level of servicing, which could potentially more than double the total recovery cost of the home. There is also a serious concern to M.H.R.C. since conversions take place according to a subsidized purchase program which provides mortgage assistance. The greater the total recovery cost of the home, and subsequently the lower his monthly gross income, the greater the degree of subsidy required. In no case can payments by the resident currently exceed 25 percent of his gross monthly income.

iii) the maintenance costs to the home. The resident under home ownership is completely responsible for the physical upkeep and maintenance of the dwelling unit. These costs have the potential to be a significant cost burden for residents.

One cannot ignore, while viewing the above major cost impact areas upon residents, what the effect of rapidly increasing prices and inflation will have upon residents. For the sake of clarifying this point, consider the following example:

The new Manitoba Hydro electric service rates which came into effect on February 1, 1978 will have a substantial effect upon the total annual electrical bill that remote residents (particularly those in rural and northern homes with all-electric service) will receive.

The old rate structure for rural residents in effect from April 1, 1975 to April 1, 1976, and used for calculations for the heat and utility section of this chapter was as follows:

The first 100 kWh/month = 8.5¢/kWh.
The next 175 kWh/month = 3.0¢/kWh.
The remainder = 1.58¢/kWh.

Effective as of February 1, 1978, is the following:

Service charge = $7.00/month (applicable on new and old rural units).

Underground service charge = $2.10 (only applicable in designated underground areas, i.e., Brandon and Winnipeg).

The first 250 kWh/month = 4.5¢/kWh.

The remainder = 2.21¢/kWh.

Assuming that the underground service charge does not apply, then the following percentage increase calculations are then pertinent:

1. Assuming an annual consumption of 10,000 kWh and a regular consumption pattern:

Cost with 1975-76 rates:

First 100 kWh x 12 months @ 8.5¢/kWh	= $102.00
Next 175 kWh x 12 months @ 3.0¢/kWh	= $ 63.00
Remaining 6,700 kWh @ 1.58¢/kWh	= $105.86
Total	= $270.86

Cost with February 1, 1978 rates:

Service charge--	
$7.00/month x 12 months	= $ 84.00
First 250 kWh x 12 months @ 4.5¢/kWh	= $135.00
Remaining 7,000 kWh @ 2.21¢/kWh	= $154.70
Total	= $373.70

Percentage Increase = $\frac{102.84}{270.86}$ = 37.97%

2. Assuming an annual consumption of 15,000 kWh and a regular consumption pattern:

Cost with 1975-76 rates	= $349.86
Cost with February 1, 1978 rates	= $484.20

Percentage Increase = $\frac{134.34}{349.86}$ = 38.40%

3. Assuming an annual consumption of 20,000 kWh and a regular consumption pattern:

Cost with 1975-76 rates = $428.86

Cost with February 1, 1978 rates = $594.70

Percentage Increase = $\frac{165.84}{428.86}$ = 38.67%

4. Assuming an annual consumption of 25,000 kWh and a regular consumption pattern:

Cost with 1975-76 rates = $507.86

Cost with February 1, 1978 rates = $705.20

Percentage Increase = $\frac{197.34}{507.86}$ = 38.86%

Unless the resident can improve the purchasing power of his dollars, or find viable methods of curbing the effects of inflation and price increases, the cost impacts upon him have very serious implications. This situation is particularly pertinent under home ownership arrangements for residents, where there is a greater onus in terms of actual and/or potential cost impacts upon the individual.

CHAPTER III

CHAPTER III

PROBLEM OVERVIEW AND RELATIONSHIP TO PROVINCIAL OBJECTIVES

The intent of this chapter is to review the provincial objectives as summarized and outlined in Chapter I, and to discuss them in the light of the research and investigations carried out in Chapter II. Concerns with respect to specific objectives can then be outlined and assist in defining the areas in which greater concentration of efforts may be necessary. Such a discussion may also aid in directionalizing one's thoughts in a positive sense with respect to provincial home-ownership programs.

Additionally, such a discussion relates directly to the stated hypothesis of this thesis. It attempts to outline the areas where insufficient attention has been paid to the provincial objectives, and by doing so, any suggested alternative to past and/or current programs can later be evaluated according to its ability to assist in rectifying this situation.

A. DEFINITION OF INCONSISTENCIES AND EVALUATION

1. Direct Cost Reduction Assistance Objectives

The objectives outlined under this section as presented in Chapter I were:

a) to provide for the production of reasonably costed units;

b) to minimize ongoing operating and maintenance costs to purchasers through design innovation and product improvements;

c) to provide for the satisfaction of need, and reduce current costs to the individual by providing as optimum a number of units to the various communities throughout the province as is feasibly possible;

d) in keeping with c) above, to be able to swiftly identify interest and need in provincial housing programs at the individual applicant level;

e) generally, then, to shorten the length of time between expressed needs of people and the delivery of assistance.

With reference to the objective of the production of reasonably costed units to residents under the Remote Housing Program, there is no doubt in this author's mind that this

is precisely what has occurred. The first units provided under this program in 1969-70 were provided in some areas for as little as $8,000.00 to $9,000.00 per unit. Where the income of a particular family in such a unit is particularly low, this is of great consequence because the total recovery cost of their unit is certainly not substantial. The earliest units provided comply most completely with this objective.

The second objective outlined above -- to minimize ongoing operating and maintenance costs to purchasers through design innovation and product improvements -- presents a different situation. It is true that design innovation and product improvements have led to the general advancement of a better home which could be provided over the years under the Remote Program. However, now that the homes are built, and to an ever-increasing extent are becoming the greater responsibility of the unit residents through the home ownership conversion program, the opportunity to advance savings to existing unit residents is stifled. Under home ownership, ongoing operation and maintenance costs become the responsibility of the unit resident and the onus will be solely upon him to further satisfy this objective.

With respect to objective c) above -- to provide for the satisfaction of need, and reduce current costs to the individual by providing as optimum a number of units to

the various communities throughout the province as is feasibly possible -- there is little doubt in this author's mind that, in terms of helping to provide decent, safe, sanitary housing for many needy families, this has indeed occurred. The word "need", however, can refer to many things. Whether the provision of such housing has really helped to meet the often deeply set physical, social and emotional problems of the residents or whether it has really helped to assist in the question of social and economic integration within Manitoba's various communities, is still a matter seriously in need of future research.

Objectives d) and e) above -- to be able to swiftly identify interest and need in provincial housing programs, and to shorten the length of time between expressed needs of people and the delivery of assistance -- have, for the most part, little significance in the question of home ownership conversions. It is important to point out, however, that in the case of the latter objective, the home ownership conversion process seems to suggest a reduced sensitivity to the needs of the resident due to the fact that, under home ownership, greater onus is placed upon the individual family to satisfy its own needs and take responsibility for the effects of a more diverse range of cost impacts.

2. Resource Related Objectives

These objectives as outlined in Chapter I are as follows:

a) To train and employ local residents wherever possible.

b) To use local raw materials wherever possible.

It is anticipated by this author that the home ownership conversion process of M.H.R.C. will have little or no effect in the furtherance of these objectives.

3. Housing Stock Improvement Objectives

The objectives outlined in this section were:

a) To minimize ongoing operating and maintenance costs to purchasers through design innovation and product improvements. (See 1 b) above).

b) To assume an active role in the rehabilitation of existing units which can be utilized for public housing.

c) To offer wider housing alternatives than are presently available to urban and rural areas.

Again, because of the reduced role which M.H.R.C. will play in the satisfaction of these objectives for remote units under the home ownership conversion process, little

can be expected in terms of the furtherance of these objectives.

4. Community Related Objectives

Included here were the following:

a) To involve communities more closely in the fulfilling of their housing requirements.

b) To foster greater responsibility on the part of communities in the management and maintenance of their housing.

Although the home conversions will have no effect with respect to a) above, there is a direct relationship to the furtherance of objective b). Communities will now have a new role to play in assisting the residents of converted units in the fulfilling of their new roles as homeowners. They may wholeheartedly assume this role, or reject it. Communities, however, have a responsibility to themselves to maintain as high a quality of housing stock as they can feasibly manage. Conversions do place more responsibility on affected community members to manage their own affairs with respect to their housing. To this end, conversions do lead to the furtherance of this objective.

The omitted objectives as outlined in Chapter I are as follows:

Environmental and Planning Oriented Concerns:

1. To carry out provincial public housing programs while at the same time minimizing negative environmental impacts.

2. To carry out these programs with a minimum of interference to the surrounding neighborhoods and their lifestyles.

3. That proper planning and design principles will be a high priority in the provision of publicly assisted housing.

The only objective which is affected in a positive sense is number 2. A decreased role on the part of M.H.R.C. with respect to remote units will mean that affected individuals will have greater freedom to manage their own affairs and make their own choices. The overall effect that M.H.R.C. can have upon lifestyle of residents will subsequently be lessened.

B. SUMMARY AND CONCLUSIONS

A review of the various provincial objectives which established the Remote Housing Program and delivered the many housing units to families in the respective rural and northern communities has been helpful in concluding that home ownership programs currently underway have

little to contribute in the furtherance of these objectives in the future.

If one is to be concerned with the further satisfaction of these objectives, it seems highly desirable at this point to discuss any suggestions which might assist in this end. It is in keeping with this desire that Chapter IV addresses the question of possible future directions.

CHAPTER IV

CHAPTER IV

POSSIBLE FUTURE DIRECTIONS

It is evident from the discussions in Chapter II that as the various cost impacts discussed become the sole responsibility of the affected residents, the need for cost-reduction alternatives increases. Where alternatives are not provided, the resident, given the same level of income, will be forced to reduce his standard of living in order to cope with these additional costs.

Since, under the proposed and existing conversions from lease-rental to ownership for remote units, it has been shown that new costs will be impacted upon residents immediately, an alternative cost-reduction method which offers both short and long term advantages is needed.

The alternative of creating new industries and, therefore, new jobs to increase incomes is not a viable alternative with respect to M.H.R.C.'s affected remote unit residents. Industries require capital to set up, and developed skills on the behalf of workmen to operate. In addition, with the large number of communities affected, the capital outlay would have to be tremendous.

The intention of the provincial government at present is not to increase subsidies to the affected remote unit residents. Therefore, the family incomes cannot be increased in this manner. This chapter attempts to show that by utilizing cost-reducing self-help program alternatives on a community-specific basis, actual and potential cost impacts can be reduced while needed and/or desired amenities are provided.

Such a discussion relates directly to the stated hypothesis. To prove the hypothesis, it is necessary to show that a self-help program can be a viable cost-reducing alternative which can be advantageous to both residents and government and that, at the same time, such a program can also provide needed and/or desired amenities for residents. Consideration will, therefore, be given as to whether possibilities exist to further satisfy provincial housing objectives.

A. INTRODUCTION

Certainly one of the worst human conditions which one can imagine is material poverty which is compounded and further reinforced by a lack of hope. It is out of concern for this situation that this analysis now orients itself towards discussing a means by which just such a situation might possibly be avoided.

The intention is not to suggest that there is any quick and easy solution to the problem of cost impacts upon rural and northern residents, nor is it to assume that no remedies can possibly be developed to assist in both the near and distant futures.

Concern with respect to alleviating cost impacts necessarily implies careful consideration on behalf of our society to establish any path towards a viable remedy as conscientiously as is possible. Critical to this idea, as this chapter attempts to point out, is the fact that although the importance of government and the private sector in any such process should not be understated, neither should one underestimate the significance of the individual's potential contributions and, subsequently, the role which enhanced pride and initiative on behalf of the individual can play in any process of cost reduction.

B. THE ROLE AND RESPONSIBILITIES OF THE RESIDENT UNDER HOME OWNERSHIP

As Chapter II has attempted to point out, there are various cost impacts which actually affect or potentially can affect a resident, and his or her income, when the responsibilities associated with home ownership become those of the resident. Cost aspects of rental programs which previously were attended to and subsequently subsidized (in whole or in part) such as maintenance costs, for example, will likely become the responsibility of the residents in the future. Difficulties experienced by government with respect to obtaining future funds for subsidy payments to residents, and high costs encountered with respect to existing subsidies to these residents, could possibly necessitate such a situation. Conversions from subsidized rental housing to home ownership programs would then have, as one major objective, the lowering of subsidy costs to government. At the same time, government would wish to increase the onus upon the individual resident to bear a greater proportion of the home operating costs.

It is primarily because such a situation is within the realm of possibility in the future, that it is important to be considering means by which residents can remain in their homes under home ownership programs while, at the same time, learn how to cope with the various cost im-

pacts and associated anticipated future cost increases.

The situation is particularly critical where unskilled and uneducated individuals may be expected to operate a home and maintain it under a home ownership program, and obtain adequate food and clothing for themselves and their families, while not having acquired the knowledge to be able to do this at minimal cost to themselves and with a reasonable degree of skill. Ultimately, situations will occur where such individuals will not always be acting in the best interests of themselves and their families in attempting to lower costs.

Not only should one consider the importance of cost reduction with respect to the various major cost impacts implicit in the physical operation of the home itself, but also one should not ignore the possibility of cost trade-offs (i.e., reduced food expenditures can result in more funds available to cope with higher costs in other areas), and costs which can be implicit in a resident attempting to provide himself with some additional necessary and/or desired amenity. If a means of increasing cost trade-offs (without sacrificing quantity or quality of food, for example) while at the same time reducing implicit costs in the provision of additional amenities could be implemented, some positive improvement in lifestyle for rural and northern residents could be achieved. It would be a further advantage if such a

means could be applied to reduce costs associated with the physical operation of the home itself.

In the opinion of this author, the greatest cost savings can potentially be realized with respect to the management of available resources. It is through the most efficient use of available manpower and materials that a means of cost reduction in a time of restraints can be realized. Labour and materials are both required when any improvements are made to an existing environment and, generally, labour is the most costly element of the two. When a resident is faced with having to pay for labour and material-related expenses and is in a low-income situation, any increase in the amount payable by the resident will necessitate that the resident be in a position to help himself. The greater the increase in the amount the resident is solely responsible for, the greater the need for self-help.

C. DIRECTIONALIZING ASSISTANCE THROUGH PROPOSED COMMUNITY-SPECIFIC PROGRAMS

Self-Help Defined

The term "self-help" has traditionally meant "the act of providing for or helping or the ability to provide for or help oneself without assistance from others".[28] The idea of self-help is, of course, a good one. There are, however, many of our rural and northern neighbors who, for

a variety of reasons, are unable to help themselves in ways which would best make use of their time, energy and available materials. Furthermore, situations exist where a minimum amount of external assistance need be provided in order to initiate a process which can be highly efficient with respect to the self-help concept.

It is because of concerns such as these that this author redefines "self-help" as follows:

Self-help is a program established by the provincial government (and/or the private sector) to utilize to as great an extent as possible/feasible, local labour and materials, to provide those necessary or desired amenities which, because of cost/payment limitations, would otherwise be unavailable if not accomplished by the unit residents themselves.

What is being proposed then, is a form of aided self-help in an attempt to relieve actual and potential cost impacts. A review of existing literature on self-help revealed that critical to a workable proposal for aided self-help in communities such as those currently under the jurisdiction of M.H.R.C. are the following essential considerations:

1. That government (and/or the private sector) is willing to provide support for self-help proposals.

2. That proper preparation and co-ordination with respect to self-help programs can be established by the government departments to be involved in such a process.

3. That a co-ordinating committee can be established to dispense pertinent information as required to communities, and that the committee be composed of capable, interested participants.

4. That communities be selected and analysed on a community-specific basis.

5. That a community representative be established in each participating community.

6. That a community self-help program commence on a small scale with a sample of perhaps one or two communities in order that in-depth evaluations of respective successes and failures can be conducted.

7. That prospective participants in the initial sample communities be selected on the basis of their interests in self-improvement, and their desire to learn through their own efforts. Participants should be selected on an individual basis.

8. That a workable program of self-help requires that training and assistance can be offered to participants when required.

9. That the self-help program be tailored to the way of life and problems within any one community.

Critical also are the following individual-oriented concerns:

10. That it is essential that patience and perseverance be inherent in the program's approach.

11. That an on-going process of encouragement be inherent in the program's approach.

12. That morale and productivity be maintained through aspects of the program.

13. That the program respect the participant's own creativity and intelligence.

14. That the program concentrate on forming effective and cohesive working relationships.

Overview of Approach

In attempting to suggest any program of self-help to assist in reducing costs for rural and northern residents, it is important to consider the resident. Where choices and decisions need to be made, it is essential they remain in the arena of the resident's view and do not stifle his attempts to participate in any process aimed at providing him with assistance. In other words, he must be able to

participate as fully as possible. This notion of participation means not only allowing the citizen to be heard, but also implies that he is able to become well informed about the underlying reasons for any proposals which may affect him directly.

Essentially what is being proposed here is a community training program to teach individuals within a community how to use self-help to their own advantage in improving their style of life and, at the same time, assist themselves in lowering cost impacts associated with their own individual requirements.

Initially, the government agency or agencies partaking in the institution of such a process would select one or two communities in which to test various approaches and to evaluate the respective successes and failures. There are three essential elements to such a process:

a) A co-ordinating committee composed of interested individuals, knowledgeable in the various means and methods available to assist others in reducing cost impacts through self-help.

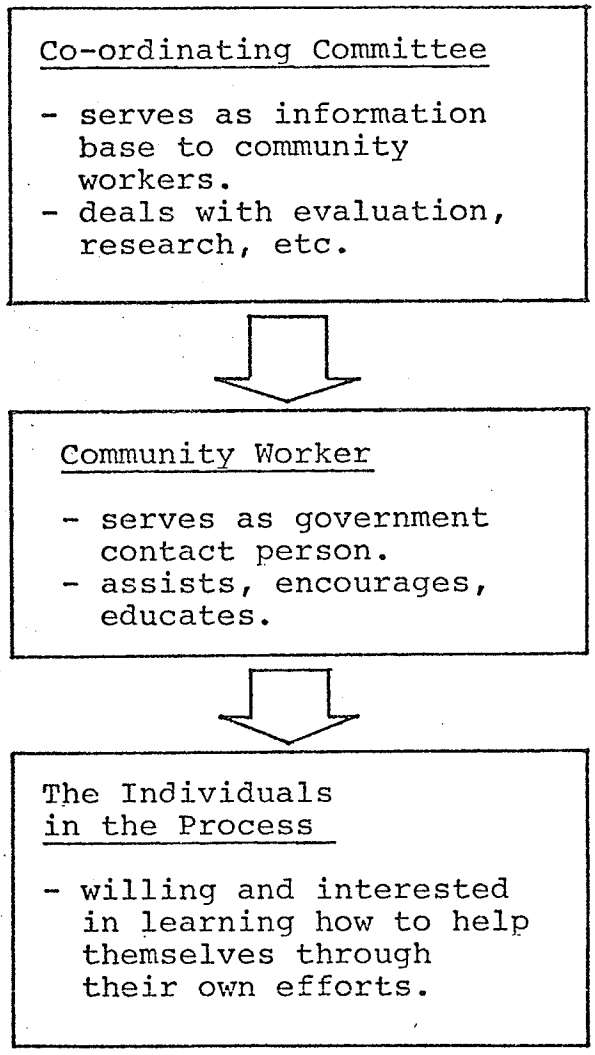
b) A community worker, preferably who lives in the community and works with the various individuals and helps them to achieve their own aims and objectives with respect to self-help.

c) The willing, interested participant.

These three elements are depicted in the following diagram:

FIGURE 10

SELF-HELP PROCESS DIAGRAM



The co-ordinating committee would be made responsible by a government agency to prepare a manual for community

workers which outlines a variety of methods whereby residents can provide themselves with necessary and/or desired amenities. The manual could include such basi information as:

a) How to dc a variety of repairs to a home simply and easily. Such suggestions could be tailored specifically to M.H.R.C. R3 dwelling units.

b) How to recycle materials and to use natural materials to make repairs and improvements.

c) How to build a simple greenhouse, start a compost heap, grow vegetables, and how to garden, even in areas where good soil is virtually non-existent.

d) How to recycle wastes.

e) How to perform basic landscaping tasks.

The list could, doubtless, be very extensive.

The main intent would be to identify interested participants and, with the aid of the community worker, to gradually train the participants so that over time they can progress from simple to more complex tasks. The coordinating committee would be able to provide assistance on an on-going basis to the community workers, and all the while would have to remain conscious of community-specific needs and limitations.

It would certainly be critical to the success of such a program that community workers be chosen properly. They must be able to provide training and assistance to various individuals as well as encouragement. The potential also exists for community workers to set up group training sessions and encourage groups to work together to assist each other. The community worker may be provided with a variety of tools for loan to individuals in the community who do not have, and cannot afford, their own.

The individual participants have much to contribute to the process:

a) They provide the opportunity to bring forth opinions and judgments concerning the feasibility of any proposals.

b) They have an intimate knowledge of the community context -- its needs and attributes.

c) They can express the idiosyncracies of their neighborhood or community.

d) They can produce information concerning the specific behavioral traits of individuals in their community.

e) They can assist in balancing any proposals with their own values.

Though there will certainly be individuals who intially do not wish to participate in a self-help program, the advantages of taking part in self-help will become evident to these people when they see the progress of their neighbors and friends. This may certainly be enough encouragement to convince many of them to participate.

Such a program can be a very positive element for government. With a comparatively small financial outlay, individuals and communities will gradually learn how to help themselves and provide for their own needs. A training program of this type will help to develop skills and foster pride and initiative in the individuals involved in the process. The government will be assisting in the positive spread of useful cost-lowering suggestions throughout the north and also assist directly and indirectly in the beautification of the northern environment.

D. SUMMARY AND CONCLUSIONS: RETURN TO OBJECTIVES

In the opinion of this author, aided self-help programs can be a positive force in assisting individuals to relieve cost impacts upon themselves and, at the same time, provide necessary and/or desired amenities. It is extremely crucial to the process, however, that proper care be taken in how it is established and operated.

Self-help programs can lead to the furtherance of provincial housing objectives.

a) Direct cost reduction assistance is provided through savings in labour costs, minimizing on-going operating and maintenance costs through a variety of potential self-help projects and the injected creativity of the individual, delivering assistance through training and help by community workers to the individual, providing an on-going method of identifying individual interests and needs.

b) The resource-related objectives are furthered by the provision of training at the individual level and the encouragement of utilizing and recycling, where possible, local raw materials.

c) Housing stock improvement objectives can be advanced through the efforts and creativity of the individual to rehabilitate, maintain and repaint his own dwelling unit.

d) Community-related objectives are more fully satisfied because individuals have a means by which they can participate more fully in their community, take greater interest in its beautification through the management and maintenance of their own affairs.

Furthermore, self-help can lead to an increased emphasis

upon the other planning and environment-related concerns by encouraging individuals to participate more fully in their home and surrounding environment.

CONCLUSION

CONCLUSION

An analysis of the home operating cost factors which currently affect or potentially will affect the disposable income of residents operating provincially subsidized housing units in selected rural and northern communities reveals that:

1) as the various cost impacts to rural and northern residents are incorporated into Provincial Housing Programs, the need for viable cost-reduction alternatives increases;

2) it is advantageous to both the affected residents and government to utilize cost-reducing self-help program alternatives on a community-specific basis to minimize actual and potential cost impacts while at the same time providing needed and/or desired amenities for residents.

The hypothesis of this thesis has, therefore, been proved.

In this thesis the author has used an on-the-spot investigative approach to defining the major potential and actual cost impacts upon rural and northern residents living in subsidized housing units constructed under the

Remote Housing Program of The Manitoba Housing and Renewal Corporation.

Implicit in the approach has been the defining of the major new cost impacts upon residents who have previously rented their dwelling units, and are now faced with the added cost responsibilities inherent under the home ownership program currently underway by M.H.R.C. The home ownership program converts the dwelling units from rental to ownership for the residents.

Though specific costs relating to any particular resident are difficult to define, an overview of the major cost-problem areas has led to a greater understanding of the potential magnitude of such costs upon subsidized rural and northern residents.

The major conclusions of this author, arrived at during the course of compiling the research for this thesis, and subsequently indicated within its respective chapters, the the following:

Chapter I:

a) That society has established a variety of valid reasons why governments should provide assistance to low-income peoples through the provision of income-assisted housing.

b) That this author has been able to discover no comprehensive, well-defined list of income-assisted housing objectives in use by the Manitoba provincial government when its agency, The Manitoba Housing and Renewal Corporation provided for homes under its Remote Housing Program from 1969 to 1974.

Chapter II:

a) That the method of establishing heat and utility cost calculations and projections as proposed by Manitoba Hydro allowed the author to establish the major inconsistencies responsible for large variations in the heating costs of specific residents.

b) That there are substantial cost variations between fuel prices and total heating bills between southern and northern Manitoba, and that heat and utility cost impacts are much more significant in the case of the northern residents.

c) That local improvements, particularly with respect to water and sewage servicing, can have a potentially severe effect upon the total recovery cost of a dwelling unit.

d) That there is evidence to indicate the need for research into the low-pressure sewer system for application in rural and northern communities in Manitoba

and that it holds significant potential for cost reduction.

e) That the cost impacts to residents can be substantially greater under home ownership than under the current rental arrangements and that a major potential contributor to this is the added cost burden of maintenance concerns.

f) That the combined cost effects under home ownership with respect to the on-going physical operation of the home have the potential to be much greater to residents than under rental arrangements.

g) That a viable means of cost reduction without substantial implicit costs to government would be a desired beneficial improvement to actual and potential cost impacts.

Chapter III

a) That home ownership conversions do little in the furtherance of the derived Manitoba Provincial Housing Objectives.

Chapter IV

a) That self-help programs can assist in the reduction of cost impacts upon residents.

b) That the means by which self-help programs are im-

plemented has much to do with the eventual success or failure of such programs, and that government has a crucial role to play therein.

In view of the above, Planners have significant roles which they can perform to assist in the difficult task of improving the lifestyle and reducing the problems encountered by our neighbors in Manitoba's rural and northern communities. Much more research is needed and much more work needs to be done in order that Planners can make conscientious, significant contributions to government and to communities to assist in improving the lot of the individual. This thesis has attempted to shed some light for future travellers along this path.

FOOTNOTES

[1]Robert Moore Fisher, 20 Years of Public Housing, (New York: Harper and Bros., 1959), p. 3.

[2]Albert Rose, "Social Aspects of Public Housing" in Canadian Housing: A Reader, Kamal S. Sayegh, ed., (Waterloo, Ontario: The University of Waterloo, 1972), p. 52.

[3]ibid., p. 51.

[4]These are three of the most common terms used to classify poor-grade housing. See Richard S. Scobie, Problem Tenants in Public Housing: Who, Where and Why Are They?, (New York: Praeger Publishers, 1975), pp. 1-3.

[5]Robert Moore Fisher, op. cit., p. 29.

[6]Catherin Bauer, A Citizen's Guide to Public Housing, (New York: Vassar College, 1940), pp. 2-3.

[7]Robert Moore Fisher, op. cit., p. 9.

[8]Central Mortgage and Housing Corporation, "Housing in Canada 1946-1970" in Canadian Housing: A Reader, Kamal S. Sayegh, ed., (Waterloo, Ontario: The University of Waterloo, 1972), p. 66.

[9]ibid., p. 69.

[10]Dennis and Fish, Programs in Search of a Policy, (Toronto: Hakkert, 1972), p. 176.

[11]B. Hill, "Final Report on Housing Working Group Northern Housing Strategy", December 1976, pp. 22-27.

[12]Dennis and Fish, op. cit., p. 5.

[13]Manitoba Hydro, "Electric Heating: Application in Various Types of Building Construction", (Marketing Department, Winnipeg, Manitoba, December 1975).

[14]ibid., p. 47. This is the interior temperature which is understood to be the dry bulb temperature at the breathing line, five feet above the floor, or at seating level, 30 inches above the floor and not less than three feet from the outside walls.

[15]ibid., pp. 40-66.

[16]Vern Christensen and John Reid, "N.W.T. Water and Sanitation Policy and Program Review", Municipal Affairs Division and Department of Planning and Program Evaluation, N.W.T., 1977.

[17]See I. Gillies, "A Framework for Improving Water Services in Manitoba's Remote Communities", Master of Natural Resources Thesis, The Natural Resource Institute, University of Manitoba, 1975.

[18]V. Christensen and J. Reid, op. cit., p. 4.

[19]V. Christensen and J. Reid, op. cit., p. 3.

[20]Adapted from Components of Waste Management Systems in "A Feasibility Study of Two Alternate Waste Management Systems for Remote Northern Communities", by L. Sherwood, The Natural Resources Institute, University of Manitoba, Winnipeg, 1975.

[21]Adapted from Water Sanitation System Schematic in "A Framework for Improving Water Services in Manitoba's Remote Communities", op. cit.

[22]W. H. Brant, "A Special Report on Low Pressure Sewer Systems", prepared for the Province of Manitoba, Department of Mines, Resources and Environmental Management, Water Resources Branch, August 1975.

[23]ibid., p. 2.

[24] ibid.

[25] ibid., pp. 8-14.

[26] Personal interview with Mr. Erv Griffin, Low Pressure Servicing Specialist, Department of Agriculture, Province of Manitoba.

[27] Personal interview with the Director of Renewal and Rural Housing, The Manitoba Housing and Renewal Corporation, March 1978.

[28] The Organization for Social and Technical Innovation, Inc., Self-Help Housing in the U.S.A.: a Preliminary Report, June 1969, p. 9.

APPENDIX

APPENDIX : SECTION I

Presented herein are the actual monthly electrical energy consumption figures for the residents of the selected electric communities living in subsidized units. Data presented is for the one year period May 1975 to April 1976.

'No read' indicates that a meter was not read for a particular month, but the actual consumption figure for that month is shown combined with the consumption for the following month.

A zero or a blank square indicated that no consumption was recorded for that particular month.

It should be noted here that in order to preserve the privacy of the various residents, a letter of the alphabet has been used to identify each household.

CAMPERVILLE				PARALLELS 49 - 52				ZONE 1				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
A	1990	970	680	860	1280	2000	2440	3730	5520	3900	3730	2440
B	1110	620	1420	930	820	1480	2230	2730	4040	2700	2640	1510
C	1290	2080	540	1010	1410	1940	1860	4410	4760	3140	3330	1370
D	2720	120	230	570	820	1720	2590	3700	5430	3110	3290	1960
E	1500	800	400	580	910	1430	3130	1750	4120	4600	2800	1880
F	1630	1020	440	650	1030	1680	2430	3000	4710	3160	3240	2170
G	2070	1030	580	970	No Read	3150	2720	3550	4880	3070	3500	2430
H	2110	1280	620	1070	1350	2650	3600	3860	5300	3410	3680	2480

CAMPERVILLE (cont'd.)				PARALLELS 49 - 52				ZONE 1				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
I	2010	1070	570	750	1440	3350	2280	3700	5220	3220	3310	2040
J	1660	1030	270	1640	1060	550	2230	2650	4190	2630	2590	2010
K	398	319	354	536	253	1498	2395	2710	4010	2620	2550	1470
L	532	716	547	652	712	1482	2845	1543	3784	2334	2464	1704
M	454	553	402	582	850	1426	2028	2695	3023	3580	2700	1810
N	1340	650	420	460	910	350	3700	3270	4590	2850	2860	1770

MANIGOTOGAN			PARALLELS 49 - 52				ZONE 1					
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
A	1200	900	290	1000	1390	2000	3860	5110	4870	4150	3450	2130
B	1560	800	740	1110	870	No Read	4610	4930	2730	2210	2680	1890
C	1500	560	170	750	1260	1400	3410	3770	3000	3220	2760	1920
D	1020	640	500	510	2150	1400	5490	4140	5180	4500	4000	1080
E	1220	620	470	690	1170	1300	4070	3000	5540	3300	3130	1800

PELICAN RAPIDS				PARALLELS 52 - 53				ZONE 2				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
A	2630	670	810	240	2910	2510	3490	4170	5070	3190	3870	2200
B	1660	640	840	880	2960	1430	3140	3240	4000	2660	3630	1900
C	910	280	150	140	1890	1100	600	2020	2210	1530	1690	600
D	80	120	110	110	970	1380	1980	2470	3180	2290	2450	1160
E	2110	1130	1660	1110	1860	2370	3970	2630	4460	3290	3880	2000
F	1630	570	880	270	3250	2460	2580	3840	5320	3770	4410	3260
G	456	202	352	346	304	467	669	1081	1769	2773	3824	1933
H	1180	210	410	1190	520	600	2000	2170	2830	1650	1900	770

PELICAN RAPIDS (cont'd.)				PARALLELS 52 - 53				ZONE 2				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
I	700	430	320	2250	2210	3160	3420	4320	3340			2060

WABOWDEN			PARALLELS 54 - 55				ZONE 4					
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
A	1990	1030	1450	1630	1530	1590	1550	1630	1220	1230	1250	1140
B	800	790	240	730	540	410	1220	2930	1880	2260	2160	1890
C	49	57	522	505	6	43	114	204	5132	2948	2387	4474
D	0	1860	1690	1650	4610	4660	5260	5430	No Read	No Read	No Read	18110
E	3440	1720	1420	1440	2400	2510	3690	4260	4350	3210	3650	2300
F	3940	1960	950	1050	2420	4340	4550	5070	5650	5170	4550	2690
G	3090	1330	1030	1020	2030	3690	3560	4020	5930	5300	4230	2510
H	2210	1050	130		1960	3420	3950	4050	4750	4620	4730	2140

WABOWDEN (cont'd.)				PARALLELS 54 - 55				ZONE 4				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
I	808	727	540	543	664	1061	1211	1250	5093	4538	4460	2634
J	1119	59	1	196	835	3173	4178	4860	4000	2720	3570	1810
K	3280	1320	1450	1360	1790	2690	3780	4160	3050	2560	3240	2810
L	2520	1140	400	800	1890	2590	3310	4230	4770	3250	3880	3030
M	1560	1210	950	1030	180	2430	4070	4150	4350	3160	3380	2920
N	3000	1560	440	790	1620	2630	3710	4140	5710	3270	4180	3230
O	207	205	211	231	850	No Read	1775	4770	4830	4290	4160	2010
P	689	633	639	643	1123	2053	3093	3950	5940	4250	3420	1820

WABOWDEN (cont'd.)			PARALLELS 54 - 55					ZONE 4				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
Q	1093	946	975	852	1188	3235		3960	4780	3870	3480	3050
R	5010	2040	1020	1150	1570	4110	4220	4860	4720	3510	3320	2850
S	215	240	247	509	1087	516		4010	5160	2650	2940	2070
T	540	538	551	1021	1826	No Read	No Read	8318	5810	3440	3080	3770
U	256	262	270	1200	2844	1734	725		4130	2500	2530	2590

NELSON HOUSE	PARALLELS 55 - 56							ZONE 5				
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
A	2420	950	800	1430	3080	2650	5890	6030	4610	4780	4360	2630
B	3790	240	1100	2060	3850	2250	4700	5190	4420	4050	3970	2530
C	510	460	920	1910			2090	3680	930	3420	2540	1600
D	900	340	100	1160	1460	2240	4360	4330	3660	4010	3860	2520
E	2070	800	430	1210	2660	2370	4270	4930	4460	4010	4250	2650
F	400	1370	1280	1940	1490	2650	4630	5410	4450	4320	4140	3190
G	1870	830	460	1130	2700	1990	4870	6170	5090	4770	3710	2040

ILFORD			PARALLELS 56 - 57				ZONE 6					
HOUSE-HOLD	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
H	1720	No Read	2100	1180	No Read	7660	4630	7250	No Read	7910	4300	2500
I	1360	No Read	1800	1050	No Read	5410	3780	6590	No Read	6710	3460	2000
J	1840	No Read	1900	1190	No Read	6730	4710	7670	No Read	8370	4210	3000
K	303	No Read	1188	705	No Read	3105	1180	2908	No Read	7740	4040	2000
L	110	No Read	542	156	No Read	1774	958	1350	No Read	6580	3380	2000
M	20	No Read	90	20	No Read	380	190	890	No Read	6030	3060	2000
N	500	No Read	880	200	No Read	580	230	1320	No Read	7110	3780	1000
O	69	No Read	470	612	No. Read	900	344	1470	No Read	6800	3750	2000

ILFORD (Cont'd.)			PARALLELS 56 - 57				ZONE 6					
HOUSE-HOLD	MAY	JUNE	JULY	AUG..	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
P	370	No Read	360	90	No Read	450	270	1150	No Read	5580	2310	1000
Q	1110	No Read	520	160	No Read	300	710	720	No Read	4530	2830	1000
R	1528	No Read	2230	1105	No Read	6869	2527	3500	No Read	15290	4540	2500
S	50	No Read	1840	950	No Read	6640	4030	7740	No Read	8170	4870	3500
T	867	No Read	1023	492	No Read	3665	1671	8040	No Read	6610	3770	2000
U	30	No Read	1510	920	No Read	5690	3650	6720	No Read	7020	4030	2000

APPENDIX: SECTION 2

The intent of this appendix is to present the information which was used to calculate theoretical heat costs for the eight established zones in Manitoba. Although a detailed description of the formulas used in the calculations, and their derivation, is not presented here, the method describing them is outlined in "Electric Heating: Application in Various Types of Building Construction", pages 40 to 66.

This publication, combined with the information presented herein, would allow a heating specialist to follow the complete analysis and facilitate further study using this same method. For the purposes of this paper, however, and to avoid the presentation of cumbersome technical data to the reader, this researcher has chosen to omit such a discussion.

The first pages of this section present the total heat loss calculations in watts for the standard R3 and the modified R3 with improved heat retention characteristics. These figures were arrived at in consultation with Manitoba Hydro assisting with the calculations, and representatives of The Manitoba Housing and Renewal Corporation, who were very helpful in supplying the necessary construction data.

The remainder of this section gives the theoretical heat cost calculations for the two units mentioned above located

in the eight established zones in Manitoba as derived in consultation with Manitoba Hydro.

NOTE: Slight variations in theoretical consumptions may be the result of actual degree day zones not exactly coinciding with latitude oriented degree day zones used by Manitoba Hydro. See "Climatic Information for Building Design in Canada 1975", Supplement No. 1 to the National Building Code of Canada, NRC No. 13986.

x10-1523

HEAT LOSS CALCULATION WORK SHEET

Name STANDARD R3

DESCRIPTION	HEAT LOSS COEFFICIENT: Watts or Btu. Loss per Sq.Ft. per °T.D.	TEMP. DIFF.	Watts or Btu. Loss per Sq.Ft.	ROOM HOUSE: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS
GROSS OUTSIDE WALL Sq. Ft.				896									
GLASS Sq. Ft.			15	72	1080								
OUTSIDE DOOR Sq. Ft.			7.9	18	142.2								
NET OUTSIDE WALL Sq. Ft.			2.3	806	1853.8								
CEILING Sq. Ft.			1.55	768	1190.4								
FLOOR JOIST Sq. Ft.													
FLOOR SLAB Lin. Ft.													
INFILTRATION Crack or Cu. Ft.			3.2	768	2457.6								
LOSS IN WATTS													
LOSS IN BTU.													
INSTALL													

DESCRIPTION	HEAT LOSS COEFFICIENT: Watts or Btu. Loss per Sq.Ft. per °T.D.	TEMP. DIFF.	Watts or Btu. Loss per Sq.Ft.	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS
GROSS OUTSIDE WALL Sq. Ft.													
GLASS Sq. Ft.													
OUTSIDE DOOR Sq. Ft.													
NET OUTSIDE WALL Sq. Ft.													
CEILING Sq. Ft.													
FLOOR JOIST Sq. Ft.													
FLOOR SLAB Lin. Ft.													
INFILTRATION Crack or Cu. Ft.													
LOSS IN WATTS													
LOSS IN BTU.													
INSTALL													

BASEMENT	HEAT LOSS COEFFICIENT: Watts or Btu. Loss per Sq.Ft. per °T.D.	TEMP. DIFF.	Watts or Btu. Loss per Sq. Ft.	ROOM CRAWL-SPACE: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height above / Below / AREA/VOLUME	HEAT LOSS
GROSS OUTSIDE WALL Above Grade Sq. Ft.				112							
GROSS OUTSIDE WALL Below Grade Sq. Ft.											
GLASS Sq. Ft.											
OUTSIDE DOOR Sq. Ft.											
NET OUTSIDE WALL Above Grade Sq. Ft.			3.9	112	436.8						
NET OUTSIDE WALL Below Grade Sq. Ft.											
CEILING Sq. Ft.											
FLOOR Sq. Ft.			1.2	768	921.6						
INFILTRATION Crack or Cu. Ft.			2.1	768	1612.8						
LOSS IN WATTS											
LOSS IN BTU.											

Total Bldg. Loss 9695.2 W.

Total Cu. Ft. Installed

X10-1523

HEAT LOSS CALCULATION WORK SHEET

Name ..MODIFIED...R-3.....

DESCRIPTION	HEAT LOSS COEFFICIENT: Watts or Btu. Loss per Sq.Ft. per °T.D.	TEMP. DIFF.	Watts or Btu. Loss per Sq.Ft.	ROOM HOUSE: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS
GROSS OUTSIDE WALL Sq. Ft.				896									
GLASS Sq. Ft.			15.0	72	1080								
OUTSIDE DOOR Sq. Ft.			7.9	18	142.2								
NET OUTSIDE WALL Sq. Ft.			2.1	806	1692.6								
CEILING Sq. Ft.			1.4	768	1075.2								
FLOOR JOIST Sq. Ft.													
FLOOR SLAB Lin. Ft.													
INFILTRATION Crack or Cu. Ft.			3.2	768	2457.6								
LOSS IN WATTS													
LOSS IN BTU.													
INSTALL													

DESCRIPTION	HEAT LOSS COEFFICIENT: Watts or Btu. Loss per Sq.Ft. per °T.D.	TEMP. DIFF.	Watts or Btu. Loss per Sq.Ft.	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height / AREA/VOLUME	HEAT LOSS
GROSS OUTSIDE WALL Sq. Ft.													
GLASS Sq. Ft.													
OUTSIDE DOOR Sq. Ft.													
NET OUTSIDE WALL Sq. Ft.													
CEILING Sq. Ft.													
FLOOR JOIST Sq. Ft.													
FLOOR SLAB Lin. Ft.													
INFILTRATION Crack or Cu. Ft.													
LOSS IN WATTS													
LOSS IN BTU.													
INSTALL													

BASEMENT	HEAT LOSS COEFFICIENT: Watts or Btu. Loss per Sq.Ft. per °T.D.	TEMP. DIFF.	Watts or Btu. Loss per Sq. Ft.	ROOM CRAWL-SPACE: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS	ROOM: Length / Width / Height Above / Below / AREA/VOLUME	HEAT LOSS
GROSS OUTSIDE WALL Above Grade Sq. Ft.				112							
GROSS OUTSIDE WALL Below Grade Sq. Ft.											
GLASS Sq. Ft.											
OUTSIDE DOOR Sq. Ft.											
NET OUTSIDE WALL Above Grade Sq. Ft.			3.9	112	436.8						
NET OUTSIDE WALL Below Grade Sq. Ft.											
CEILING Sq. Ft.											
FLOOR Sq. Ft.			1.2	768	921.6						
INFILTRATION Crack or Cu. Ft.			2.1	768	1612.8						
LOSS IN WATTS											
LOSS IN BTU											

Total Bldg. Loss .....9418.8 BTU.....

THEORETICAL HEAT COST CALCULATIONS

Applied Formula: $\frac{HL \times DD \times C \times \$}{T.D.}$ where

HL = Computed heat loss of building in kilowatts

DD = Annual degree days for area

C = Constant (estimated number of hours use per day)

R = Cost of energy per kilowatt hour ($.0158/kilowatt hour was used)

T.D. - Design temperature difference

Parallel Divisions	Standard R3	Modified R3
49-52: Zone 1	$234.05	$227.56
52-53: Zone 2	247.51	240.64
53-54: Zone 3	273.43	265.77
54-55: Zone 4	284.13	276.15
55-56: Zone 5	302.99	294.46
56-57: Zone 6	316.01	307.10
57-58: Zone 7	337.44	327.91
58-59: Zone 8	358.88	348.73

APPENDIX: SECTION 3

The following tables present an analysis of the total consumption figures for the one-year period May 1975 to April 1976. According to information described by Manitoba Hydro as discussed in pages 34 - 39 of this thesis, heat and utility consumptions and the percentage they represent of the total consumption figures are given.

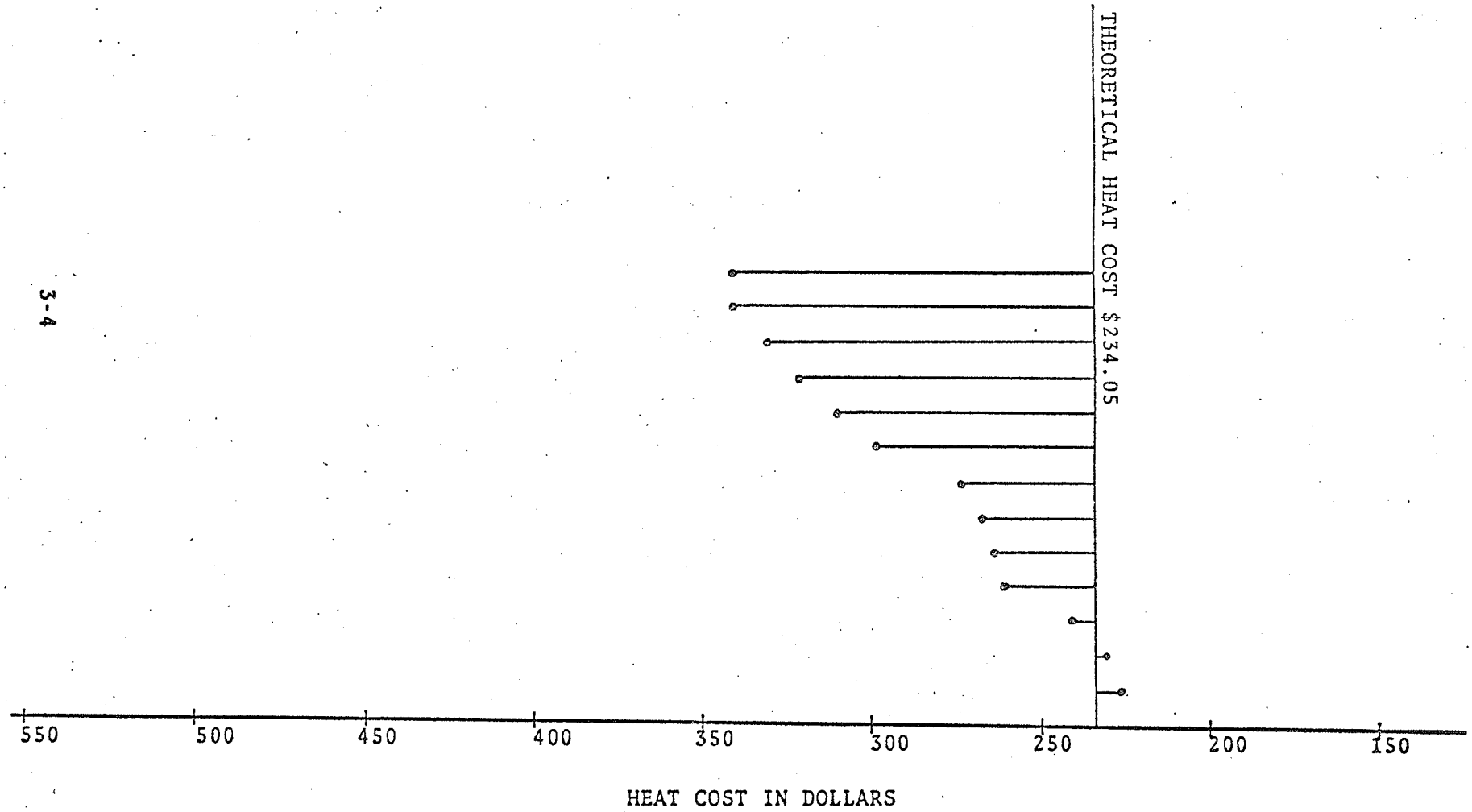
Furthermore, a comparison of actual and theoretical heat costs is presented and differences between these figures are expressed in terms of both dollars and percentages. The percentages given describe the relationship which exists when actual heating costs are above theoretical heating costs. Where actual costs are below theoretical, these inconsistencies are noted by "actual below theoretical", and explained in pages 53 - 57 of this thesis. In addition, a negative percentage figure has been calculated in the case of these inconsistencies. Since no true theoretical costs can be calculated for utilities on the basis of Manitoba Hydro's methods, utility consumption is presented as an estimated actual dollar figure only.

CAMPERVILLE		PARALLELS 49 - 52			ZONE 1		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
A	29540	21903.91	7931.49 ($125.32)	$234.05	$355.12	$127.07	51.73%
B	22230	16261.25	5968.76 ($ 94.31)	$234.05	$265.97	$ 31.92	13.64%
C	27140	19852.91	7287.09 ($115.14)	$234.05	$322.72	$ 88.67	37.89%
D	26200	19165.3	7034.7 ($111.15)	$234.05	$311.85	$ 77.80	33.24%
E	21900	16019.85	5880.15 ($ 92.91)	$234.05	$262.15	$ 28.10	12.01%
F	25160.0	18404.54	6755.46 ($106.74)	$234.05	$299.83	$ 65.78	28.11%
G	27950	20445.43	7504.58 ($118.57)	$234.05	$332.08	$ 98.03	41.88%
H	31410.0	22976.42	8433.59 ($133.25)	$234.05	$343.75	$109.70	46.87%

CAMPERVILLE (cont'd.)			PARALLELS 49 - 52			ZONE 1	
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
I	28960	21184.24	7775.76 ($122.86)	$234.05	$343.75	$109.70	46.87%
J	22510	16466.07	6043.94 ($ 95.49)	$234.05	$269.20	$ 35.15	15.02%
K	19073	13951.9	5121.10 ($ 80.91)	$234.05	$229.48	Actual Below	Theoretical - 1.94%
L	19288	14109.17	5178.83 ($ 81.83)	$234.05	$231.96	Actual Below	Theoretical - 0.88%
M	20103	14705.34	5397.66 ($ 85.28)	$234.05	$241.38	$ 7.33	3.13%
N	23170	16948.86	6221.15 ($ 98.39)	$234.05	$276.83	$ 42.78	18.28%

CAMPERVILLE - TOTAL OF 14 UNITS

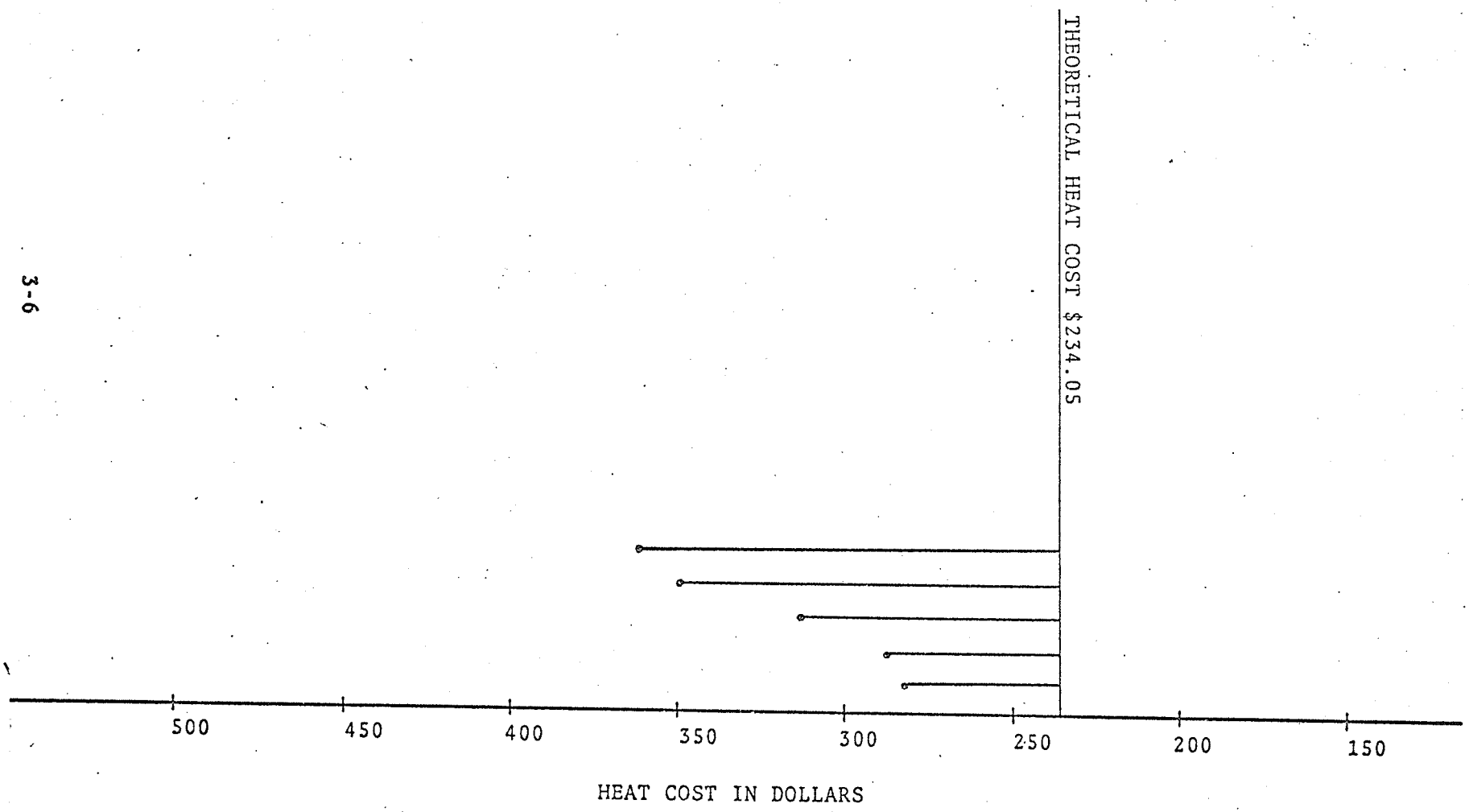
DISPERSION OF ACTUAL COSTS RELATIVE TO THEORETICAL



MANIGOTOGAN		PARALLELS 49 - 52			ZONE 1		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
A	30440	22266.86	8173.14 ($129.14)	$234.05	$360.86	$126.81	54.18%
B	24130	17651.10	6478.91 ($102.37)	$234.05	$287.93	$ 53.88	23.03%
C	23720	17351.18	6368.82 ($100.63)	$234.05	$283.19	$ 49.14	21.0%
D	30610	22391.22	8218.79 ($129.86)	$234.05	$362.82	$128.77	55.02%
E	26310	19245.77	7064.24 ($111.61)	$234.05	$313.12	$ 79.07	33.78%

MANIGOTOGAN - TOTAL OF 5 UNITS

DISPERSION OF ACTUAL COSTS RELATIVE TO THEORETICAL

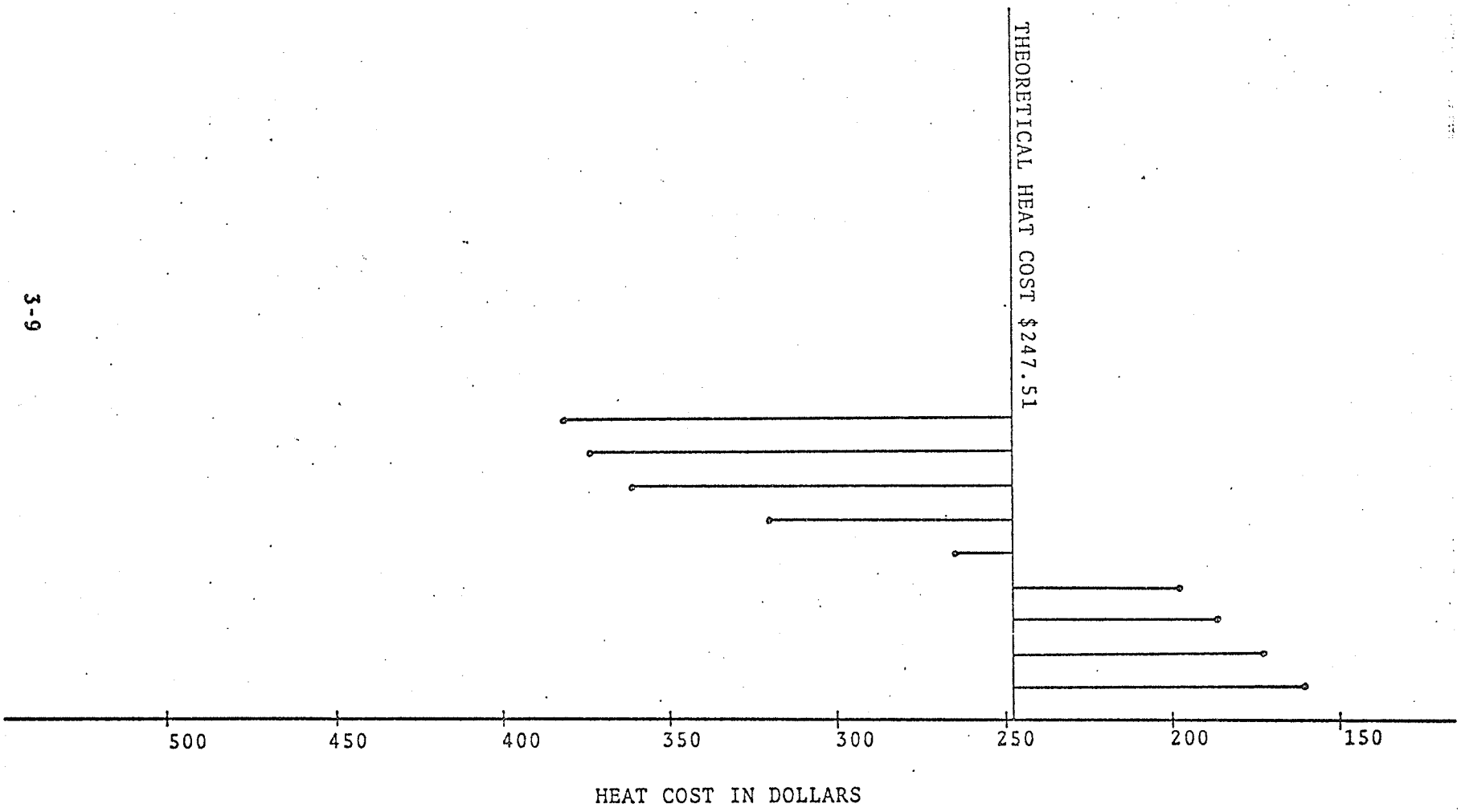


PELICAN RAPIDS			PARALLELS 52 - 53		ZONE 2		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
A	31760	23232.44	8521.56 ($134.64)	$247.51	$376.11	$128.60	51.96%
B	26980	19735.87	7244.13 ($114.46)	$247.51	$320.87	$ 73.36	29.64%
C	16300	11923.45	4376.55 ($ 69.15)	$247.51	$197.43	Actual Below Theoretical	-20.24%
D	13120	9597.28	3522.72 ($ 55.66)	$247.51	$160.68	Actual Below Theoretical	-35.08%
E	30470	22288.81	8181.20 ($129.26)	$247.51	$361.20	$113.69	45.93%
F	32240	23583.56	8656.44 ($136.77)	$247.51	$381.66	$134.15	54.20%
G	14176	10369.74	3806.26 ($ 60.14)	$247.51	$172.88	Actual Below Theoretical	-30.15%
H	15430	11287.05	4142.96 ($ 65.46)	$247.51	$187.38	Actual Below Theoretical	-24.30%

PELICAN RAPIDS (cont'd.)		PARALLELS 52 - 53			ZONE 2		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
I	22210	16246.62	5963.39 ($ 94.22)	$247.51	$265.74	$ 18.23	7.37%

PELICAN RAPIDS - TOTAL OF 9 UNITS

DISPERSION OF ACTUAL COSTS RELATIVE TO THEORETICAL



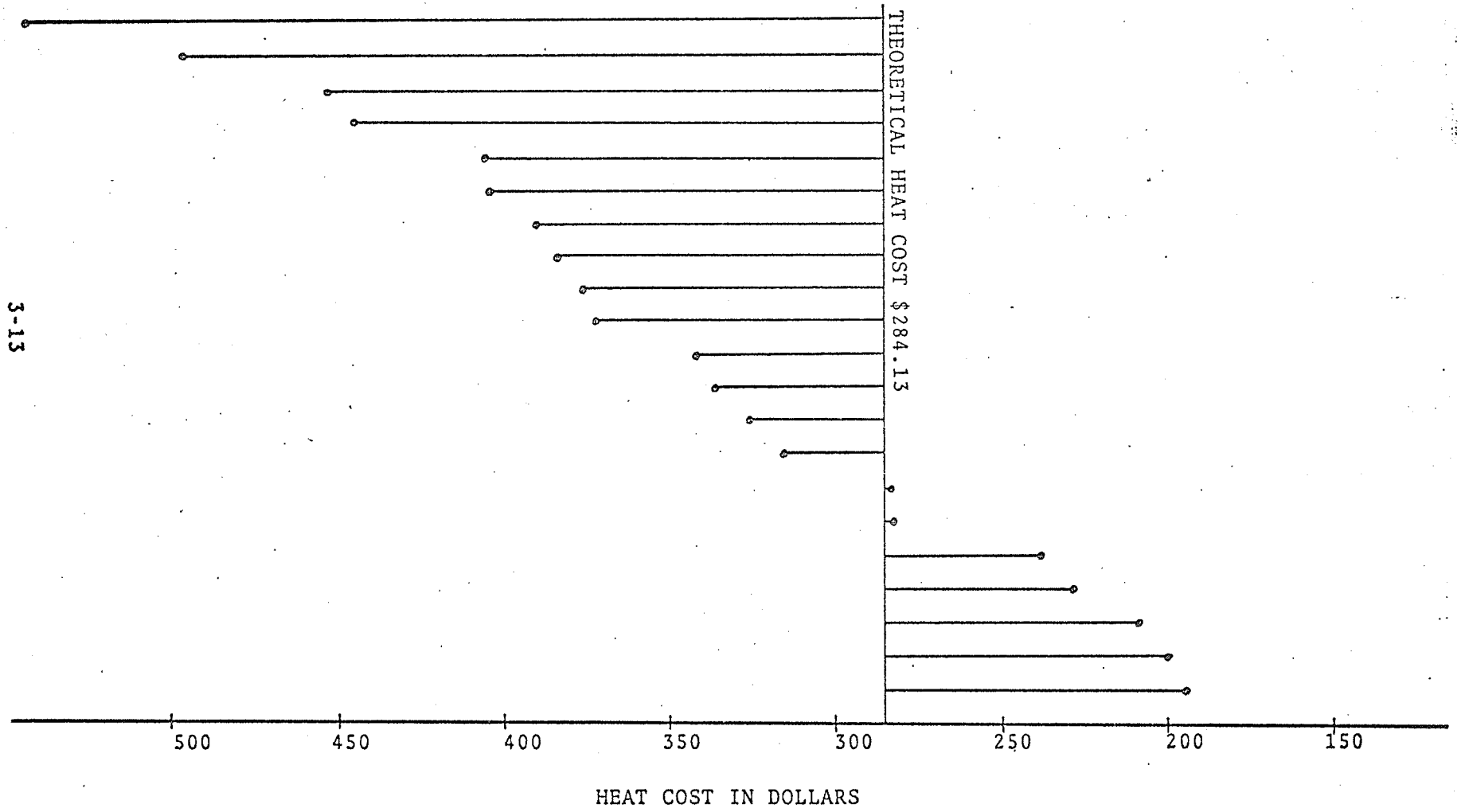
WABOWDEN			PARALLELS 54 - 55			ZONE 4	
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
A	17240	12611.06	4628.94 ($ 73.14)	$284.13	$208.29	Actual Below	Theoretical -26.69%
B	15850	11594.28	4255.73 ($ 67.24)	$284.13	$192.23	Actual Below	Theoretical -32.34%
C	16441	12026.59	4414.41 ($ 69.75)	$284.13	$199.06	Actual Below	Theoretical -29.24%
D	46360	33912.34	12447.66 ($196.67)	$284.13	$544.85	$260.72	91.76%
E	34390	25156.29	9233.72 ($145.89)	$284.13	$406.51	$122.38	43.07%
F	42340	30971.71	11368.29 ($179.62)	$284.13	$498.39	$214.26	75.41%
G	37740	27606.81	10133.19 ($160.10)	$284.13	$445.23	$161.10	56.70%
H	33010	24146.82	8863.19 ($140.04)	$284.13	$390.56	$106.43	37.46%

WABOWDEN (cont'd.)			PARALLELS 54 - 55			ZONE 4	
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
I	23529	17211.46	6317.54 ($ 99.82)	$284.13	$280.98	Actual Below	Theoretical - 1.10%
J	26521	19400.11	7120.89 ($112.51)	$284.13	$315.56	$ 31.43	11.06%
K	31490	23034.94	8455.07 ($133.59)	$284.13	$372.99	$ 88.86	31.27%
L	31810	23269.02	8540.99 ($134.95)	$284.13	$376.69	$ 92.56	32.58%
M	29390	21498.79	7891.22 ($124.68)	$284.13	$384.72	$ 64.59	35.40%
N	34280	25075.82	9204.18 ($145.43)	$284.13	$405.24	$121.11	42.62%
O	23539	17218.78	6320.22 ($ 99.86)	$284.13	$281.10	Actual Below	Theoretical - 1.06%
P	28253	20667.07	7585.93 ($119.86)	$284.13	$335.58	$ 51.45	18.11%

WABOWDEN (cont'd.)			PARALLELS 54 - 55			ZONE 4	
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
Q	27290	19962.64	7327.37 ($115.77)	$284.13	$324.45	$ 40.32	14.19%
R	38380	28074.97	10305.03 ($162.82)	$284.13	$452.62	$168.49	59.30%
S	19664	14369.59	5274.41 ($ 83.34)	$284.13	$236.08	Actual Below Theoretical	-16.91%
T	28894	21135.96	7758.96 ($122.59)	$284.13	$342.99	$ 58.86	20.72%
U	19041	13928.49	5112.51 ($ 80.78)	$284.13	$229.11	Actual Below Theoretical	-19.36%

WABOWDEN - TOTAL OF 21 UNITS

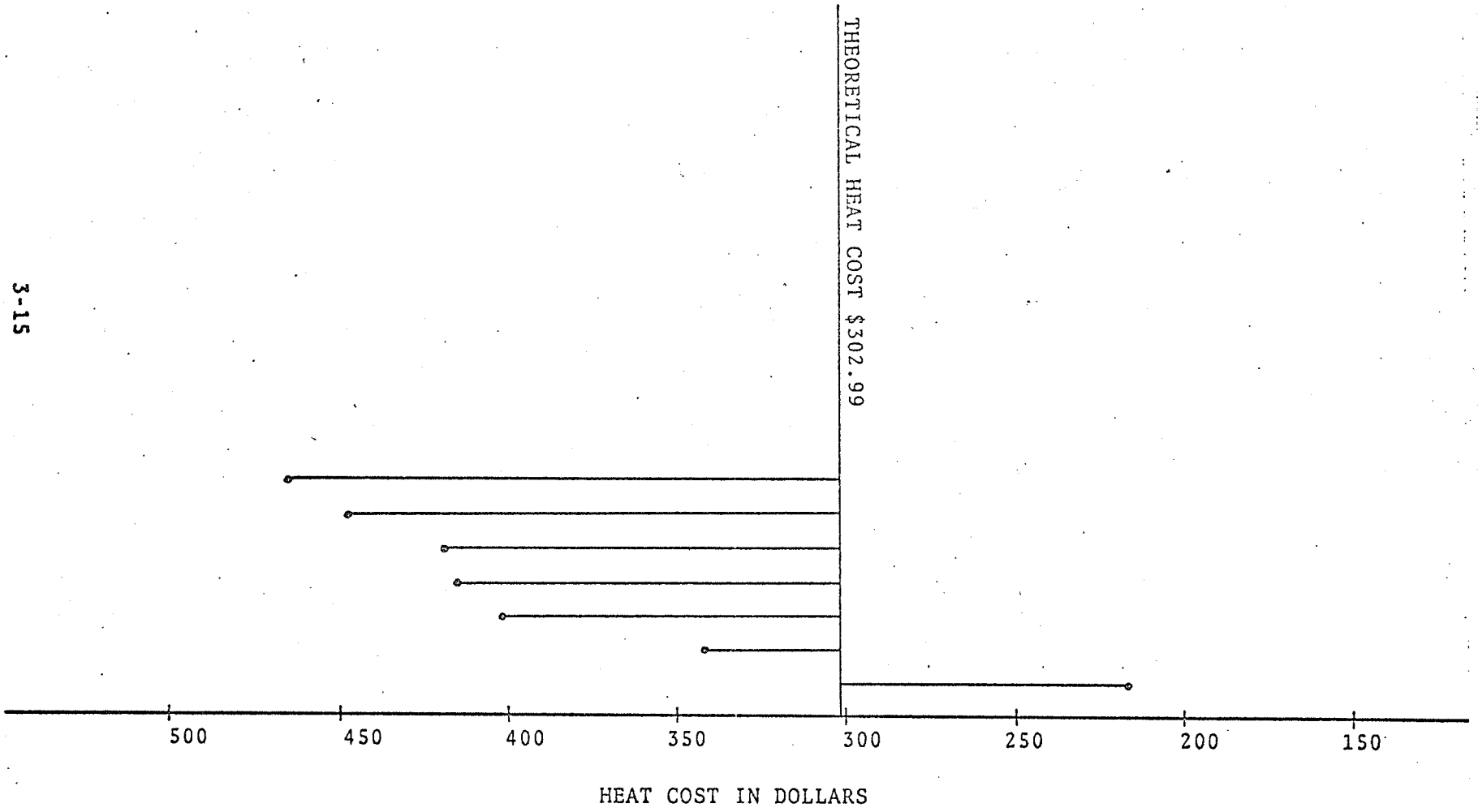
DISPERSION OF ACTUAL COSTS RELATIVE TO THEORETICAL



NELSON HOUSE		PARALLELS 55 - 56			ZONE 5		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
A	39630	28989.35	10640.66 ($168.12)	$302.99	$467.07	$164.08	54.15%
B	38150	27906.73	10243.28 ($161.84)	$302.99	$449.97	$146.98	48.51%
C	18060	13210.89	4849.11 ($ 76.62)	$302.99	$217.77	Actual Below	Theoretical -28.11%
D	28940	21169.61	7770.39 ($122.77)	$302.99	$343.52	$ 40.53	13.38%
E	34110	24951.47	9158.54 ($144.70)	$302.99	$403.27	$100.28	33.10%
F	35270	25800.01	9470.0 ($149.63)	$302.99	$416.68	$113.68	37.52%
G	35630	26063.35	9566.66 ($151.15)	$302.99	$420.84	$117.85	38.80%

NELSON HOUSE - TOTAL OF 7 UNITS

DISPERSION OF ACTUAL COSTS RELATIVE TO THEORETICAL



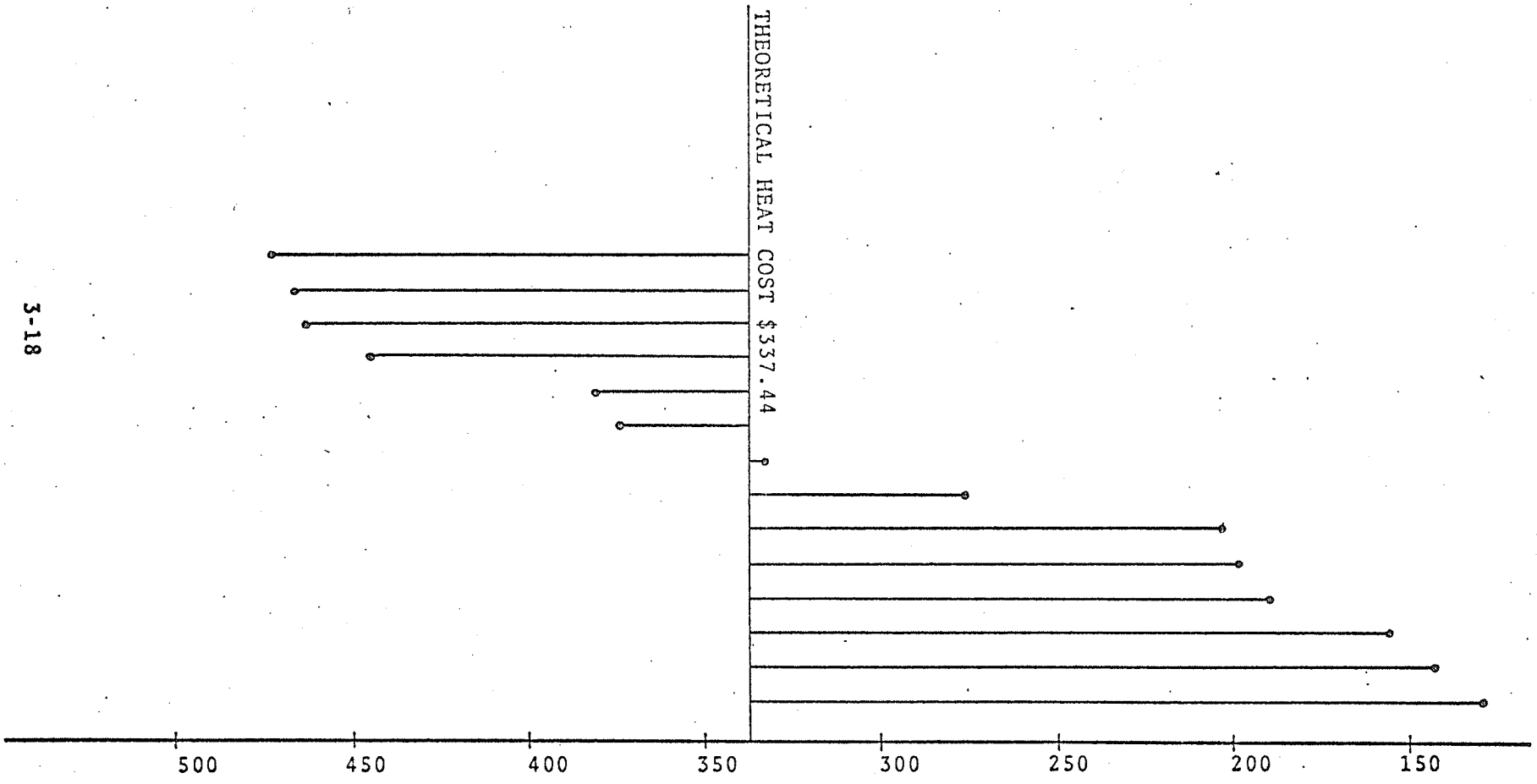
ILFORD		PARALLELS 56 - 57			ZONE 6		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
A	39250	28711.38	10538.63 ($166.51)	$337.44	$462.68	$178.55	37.14%
B	32160	23525.04	8634.96 ($136.43)	$337.44	$380.74	$ 43.30	12.83%
C	39620	28982	10637.97 ($168.08)	$337.44	$466.96	$129.52	38.38%
D	23169	16948.12	6220.88 ($ 98.29)	$337.44	$276.82	Actual Below Theoretical	-17.96%
E	16850	12325.78	4524.23 ($ 71.48)	$337.44	$203.78	Actual Below Theoretical	-39.61%
F	12680	9275.42	3404.58 ($ 53.79)	$337.44	$155.59	Actual Below Theoretical	-53.89%
G	15600	11411.4	4188.6 ($ 66.18)	$337.44	$189.34	Actual Below Theoretical	-43.89%
H	16415	12007.57	4407.43 ($ 69.64)	$337.44	$198.76	Actual Below Theoretical	-41.10%

ILFORD (cont'd.)		PARALLELS 56 - 57			ZONE 6		
HOUSE-HOLD	TOTAL CONSUMPTION	HEAT CONSUMPTION (73.15%)	UTILITY CONSUMPTION (26.85%)	THEORETICAL HEAT COST	ACTUAL HEAT COST	ACTUAL MINUS THEORETICAL	PERCENTAGE ABOVE THEORETICAL
I	11580	8470.77	3109.23 ($ 49.13)	$337.44	$142.88	Actual Below	Theoretical -57.66%
J	11180	8178.17	3001.83 ($ 47.43)	$337.44	$129.22	Actual Below	Theoretical -61.71%
K	40089	29325.10	10763.90 ($170.07)	$337.44	$472.38	$134.94	39.99%
L	37790	27643.39	10146.62 ($160.32)	$337.44	$445.81	$108.37	32.12%
M	28138	20582.95	7555.05 ($119.37)	$337.44	$334.25	Actual Below	Theoretical - 0.94%
N	31570	23093.46	8476.55 ($133.93)	$337.44	$373.92	$ 36.48	10.81%

ILFORD - TOTAL OF 14 UNITS

Note: Most Ilford residents examined supplement electrical consumption with fuel oil.

DISPERSION OF ACTUAL COSTS RELATIVE TO THEORETICAL



APPENDIX : SECTION 4

This section presents the procedure followed in order to discover whether or not the communities discussed earlier in this appendix would, on the average, display any inconsistencies with reference to the theoretical cost figure. The theoretical cost figure remains constant for all the households within a particular community and is, therefore, considered to be ±0.0%. Negative and positive percentages (i.e. those below and above theoretical as shown in Section 3 of this appendix) were summed for each community, and the difference between these two figures was determined. Dividing this difference for each community by the number of households within it results in the average percentage/household above or below theoretical.

Community	Sum Of Households Below Theoretical	Sum Of Households Above Theoretical	Difference	Average Percentage/ Household Below or Above Theoretical
Camperville	-224.02	+339.36	+115.34	+ 8.24
Manigotogan	- 0.0	+187.0	+187.0	+37.4
Pelican Rapids	-109.77	+189.1	+ 79.3	+ 8.81
Wabowden	-127.4	+569.65	+442.25	+21.06
Nelson House	- 28.11	+225.56	+197.45	+28.21
Ilford	-316.76	+171.27	-145.49	-10.39*

*Indicates inconsistency due to partial oil heat.

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