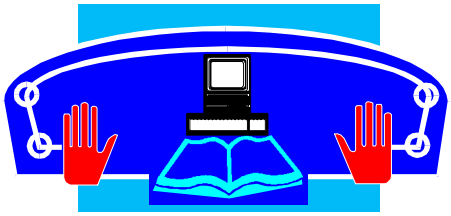

Arctic Development
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A Fuelwood Study For Mackenzie Region Communities Of The Northwest Territories Type of Study: Consultant Profile Forestry, Fuelwood/firewood Information Author: Treeline Planning Services Ltd Catalogue Number: 4-11-5

A FUELWOOD STUDY FOR MACKENZIE REGION COMMUNITIES OF THE NORTHWEST TERRITORIES

A FUELWOOD STUDY

FOR MCKENZIE REGION COMMUNITIES

OF TSE NORTHWEST TERRITORIES

Prepared for:

N.W. T. ASSOCIATION OF MUNICIPALITIES

Prepared by:

Treeline Planning Services Ltd.
Yellowknife, N.W.T.

March 1985

RCDP/PDCE-73

This report was prepared with a contribution from the Remote Community Demonstration Program of Energy, Mines and Resources Canada (EMR). Distribution of this report by EMR does not necessarily signify that the contents reflect the views and policies of EMR. Mention of trade namea and commercial products doea not constitute recommendation or endorsement for use.

Chapter 1 - Introduction and Background

In bygone years, wood was the major source of all heating, cooking and transport in the Mackenzie communities. The wood-fueled sternwheelers of the Yukon, Alaska, Slave, and Mackenzie Rivers plied the inland waterways for a distance of more than 4000 kilometers.

With the influx of Canadian Government North of the Sixtieth Parallel, especially since 1945, came an unconscious but nonetheless real changeover to widespread fuel oil use in space heating and electric energy. Increased oil use made sense to decision-makers of the time because it was easier to transport, handle, and use than wood; and because it was less labour-intensive than the traditional wood fuel. A number of oil finds in Western Canada Leduc, Alberta in 1947) and in the Western NWT (Norman Wells in 1920) made it appear to leaders of the era that would probably be plentiful for the foreseeable future.

As the limits of these smaller resources close to home became more obvious, and the sources of cheap imported oil dried up in the 90's with the use of OPEC and international cartel of oil-producing nations); prices for all hydrocarbon fuels began to rise steeply, forcing many customers to rethink their energy use. North Americans discovered that their embracing of oil-based energy had made them dependent and vulnerable.

The NWT Association of Municipalities is an umbrella organization representing the interests of 7 municipalities (approximately 65% of the Territorial population) across the Northwest Territories The Association is very concerned with the reponses that their members should make to all aspects of energy use in the North; given the cold climate, isolated community locations, and rapidly growing populations. An examination of the potential use of wood for space heating in communities represents a opportunity for the Association to plan for the future of its members South of the treeline.

While historical form of heating the technology surrounding wood heat has changed remarkably in the past fifty years Tighter (improved air seal) and better insulated buildings; and more efficient burning appliances, have reduced the amounts of energy required to heat a given building in a specific location

The considerable quantities of biomass growing in the NWT below the treeline, coupled with growing populations and unemployment, give residents and their elected representatives cause to consider the advantages of a new emphasis for wood fuels, while maintaining the comfort and safety of citizens. This study is seen as an early step in that direction. The 28 communities considered in this study are listed in Table 2

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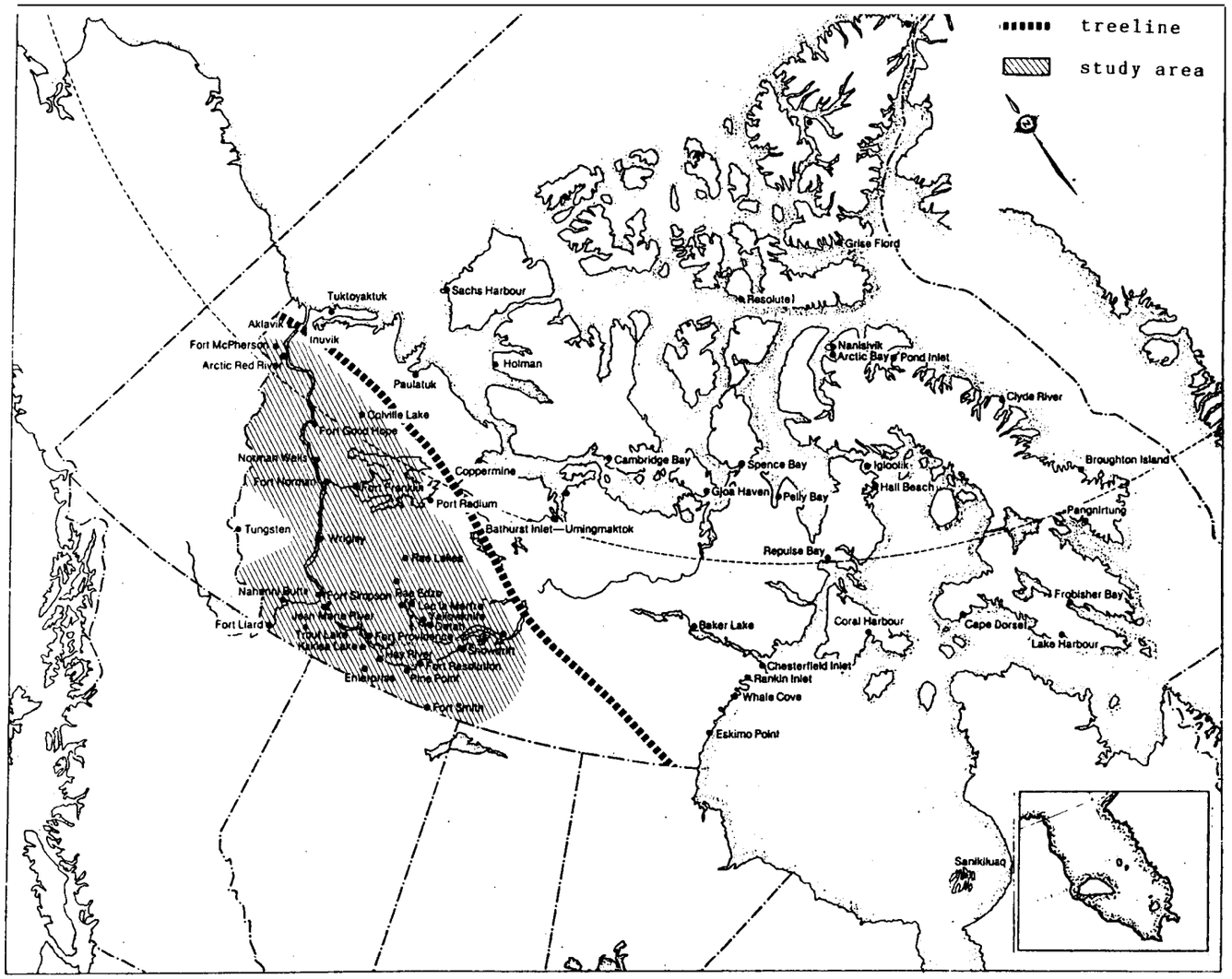

treeline
study area
Grise Fiord
Resolute
Sachs Harbour
Tuktoyaktuk
Aklavik
Inuvik
Fort McPherson
Arctic Red River
Holman
Nanisivik
Arctic Bay
Pond Inlet
Clyde River
Paulatuk
Colville Lake
Fort Good Hope
Norman Wells
Fort Norman
Coppermine
Cambridge Bay
Spence Bay
Igloolik
Broughton Island
Gjoa Haven
Pelly Bay
Hall Beach
Fort Franklin
Port Radium
Bathurst Inlet—Umingmaktok
Pangnirtung
Tungsten
Wrigley
Repulse Bay
Rae Lakes
Nahanni Butte
Fort Simpson
Rae Edzo
Lac la Martre
Yellowknife
Jean Marie River
Fort Liard
Trout Lake
Fort Providence
Snowdrift
Kakisa Lake
Hay River
Fort Resolution
Enterprise
Pine Point
Fort Smith
Baker Lake
Coral Harbour
Cape Dorset
Frobisher Bay
Lake Harbour
Chesterfield Inlet
Rankin Inlet
Whale Cove
Eskimo Point
Sanikiluaq

EXECUTIVE SUMMARY

This 1985 Biomass study was undertaken for the Northwest Territories Associati On Of Municipalities, with the financial support of the Remote Community Demonstration Program of Energy, Mines and Resources Canada, and of the Economic Development Secretariat of the Government of the Northwest Territories.

The study continues initiative begun in the 1982, 1983 and 1984 Building Inventory and Energy Use Surveys (BIEUS). This 1985 exercise looks more carefully at the potential for the use of wood fuels in apace heating.

The study concludes that an organized fuel switch to wood from fuel oil could produce considerable opportunities for savings in space heating costs, and for the creation of badly-needed local employment in the 28 ● tudy com- ❑ unities. Due to ● variety of government policies, oil is the predominant fuel type ● t the moment. A successful move to wood from oil would require free-market pricing, or a serious curtailment of present oil subsidy programs, in order to provide consumer incentive to ● eek the lower cost heating fuel alternative.

Initial research indicates that there is an abundant sustainable supply of wood fuel for virtually all communities and some potential for inter- community trade with the larger centres, such as Yellowknife. Efficient harvesting would require the creation of forestry inventories, forestry management plans, ● n d some access routes.

In more specific terms, it is estimated that up to $17.5 ❑ illion could be saved ● nnually with full conversion to wood from fossil fuels. In addition, it is felt there would be significant but "intangible" benefits of community pride, control, ● nd self-worth based upon the exploitation of ● local renewable resource.

In terms of employment, it is estimated that full conversion to wood fuel would create up co 218,000 days of work across the study communities. This would equate to roughly 1,000 full-time jobs. Similarly, it is felt that the activity of using local wood fuels would create small business opportunities for entrepreneurial individuals or community groups.

This study was prepared for the Northwest Territories Association of Municipalities by Treeline Planning Services Ltd.

ETuDE DES BESOINS EN BIOCOMBUSTIBLE DANS LES COLLECTIVITÊS DES TERRITOIRES W NORD-OUEST

Résumé

Cette étude sur la biomasse a été réalisée en 1985 POW l'Association des municipalités des Territoires du Nerd-Duest (T.N.-O.) avec l'appui concret d'Énergie, Mines et Resources Canada et du Secrétariat au développement économique du gouvernement des T.N.-O. L'étude fait suite aux projets réalisés en 1982, 1983 et 1984 clans le cadre de l'Inventaire des immeubles et examen de leur consummation d'énergie. Le présent document se penche en particulier sur la possibility d'avoir recours aux combustibles du bois pour le chauffage des locaux.

Selon les conclusions de l'étude, le replacement du mazout par le bois comme moyen de chauffage pourrait dormer de grands avantages: la réduction des coûts liés au chauffage des locaux, et la création d'emplois sur place dent ont grandement besoin les 28 collectivités visées par l'étude. En raison des diverses politiques gouvernementales, le pétrole constitue le type de combustible le plus utilisé actuellement. Pour réussir le replacement du ❑ azout par le bois, il faudrait prodder à une réduction importante de subventions actuelles relatives au mazout ou déréglementer les prix du pétrole de façon à encourager lea consommateurs à rechercher les substitute au mazout les moins coûteux.

Des recherches antérieures démontrent qu'en fait, toutes les collectivités disposent d'une source abondante et soutenue de bois de chauffage et qu'elles pourraient en exporter vers les grands centres, comme Yellowknife. Pour exploiter les forêts de façon efficace, cependant, il faudrait que des plans de gestion soient élaborés et que certaines routes d'ace% soient construites.

Pour être plus précis, *on* évalue à 17,5 ❑ illions de dollars le montant qu'il serait possible d'épargner annuellement en remplaçant les combustibles fossiles par le bois. De plus, on croit que les collectivités retireraient des avantages important, bien qu'impondérables, sous forme de fierté, de contrôle et de valorisation en exploitant une ressource renouvelable locale.

En ce qui concerne l'emploi, on évalue à 218 000 le nombre de jours-personnes que créerait pour les 28 collectivités visées (voir Tableau 18) le replacement complet du mazout par le bois. Ces chiffres correspondent à environ 1 000 emplois à temps plein.

Énergie, Mines et Ressources Canada a contribué financièrement à la réalisation de cette étude par l'intermédiaire du Program-s de démonstration clans les collectivités éloignées. L'étude a été préparé par Treeline Planning Services Ltd.

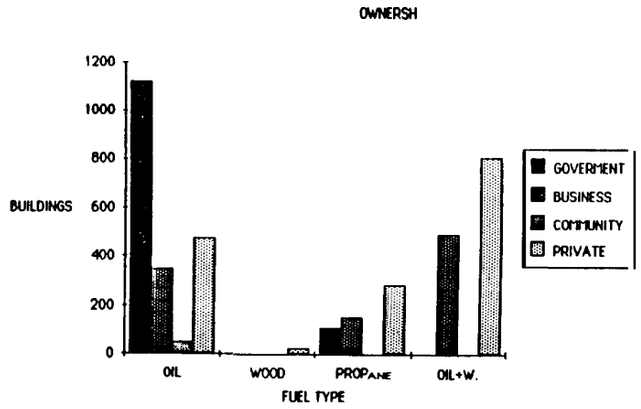
Chapter 2 - Activity 0 - Yellowknife Ownership and Fuel Type

The previous Building Inventory and Energy Use Surveys (BIEUS) of the 1982,1983 and 1984, done for Energy, Mines & Resources Canada, have gathered and organized data on the number and fuel types of buildings found in the Mackenzie River Communities, excluding Yellowknife.

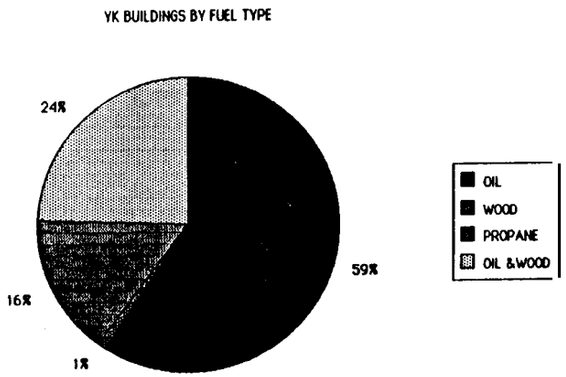
With roughly 40% of the building units and population of the lower Mackenzie Region South of the treeline, it was felt that Yellowknife could not be ignored as part of a general assessment. It was therefore decided that a brief estimation exercise on the number of building units, their ownership, and fuel type should be done before looking into the overall picture for the 28 communities of the BIOMASS study. The outcome of the research is summarized in Table 1; it shows the estimated breakdown for Yellowknife buildings by Ownership and Fuel Type.

Illustration 1 shows the building number breakdown by Ownership/User and Fuel type, in bar chart form. A quick glance reveals that oil is popular across all ownership groups, that the Government Ownership group favours the use of oil-only for space heating energy, and that the Private ownership group leads the way in use of wood.

Illustration 2 shows the "percentage of all units" breakdown by fuel type. Oil-only burners predominate at 59% of



ILLUSTRATION



all units, with mixed wood-oil burners making up 24% of this total.

From Table 4.3 we see that the Government ownership group is a major user of oil-only burning units) The Table suggests further that a large number of the Private-owner group use some amount of wood fuels, in order to reduce the overall fuel costs. Having both fuel systems in a given building allows the private owner to i) burn more wood to economy with additional labour) or burn more fuel or reliability in peoples deep cold or unattended appliance operation.

We can conclude from the above that the personal accountability of Private building owner/operators probably motivates their fuel preferences, in spite of the additional effort required to maintain wood-fired heating systems. It would also see that Government organizations have little motivation to find similar low-cost fueling options, because user-pay or heating performance checks are not in effect.

Chapter 3 - Activity 1 - Current, Projected Heating Requirements

This chapter contains current and projected heating requirements expressed in litre quantities of fuel oil. The small amounts of propane and wood used were considered to be negligible for purposes of this exercise.

In Table 2, projected heating demands were prepared for three possible scenarios: "Without Conservation", "Cost-effective Conservation", and "Maximum Conservation". Each of these scenarios was calculated for three separate time horizon years: 1985,1995, and 2005; spanning the study forecast period of the present to the year 2005 A.D. The bottom-line results are summarized graphically in Illustration 3 entitled "Demand Projection by Scenario".

Table 2 methodology involved calculating per capita fuel consumptions for current years, and then calculating proportional increases based upon GNWT population forecasts for the three horizon years. See extract from GNWT population forecasts in Appendix C of this document. For further detail on the methodology of these tables, see the Notes on the Development of Tables 2 & 3 in Appendix A of this document.

Burning fuel at current per capita rates of consumption, fuel oil demand would rise from 66 to 92 million litres. If a "cost-effective conservation" approach were to be followed, we

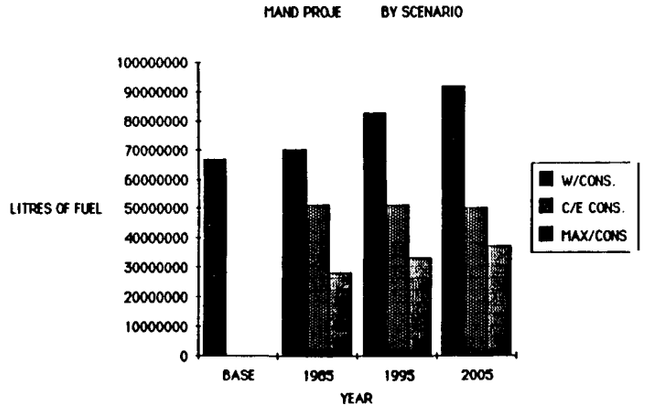


ILLUSTRATION 3

ould look forward to a constant 5 million litre demand A "maximum conservation" forecast (explained in the Notes on Development of Tables 2 & 3 in Appendix A) would show the study area to be heated with 28 to 37 million litres.

We can conclude that with cost effective conservation it is both reasonable and possible for the Mackenzie region to simultaneous experience space heating fuel reductions of about 20% while absorbing forecast population rises beyond the turn of the century

Chapter 4 - Activity 2 - Projected Heating by Sector & Ownership

This study portion projects heating fuel requirements within the study communities by means of two methodologies.

The first methodology, described in Appendix A-3i), is the simpler of the two, and is based upon the BIEUS data, coupled with some broad assumptions with regard to fuel consumption. Table 4 indicates that a majority, 68% of the building stock in the communities has a residential use. The remaining buildings have either a commercial (16%), or a community (16%) use. Bottom-line consumption estimates, for each heating year and for each use sector, based upon current levels of consumption are shown graphically in Illustration 4. Because residential uses make up such a significant portion of the building stock, this approach concludes that residential use quantities would remain dominant throughout the study time span, with current heating patterns unchanged

The second methodology described in Appendix A-3ii), takes a more articulated look at energy projections, by combining data from the 1980 Science Advisory Board (SAB) study, and the BIEUS data of 1982 to 1984. Basing projection calculations on the quantity relationships established in the SAB report, the Commercial sector would appear to be the dominant use sector. It would follow that the Commercial use sector should be the prime target for future programs of space heating energy conservation, and/or conversion to biomass fuels

The reader should be aware, however, that use sector definition differences between the SAB and BIEUS reports, in the sec○.d metho•○.og. c⊟.se an ○ve..tated c○mme.cia. use ○. .○e. a. the expe.se ○. the ..○mo..ty use sec.○. ○E the B.EUS ..○dy For instance, schools are known to be large fuel users; but these b○..d.ngs were classified as 'commercial' in the SAB study, and as 'community' in the BIEUS efforts.

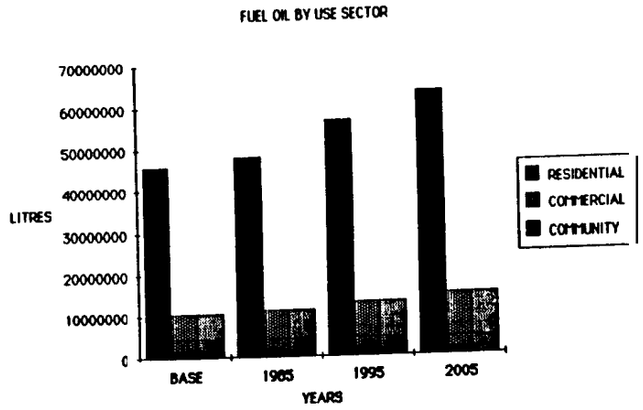


ILLUSTRATION 4

Chapter 5 - Activity 3 - Heating for Three Scenarios

Tables 6, 7, and 8 show projections for future demand for oil, wood, and propane respectively. Each of the projections is based upon current estimated levels of demand. It is taken for granted in the projections that all new growth in the same proportion as oil.

If however, wood were to be burned on a large scale, it is felt that the demand for oil and propane would decline more in the smaller communities where wood supplies would be plentiful and close at hand.

1 cord of wood is normally considered to be the equivalent of 100 gallons or 455 litres of fuel oil.

In the larger centres of Yellowknife, Hay River, and Pine Point, it is probable that any switching away from oil would be slow and restricted to the smaller units. A great proportion of high-income office workers, residents, unfamiliar with solid fuel appliances, may well opt to retain the greater reliability and security of fossil fuel systems, in spite of the higher cost to their household budgets.

Chapter 6 - Activity 4 - Biomass Energy Equivalent

In terms of owner ship the sheer number of units owned and operated by government agencies (NWT Housing Corporation, Territorial Government, Federal Government) cause them to be a major responsibility centre of the current and future space heating consumption pattern, whether the fuel be oil or wood.

Tables 10,11,12, and 13 show estimated community wood use totals broken down by building use sector. Residential building use is most significant in this segment.

The above suggests that Government-owned, Residential use building are also a prime area for conservation and/or conversion programs of space heating energy conservation and/or conversion to biomass fuels. Community-level quite site-specific investigations could provide the basis for decisions of action.

Chapter 7 - Activity 5 - Levels of Conversion to Biomass

Table 14 estimates the cordages that would be required to convert all currently-used fuel forms to biomass (wood fuel) in the study communities.

Conversion cordages for all communities would be as follows:

At Full Conversion - 186,462 cords
At Partial Conversion 93,231 cords
At Current Levels - - 30,434 cords

In real terms, conversion to biomass would gradually take place over a number of years, as people and communities reintroduced themselves to wood heat; and as entrepreneur harvesters and suppliers were able to provide sufficient quantities of suitable fuel at reasonable prices.

Professional foresters would wish to assure themselves and the population that the projected long-term harvesting could be sustained for future generations, and that the actual harvesting and regeneration techniques were as efficient as possible, while not interfering with other renewable - resource activities (trapping of fur-bearing animals)

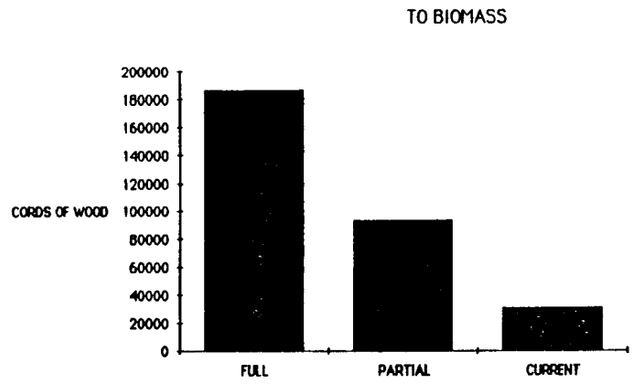


ILLUSTRATION 5

TABLE 4-26 TROUT LAKE FUEL PROJEC11OMS

USE SECTOR & OWNERSHIP	# UNITS	10FTOTM	CURRENT FUEL USE RESIDENT.	COMMERC.	UNIDENTIFIED	PROJECTED 1985 FUEL RESIDENT.	COMMERC.	UNIDENTIFIED	PROJECTED 1995 FUEL RESIDENT,	COMMERC.	UNIDENTIFIED	PROJECTED 2005 FUEL RESIDENT.	COMMERC.	UNIDENTIFIED
RESIDENTIAL SUBTOT	20	**80.00**	1s,661			14,s63			18,147			**21,284**		
NWTHC	0	.00	o			0			0			o		
TERR.	1	5.00	693			**72B**			907			**1,064**		
FED.	0	.00	0			0			0			0		
CROWN CORP	0	.00	0			0			0			0		
COMMUNITY	0	.00	0			0			0			0		
INDUSTRIAL	0	**.00**	0			0			0			0		
COMMERCIAL	0	.00	0			0			0			0		
PRIVATE	15	75.00	10,2s0			10,922			13,610			15,963		
OTHER - @	0	.00	o			0			0			0		
COMMERCIAL	0	ERROR		41,000			**43,689**			**54,443**			**63,852**	
NWTHC	0	ERROR		ERROR			ERROR			ERROR			ERROR	
TERR.	0	ERROR		**ERROR**			ERROR			ERROR			ERROR	
FED.	0	ERROR		ERROR			ERROR			ERROR			ERROR	
CROWN CORP	0	ERROR		ERROR			ERROR			ERROR			ERROR	
COMMUNITY	0	ERROR		ERROR			ERROR			ERROR			ERROR	
INDUSTRIAL	0	ERROR		ERROR			ERROR			ERROR			ERROR	
COMMERCIAL	0	ERROR		ERROR			ERROR			ERROR			ERROR	
PRIVATE	0	ERROR		**ERROR**			ERROR			ERROR			ERROR	
OTHER-?	0	ERROR		ERROR			ERROR			ERROR			ERROR	
UNID. + COMMUNITY	4	**100.00**			0									0
NWTHC	0	**.00**			0									0
TERR.	1	25.00			0									0
FED.	0	.00			0									0
CROWN CORP	0	.00			0									0
COMMUNITY	2	50.00			0									0
INDUSTRIAL	0	.00			0									0
COMMERCIAL	0	.00			0									0
PRIVATE	1	25.00			0									0
OTHER-@	0	.00			0									0
TOTAL	24													

TABLE 4-27 WRIGLEY FUEL PROJECTIONS

USE SECTOR & OWNERSHIP	# UNITS	% OF TOTAL	CURRENT FUEL USE			PROJECTED 1985 FUEL			PROJECTED 1995 FUEL		2005 FUEL	
			RESIDENT.	COMMERC.	UNIDENTIFIED	RESIDENT.	COMMERC.	UNIDENTIFIED	RESIDENT.	UNIDENTIFIED	RESIDENT.	COMMERC. UNIDENTIFIED
RESIDENTIAL SUBTOT	43	100.00	95,264			98,571			117,095		136,280	
NWTHC	6	13.95	13,293			13,754			16,339		19,016	
TERR.	5	11.63	11,077			11,462			13,616		15,847	
FED.	3	6.98	6,646			6,877			8,169		9,508	
CROWN CORP	0	.00	0			0			0		0	
COMMUNITY	0	.00	0			0			0		0	
INDUSTRIAL	0	.00	0			0			0		0	
COMMERCIAL	0	.00	0			0			0		0	
PRIVATE	29	67.44	64,248			66,478			78,971		91,910	
OTHER - @	0	.00	0			0			0		0	
COMMERCIAL	2	100.00		349,402			361,534			429,473		499,839
NWTHC	0	.00		0			0			0		0
TERR.	0	.00		0			0			0		0
FED.	0	.00		0			0			0		0
CROWN CORP	0	.00		0			0			0		0
COMMUNITY	0	.00		0			0			0		0
INDUSTRIAL	0	.00		0			0			0		0
COMMERCIAL	1	50.00		174,701			180,767			214,737		249,920
PRIVATE	1	50.00		174,701			180,767			214,737		249,920
OTHER - @	0			0			0			0		0
UNID. + COMMUNITY	15	100.00			31,605			32,703		38,848		45,213
NWTHC	0	.00			0			0		0		0
TERR.	5	33.33			10,535			10,901		12,949		15,071
FED.	2	13.33			4,214			4,360		5,180		6,028
CROWN CORP	2	13.33			4,214			4,360		5,180		6,028
COMMUNITY	4	26.67			8,428			8,721		10,359		12,057
INDUSTRIAL	0	.00			0			0		0		0
COMMERCIAL	0	.00			0			0		0		0
PRIVATE	2	13.33			4,214			4,360		5,180		6,028
OTHER - @	0	.00			0			0		0		0
TOTAL	60											

TABLE 4-28 YELLOWKNIFE FUEL PROJECTIONS

USE SECTOR & OWNERSHIP	# UNITS	% OF TOTAL	CURRENT FUEL USE RESIDENT.	CURRENT FUEL USE COMMERC.	CURRENT FUEL USE UNIDENTIFIED	PROJECTED 1985 FUEL RESIDENT.	PROJECTED 1985 FUEL COMMERC.	PROJECTED 1985 FUEL UNIDENTIFIED	PROJECTED 1995 FUEL RESIDENT.	PROJECTED 1995 FUEL COMMERC.	PROJECTED 1995 FUEL UNIDENTIFIED	PROJECTED 2005 FUEL RESIDENT.	PROJECTED 2005 FUEL COMMERC.	PROJECTED 2005 FUEL UNIDENTIFIED
RESIDENTIAL SUBTOT	1,768	59.28	6,501,636			6,796,883			7,'s93,075			8,731,157		
NWTHC	179	10.12	658,254			688,146			799,127			883,980		
TERR.	202	11.43	742,034			776,567			901,811			997,564		
FED.	293	16.57	1,077,477			1,126,407			1,308,072			1,446,962		
CROWN CORP	9	.51	33,097			34,600			40,180			44,446		
COMMUNITY	43	2.43	158,128			165,309			191,970			212,353		
INDUSTRIAL	50	2.83	183,870			192,220			223,220			246,922		
COMMERCIAL	199	11,26	731,S02			765,034			888,417			902,749		
PRIVATE	73	4.1s	260,450			280,641			325,902			360,506		
OTHER-t	o	,00	0			o			0			o		
COMMERCIAL	795	100.00		22,922,111			23,963,034			27,827,757			30,782,4'73	
NWTHC	0	.00		0			0			0			o	
TERR.	101	12.70		2,912,117			3,044,360			3,535,350			3,910,732	
FED.	147	18.49		4,230,428			4,430,901			5,145,510			5,691,857	
CROWN CORP	5	.63		144,164			150,711			175,017			193,601	
COMMUNITY	22	2.77		634,323			663,128			770,076			851,843	
INDUSTRIAL	25	3.14		720,821			753,555			875,087			968,003	
COMMERCIAL	99	12.45		2,854,452			2,984,076			3,465,343			3,833,292	
PRIVATE	396	49.81		11,417,806			11,936,304			13,861,373			15,333,166	
OTHER-Q	0	.00		0			0			o			o	
UNID. + COMMUNITY	791	100,00			6,944,607			7,259,970			8,430,848			9,326,030
NWTHC	1	.13			8,780			9,178			10,658			11,790
TERR.	101	12.77			006,732			927,000			1,076,505			1,190,806
FEO.	146	18.46			1,281,811			1,340,020			1,556,136			1,721,366
CROWN CORP	4	.51			35,118			36,713			42,634			47,161
COMMUNITY	21	2.65			184,370			192,743			223,828			247,594
INDUSTRIAL	24	3.03			210,707			220,277			255,003			282,964
COMMERCIAL	99	12.52			869,173			908,644			1,055,18s			1,167,228
PRIVATE	395	49.94			3,467,914			3,625,396			4,210,095			4,657,120
OTHER-Q	0	.00			0			o			0			o
TOTAL	3,354													

TABLE 5 - BUILDING USE SECTOR AND

EXPRESSED IN NUMBERS OF BUILDING UNITS - **

USE SECTOR & OWNERSHIP	COMMUNITIES BY NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24 ***	25	26	27	28 *	TOTAL
RESIDENTIAL																													
NWTHC	17	0	0	0	67	27	14	62	40	91	43	33	2	42	0	0	0	4	0	15	34	0	27		20	0	6	179	723
TERR.	3	0	5	1	11	18	5	17	12	6	0	9	62	46	0	0	0	0	1	18	0	0	127	2	2	1	5	202	553
FED.	0	0	1	0	0	3	6	1	3	2	4	33	75	58	0	0	0	3	0	26	5	0	2		1	0	3	293	519
CROWN CORP	0	1	0	0	3	3	0	5	2	0	0	0	1	82	0	0	0	0	0	4	0	0	0		0	0	0	9	110
COMMUNITY	0	0	0	0	0	2	0	0	0	0	0	2	7	4	38	1	0	0	0	0	8	0	0		0	0	0	43	105
INDUSTRIAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	430	0	0		0	0	0	50	480
COMMERCIAL	1	6	0	0	5	6	1	2	7	0	1	3	1	117	0	0	0	0	1	114	0	0	1		1	0	0	199	466
PRIVATE	9	18	22	16	22	72	58	78	25	8	54	132	429	446	0	14	7	30	20	27	1	35	42	19	13	15	29	793	2434
OTHER																													0
SUB-TOTAL	30	25	28	17	108	131	84	165	89	107	102	212	577	795	38	15	7	37	22	204	478	35	199	21	37	16	43	1768	5390
COMMERCIAL																													
NWTHC	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	2
TERR.	7	0	0	0	2	6	0	20	1	0	0	0	0	3	0	0	0	0	0	3	0	0	1		0	0	0	101	144
FED.	0	0	0	0	0	2	0	2	0	0	0	1	1	1	0	1	0	0	0	12	0	0	1		0	0	0	147	168
CROWN CORP	3	0	0	0	5	5	0	1	1	0	0	0	0	14	0	0	0	0	1	7	0	0	0		0	0	0	5	42
COMMUNITY	0	0	0	0	0	0	0	1	0	2	0	0	1	1	1	0	0	0	0	0	0	1	0		0	0	0	22	29
INDUSTRIAL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0		0	0	0	25	26
COMMERCIAL	2	1	1	4	9	7	4	7	1	5	3	25	18	83	0	0	0	2	3	60	4	0	4		1	0	1	99	344
PRIVATE	0	0	0	0	0	0	0	4	0	1	5	2	13	0	0	0	0	0	0	0	4	0	0		1	0	1	396	427
OTHER																								1					1
SUB-TOTAL	12	1	1	4	16	20	4	35	4	8	8	28	34	102	1	1	0	2	4	83	8	1	6	1	2	0	2	795	1183
COMMUNITY																													
NWTHC	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1		0	0	0	1	6
TERR.	3	0	2	0	9	10	3	5	10	5	3	9	37	13	0	2	0	3	5	6	2	2	2		6	1	5	101	244
FED.	1	1	0	0	1	1	7	3	2	2	5	9	5	9	0	1	0	4	0	9	1	3	5		2	0	2	146	219
CROWN CORP	1	0	0	0	3	4	0	3	3	0	0	0	0	0	0	0	0	0	0	2	0	0	0		0	0	2	4	22
COMMUNITY	0	0	2	0	1	0	4	5	3	4	6	6	10	8	4	2	0	3	1	4	3	3	6		3	2	4	21	105
INDUSTRIAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		0	0	0	24	25
COMMERCIAL	2	5	0	0	2	2	0	3	2	0	0	2	1	8	0	0	0	0	0	0	0	0	0		0	0	0	99	126
PRIVATE	0	0	1	0	0	0	1	0	0	1	0	4	5	7	0	1	0	1	1	0	3	1	1		1	1	2	395	426
OTHER																													0
SUB-TOTAL	8	6	5	0	16	17	15	19	20	15	14	30	58	45	4	6	0	11	7	21	10	9	15	0	12	4	15	791	1173
TOTAL	50	32	34	21	140	168	103	219	113	130	124	270	669	942	43	22	7	50	33	308	496	45	220	22	51	20	60	3354	7746

COMMUNITIES

1-ARCTIC RED RIVER
2-COLVILLE LAKE
3-DETAH
4-ENTERPRISE
5-FORT FRANKLIN
6-FORT GOOD HOPE
7-FORT LIARD
8-FORT MCPHERSON
9-FORT NORMAN
10-FORT PROVIDENCE
11-FORT RESOLUTION
12-FORT SIMPSON
13-FORT SMITH
14-HAY RIVER
15-HAY RIVER VILLAGE
16-JEAN-MARIE RIVER
17-KAKISA
18-LAC LA MARTRE
19-NAHANNI BUTTE
20-NORMAN WELLS
21-PINE POINT
22-RAE LAKES
23-RAE-EDZO
24-SNARE LAKES
25-SNOWDRIFT
26-TROUT LAKE
27-WRIGLEY
28-YELLOWKNIFE

* - ASSUMED RESIDENTIAL, COMMERCIAL AND COMMUNITY USES TO BE .5, .25 & .25 OF YK ASSESSMENT ROLE ENTRIES (EX NWTHC)
** - SOURCE: BIEUS 82/83 DATA
*** - DATA ACQUIRED BY PERSONAL COMMUNITCATION

TABLE 6 - FUEL OIL PROJECTIONS FOR ALL COMMUNITIES

	BIEUS ESTIMATED AMOUNTS FUEL-OIL (LITRES)	FUEL OIL W/C SCENARIO 1985	FUEL OIL W/C SCENARIO 1995	FUEL OIL W/C SCENARIO 2005	FUEL OIL C/E SCENARIO 1985	FUEL OIL C/E SCENARIO 1995	FUEL OIL C/E SCENARIO 2005	FUEL OIL MAI CONS. 1985	FUEL OIL MAI CONS. 1995	FUEL OIL MAI CONS. 2005
ARCTIC RED RIVER	149,559	156351	184,577	206,739	117263	138,433	155,054	51596	60910	68224
COLVILLE LAKE	4,909	5132	6,058	6,786	3849	4,544	5,089	1694	1999	2239
DETAH	232,287	242836	286,675	321,095	182127	215,006	240,822	80136	94603	105961
ENTERPRISE	79,550	83163	98,176	109,964	62372	73,632	82,473	27444	32398	36288
FORT FRANKLIN	1,163,120	1215941	1,435,455	1,607,806	911956	1,076,591	1,205,855	401261	473700	530576
FORT GOOD HOPE	1,008,955	1054775	1,245,194	1,394,706	791081	933,895	1,046,025	348076	410914	460251
FORT LIARD	730,157	763316	901,117	1,009,312	572487	675,838	756,984	251894	297369	333073
FORT MCPHERSON	1,290,954	1349581	1,593,221	1,784,514	1012186	1,194,915	1,338,385	445362	525763	588890
FORT NORMAN	1,392,724	1455973	1,718,819	1,925,193	1091979	1,289,114	1,443,894	480471	567210	635314
FORT PROVIDENCE	7,000,000	7317895	8,638,994	9,676,252	5488421	6,479,245	7,257,189	2414905	2850868	3193163
FORT RESOLUTION	1,033,300	1080226	1,275,239	1,428,353	810169	956,429	1,071,265	356475	420829	471357
FORT SIMPSON	1,227,444	1283187	1,514,840	1,696,723	962390	1,136,130	1,272,542	423452	499897	559918
FORT SMITH	5,000,000	5227068	6,170,710	6,911,609	3920301	4,628,032	5,183,706	1724932	2036334	2280831
HAY RIVER	8,907,922	9312463	10,993,640	12,313,614	6984347	8,245,230	9,235,211	3073113	3627901	4063493
HAY RIVER VILLAGE	30,000	31362	37,024	41,470	23522	27,768	31,102	10350	12218	13685
JEAN-MARIE RIVER	86,626	90560	106,909	119,745	67920	80,182	89,809	29885	35280	39516
KAKISA	0	0	0	0	0	0	0	0	0	0
LAC LA MARTRE	507,078	530106	625,806	700,945	397580	469,355	525,709	174935	206516	231312
MAHANNI BUTTE	147,625	154329	182,190	204,065	115747	136,643	153,049	50929	60123	67342
NORMAN WELLS	0	0	0	0	0	0	0	0	0	0
PINE POINT	3,223,100	3369473	3,977,763	4,455,361	2527104	2,983,322	3,341,521	1111926	1312662	1470269
RAE LAKES	215,775	225574	266,297	298,270	169181	199,723	223,703	74439	87878	98429
RAE-EDZO	3,149,908	3292957	3,887,434	4,354,186	2469717	2,915,575	3,265,640	1086676	1282853	1436881
SNARE LAKES	0	0	0	0	0	0	0	0	0	0
SNOWDRIFT	672,896	703455	830,449	930,159	527591	622,837	697,619	232140	274048	306952
TROUT LAKE	41,000	42862	50,600	56,675	32146	37,950	42,506	14144	16698	18703
WRIGLEY	476,271	497900	587,786	658,360	373425	440,840	493,770	164307	193969	217259
YELLOWKNIFE	36,368,717	38020351	44,884,160	50,273,268	28515264	33,663,121	37,704,951	12546716	14811773	16590179
TOTAL	74,139,877	77506836	91,499,134	102,485,163	58130127	68,624,351	76,863,872	25577255	30194714	33820104

TABLE 7 - WOOD PROJECTIONS FOR ALL COMMUNITIES

	BIEUS-ESTIMATED AMOUNTS WOOD (CORDS)	WOOD W/C SCENARIO 1985	WOOD W/C SCENARIO 1995	WOOD W/C SCENARIO 2005	WOOD C/E SCENARIO 1985	WOOD C/E SCENARIO 1995	WOOD C/E SCENARIO 2005	WOOD MAI CONS.SCENARIO 1985	WOOD MAI CONS.SCENARIO 1995	WOOD MAI CONS.SCENARIO 2005
ARCTIC RED RIVER	530	554	654	733	416	491	549	183	216	242
COLVILLE LAKE	370	387	457	511	290	342	384	128	151	169
DETAH	252	263	311	348	198	233	261	87	103	115
ENTERPRISE	48	50	59	66	38	44	50	17	20	22
FORT FRANKLIN	1410	1474	1,740	1,949	1106	1,305	1,462	486	574	643
FORT GOOD HOPE	1690	1767	2,086	2,336	1325	1,564	1,752	583	688	771
FORT LIARD	756	790	933	1,045	593	700	784	261	308	345
FORT MCPHERSON	2220	2321	2,740	3,069	1741	2,055	2,302	766	904	1013
FORT NORMAN	1290	1349	1,592	1,783	1011	1,194	1,337	445	525	588
FORT PROVIDENCE	96	100	118	133	75	89	100	33	39	44
FORT RESOLUTION	456	477	563	630	358	422	473	157	186	208
FORT SIMPSON	516	539	637	713	405	478	535	178	210	235
FORT SMITH	2436	2547	3,006	3,367	1910	2,255	2,526	840	992	1111
HAY RIVER	9370	9796	11,564	12,952	7347	8,673	9,714	3233	3816	4274
HAY RIVER VILLAGE	444	464	548	614	348	411	460	153	181	203
JEAN-MARIE RIVER	192	201	237	265	151	178	199	66	78	88
KAKISA	84	88	104	116	66	78	87	29	34	38
LAC LA MARTRE	372	389	459	514	292	344	386	128	152	170
MAHANNI BUTTE	144	151	178	199	113	133	149	50	59	66
NORMAN WELLS	3110	3251	3,838	4,299	2438	2,879	3,224	1073	1267	1419
PINE POINT	0	0	0	0	0	0	0	0	0	0
RAE LAKES	444	464	548	614	348	411	460	153	181	203
RAE-EDZO	132	138	163	182	103	122	137	46	54	60
SNARE LAKES	200	209	247	276	157	185	207	69	81	91
SNOWDRIFT	240	251	296	332	188	222	249	83	98	109
TROUT LAKE	228	238	281	315	179	211	236	79	93	104
WRIGLEY	324	339	400	448	254	300	336	112	132	148
YELLOWKNIFE	3080	3220	3,801	4,258	2415	2,851	3,193	1063	1254	1405
TOTAL	30434	31816	37,560	42,070	23862	28,170	31,552	10499	12395	13883

TABLE 8- PROPANE PROJECTIONS FOR ALL COMMUNITIES

	BIEUS-ESTIMATED AMOUNTS									
	PROPANE (LITRES)	PROPANE WCS 1985	CENAR10 1995	2005	PROPANE /ES 1985	SCENARIO 1995	2005	PROPANE MAX 1985	CONS. 1995	SCENAR10 2005
ARCTIC DRIVER	0	0	0	0	0	0	0	0	0	0
COLVILLE LAKE	0	0	0	0	0	0	0	0	0	0
DETAH	0	0	0	0	0	0	0	0	0	0
ENTERPRISE	43,478	45452	53,658	60,101	34009	40,244	45,075	14999	17707	19033
FORT FRANKLIN	0	0	0	0	0	0	0	0	0	0
FORT 6000 HOPE	0	0	0	0	0	0	0	0	0	0
FORT LIARD	0	0	0	0	0	0	0	0	0	0
FORT MCPHERSON	0	0	0	0	0	0	0	0	0	0
FORT NORMAN	0	0	0	0	0	0	0	0	0	0
FORT PROVIDENCE	10,II10	11364	13,415	15,026	8523	10,061	11,269	3750	4427	4959
FORT RESOLUTION	27,1?4	28408	33,537	37,563	21306	25,152	28,172	9375	11067	12396
FORT SIMPSON	*119,565*	124995	147,560	165,217	93746	110,670	123,958	41248	48695	54542
FORT SMITH	86,956	90905	107,316	120,201	68179	80,487	90.151	29999	35414	39666
HAY RIVER	7,121,900	7445331	8,789,438	9,844,757	5503978	*6,592,017*	7,383,568	*2456959*	2900514	3248770
HAY RIVER VILLAGE	0	0	0	0	0	0	0	0	0	0
JEAN-MARIE RIVER	5,435	5682	6,708	7,513	4261	*5,031*	*5,635*	1875	2213	2479
KAKISA	0	0	0	0	0	0	0	0	0	0
LAC LA MARTRE	0	0	0	0	0'	0	0	0	0	0
NAHANNI BUTTE	0	0	0	0	0	0	0	0	0	0
NORMAN ELLS	0	0	0	0	0	0	0	0	0	0
PINE POINT	43,478	45452	53,658	60,101	34089	*40,244*	45,075	14999	17707	19833
RAE LAKES	0	0	0	0	0	0	0	0	0	0
RAE-ED10	38,043	39771	46,950	52,588	29828	*35,213*	39,441	13124	15494	17354
SNARE LAKES	500	523	617	691	392	463	518	172	204	228
SNOWDRIFT	0	0	0	0	0	0	0	0	0	0
TROUT LAKE	0	0	0	0	0	0	0	0	0	0
WRIGLEY	0	0	0	0	0	0	0	0	0	0
YELLOWKNIFE	1,000,000	1045414	1,234,142	1,382,322	784060	925,606	1,036,741	344986	*407267*	456166
TOTAL	8,497,399	8883296	10,486,997	11,746,139	6662472	7,865,248	8,809,604	2931488	3460709	3876226

TABLE 9 BIOMASS ENERGY EQUIVALENT BY COMMUNITY & OWNERSHIP

COMMUNITY	VOLUME OF FUEL OIL IN LITRES	BTEUS WOOD IN CORDS	PROPANE IN LITRES	NUMBER OF UNITS BY OWNERSHIP NWTHC	TERR.	FED	CROWN	COMMUNITY	INDUST	COMMERC	PRIVATE	TOTAL	TOTAL ENERGY IN GIGAJOULES***
ARCTIC RED RIVER	149,559	530	0	18	13	1	4	0	0	5	9	50	13735
COLVILLE LAKE	4,909	370	0	0	0	1	1	0	0	13	18	33	6132
DETAH	232,287	252	0	0	7	1	0	2	0	1	23	34	12129
ENTERPRISE	79,550	48	43,478	0	1	0	0	0	0	4	16	21	4534
FORT FRANKLIN	1,163,120	1,410	0	67	22	1	11	1	0	16	22	140	63119
FORT GOOD HOPE	1,008,955	1,690	0	27	34	6	12	2	0	15	72	168	62276
FORT LIARD	730,157	756	0	14	8	13	0	4	0	5	59	103	37543
FORT MCPHERSON	1,290,954	2,220	0	62	42	6	9	6	0	12	82	219	80611
FORT NORMAN	1,392,724	1,290	0	41	23	5	6	3	0	10	25	113	69161
FORT PROVIDENCE	700,000	96	10,870	94	11	4	0	6	0	5	10	130	26110
FORT RESOLUTION	1,033,300	456	27,174	43	3	9	0	6	0	4	59	124	43862
FORT SIMPSON	1,227,444	516	119,565	33	18	43	0	8	0	30	138	270	53691
FORT SMITH	5,000,000	2,436	86,956	2	99	81	1	18	1	20	447	669	214917
HAY RIVER	8,907,922	9,370	7,121,900	42	62	68	96	13	0	208	453	942	623721
HAY RIVER VILLAGE	30,000	444	0	0	0	0	0	43	0	0	0	43	8196
JEAN-MARIE RIVER	86,626	192	5,435	0	2	2	0	3	0	0	15	22	6227
KAKISA	100	84	0	0	0	0	0	0	0	0	7	7	1357
LAC LA MARTRE	507,078	372	0	4	3	7	0	3	0	2	31	50	23607
NAHANNI BUTTE	147,625	144	0	0	6	0	1	1	0	4	21	33	7448
NORMAN WELLS	100	. 3,110	0	16	27	47	13	4	0	174	27	308	50114
PINE POINT	3,223,100	0	43,478	34	2	6	0	11	431	4	8	496	112949
RAE LAKES	215,775	444	0	0	2	3	0	4	0	0	36	45	14649
RAE-EDZO	2,078,715	132	38,043	28	130	8	0	6	0	5	43	220	75202
SNARE LAKES	100	200	500	0	2	0	0	0	0	2	17	21	3238
SNOWDRIFT	672,896	240	0	20	8	3	0	3	0	2	15	51	27240
TROUT LAKE	41,000	228	0	0	2	0	0	2	0	0	16	20	5098
WRIGLEY	476,271	324	0	6	10	5	2	4	0	1	32	60	21764
YELLOWKNIFE	36,368,717	3,080	1,000,000	179	404	586	18	86	99	397	1585	3354	1335804
TOTAL	66,768,984	30,434	8,497,399	730	941	906	174	239	531	939	3286	7746	3004432

BIOMASS EQUIVALENCY AMOUNTS (IN CORDS) BY OWNERSHIP - @ NWTHC	TERR.	FED	CROWN	COMMUNITY	INDUST	COMMERC	PRIVATE	TOTAL
307	222	17	68	0	0	85	153	852
0	0	12	12	0	0	150	208	381
0	155	22	0	44	0	22	509	753
0	13	0	0	0	0	54	214	281
1875	616	28	308	28	0	448	616	3,917
621	782	138	276	46	0	345	1656	3,865
317	181	294	0	90	0	113	1335	2,330
1416	959	137	206	137	0	274	1873	5,003
1557	874	190	228	114	0	380	950	4,292
1172	137	50	0	75	0	62	125	1,620
944	66	198	0	132	0	88	1295	2,722
407	222	531	0	99	0	370	1703	3,332
40	1974	1615	20	359	20	399	8912	13,338
1726	2548	2794	3945	534	0	8547	18615	38,710
0	0	0	0	509	0	0	0	509
0	35	35	0	53	0	0	264	386
0	0	0	0	0	0	0	84	84
117	88	205	0	88	0	59	908	1,465
0	84	0	14	14	0	56	294	462
162	273	475	131	40	0	1757	273	3,110
481	28	85	0	155	6,091	57	113	7,010
0	40	61	0	81	0	0	727	909
594	2758	170	0	127	0	106	912	4,667
0	19	0	0	0	0	19	163	201
663	265	99	0	99	0	66	497	1,691
0	32	0	0	32	0	0	253	316
135	225	113	45	90	0	23	720	1,351
4424	9986	14485	445	2,126	2,447	9813	39178	82,903
16958	22582	21752	5697	5,072	8,558	23292	82551	186,462

ASSUMES: 116600 BTU/GALLON OF FUEL OIL OR 36646.8 BTU/LITRE &
110000 BTU/ GALLON OF PROPANE OR 24196.6 BTU/LITRE &
17000000 BTU/CORD OF WOOD.

@ - ASSUMES HALF OF ENERGY REQUIREMENT MET BY WOOD

@@ - ASSUMES CONSTANT BURNING EFFICIENCY RATE ACROSS FUELS

@ - ASSUMES ALL UNITS BURN AN EQUAL SHARE OF COMMUNITY FUEL

@@@ - BTU's/1,055,060 = gigajoule(s)

TABLE 10 - BIOMASS ENERGY EQUIVALENT BY COMMUNITY & USE

COMMUNITY	# BUILDINGS	VOLUME OF FUEL OIL IN LITRES	BTEUS WOOD IN CORDS	PROPANE IN LITRES	TOTAL ENERGY IN GIGAJOULES***	FULL CONVERSION TO BIOMASS
ARCTIC RED RIVER						
RESIDENTIAL	30	89,735	318	0	8241	511
COMMERCIAL	12	35,894	127	0	3296	205
COMMUNITY	8	23,929	85	0	2198	136
TOTAL	50	149,559	530	0	13735	852
COLVILLE LAKE						
RESIDENTIAL	25	3,835	289	0	4791	297
COMMERCIAL	1	153	12	0	192	12
COMMUNITY	6	920	69	0	1150	71
TOTAL	32	4,909	370	0	6132	381
DETAH						
RESIDENTIAL	28	191,295	208	0	9988	620
COMMERCIAL	1	6,832	7	0	357	22
COMMUNITY	5	34,160	37	0	1784	111
TOTAL	34	232,287	252	0	12129	753
ENTERPRISE						
RESIDENTIAL	17	64,398	39	35,196	3670	228
COMMERCIAL	4	15,152	9	8,282	864	54
COMMUNITY	0	0	0	0	0	0
TOTAL	21	79,550	48	43,478	4534	281
FORT FRANKLIN						
RESIDENTIAL	108	115,374	409	0	10595	658
COMMERCIAL	16	17,092	61	0	1570	97
COMMUNITY	16	17,092	61	0	1570	97
TOTAL	140	149,559	530	0	13735	852
FORT GOOD HOPE						
RESIDENTIAL	131	3,828	289	0	4782	297
COMMERCIAL	20	584	44	0	730	45
COMMUNITY	17	497	37	0	621	39
TOTAL	168	4,909	370	0	6132	381
FORT LIARD						
RESIDENTIAL	84	189,438	206	0	9891	614
COMMERCIAL	4	9,021	10	0	471	29
COMMUNITY	15	33,828	37	0	1766	110
TOTAL	103	232,287	252	0	12129	753
FORT MCPHERSON						
RESIDENTIAL	165	59,935	36	32,757	3416	212
COMMERCIAL	35	12,713	8	6,949	725	45
COMMUNITY	19	6,902	4	3,772	393	24
TOTAL	219	79,550	48	43,478	4534	281

TABLE 11 - BIOMASS ENERGY EQUIVALENT BY COMMUNITY & USE

COMMUNITY	# BUILDINGS	VOLUME OF FUEL OIL IN LITRES	BTEUS WOOD IN CORDS	PROPANE IN LITRES	TOTAL ENERGY IN GIGAJOULES	FULL CONVERSION TO BIOMASS
FORT NORMAN						
RESIDENTIAL	89	1,096,924	1,016	0	54472	3381
COMMERCIAL	4	49,300	46	0	2448	152
COMMUNITY	20	246,500	228	0	12241	760
TOTAL	113	1,392,724	1,290	0	69161	4292
FORT PROVIDENCE						
RESIDENTIAL	107	576,154	79	8,947	21491	1334
COMMERCIAL	8	43,077	6	669	1607	100
COMMUNITY	15	80,769	11	1,254	3013	187
TOTAL	130	700,000	96	10,870	26110	1620
FORT RESOLUTION						
RESIDENTIAL	102	849,973	375	22,353	36080	2239
COMMERCIAL	8	66,665	29	1,753	2830	176
COMMUNITY	14	116,663	51	3,068	4952	307
TOTAL	124	1,033,300	456	27,174	43862	2722
FORT SIMPSON						
RESIDENTIAL	212	963,771	405	93,881	42157	2616
COMMERCIAL	28	127,290	54	12,399	5568	346
COMMUNITY	30	136,383	57	13,285	5966	370
TOTAL	270	1,227,444	516	119,565	53691	3332
FORT SMITH						
RESIDENTIAL	577	4,312,407	2,101	74,998	18[illegible]2	11504
COMMERCIAL	34	254,111	124	4,419	1[illegible]3	678
COMMUNITY	58	433,483	211	7,539	1[illegible]3	1156
TOTAL	669	5,000,000	2,436	86,956	21[illegible]7	13338
HAY RIVER						
RESIDENTIAL	795	7,517,832	7,908	6,010,521	526388	32669
COMMERCIAL	102	964,552	1,015	771,161	67537	4191
COMMUNITY	45	425,538	448	340,218	29796	1849
TOTAL	942	8,907,922	9,370	7,121,900	623721	38710
HAY RIVER VILLAGE						
RESIDENTIAL	38	26,512	392	0	7243	450
COMMERCIAL	1	698	10	0	191	12
COMMUNITY	4	2,791	41	0	762	47
TOTAL	43	30,000	444	0	8196	509
JEAN-MARIE RIVER						
RESIDENTIAL	15	59,063	131	3,706	4246	264
COMMERCIAL	1	3,938	9	247	283	18
COMMUNITY	6	23,625	52	1,482	1698	105
TOTAL	22	86,626	192	5,435	6227	386

TABLE 12 - BIOMASS ENERGY EQUIVALENT BY COMMUNITY & USE

COMMUNITY	# BUILDINGS	VOLUME OF FUEL OIL IN LITRES	BTEUS WOOD IN CORDS	PROPANE IN LITRES	TOTAL ENERGY IN GIGAJOULES	FULL CONVERSION TO BIOMASS
FORT LIARD						
RESIDENTIAL	7	100	84	0	1357	84
COMMERCIAL	0	0	0	0	0	0
COMMUNITY	0	0	0	0	0	0
TOTAL	7	100	84	0	1357	84
LAC LA MARTRE						
RESIDENTIAL	37	375,238	275	0	17469	1084
COMMERCIAL	2	20,283	15	0	944	59
COMMUNITY	11	111,557	82	0	5194	322
TOTAL	50	507,078	372	0	23607	1465
NAHANNI BUTTE						
RESIDENTIAL	22	98,417	96	0	4965	308
COMMERCIAL	4	17,894	17	0	903	56
COMMUNITY	7	31,314	31	0	1580	98
TOTAL	33	147,625	144	0	7448	462
NORMAN WELLS						
RESIDENTIAL	204	66	2,060	0	33193	2060
COMMERCIAL	83	27	838	0	13505	838
COMMUNITY	21	7	212	0	3417	212
TOTAL	308	100	3,110	0	50114	3110
PINE POINT						
RESIDENTIAL	478	3,106,133	0	41,900	108850	6756
COMMERCIAL	8	51,985	0	701	1822	113
COMMUNITY	10	64,982	0	877	2277	141
TOTAL	496	3,223,100	0	43,478	112949	7010
RAE LAKES						
RESIDENTIAL	35	167,825	345	0	11394	707
COMMERCIAL	1	4,795	10	0	326	20
COMMUNITY	9	43,155	89	0	2930	182
TOTAL	45	215,775	444	0	14649	909
RAE-EDZO						
RESIDENTIAL	199	1,880,292	119	34,412	68024	4222
COMMERCIAL	6	56,692	4	1,038	2051	127
COMMUNITY	15	141,731	9	2,594	5127	318
TOTAL	220	2,078,715	132	38,043	75202	4667
SNARE LAKES						
RESIDENTIAL	21	95	191	477	3090	192
COMMERCIAL	1	5	9	23	147	9
COMMUNITY	0	0	0	0	0	0
TOTAL	22	100	200	500	3238	201

TABLE 13 - BIOMASS ENERGY EQUIVALENT BY COMMUNITY & USE

COMMUNITY	# BUILDINGS	VOLUME OF FUEL OIL IN LITRES	BTEUS WOOD IN CORDS	PROPANE IN LITRES	TOTAL ENERGY IN GIGAJOULES	FULL CONVERSION TO BIOMASS
SNOWDRIFT						
RESIDENTIAL	37	488,179	174	0	19762	1226
COMMERCIAL	2	26,388	9	0	1068	66
COMMUNITY	12	158,328	56	0	6409	398
TOTAL	51	672,896	240	0	27240	1691
TROUT LAKE						
RESIDENTIAL	16	32,800	182	0	4078	253
COMMERCIAL	0	0	0	0	0	0
COMMUNITY	4	8,200	46	0	1020	63
TOTAL	20	41,000	228	0	5098	316
WRIGLEY						
RESIDENTIAL	43	341,328	232	0	15597	968
COMMERCIAL	2	15,876	11	0	725	45
COMMUNITY	15	119,068	81	0	5441	338
TOTAL	60	476,271	324	0	21764	1351
YELLOWKNIFE						
RESIDENTIAL	1676	18,173,515	1,539	499,702	667504	41427
COMMERCIAL	839	9,097,601	770	250,149	334150	20738
COMMUNITY	839	9,097,601	770	250,149	334150	20738
TOTAL	3354	36,368,717	3,080	1,000,000	1335804	82903

TABLE - ALL FUELS BIOMASS ENERGY EQUIVALENT BY COMMUNIT

	VOLUME OF FUEL OIL IN LITRES	BTEUS WOOD IN CORDS	PROPANE IN LITRES	TOTAL ENERGY IN GIGAJOULES***	FULL CONVERSION TO BIOMASS	PARTIAL * CONVERSION TO BIOMASS	CURRENT BIOMASS USE
ARCTIC RED RIVER	149,559	530	0	13,735	852	426	530
COLVILLE LAKE	4,909	370	0	6,132	381	190	370
DETAH	232,287	252	0	12,129	753	376	252
ENTERPRISE	79,550	48	43,478	4,534	281	141	48
FORT FRANKLIN	1,163,120	1,410	0	63,119	3,917	1,959	1,410
FORT GOOD HOPE	1,008,955	1,690	0	62,276	3,865	1,932	1,690
FORT LIARD	730,157	756	0	37,543	2,330	1,165	756
FORT MCPHERSON	1,290,954	2,220	0	80,611	5,003	2,501	2,220
FORT NORMAN	1,392,724	1,290	0	69,161	4,292	2,146	1,290
FORT PROVIDENCE	700,000	96	10,870	26,110	1,620	810	96
FORT RESOLUTION	1,033,300	456	27,174	43,862	2,722	1,361	456
FORT SIMPSON	1,227,444	516	119,565	53,691	3,332	1,666	516
FORT SMITH	5,000,000	2,436	86,956	214,917	13,338	6,669	2,436
HAY RIVER	8,907,922	9,370	7,121,900	623,721	38,710	19,355	9,370
HAY RIVER VILLAGE	30,000	444	0	8,196	509	254	444
JEAN-MARIE RIVER	86,626	192	5,435	6,227	386	193	192
KAKISA	100	84	0	1,357	84	42	84
LAC LA MARTRE	507,078	372	0	23,607	1,465	733	372
NAHANNI BUTTE	147,625	144	0	7,448	462	231	144
NORMAN WELLS	100	100	0	1,615	100	50	0
PINE POINT	3,223,100	0	43,478	112,949	7,010	3,505	0
RAE LAKES	215,775	444	0	14,649	909	455	444
RAE-EDZO	2,078,715	132	38,043	75,202	4,667	2,334	132
SNARE LAKES	100	200	500	3,238	201	100	200
SNOWDRIFT	672,896	240	0	27,240	1,691	845	240
TROUT LAKE	41,000	228	0	5,098	316	158	228
WRIGLEY	476,271	324	0	21,764	1,351	675	324
YELLOWKNIFE	36,368,717	3,080	1,000,000	1,335,804	82,903	41,452	3,080
TOTAL	66,768,984	27,424	8,497,399	2,955,932	183,452	91,726	27,324

ASSUMES:116600 BTU/GALLON OF FUEL OIL OR 36646.8 BTU/LITRE &
110000 BTU/ GALLON OF PROPANE OR 24196.6 BTU/LITRE &
17000000 BTU/CORD OF WOOD.

* - ASSUMES HALF OF ENERGY REQUIREMENT MET BY WOOD

** - ASSUMES CONSTANT BURNING EFFICIENCY RATE ACROSS FUELS

*** - BTU's/1,055,060 = gigajoule(s)

TABLE 15/ - VALUE OF DISPLACED FOSSIL FUEL

COMMUNITY	VOLUME OF FUEL OIL IN LITRES	ESTIMATED $VALUE @ $.41/1.	PROPANE IN LITRES	ESTIMATED $VALUE @$.30/1,	$VALUE FOWL FUELS	ESTIMATED CORDAGES REQUIRED	ESTIMATED $VALUE @ $80/curd	ESTIMATED $SAVINGS OF WOOD OVER OIL
ARCTIC RED RIVER	149,559	61,319	0	0	61,319	322	25,792	35,527
COLVILLE LAKE	4,909	2,013	0	0	2,013	II	047	1,166
DETAH	232,2B7	95,238	0	0	95,238	501	40,059	55,178
ENTERPRISE	79,550	32,616	43,478	13,043	45,659	233	18,670	26,989
FORT FRANKLIN	1,163,120	476,079	0	0	476,079	2,507	200,586	276,293
FORT GOOD HOPE	1,008,955	413,672	0	0	413,672	2,175	174,000	239,672
FORT LIARD	730,157	299,364	0	0	299,364	1,574	125,920	173,445
FORT MCPHERSON	1,290,954	529,291	0	0	529,291	2,783	222,632	306,659
FORT NORMAN	1,392,724	571,017	0	0	571,017	3,002	240,183	330,834
FORT PROVIDENCE	700,000	287,000	10,870	3,261	290,261	[,524	121,957	168,304
FORT RESOLUTION	1,033,300	423,653	27,174	8,152	431,805	2,266	181,293	250,513
FORT SIMPSON	1,227,444	50S,252	119,565	35,870	539,122	2,816	225,294	313,828
FORT SMITH	5,000,000	2,050,000	86,956	26,087	2,076,087	10,902	872,179	1,203,908
HAY RIVER	8,907,922	3,652,248	7,121,900	2,136,570	5,700,010	29,340	2,347,165	3,441,653
HAY RIVER VILLAGE	30,000	12,300	0	0	12,300	65	5,174	7,126
JEAN-MARIE RIVER	'S6,626	35,517	5,435	1,631	37,147	194	15,558	21,589
KAKISA	100	41	0	0	41	0	17	24
LAC LA MARTRE	507,078	207,902	0	0	207,902	1,093	87,448	120,4S4
NAHANNI BUTTE	147,625	60,526	0	0	60,526	318	25,459	35,068
NORMAN WELLS	100	41	0	0	41	0	17	24
PINE POINT	3,223,100	1,321,471	43,470	13,043	1,334,514	7,010	560,792	773,722
RAE LAKES	215,775	88,468	0	0	88,468	4b5	37,212	51,256
ROE-EO1O	2,078,715	B52,273	38,043	11,413	B63,686	4,535	362,818	500,S6S
SNARE LAKES	100	41	500	150	191	1	74	117
SNOWDRIFT	672,096	275,887	0	0	275,887	1,451	116,045	159,843
TROUT LAKE	41,000	16,B1O	0	0	16,810	88	7,071	'4,739
WRIGLEY	476,271	195,271	0	0	195,271	1,027	82,136	113,136
YELLOWKNIFE	36,360,717	14,911,174	1,000,000	300,000	15,211,174	79,023	6,385,853	8,825,321
TOTAL	66,768,984	27,375,283	B,497,399	2,549,220	29,924,503	156,028	12,482,248	17,442,255

ASSUMES: 116600 BTU/GALLON OF FUEL OIL OR 36646.8 BTU/LITRE &
110000BTLV66LLONOF PROPANE OR 24196.6 BTU/LITRE &
17000000 BTU/CORD OF WOOD.

** - ASSUMES CONSTANT BURNING EFFICIENCY RATE ACROSS FUELS

TABLE 16 - COST OF CONVERSION TO WOOD FUEL

COMMUNITY	NUMBER OF BUILDINGS	$$ $COST TO PURCHASE NEW AND INSTALL WOOD-BURNING SYSTEM	FREIGHT$/ UNIT	TOTAL$ FREIGHT	TOTAL ESTIMATED COST
ARCTIC RED RIVER	53	80,083	100	5,300	85,383
COLVILLE LAKE	37	55,907	150	5,550	61,457
DETAH	35	52,885	0	0	52,885
ENTERPRISE	23	34,753	0	0	34,753
FORT FRANKLIN	141	213,051	100	14,100	227,151
FORT GOOD HOPE	169	255,359	100	16,900	272,259
FORT LIARD	108	163,188	100	10,800	173,988
FORT MCPHERSON	222	335,642	100	22,200	357,842
FORT NORMAN	129	194,919	100	12,900	207,819
FORT PROVIDENCE	132	199,452	0	0	199,452
FORT RESOLUTION	126	190,386	0	0	190,386
FORT SIMPSON	274	414,014	0	0	414,014
FORT SMITH	689	1,041,079	0	0	1,041,079
HAY RIVER	936	1,414,296	0	0	1,414,296
HAY RIVER VILLAGE	43	64,973	0	0	64,973
JEAN-MARIE RIVER	22	33,242	100	2,200	35,442
KAKISA	7	10,577	0	0	10,577
LAC LA MARTRE	50	75,550	100	5,000	80,550
NAHANNI BUTTE	34	51,374	150	5,100	56,474
NORMAN WELLS	311	469,921	100	31,100	501,021
PINE POINT	498	752,478	0	0	752,478
RAE LAKES	45	67,995	100	4,500	72,495
RAE-EDZO	208	314,288	0	0	314,288
SNARE LAKES	22	33,242	100	2,200	35,442
SNOWDRIFT	55	83,105	100	5,500	88,605
TROUT LAKE	20	30,220	150	3,000	33,220
WRIGLEY	61	92,171	100	6,100	98,271
YELLOWKNIFE	3000	4,533,000	0	0	4,533,000
TOTAL		11,256,950	1,750	152,450	11,409,400

$ - SOURCE: BASED ON YELLOWKNIFE PRICES - WOODSTOVE SHOP - GARTH WALLBRIDGE - FEB,19,1985
$$ - AVERAGE PURCHASE AND INSTALLATION = $1511

TABLE 17 - BIOMASS AREAS & DISTANCES BY COMMUNITY

*SEE ASSUMPTIONS BELOW

COMMUNITY	NUMBER OF BUILDINGS	TOTAL CORDS	TOTAL $VALUE	FOREST YIELD CDS./ACRE	ACRES PER YEAR	LIFECYCLE ACRES	LIFECYCLE SQ.MILES	RADIUS MILES
BIEUS'83								
AKLAVIK	248	2480	198400.00	5.00	496.00	62000	97	5.55
INUVIK	750	7500	600000.00	.98	7653.06	956633	1495	21.81
FT.MCPHERSON	222	2220	177600.00	1.00	2220.00	277500	434	11.75
ARCTIC RED	53	530	42400.00	1.22	434.43	54303	85	5.20
COLVILLE LAKE	37	370	29600.00	.75	493.33	61667	96	5.54
FT.GOOD HOPE	169	1690	135200.00	2.54	665.35	83169	130	6.43
NORMAN WELLS	311	3110	248800.00	2.51	1239.04	154880	242	8.78
FT.FRANKLIN	141	1410	112800.00	2.85	494.74	61842	97	5.55
FT.NORMAN	129	1290	103200.00	3.50	368.57	46071	72	4.79
HAY RIVER	937	9370	749600.00	15.65	598.72	74840	117	6.10
SUB-TOTAL	2997	29970	2397600.00		14663.25	1832906	2864	
BIEUS'82								
DETAH	35	350	28000.00	6.20	56.45	7056	11	1.87
EDZO	76	760	60800.00	8.53	89.10	11137	17	2.35
ENTERPRISE	23	230	18400.00	15.65	14.70	1837	3	.96
FORT LIARD	108	1080	86400.00	40.00	27.00	3375	5	1.30
FORT PROVIDENCE	132	1320	105600.00	35.50	37.18	4648	7	1.52
FORT RAE	153	1530	122400.00	8.53	179.37	22421	35	3.34
FORT RESOLUTION	126	1260	100800.00	35.00	36.00	4500	7	1.50
FORT SIMPSON	272	2720	217600.00	39.00	69.74	8718	14	2.08
FORT SMITH	687	6870	549600.00	16.00	429.38	53672	84	5.17
HAY RIVER VILLAGE	43	430	34400.00	15.65	27.48	3435	5	1.31
JEAN MARIE RIVER	22	220	17600.00	39.50	5.57	696	1	.59
KAKISA	7	70	5600.00	32.50	2.15	269	0	.37
LAC LA MARTRE	50	500	40000.00	10.25	48.78	6098	10	1.74
NAHANNI BUTTE	34	340	27200.00	22.00	15.45	1932	3	.98
PINE POINT	498	4980	398400.00	15.00	332.00	41500	65	4.54
RAE LAKES	45	450	36000.00	7.75	58.06	7258	11	1.90
SNOWDRIFT	55	550	44000.00	33.50	16.42	2052	3	1.01
TROUT LAKE	20	200	16000.00	27.00	7.41	926	1	.68
WRIGLEY	61	610	48800.00	11.60	52.59	6573	10	1.81
SUB-TOTAL	2447	24470	1957600.00		1504.82	188103		
TOTAL	5444	54440	4355200.00		16168.07	2021009		

ASSUMPTIONS:
ANN.CONSUMP'N PER BUILDING= 10
RETAIL $ VALUE PER CORD= 80
FOREST LIFECYCLE YEARS= 125
ONE SQ.MILE= 640 ACRES

TABLE 18 - EMPLOYMENT WITH BIOMASS FUELS BY COMMUNITY

COMMUNITY	VOLUME OF FUEL OIL IN LITRES	BIEUS WOOD IN CORDS	PROPANE IN LITRES	TOTAL ENERGY IN GIGAJOULES	CORDS AT FULL CONVERSION TO BIOMASS	CORDS AT PARTIAL * CONVERSION TO BIOMASS	CORDS AT CURRENT BIOMASS USE	BIOMASS HARVEST JOBS FULL CONV MAN-DAYS	BIOMASS HARVEST JOBS PART CON MAN-DAYS	BIOMASS HARVEST JOBS CURRENT MAN-DAYS	** TOTAL JOBS FULL CONV MAN-DAYS	** TOTAL JOBS PART CON MAN-DAYS	** TOTAL JOBS CURRENT MAN-DAYS
ARCTIC RED RIVER	149,559	530	0	13735	852	426	530	284	142	177	994	497	618
COLVILLE LAKE	4,909	370	0	6132	381	190	370	127	63	123	444	222	432
DETAH	232,287	252	0	12129	753	376	252	251	125	84	878	439	294
ENTERPRISE	79,550	48	43,478	4534	281	141	48	94	47	16	328	164	56
FORT FRANKLIN	1,163,120	1,410	0	63119	3917	1959	1410	1306	653	470	4,570	2,285	1,645
FORT GOOD HOPE	1,008,955	1,690	0	62276	3865	1932	1690	1288	644	563	4,509	2,255	1,972
FORT LIARD	730,157	756	0	37543	2330	1165	756	777	388	252	2,718	1,359	882
FORT MCPHERSON	1,290,954	2,220	0	80611	5003	2501	2220	1668	834	740	5,837	2,918	2,590
FORT NORMAN	1,392,724	1,290	0	69161	4292	2146	1290	1431	715	430	5,008	2,504	1,505
FORT PROVIDENCE	700,000	96	10,870	26110	1620	810	96	540	270	32	1,891	945	112
FORT RESOLUTION	1,033,300	456	27,174	43862	2722	1361	456	907	454	152	3,176	1,588	532
FORT SIMPSON	1,227,444	516	119,565	53691	3332	1666	516	1111	555	172	3,888	1,944	602
FORT SMITH	5,000,000	2,436	86,956	214917	13338	6669	2436	4446	2223	812	15,561	7,781	2,842
HAY RIVER	8,907,922	9,370	7,121,900	623721	38710	19355	9370	12903	6452	3123	45,161	22,581	10,932
HAY RIVER VILLAGE	30,000	444	0	8196	509	254	444	170	85	148	593	297	518
JEAN-MARIE RIVER	86,626	192	5,435	6227	386	193	192	129	64	64	451	225	224
KAKISA	100	84	0	1357	84	42	84	28	14	28	98	49	98
LAC LA MARTRE	507,078	372	0	23607	1465	733	372	488	244	124	1,709	855	434
NAHANNI BUTTE	147,625	144	0	7448	462	231	144	154	77	48	539	270	168
NORMAN WELLS	100	3,110	0	50114	3110	1555	3110	1037	518	1037	3,629	1,814	3,628
PINE POINT	3,223,100	0	43,478	112949	7010	3505	0	2337	1168	0	8,178	4,089	0
RAE LAKES	215,775	444	0	14649	909	455	444	303	152	148	1,061	530	518
RAE-EDZO	2,078,715	132	38,043	75202	4667	2334	132	1556	778	44	5,445	2,723	154
SNARE LAKES	100	200	500	3238	201	100	200	67	33	67	234	117	233
SNOWDRIFT	672,896	240	0	27240	1691	845	240	564	282	80	1,972	986	280
TROUT LAKE	41,000	228	0	5098	316	158	228	105	53	76	369	185	266
WRIGLEY	476,271	324	0	21764	1351	675	324	450	225	108	1,576	788	378
YELLOWKNIFE	36,368,717	3,080	1,000,000	1335804	82903	41452	3080	27634	13817	1027	96,720	48,360	3,593
TOTAL	66,768,984	30,434	8,497,399	3004432	186462	93231	30434	62154	31077	10145	217,539	108,770	35,506

ASSUMES: 116600 BTU/GALLON OF FUEL OIL OR 36646.8 BTU/LITRE &
110000 BTU/ GALLON OF PROPANE OR 24196.6 BTU/LITRE &
17000000 BTU/CORD OF WOOD.

* - ASSUMES HALF OF ENERGY REQUIREMENT MET BY WOOD

** - ASSUMES CONSTANT BURNING EFFICIENCY RATE ACROSS FUELS

ASSUMES HARVESTING RATE IS = 3CORDS PER DAY

@@-ASSUMES SPIN-OFF EMPLOYMENT MULTIPLIER OF 2.5 FOR EVERY BASE JOB IN BIOMASS HARVESTING

245 days / 1 job

2.5

259 days / job

PRELIMINARY POPULATION PROJECTIONS

GOVERNMENT OF THE NORTHWEST TERRITORIES
BUREAU OF STATISTICS

PAGE 70

PRELIMINARY POPULATION PROJECTIONS

POPULATION BY ETHNICITY

BASE YEAR : 1983
FERTILITY/MORTALITY RATES : MODEL 2
GROWTH DUE TO MIGRATION : 0

SETTLEMENT	YEAR	TOTAL	INDIAN	INUIT	OTHERS
YELLOWKNIFE	1983	10 504	321	167	9 016
	1984	10 751	368	175	9 208
	1985	10 981	415	183	9 383
	1986	11 180	460	191	9 529
	1987	11 373	505	199	9 669
	1988	11 593	551	207	9 835
	1989	11 781	589	215	9 977
	1990	11 945	610	223	10 112
	1991	12 120	634	231	10 255
	1992	12 296	674	239	10 383
	1993	12 444	708	247	10 489
	1994	12 589	737	255	10 597
	1995	12 752	777	263	10 712
	1996	12 907	815	271	10 821
	1997	13 051	847	279	10 925
	1998	13 191	887	287	11 017
	1999	13 319	1 [illegible]	294	11 104
	2000	13 458	1 960	301	11 197
	2001	13 578	1 993	309	11 276
	2002	13 716	2 026	317	11 375
	2003	13 852	2 052	324	11 466
	2004	13 992	2 102	332	11 558
	2005	14 106	2 130	339	11 637

Yukon
Office of the Minister
Box 2703 Whitehorse, Yukon Y1A 2C6
(403) 667-5811 Telex 036-8-260

OFFICE OF THE MAYOR
CITY OF WHITEHORSE

TO ALL RIVERDALE [redacted]

You have noticed in the past two or three years that the amount of smoke in Riverdale seems to be increasing. and that it's getting to be a nuisance. The Government of Yukon and the City of Whitehorse want to tell you more about the pollution, ● nd ● sk- your help in bringing it under control. We may be able to do this without compulsory measures, but we need your co-operation.

The Environmental Protection Service of Environment Canada has been sampling the air in Riverdale for the past four winters. They report that:

- air pollution in Riverdale will exceed Canada's 'maximum acceptable' standards on 50 to 70 days each heating ● eason, depending on the weather conditions,
- the pollution will exceed 'maximum tolerable' standards on several of these days,
- virtually all of the pollution is from wood burning appliances in people's homes, while it is concentrated in the newer parts of the subdivisions. it can be measured in all parts of Riverdale,
- the strength of a pollution ● pisode depends strongly On the weather winds, temperature and temperature inversions - but it is not yet possible to predict when pollution will be the worst.

What does the pollution mean in terms of people's health? That is a question we can not answer as yet. because we don't know enough about the air quality in the homes, schools sod other buildings. But Canada's air quality standards are set by National Health and Welfare, and they chose them to reduce the risk to health, especially for the elderly end for those who have respiratory illnesses such as ● sthma. Riverdale's air must be clean enough for everyone's needs, regardless of their age or health.

We know that memy of you burro wood to save on heating bills for oil or ● lectricity. If we restricted the use of wood, it would ❑ ean hardship for ❑ any families. We *also* know that the smoke has reeds Riverdale ● less attractive place to live and that property values have been ● ffected. That is why we are asking for your co-operation with the action plan in this letter, so that you can do your part to reduce the pollution.

Starting before Christmas we will be broadcasting notices ● bout air pollution in Riverdale, and explaining the "indexing' system in the newspapers and other media. We will call another public meeting in January to describe the results of the voluntary system and to give you an opportunity to tell us what you think ● bout this method of controlling wood smoke.

Sincerely.

Andy Philipsen, Minister
Health and Human Resources

Don Branigan, Mayor
City of Whitehorse

WOODSMOKE POLLUTION IN RIVERDALE: WHAT YOU CAN 00 TO NELP

BURN YCUR WOOD CLEANLY

- burn only seasoned wood; never burn green or partly rotted wood; never burn garbage or other materials in your wood-burning appliance; do not burro coal or synthetic logs unless you are certain your appliance and chimney are rated for the additional heat produced;
- keep your cord wood dry; split wood will provide more beat and burn more cleanly; if starting a fire, start it small with kindling and small split pieces; always ● now it to burn very hot before adding more wood;
- ● void "over stoking" your appliance; do not attempt to achieve the "long burn" rating of the manufacturer; a slow fire in an ● ppliance holding a maximum charge of fuel not only pollutes badly, but also creates dangerous creosote formations and wastes much of the heat value of the wood;
- burn small fires, feeding them frequently; the appliance's efficiency is improved, you burn less wood for the same amount of beat, creosote deposits are reduced. and pollution drops markedly; overly large fires cause overheating of your dwelling, ● xcessive "damping down", increased risk of chimney fire, and severe pollution;
- clean, inspect and service your appliance, smoke pipe. and chimney regularly;
- before installing efficiency enhancing or pollution reducing retrofit equipment on Your wood stove, consult with the Yukon Government's Energy Branch and the City's Building Inspection Services to ● nsure compatibility with your stove and that safety standards are met.

LISTEN FOR THE POLLUTION INDEX

The air pollution index for Riverdale will be:

'good'	- 0 to 25
'fair'	- 26 to SO
'poor'	- 51 to 100
'very poor'	- over 100

About one day in three during an average winter will be 'poor', and On those days we would ask you to stop burning fireplaces or unnecessary heating appliances, and to try to burn your major heating appliances as cleanly as you can.

On the few days that are 'very poor', we would ask YOU to stop burning wood in all appliance , and switch to an alternative source of heat. Hopefully, changing weather conditions - and the co-operation of the public - should limit these pollution episodes to less than 24 hours in duration. Pollution index warnings will be more frequent during these times.

We hope that with time, as we gain ❑ Ore experience bOth with Our instruments and with the Riverdale weather conditions, we will be able to give an 'air stagnation advisory', which will help you to plan when you can burn in your appliance without contributing to an air pollution problem. If everyone co-operates. with this plan. we ❑ ay not need the compulsory burning controls used in other cities.

APPENDIX E - PAMPHLET "LET'S CLEAR THE AIR ABOUT WOOD STOVES"

woodstoveoperation

Use dry, well-seasoned wood

Hardwoods such as alder or birch have a higher heal content than soft woods like spruce or pine and burn more efficiently. The energy it takes to dry the water out of green wood robs the fire of heat and greatly increases smoke. Ideally, split wood should be dried for one year to be considered well-seasoned.

Burn the wood briskly

The first 30 minutes is the period of greatest air pollution. A hot fire will heat the stove up enough to burn the wood completely and cleanly and reduce creosote build-up in the chimney.

Don't damper too far

Allow enough air into the stove to fully combust the wood. Fires that smolder due to lack of air are the worst polluters. Excessive dampering will also increase creosote build-up and the possibility of chimney fires. Read and follow the manufacturer's instructions for proper stove operation.

Don't burn garbage, newspapers, trash or coal

Garbage and trash stink when burned and many plastics release toxic gases. Coal should only be burned in specially designed stoves. Coal may contain sulphur, another pollution problem in addition to particulates from Wed. Catalytic converters can be ruined by burning material other than clean wood.

Clean the chimney regularly

Inspect the inside of the flue regularly. Stack conditions are a good indicator of how well you are operating your stove. At first, check the stack once a week. The stack Should be cleaned immedtely if there is more than six millimetres (¼ inch) of creosote build-up. Creosote deposits, even as thin as 6 mm., can cause chimney fires.

Don't burn on poor air quality days

When the air is W, avoid using your wood stove or fireplace if possible. Return to your conventional heating method until the air quality improves in your area. If you need to burn, do it in daytime hours when dispersion smoke is better.

other tips

Make your home energy efficient

Insulating and weatherizing your house will decrease heating needs from all energy sources, thereby reducing the size of stove needed and the amount of wood used. Call the Enersave Heatline for information and tips on making your home energy of ficient.

Insulate all smokestacks

Insulate stacks inside and outside the house to help minimize heat loss and reduce creosote build-up.

Install smoke stacks properly

Certain roof designs can cause your smoke to affect neighbouring homes. Increasing the height of the chimney may eliminate this problem.

Install **an outside air intake**.

Supplying fresh air directly to the stove from outside the house eliminates heat-robbing drafts caused by an inside air intake.

Smoke detectors

Every home heated with wood should be equipped with at least one smoke detector. There should be one between the stove and each section of the house, particularly the sleeping areas.

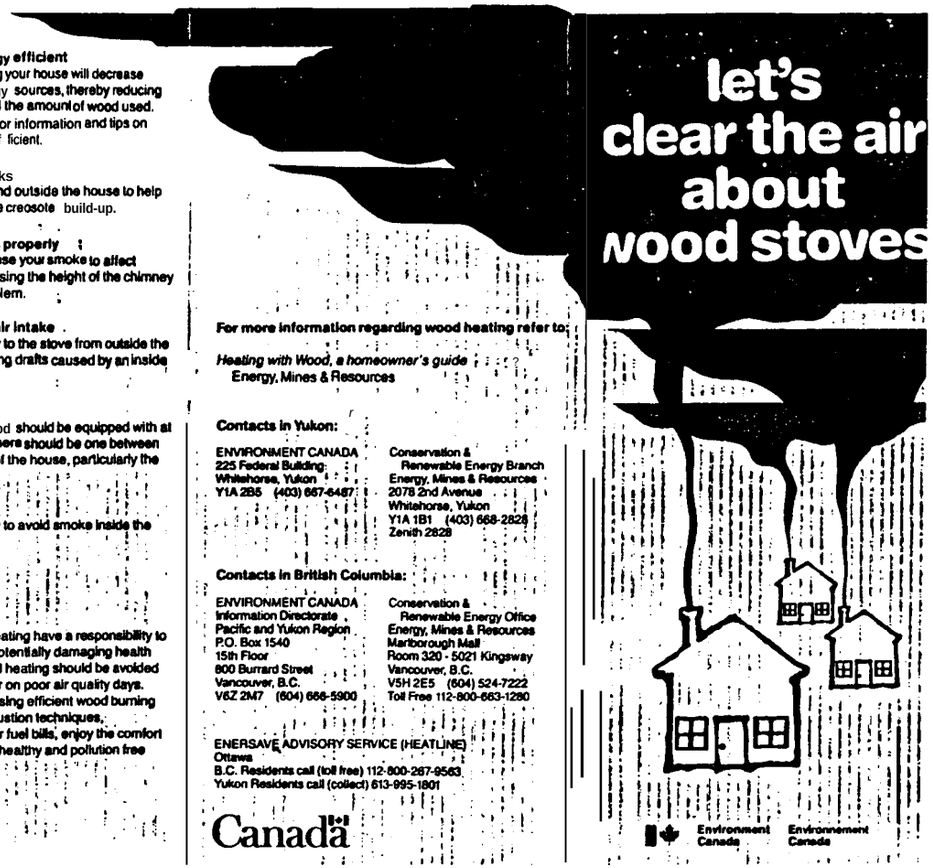
Inside air quality

Vent your appliance properly to avoid smoke inside the house.

in conclusion

Householders using wood heating have a responsibility to prevent air pollution and its potentially damaging health effects. For this reason, wood heating should be avoided in densely populated areas or on poor air quality days.

By weatherizing homes, using efficient wood burning appliances and proper combustion techniques, homeowners can reduce their fuel bills, enjoy the comfort of wood heat and preserve a healthy and pollution free environment.



let's clear the air about wood stoves

For more information regarding wood heating refer to:

Heating with Wood, a homeowner's guide
Energy, Mines & Resources

Contacts in Yukon:

ENVIRONMENT CANADA
225 Federal Building
Whitehorse, Yukon
Y1A 2B5 (403) 667-6467

Conservation & Renewable Energy Branch
Energy, Mines & Resources
2078 2nd Avenue
Whitehorse, Yukon
Y1A 1B1 (403) 668-2828
Zenith 2828

Contacts in British Columbia:

ENVIRONMENT CANADA
Information Directorate
Pacific and Yukon Region
P.O. Box 1540
15th Floor
800 Burrard Street
Vancouver, B.C.
V6Z 2M7 (604) 666-5900

Conservation & Renewable Energy Office
Energy, Mines & Resources
Marlborough Mall
Room 320 - 5021 Kingsway
Vancouver, B.C.
V5H 2E5 (604) 524-7222
Toll Free 112-800-663-1280

ENERSAVE ADVISORY SERVICE (HEATLINE)
Ottawa
B.C. Residents call (toll free) 112-800-267-9563
Yukon Residents call (collect) 613-995-1801

Canada

Environment Canada Environnement Canada

For many Canadians, wood heating provides a nostalgic and money-saving way to heat — homes, particularly in rural and northern areas. For others, wood heating is an annoying source of air pollution and associated health problems.

Since the amount of wood heating is expected to increase, it is important that clean air quality standards be maintained to protect human health and the environment.

This brochure gives householders some basic facts about the safe and efficient operation of wood stoves and answers questions about air pollution to help "clear the air."

By learning how to burn wood efficiently, householders can enjoy energy savings and reduce pollution.

What is wood smoke?

Wood smoke is a complex mixture of very small liquid and solid particles and gases, many of which are potentially damaging to human health. The main pollutants are carbon monoxide, hydrocarbons such as polycyclic organic matter, nitrogen and sulphur compounds and particulate matter.

how is wood smoke damaging to health?

Fireplaces and wood stoves can emit up to 100 times the amount of particulate matter, carbon monoxide and other gases than is released by burning oil or gas for the same amount of heat.

Gases and particulates can be carried deep inside the lungs — away from the body's ability to expel them. If inhaled over long periods of time, they can be the cause of headaches, respiratory illnesses, eye and throat irritation and are linked to an increased risk of cancer.

air pollution and wood stoves

In some towns, air pollution from wood stoves exceeds that from all other sources, including industry and automobiles. Air pollution is worst during winter months when emissions from wood stoves and automobiles are at a maximum and dispersion is limited by either cold temperatures, low winds or climatic inversions. During an inversion, warm air rises and forms a warm, stable blanket over cold ground air, trapping air pollution. Valley locations are particularly susceptible to inversions.

During times of extreme cold, below -35° C, moisture-laden emissions from wood stoves and automobile exhausts form ice fog. Ice fog reduces visibility and suspends dangerous air pollution close to ground level.

Since light winds and air mixing are needed to disperse pollutants from the atmosphere, wood burning should be limited avoided when stagnant conditions prevail

ope wood burni app ance and ntly and reduce emissions tha can cause pollution, householders should remember these guidelines.

when buying a wood burning appliance

Insurance, Fire Regulations

Householders should check their fire insurance policy and consult their local fire marshal for requirements on wood stove installation. Wood-burning appliances for mobile homes have special safety requirements. Poorly installed wood stoves are considered to be a major cause of house fires.

Buy Tested Equipment

Ensure that equipment has been tested and found acceptable for use in Canada. Choose an appliance that has been labelled by the Canadian Standards Association (CSA), Underwriter's Laboratories of Canada (ULC), or Warnock Hersey Professional Services Ltd. (WHPS)

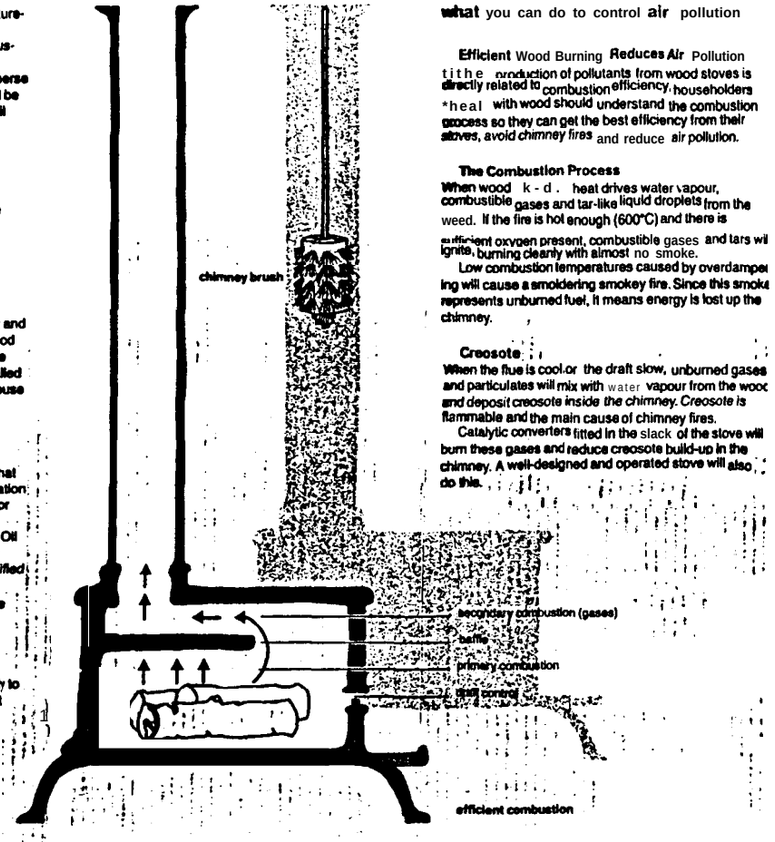
* Wood-fired appliances eligible for a COSP (Canada Oil Substitution Program) grant must have controlled combustion, a COSP acceptance number and be certified and labelled by one of the aforementioned agencies.

Note: Air-tight side drafts or stoves with baffles are considered well designed and more efficient that non air-tight or non-baffled appliances.

Choose the Right Size Stove

A stove that is too large has to be dampered constantly to keep the temperature at a comfortable level. Constant dampering increases pollutants from the stove.

A smaller stove, burning wood rapidly, produces adequate heat and less pollution.



what you can do to control air pollution

Efficient Wood Burning Reduces Air Pollution

tithe production of pollutants from wood stoves is directly related to combustion efficiency. householders *heal with wood should understand the combustion process so they can get the best efficiency from their stoves, avoid chimney fires and reduce air pollution.

The Combustion Process

When wood k-d. heat drives water vapour, combustible gases and tar-like liquid droplets from the weed. If the fire is hot enough (600°C) and there is sufficient oxygen present, combustible gases and tars will ignite, burning cleanly with almost no smoke.

Low combustion temperatures caused by overdampening will cause a smoldering smokey fire. Since this smoke represents unburned fuel, it means energy is lost up the chimney.

Creosote

When the flue is cool or the draft slow, unburned gases and particulates will mix with water vapour from the wood and deposit creosote inside the chimney. Creosote is flammable and the main cause of chimney fires.

Catalytic converters fitted in the stack of the stove will burn these gases and reduce creosote build-up in the chimney. A well-designed and operated stove will also do this.

TABLE 4B - BREAKDOWN OF CURRENT FUEL CONSUMPTION
BY COMMUNITY AND USE SECTOR

TOT EST FUEL= 66,758,984

COMMUNITY		RESIDENTIAL	% **	COMMERCIAL	% **	UNID.	% **
ARCTIC RED RIVER	149559	54,399	36.373	75,675	50.599	19,483	13.027
COLVILLE LAKE	4909	1,636	33.333	1,636	33.333	1,636	33.333
DETAH	232287	77,428	33.333	77,428	33.333	77,428	33.333
ENTERPRISE	79550	26,516	33.333	26,516	33.333	26,516	33.333
FORT FRANKLIN	1163120	387,703	33.333	387,703	33.333	387,703	33.333
FORT GOOD HOPE	1008955	360,853	35.765	417,526	41.382	231,263	22.921
FORT LIARD	730157	41,553	5.691	537,527	73.618	151,077	20.691
FORT MCPHERSON	1290954	485,773	37.629	778,252	60.285	26,929	2.086
FORT NORMAN	1392724	671,418	48.209	610,946	43.867	110,359	7.924
FORT PROVIDENCE	700000	157,857	22.551	542,143	77.449	233,331	33.333
FORT RESOLUTION	1033300	366,016	35.422	665,373	64.393	1,912	.185
FORT SIMPSON	1227444	54,989	4.480	947,243	77.172	225,199	18.347
FORT SMITH	5000000	518,700	10.374	3,413,400	68.268	1,067,900	21.358
HAY RIVER	8907922	1,227,333	13.778	6,885,646	77.298	794,943	8.924
HAY RIVER VILLAGE	30000	10,000	33.333	10,000	33.333	10,000	33.333
JEAN-MARIE RIVER	86626	1	.001	86,626	100.000	1	.001
KAKISA	100	33	33.333	33	33.333	33	33.333
LAC LA MARTRE	507078	125,831	24.815	381,247	75.185	169,024	33.333
NAHANNI BUTTE	147625	49,208	33.333	49,208	33.333	49,208	33.333
NORMAN WELLS	100	0	.335	99	99.062	1	.603
PINE POINT	3223100	90,343	2.803	3,132,950	97.203	0	.000
RAE LAKES	215775	71,924	33.333	71,924	33.333	71,924	33.333
RAE-EDZO	2078715	706,867	34.005	1,371,848	65.995	0	.000
SNARE LAKES	100	33	33.333	33	33.333	33	33.333
SNOWDRIFT	672896	176,702	26.260	447,933	66.568	48,260	7.172
TROUT LAKE	41000	0	.001	41,000	100.000	0	.000
WRIGLEY	476271	95,264	20.002	349,402	73.362	31,605	6.636
YELLOWKNIFE	36368717	6,501,636	17.877	22,922,111	63.027	6,944,607	19.095
TOTAL(LITRES)		12,260,029		44,231,429		10,680,376	

* - projected community totals sourced from TABLE 2, Without/Conservation Scenario
** - % breakdowns as per 1980 Science Advisory Board study

TABLE 4C - BREAKDOWN OF 1985 FUEL PROJECTIONS
BY COMMUNITY AND USE SECTOR

TOT EST FUEL= 69,801,204

COMMUNITY	PROJ.TOT*	RESIDENTIAL	% **	COMMERCIAL	% **	UNID.	% **
ARCTIC RED RIVER	157164	57,165	36.373	79,523	50.599	20,474	13.027
COLVILLE LAKE	4909	1,636	33.333	1,636	33.333	1,636	33.333
DETAH	241833	80,610	33.333	80,610	33.333	80,610	33.333
ENTERPRISE	83009	27,669	33.333	27,669	33.333	27,669	33.333
FORT FRANKLIN	1227164	409,051	33.333	409,051	33.333	409,051	33.333
FORT GOOD HOPE	1050955	375,874	35.765	434,906	41.382	240,889	22.921
FORT LIARD	762135	43,373	5.691	561,069	73.618	157,693	20.691
FORT MCPHERSON	1359622	511,612	37.629	819,648	60.285	28,362	2.086
FORT NORMAN	1436398	692,473	48.209	630,105	43.867	113,820	7.924
FORT PROVIDENCE	737984	166,423	22.551	571,561	77.449	245,992	33.333
FORT RESOLUTION	1077766	381,766	35.422	694,006	64.393	1,994	.185
FORT SIMPSON	1292357	57,898	4.480	997,338	77.172	237,109	18.347
FORT SMITH	5224507	541,990	10.374	3,566,666	68.268	1,115,850	21.358
HAY RIVER	9322640	1,284,473	13.778	7,206,214	77.298	831,952	8.924
HAY RIVER VILLAGE	30000	10,000	33.333	10,000	33.333	10,000	33.333
JEAN-MARIE RIVER	91436	1	.001	91,436	100.000	1	.001
KAKISA	100	33	33.333	33	33.333	33	33.333
LAC LA MARTRE	524326	130,111	24.815	394,215	75.185	174,774	33.333
NAHANNI BUTTE	154186	51,395	33.333	51,395	33.333	51,395	33.333
NORMAN WELLS	104	0	.335	103	99.062	1	.603
PINE POINT	3362699	94,256	2.803	3,268,644	97.203	0	.000
RAE LAKES	222090	74,029	33.333	74,029	33.333	74,029	33.333
RAE-EDZO	2176716	740,192	34.005	1,436,524	65.995	0	.000
SNARE LAKES	105	35	33.333	35	33.333	35	33.333
SNOWDRIFT	704193	184,921	26.260	468,767	66.568	50,505	7.172
TROUT LAKE	43689	0	.001	43,689	100.000	0	.000
WRIGLEY	492808	98,571	20.002	361,534	73.362	32,703	6.636
YELLOWKNIFE	38020267	6,795,883	17.877	23,963,034	63.027	7,259,970	19.095
TOTAL(LITRES)		12,812,444		46,243,441		11,166,547	

* - projected community totals sourced from TABLE 2, Without/Conservation Scenario
** - % breakdowns as per 1980 Science Advisory Board study