THE URBAN ARCHETYPES PROJECT

Community Case Study: The City of Whitehorse

The Urban Archetypes Project initiated by Natural Resources Canada's CANMET Energy Technology Centre (CETC), investigated 31 neighbourhoods[1] in eight communities[2] to explore the linkages between urban form, lifestyle patterns of residents and energy consumption.

The project developed energy profiles for average households within each neighbourhood for personal vehicles, household heat, hot water and electricity for lighting and appliances. It also investigated the influence of urban design, neighbourhood location and lifestyle variables on average household vehicle travel and associated energy consumption. Communities in the project reflected a range of sizes, geographical regions, climates, energy sources and energy efficiency issues.

This fact sheet, one in a series of eight **community case studies** presents the results for three neighbourhoods in the City of Whitehorse: Porter Creek; Wolf Creek and Mary Lake; and Granger.

This research project explored the use of **The Urban Archetypes Project Methodology** which allows for comparative analysis of energy consumption between neighbourhoods in the same community. A further analysis of all the project's neighbourhoods (31) will be presented in **The Urban Archetypes Project Analysis**. As available, these documents will be posted to **www.sbc.nrcan.gc.ca**.

The Urban Archetypes Project is among the first to explore, in an integrated fashion, the energy implications of land use, infrastructure and building decisions through case studies that present quantitative energy information at the neighbourhood scale. In so doing, this project begins to address a significant gap in Canadian community energy planning practice. Building on the findings of this project, CETC, with project collaborators, will continue to work to make energy information available to assist Canadian communities in making strategic energy planning decisions.

The **City of Whitehorse** is the political and commercial capital of the Yukon Territory and is located at 60°43'00"N 135°03'00"W. Historically, it was an important supply centre during the Klondike Gold Rush. Today, it's a modern and vibrant town with a population of 24,151[3].

Linear in nature, from north to south, the city extends along the Alaska Highway and Yukon River in a non-contiguous fashion for approximately 30 kilometres. The downtown/central business district is located in the geographic centre of town.

Situated in the mountain climate region, average daily temperatures range from highs of 21°C (July) to lows of –22°C (January). Similar to many northern communities, residents often rely on a mix of heating fuel sources including oil, propane, electricity and wood. Whitehorse has an abundance of electricity generation capacity; a legacy from Yukon's mining industry development.

[1] The term neighbourhood, as used in this project, denotes an area approximately 300 dwelling units in size and of relatively homogenous urban form; a neighbourhood could vary in size geographically.

[2] The term community, as used in this project, refers to the same scale as the municipality.

[3] The City of Whitehorse Integrated Community Sustainability Plan. September 2007. *http://www.city.whitehorse.yk.ca*

Canada

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NEIGHBOURHOOD DESCRIPTIONS

PORTER CREEK

Porter Creek is situated on the upper bench of the Yukon River Valley, approximately 6 km from downtown Whitehorse. Built in the late 1970s and early 1980s, dwellings are almost exclusively single detached although some contain legal secondary suites.

The neighbourhood was developed according to a grid pattern of streets and avenues complete with sidewalks, streetlights, and cross-walks; houses are set back from the street allowing for manicured front yards and a suburban appearance. While there are no commercial operations within the study area, a few commercial businesses are found on Centennial Street. A school, a church, and art theatre are also located nearby. Residents of this area have access to a local park and outdoor rink. There are many recreational trails throughout the neighbourhood.

WOLF CREEK & MARY LAKE

Wolf Creek and Mary Lake[4] are country residential subdivisions of large lots located approximately 15 km south of downtown Whitehorse on the Alaska Highway. While the first homes were built in the late 1970s, redevelopment continues to take place. The majority of residences are single-detached dwellings interspersed with a few mobile homes.

Homes are generally set back from the road, giving the neighbourhood a rural appearance. The road network pattern consists of crescents and cul-de-sacs branching out from a main road. The majority of the streets are minimally surfaced, with street lights but no sidewalks. These subdivisions are surrounded by natural green space in all directions.

There are no city services to Wolf Creek and Mary Lake (no water, sewer or public transportation). No commercial operations exist within this study area; however, a convenience store, gas station, and restaurant are located in nearby McRae industrial area. Residents do have access to a local park and outdoor rink. Many trails are found within and around the neighbourhoods.

GRANGER

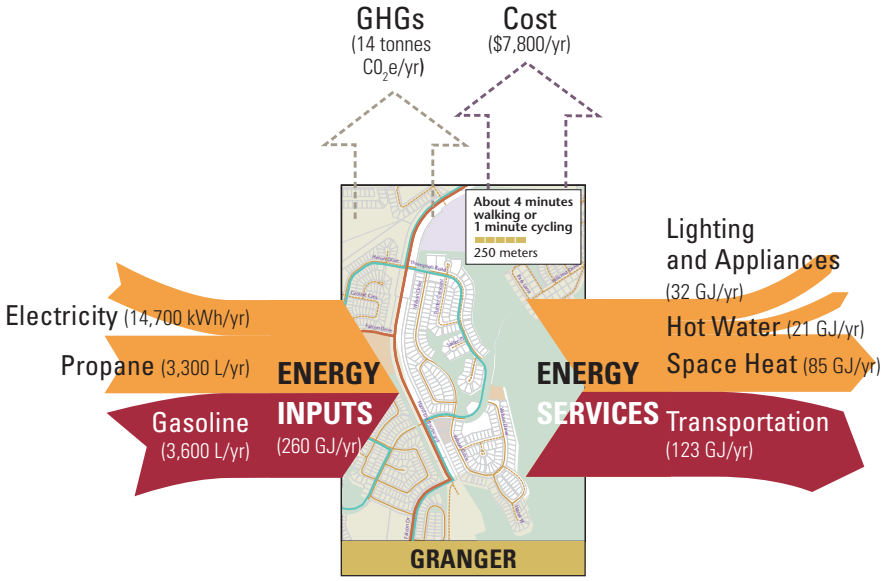
Located on the upper Yukon River bench, **Granger** lies approximately 3km west of downtown Whitehorse. Developed in the early 1990s, Granger consists mostly of single-detached homes, some of which contain legal suites, as well as a limited number of duplexes and town houses. Bordered to the south, west and north by residential development, Granger residents enjoy a large expanse of natural open space and recreational trails to the east as well as excellent views of the Yukon River valley and Grey Mountain.

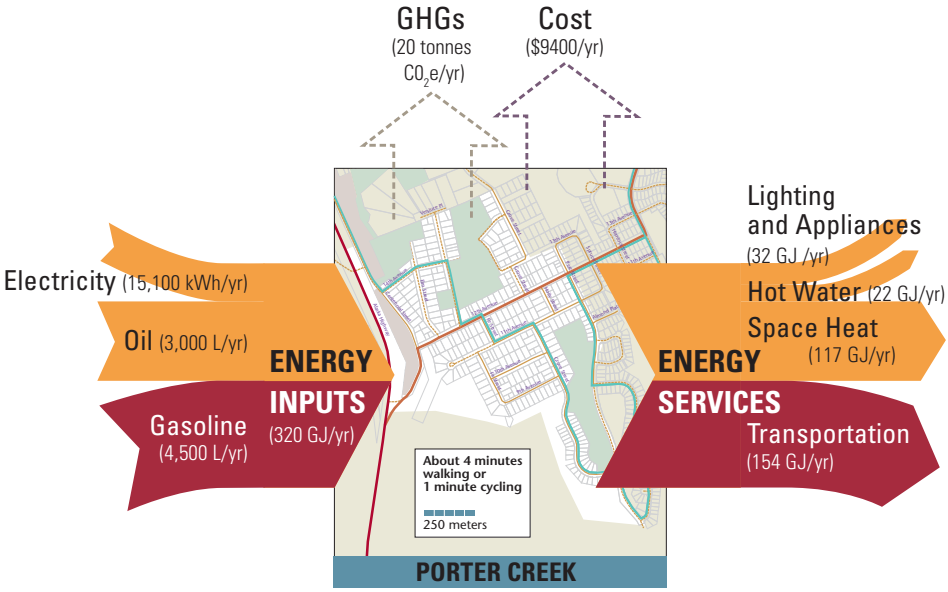
The road network pattern in Granger consists of local roads, crescents and courts branching off from Hamilton Boulevard. Commercial operations include a grocery store, daycare, gas station and video store. Granger residents have access to a local park and outdoor rink. Additional recreational opportunities are available at the nearby Canada Games Centre. The neighbourhood has bus service to downtown and bike and pedestrian paths leading to other areas within Whitehorse.

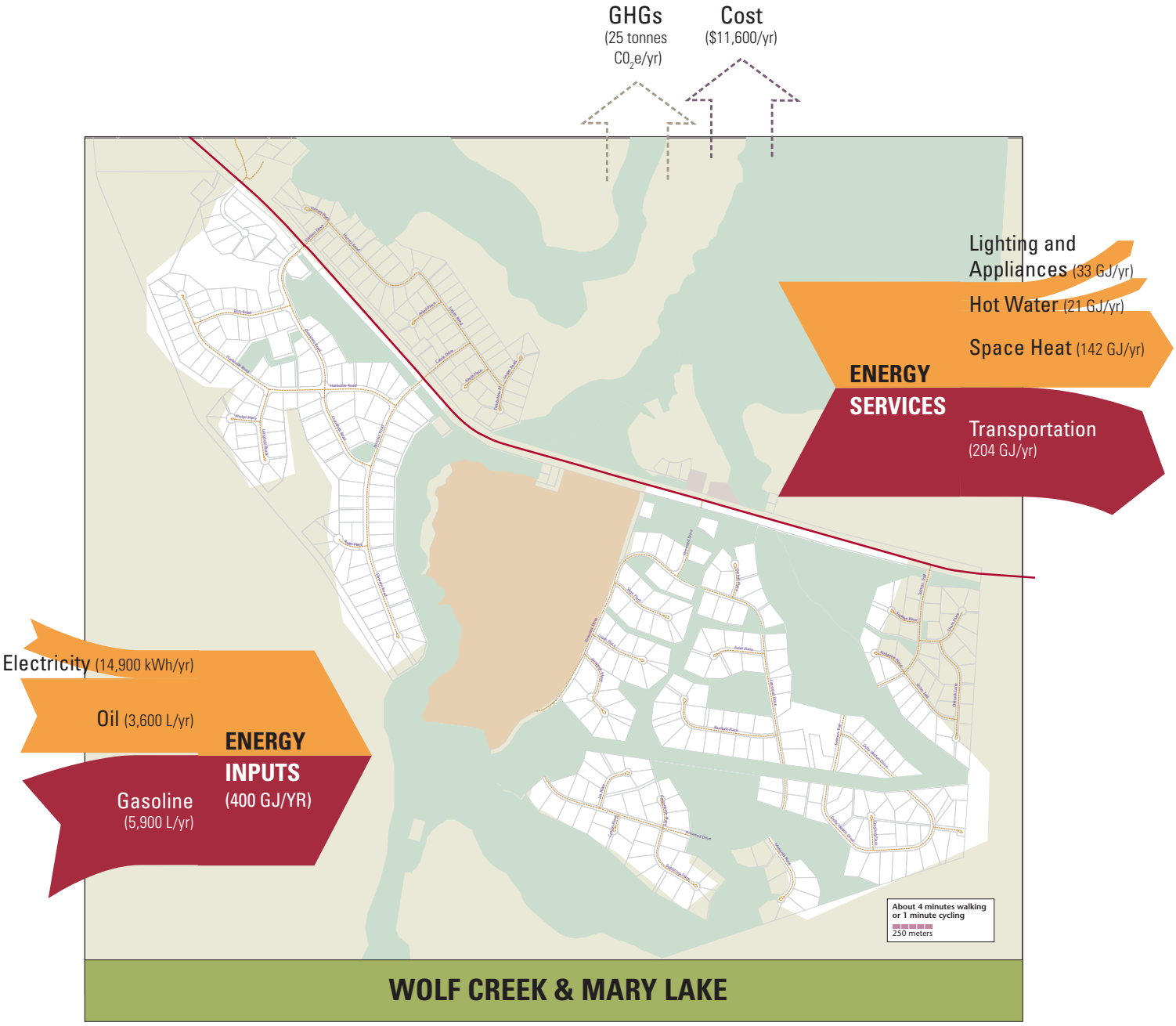
[4] Wolf Creek and Mary Lake are two separate subdivisions but were considered as one neighbourhood for the purposes of the Archetypes Project to ensure a sufficient sample size for the interviews.

SUMMARY OF ENERGY INPUTS AND SERVICES

The graphics summarize an average household's energy inputs and services. The proportional scale between neighbourhoods is accurate and is reflected in the different size of the maps. More detailed source data can be found on pages 5 & 6.







Legend for Area Maps

Residential

Study area with residential lots

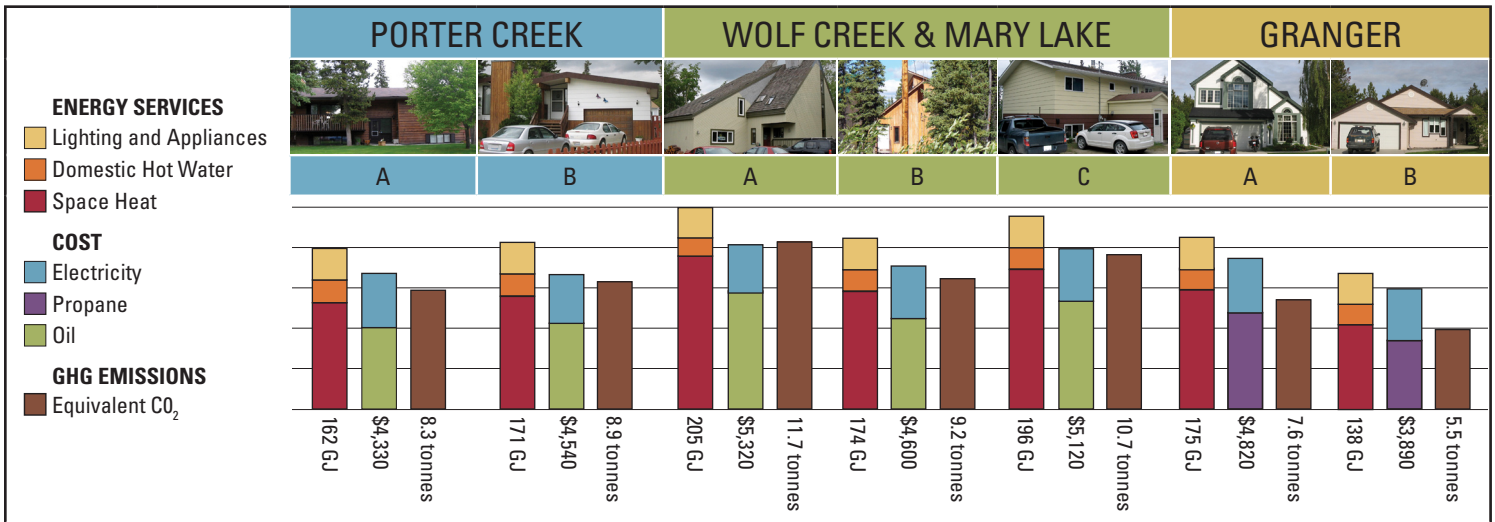
Land Use
- Retail/Commercial
- Industrial
- Institutional
- Municipal
- Recreational
- Parkland
- Water

Transportation
- Arterial (with sidewalks)
- Collector (with sidewalks)
- Local (with sidewalks)
- Roads without sidewalks
- Alleys
- Pathways
- Bike lanes, bike paths
- Bus routes

ENERGY USE IN HOUSES

The amount of energy consumed to provide the energy services of space heating, domestic hot water heating, lighting and appliances can vary substantially from house to house. Factors influencing household energy consumption include: levels of insulation and airtightness, efficiency of mechanical systems for space heating and hot water, choice of lighting and appliances, size of house, and occupant lifestyles.

The energy consumption of common house types found within the Whitehorse study areas ranges from 138 GJ to 205 GJ per year. For homes heated with oil, this represents 2,750 litres to 4,000 litres per year. For those heated with propane, it ranges from 3,250 litres to 4,650 litres per year. The electricity use for all houses ranges from 13,600 to 15,100 kilowatt hours per year for hot water heating, lighting and appliances. Given this consumption, energy costs[5] range from $3,890 to $5,320 per year for the use of a combination of oil or propane and electricity; associated greenhouse gas emissions range from 5.5 tonnes to 11.7 tonnes of equivalent CO_2 per year.



Building Type	storeys	One-storey	One-storey	Two-storeys	Two-storeys	One-storey	Two-storeys	One-storey
	attachment	single-detached	single-detached	single-detached	single-detached	single-detached	single-detached	single-detached
	built	1978-1983	1961-1977	after 1995	1984-1995	1978-1983	1984-1995	1984-1995
Heated Floor Area		185 m^2 (2,000 sq.ft.)	200 m^2 (2,150 sq.ft.)	260 m^2 (2,800 sq.ft.)	235 m^2 (2,500 sq.ft.)	240 m^2 (2,600 sq.ft.)	300 m^2 (3,200 sq.ft.)	225 m^2 (2,400 sq.ft.)
Insulation	ceiling	RSI 5.7 (R-32)	RSI 4.6 (R-26)	RSI 6.0 (R-34)	RSI 7.0 (R-40)	RSI 4.2 (R-24)	RSI 6.0 (R-34)	RSI 6.3 (R-36)
	walls	RSI 2.4 (R-14)	RSI 2.3 (R-13)	RSI 2.9 (R-16)	RSI 3.6 (R-20)	RSI 2.3 (R-13)	RSI 3.6 (R-20)	RSI 2.9 (R-16)
	foundation	RSI 2.1 (R-12)	RSI 2.3 (R-13)	RSI 3.1 (R-18)	RSI 2.6 (R-15)	RSI 2.4 (R-14)	RSI 3.7 (R-21)	RSI 3.1 (R-18)
Space Heating	fuel	oil	oil	oil	oil	oil	propane	propane
	furnace	furnace with flame retention head	furnace with flame retention head	furnace with flame retention head	mid-efficiency furnace	furnace with flame retention head	condensing furnace	condensing furnace
	efficiency	83%	83%	83%	85%	83%	87%	87%
Hot Water	fuel	electric	electric	electric	electric	electric	electric	electric
	tank	conventional tank	conventional tank	conserver tank	conserver tank	conserver tank	conserver tank	conserver tank
	efficiency	82%	82%	87%	87%	87%	87%	87%
Lighting		standard residential incandescent lighting	standard residential incandescent lighting	standard residential incandescent lighting	standard residential incandescent lighting	standard residential incandescent lighting	standard residential incandescent lighting	standard residential incandescent lighting
Appliances		standard appliances	standard appliances	standard appliances	standard appliances	standard appliances	standard appliances	standard appliances
Occupants		4	4	3	4	4	4	4

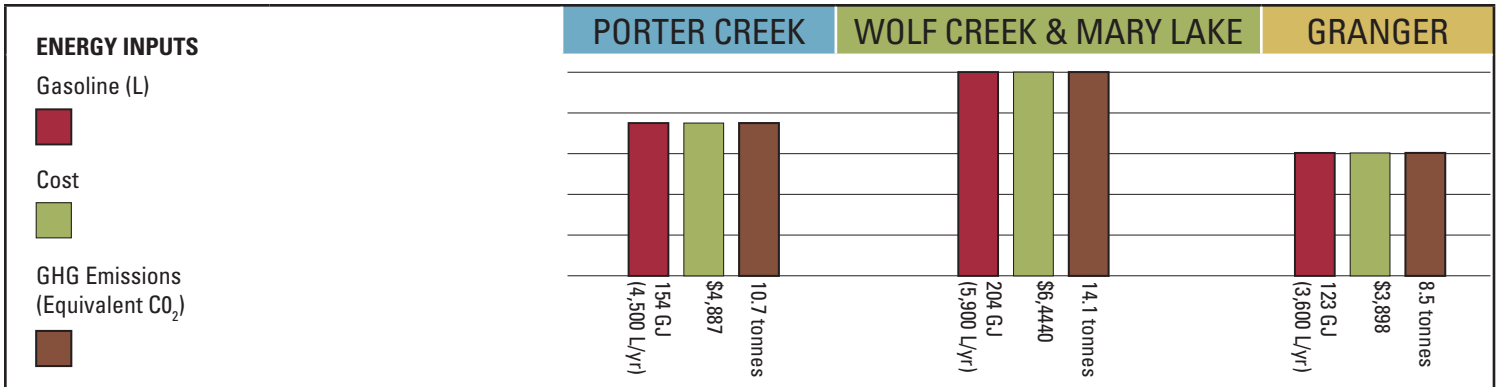
[5] Average costs were calculated using available price data for Whitehorse: Oil (93.9 ¢/L, 2006 average), Propane (67¢/L, 2006 average) and Electricity (11.5 ¢/kWh, 2005 average).

ENERGY USE FOR PERSONAL VEHICLE TRANSPORTATION[6]

Personal transportation helps Canadians accomplish a wide variety of activities and is essential to the functioning of our communities. Personal vehicles are the predominant form of personal transportation, accounting for 78% of total passenger transportation energy end-use in Canada in 2005[7].The Urban Archetypes Project calculated energy consumption for personal vehicles[8] and additionally examined public transit and the active modes of walking and cycling.

Factors influencing transportation energy consumption for personal vehicles considered here include distance travelled, vehicle type, and fuel efficiency. The influence of neighbourhood design characteristics, neighbourhood location and lifestyle were analyzed across all neighbourhoods included in the study, the results of which are presented in **The Urban Archetypes Methodology**.

Average annual household Vehicle Kilometres Travelled[9] (VKT) in the Whitehorse study areas ranged from 30,700 km to 42,000 km. In 2006, the average study area household consumed between 3,560 and 5,885 litres of gasoline that cost[10] between $3,898 and $6,444, and produced greenhouse gas emissions of between 9 and 14 tonnes of equivalent CO_2.



		PORTER CREEK	WOLF CREEK & MARY LAKE	GRANGER
Neighbourhood Design	Gross Density	4.00 UPH	0.46 UPH	6.60 UPH
	Percent of Housing Units Single Detached	93%	98%	88%
	Land Use Mix Index	0.31	0	0.39
	Total Road Length	7.9 km	22.8 km	6.0 km
Neighbourhood Location	Distance to Central Business District	6.4 km	15.0 km	3.2 km
Resident Lifestyle	Average Number of Vehicles per Household	2.4	2.5	1.9
Vehicle Kilometers Traveled (VKT)		30,700 km	42,000 km	24,400 km

PROJECT COLLABORATION

Natural Resources Canada recognizes the contribution of project collaborators in Whitehorse including the City of Whitehorse, the Northern Climate Exchange, Yukon Electric and North 60° Petro.

FOR MORE INFORMATION

To learn more about the Urban Archetypes Project, or to access project companion documents (Methodology and additional case studies), go to **www.sbc.nrcan.gc.ca** or contact Jessica Webster by phone: (613) 992-9532 or email: **jessica.webster@nrcan.gc.ca**.

[6]Indicator definitions can be found in The Urban Archetypes Project Methodology (*www.sbc.nrcan.gc.ca*).

[7] Passenger Transportation Secondary Energy Use by Energy Source and Transportation Mode *http://www.oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/tran_00_4_e_2.cfm?attr=0.*

[8] Personal vehicles include small and large cars and light trucks.

[9] Based on total household VKT-AVG responses, collected from study area residents in 2006. See Urban Archetype Project Methodology for more details.

[10] Average costs were calculated using available price data for Whitehorse: Gasoline ($1.095/L, 2006 average).