



CanmetENERGY

Leadership in ecoInnovation

THE URBAN ARCHETYPES PROJECT

Community Case Study: Halifax Regional Municipality

The Urban Archetypes Project, initiated by Natural Resources Canada's CanmetENERGY in Ottawa, investigated 31 neighbourhoods¹ in 8 communities² to explore the linkages among 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 four neighbourhoods in the Halifax Regional Municipality as studied in 2007: Clayton Park, Hydrostone, Kingswood and Lucasville.

This research project used *The Urban Archetypes Project Methodology*,³ which allows for a comparative analysis of energy consumption of typical households in different neighbourhoods in the same community. A further analysis of all of the project's neighbourhoods (31) will be presented in *The Urban Archetypes Project Analysis*. These documents will be posted to www.canmetenergy.nrcan.gc.ca as they become available.

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 in a neighbourhood context. In so doing, this project begins to address a significant gap in Canadian community energy-planning practice. Building on the findings of this project, CanmetENERGY, with project collaborators, will continue to work to provide energy information to assist Canadian communities in making strategic energy-planning decisions.

Halifax Regional Municipality is the political and commercial capital of Nova Scotia. Located at 44°38'56" north latitude and 63°34'30" west longitude, it is the halfway point between Europe and the west coast of North America. Since its founding in 1749, the city has had a military connection, from serving as

a staging ground for the English in the Seven Years' War (1756–1763) to being the western hub of the naval convoy routes that spanned the Atlantic during World Wars I and II. Over the years, Halifax has also been the site of many Canadian firsts, including the first post office and the first newspaper.⁴

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 Definitions of measures and indicators can be found in *The Urban Archetypes Project Methodology*. www.canmetenergy.nrcan.gc.ca

⁴ Halifax Regional Municipality. A Brief History of Halifax. www.halifax.ca/community/history.html

Today Halifax is a modern port city and a major economic centre of eastern Canada, with a population of 372 858.⁵ In 1996, amalgamation brought together the four municipalities of Halifax, Dartmouth, Bedford and Halifax County. Defence and port functions continue to be economic strengths, with trade, distribution, transportation, finance, research and government all contributing to a diversified economy.⁶

Halifax is located on a 3.3-kilometre (km) wide by 7.5-km long peninsula in the world's second largest natural harbour. With a maritime climate, average daily temperatures range from highs of 18.2°C in July to lows of -5.7°C in January. Similar to many communities in Canada's Atlantic provinces, residents rely on a mix of fuel sources, including oil and electricity, for space heating and domestic hot water. In 2007, Halifax finalized a community energy plan to help identify cleaner energy sources and improve energy efficiency.⁷

NEIGHBOURHOOD DESCRIPTIONS

CLAYTON PARK



Clayton Park is located approximately 12 km from Halifax's central business district. The study area comprises two sections of the larger Clayton Park neighbourhood: single-family and duplex dwellings on Trailwood Place and Amberwood Court and, on the east side of Dunbrack Street, multi-unit residential buildings (MURBs) on Chipstone Close.

The apartments and houses in the study area were built in the late 1980s with a widespread use of brick exteriors.

Neighbourhood amenities include Tremont Park, which offers trails for dog walking, a basketball court, a soccer field and a playground. Nearby shops and services are found at Rockingham Ridge, a small plaza to the north, and Park West Centre and Clayton Park Shopping Mall to the south. An elementary school and a high school are within walking distance.

HYDROSTONE



Hydrostone was created to provide housing for the people displaced by the catastrophic Halifax explosion of 1917. Completed in 1920, the neighbourhood was the nation's first government-assisted housing project. The study area is bounded by Novalea Drive to the east, Young Street to the south, Isleville Street to the west and Duffus Street to the north.

Built from hydrostone concrete blocks, dwellings are mostly row houses with large single-detached homes found at the end of each street; all have been well maintained. The neighbourhood follows a standard grid pattern, with the bulk of the streets being boulevards with green space and seating in the centre. Homes are also serviced by back lanes. The boulevards are lined with mature deciduous trees, and many properties feature coniferous trees of varying sizes.

Fort Needham Memorial Park is at the eastern end of the study area, with the Halifax Harbour only a few hundred metres beyond. Religious and institutional buildings are nearby, as is industry in the form of a major brewery and a lively commercial area with popular shops and restaurants.

⁵ Halifax Regional Municipality. Halifax Quick Facts. www.greaterhalifax.com/site-ghp2/media/greaterhalifax/Quick_Facts_Final.pdf

⁶ The Canadian Encyclopedia. Halifax: Economy and Labour Force. www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1SEC910433

⁷ Halifax Regional Municipality. Community Energy Plan. www.halifax.ca/environment/energyplan/index.html

KINGSWOOD



The **Kingswood** neighbourhood in Hammonds Plains is approximately 20 minutes by car from downtown Halifax. The study area is bounded by Remo and Cresco drives to the east, Virginia Drive to the south and St. George Boulevard to the west and north. Built in the mid-late 1990s, the homes are typically 2–3 storey single-family dwellings with exteriors of brick, wood stucco and vinyl siding.

The subdivision has a rolling landscape and contains a number of lakes. Homes sit on sizeable lots ranging from 0.75 to about 4.0 acres. The roadways winding through the neighbourhood are in good condition. There are few sidewalks or pathways for walking or biking. Most dwellings are supplied with city water, though some have wells.

Commercial spaces are located on Hammonds Plains Road at the turnoff to Kingswood, and there are a few other commercial and industrial operations along Hammonds Plains Road. An elementary school is in the area.

LUCASVILLE

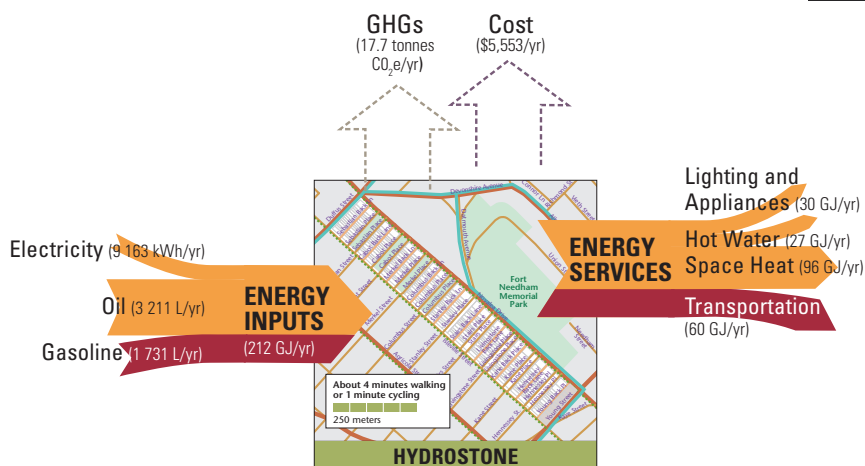
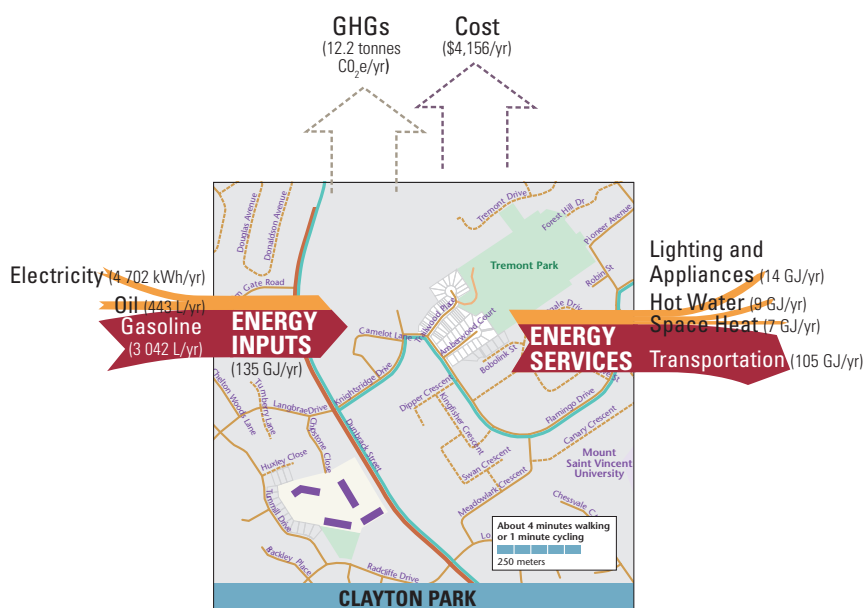
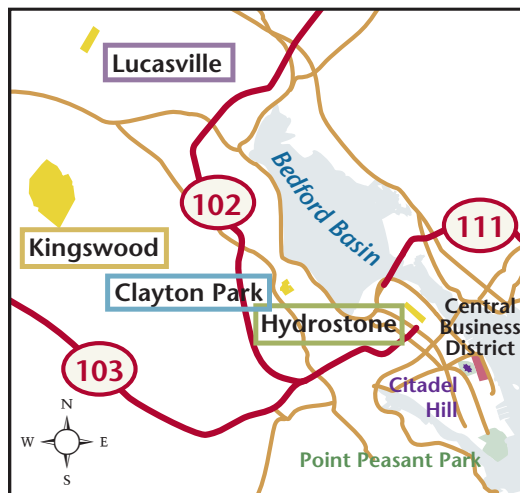


The **Lucasville** neighbourhood, consisting of the Timber Trails Mobile Home Park, is a series of 10 streets branching off the west side of Lucasville Road. The mobile homes are 4- or 5-metres (14- or 16-feet) wide and from 17- to 24-metres (55- to 78-feet) long; most residents have built decks onto their trailer. Virtually everyone uses electric heat. Oil heating was permissible when the park first opened but has since been banned. As a result, anyone selling an older, oil-heated trailer must first convert it to electric heat.

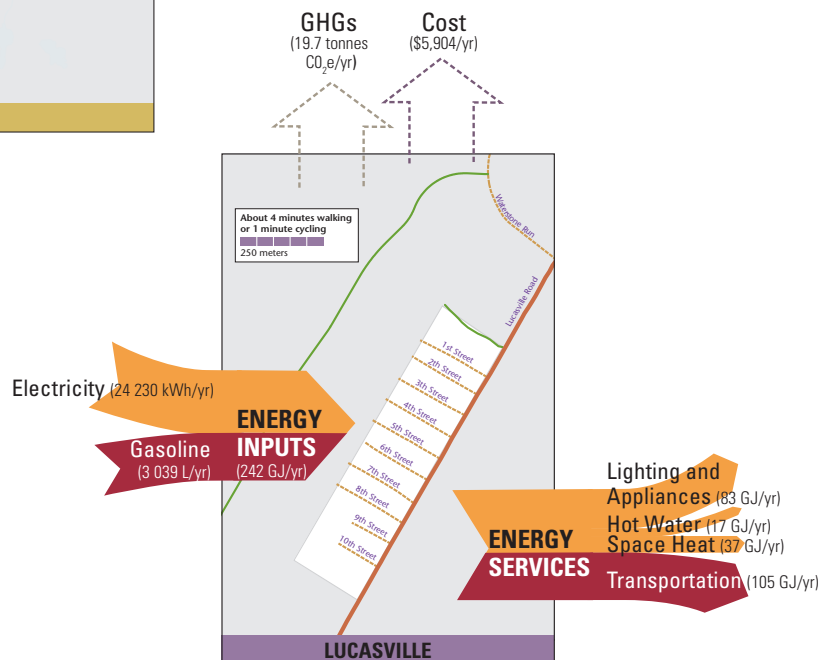
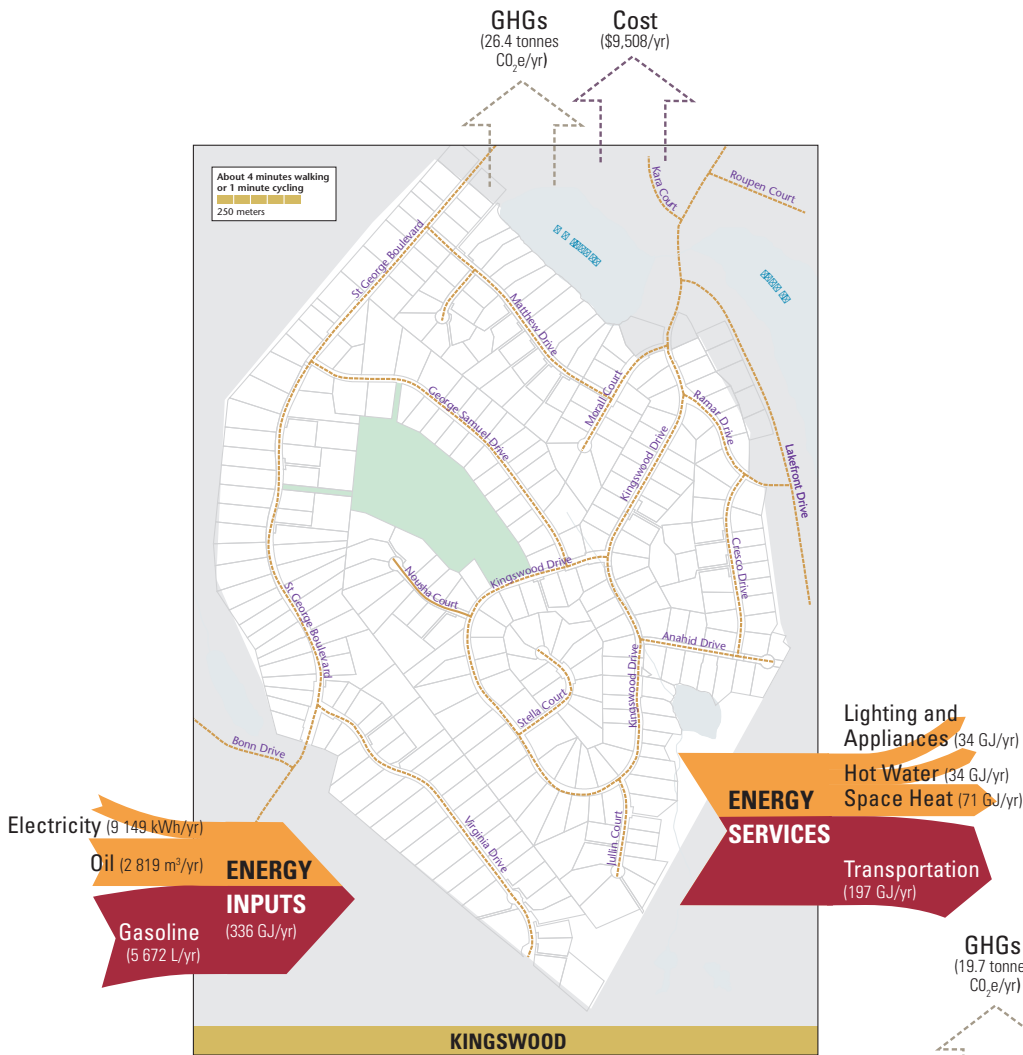
The land across the road is undeveloped woodland. Apart from a golf course and one or two wholesale businesses, there is no other development along Lucasville Road. The closest bus stops to the park are kilometres away at either end of Lucasville Road. There is another, more direct bus route into town, but it is available only three times a day. Residents would like to have a shuttle service along Lucasville Road, so they could connect with a more useful bus line. Residents with bicycles are unwilling to ride them on Lucasville Road, which carries 80-km/hr traffic and has no paved shoulders.

SUMMARY OF ENERGY INPUTS AND SERVICES

The Sankey-style graphics summarize a representative household’s energy inputs and services.⁸ The proportional scale between neighbourhoods is accurate and is reflected in the different sizes of the maps and arrows. More detailed source data for housing and transportation follow.



⁸ Values in the Sankey diagrams correspond with total household energy consumption modelled for the following representative house and apartment types in Halifax: Clayton Park A, Hydrostone A, Kingswood A, Lucasville A.



Legend for Area Maps

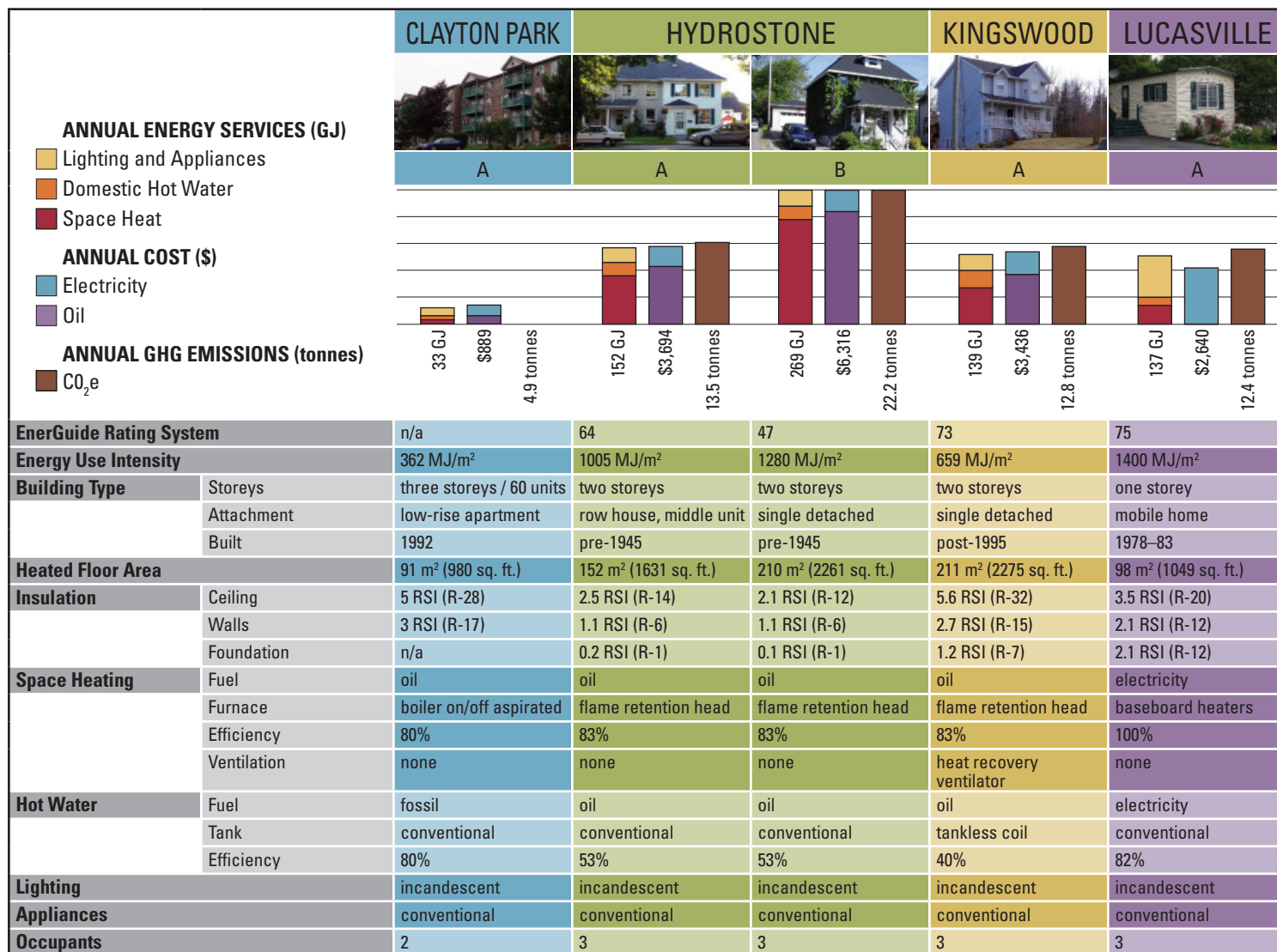
- | | | | | |
|----------------------------------|-------------------|--------------|----------------------------|---------------------------|
| Residential | Land Use | Municipal | Transportation | Roads without sidewalks |
| Study area with residential lots | Retail/Commercial | Recreational | | Arterial (with sidewalks) |
| | Industrial | Parkland | Collector (with sidewalks) | Pathways |
| | Institutional | Water | Local (with sidewalks) | Bike lanes, bike paths |
| | | | | Bus routes |

ENERGY USE IN DWELLINGS (HOUSES AND APARTMENTS)

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

Energy use in common house⁹ and apartment¹⁰ types within the Halifax study areas ranged from 137 to 205 gigajoules (GJ)

per year. For dwellings heated with oil, use ranged from 443 to 6 178 litres (L) per year. The representative dwelling heated with electricity used 24 230 kilowatt hours (kWh) per year. Electricity use for dwellings heated with oil ranged from 4 702 to 9 657 kWh per year for lighting and appliances. Given this consumption, energy costs¹¹ ranged from \$4,156 to \$6,316 per year for the combined use of oil and electricity. Associated greenhouse gas (GHG) emissions¹² ranged from 4.9 to 13.5 tonnes of carbon dioxide equivalent (CO₂e) per year.



⁹ Analysis was derived from ecoENERGY Retrofit – Homes (formerly EnerGuide for Houses) records within the study areas. A generalized profile for each representative house type was simulated using HOT2000* software and compared with the regional building archetype. Default values for house temperature and internal gains were used, and occupancy was determined by interview; Parekh, Anil. 2005. “Development of Archetypes of Building Characteristics Libraries for Simplified Energy Use Evaluation of Houses.” Ninth International Building Performance Simulation Association Conference, Montréal.

¹⁰ MURB results are a combination of observed and measured geometry with measured performance values using generic assumptions for building age. Assumptions for lighting, appliances and miscellaneous electrical use per suite are derived from *Model National Code for Buildings* schedules. Simulations were completed using Natural Resources Canada’s Screening Tool for New Building Design (www.screen.nrcan.gc.ca). Suite energy use was pro-rated from simulated whole-building energy use.

¹¹ Average costs were calculated using available price data for Nova Scotia: oil (85.03¢/L, 2007 average) and electricity (10.91¢/kWh, 2006 average).

¹² GHG emissions were determined using the marginal fuel factors for the region developed by Environment Canada, as used in HOT2000.

*HOT2000 is an official mark of Natural Resources Canada.

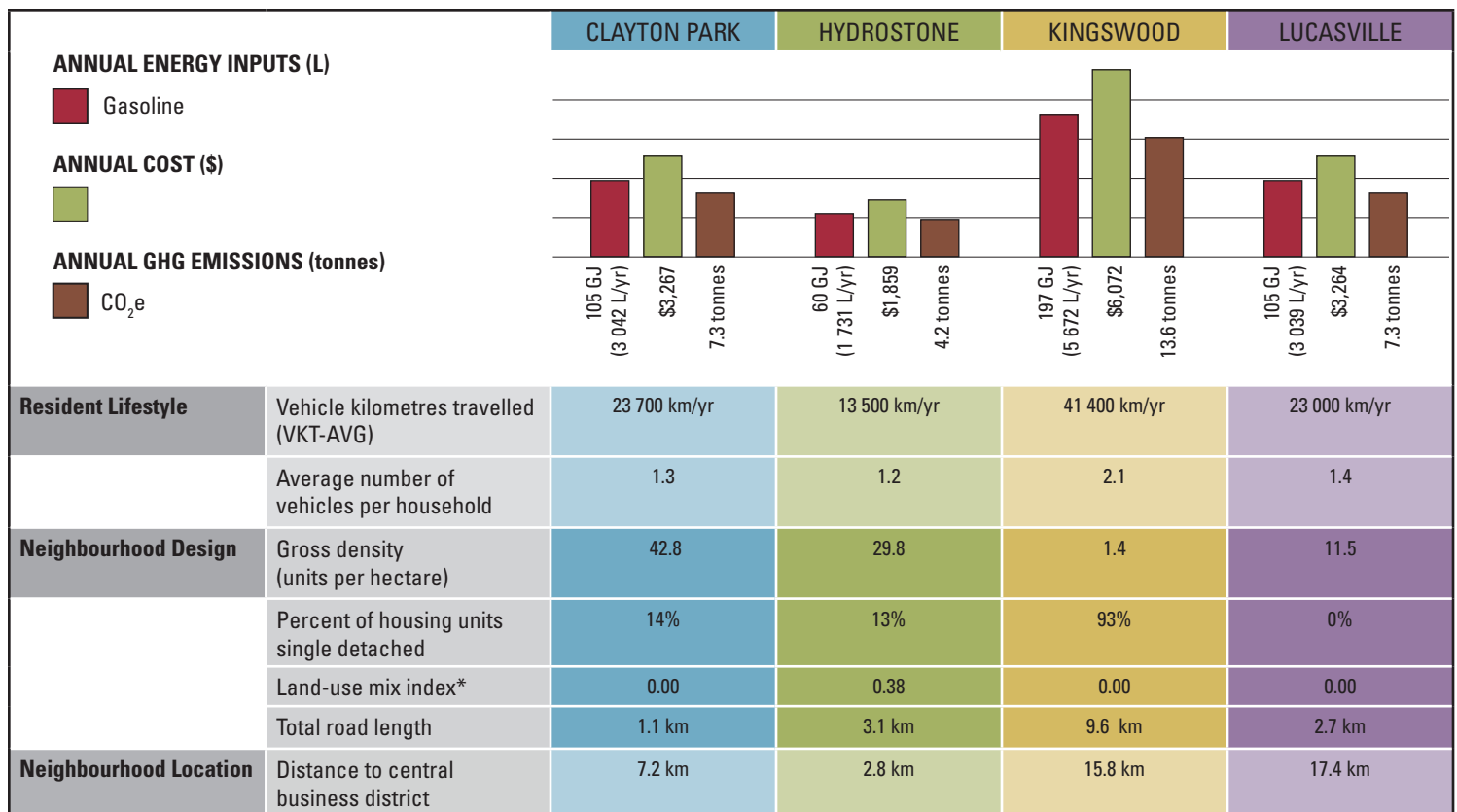
ENERGY USE FOR PERSONAL VEHICLE TRANSPORTATION

Personal transportation helps Canadians accomplish a wide variety of activities and is essential for the functioning of our communities. Personal vehicles are the predominant form of personal transportation, accounting for 78 percent of total passenger transportation energy end-use in Canada in 2005. The Urban Archetypes Project calculated energy consumption for personal vehicles¹³ and examined public transit and the active modes of walking and cycling.

The factors that influence transportation energy consumption for personal vehicles include distance travelled, vehicle

type and fuel efficiency. Furthermore, the influence of neighbourhood design characteristics, location and lifestyle for all 31 study neighbourhoods was analysed and will be presented in *The Urban Archetypes Project Analysis*.

In the Halifax study areas, average annual household Vehicle Kilometres Travelled¹⁴ (VKT-AVG) ranged from 13 500 to 41 400 km. In 2007, the average study-area household consumed between 1 731 and 5 672 litres (L) of gasoline that cost¹⁵ between \$1,859 and \$6,072 and produced GHG emissions of between 4.2 and 13.6 tonnes of CO₂e.



*Land-use mix variables include the number of retail/commercial units, retail/commercial buildings, industries, institutions and municipal buildings. The higher the score, the more mixed the land use in the neighbourhood.

PROJECT COLLABORATION

Natural Resources Canada recognizes the contribution of Halifax Regional Municipality, the Ecology Action Centre, Nova Scotia Power and Wilsons Home Heating.

FOR MORE INFORMATION

To learn more about the Urban Archetypes Project or to access companion documents (methodology, analysis and case studies), visit www.canmetenergy.nrcan.gc.ca (Buildings & Communities, Communities section) or contact Jessica Webster by telephone at 613-992-9532 or by e-mail at jessica.webster@nrcan.gc.ca.

¹³ Personal vehicles include small and large cars and light trucks.

¹⁴ Based on total estimated household Vehicle Kilometres Travelled (VKT) data collected from the study areas' residents in 2007. To account for possible under-reporting, neighbourhood household average VKT was substituted in cases of non-response, producing the Vehicle Kilometres Travelled-Average (VKT-AVG) figure. See *The Urban Archetypes Project Methodology* for more details.

¹⁵ Average costs were calculated using available price data for Halifax: gasoline (\$1.074/L, 2007 average).