HOUSEHOLD TRAVEL SURVEY

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1.0 INTRODUCTION

The Kingston Transportation Master Plan study included a comprehensive household travel survey of the City of Kingston and surrounding area. The survey was conducted by telephone in January 2002.

The survey was based on a random selection of listed telephone numbers in the study area. Travel data were collected from approximately 5% of households in the study area. The survey collected information on how household members use the transportation system of the City, and provided key information upon which the Travel Demand Model was based.

Prior to undertaking the survey a letter was sent to the randomly selected households, informing household members of the survey and requested their participation. Notices of the survey were sent to the press, government officials, and police to ensure widespread knowledge of the travel survey, and compliance with survey staff.

Data collected by the survey was grouped into three categories, household data, person data, and trip data. Trip data were collected regarding trips made by household members on the previous day to the survey. A number of questions were asked regarding each of these data categories:

- *Household Data* – dwelling type (i.e. house, apartment), number of persons residing in the household, number of vehicles available for personal use, etc.

- *Person Data* – age, gender, possession of a driver's licence, place of work or school, employment status, occupation.

- *Trip Data* – beginning and end of all trips, trip purpose (i.e. work, shopping, school), start time of the trip, type of transportation used (i.e. car, bus, bicycle), etc.

The survey data was then expanded to represent the total population of the study area using data obtained from the 2001 Canada Census.

The following table presents the number of survey records captured by the survey for each data category, as well as the expanded data total.

Table 1
Travel Survey Record Summary

Data Category	Survey Records	Expanded Total
Household Data	2,649	59,404
Person Data	6,303	142,034
Trip Data	16,045	356,841

Details of the travel survey are contained in *Kingston Transportation Master Plan 2002 Travel Survey 2002 – Data Guide*, provided to the City of Kingston as a separate document.

2.0 SUMMARY OF TRAVEL

The survey provided a snap shot of the City's existing travel patterns, and was used to understand, where, and when Kingston's residents travel around the City. Given that an understanding of the magnitude and nature of travel is essential to anyone involved in shaping the City's urban areas, this section provides a brief summary of the travel patterns of City residents.

2.1 All-Day Travel Patterns

Travel characteristics presented in the following sections are based directly on the expanded household, person, and trip databases developed from the travel survey. The data are summarized according to key descriptors of the transportation system: automobile availability, trip purpose, mode of travel, temporal distribution of trips, trip length, and geographic distribution of trips. Unless noted otherwise, the summaries represent all-day patterns of travel.

2.1.1 Automobile Availability

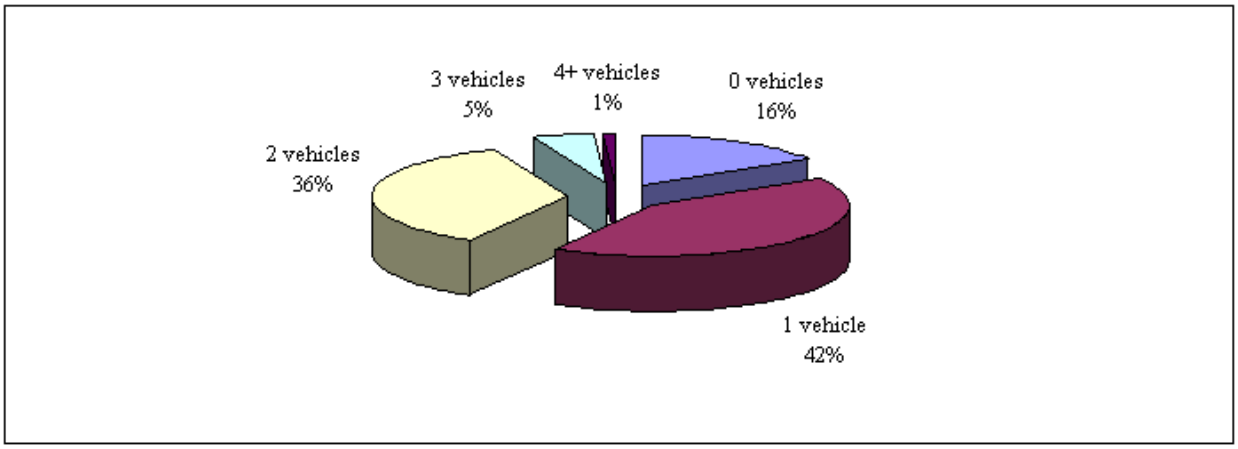
The level of household auto ownership over the recent decades has been increasing worldwide, and is particularly high in North America. Correspondingly, the number of persons per vehicle has been decreasing. The proliferation on the automobile, and reliance on it as a mode of travel increases traffic congestion and contributes to environmental pollution. Auto ownership is also correlated to household income. In general, household automobile ownership increases with household income (*Transportation Planning Handbook, Institute of Transportation Engineers*).

The survey data indicates an average of 1.34 vehicles per household. This corresponds to an average of 1.78 persons per automobile within the City. The number of vehicles per household is summarized in **Table 2**, and **Figure 1**.

Table 2
Household Automobile Ownership

Vehicles per Household	Number of Households	Percentage of Households
0	9,606	16%
1	25,025	42%
2	21,120	36%
3	2,942	5%
4 or more	710	1%
Total	**59,404**	**100%**

Figure 1
Household Automobile Ownership



2.1.2 Trip Purpose

For the most part, travel is a derived activity, in that people do not travel for travel's own sake. Transportation occurs to facilitate community activities, both social and economic. Each trip is therefore made for a particular purpose. The purpose of the trip influences the mode of travel, the time the trip is made, and the length of the trip.

Trips are defined as one-way movements that can be classified into one of five trip purpose categories. Home-based trips are trips that either begin or end at home. These trips make up over 80% of all trips within the City of Kingston. Trip purpose can be characterized according to the following five categories:

- Home-Based Shopping – shopping trips that either begin or end at home (i.e. a trip from home to the store, or a trip from the store to home).
- Non Home-Based – trips that neither begin nor end at home.
- Home-Based Other – trips that either begin or end at home, that are not work, school, or shopping related (i.e. a trip from home to a medical clinic).
- Home-Based School – school trips that either begin or end at home (i.e. a trip from home to school, or the trip from school to home).
- Home-Based Work – work trips that either begin or end at home (i.e. a trip from home to work, or the trip from work to home).

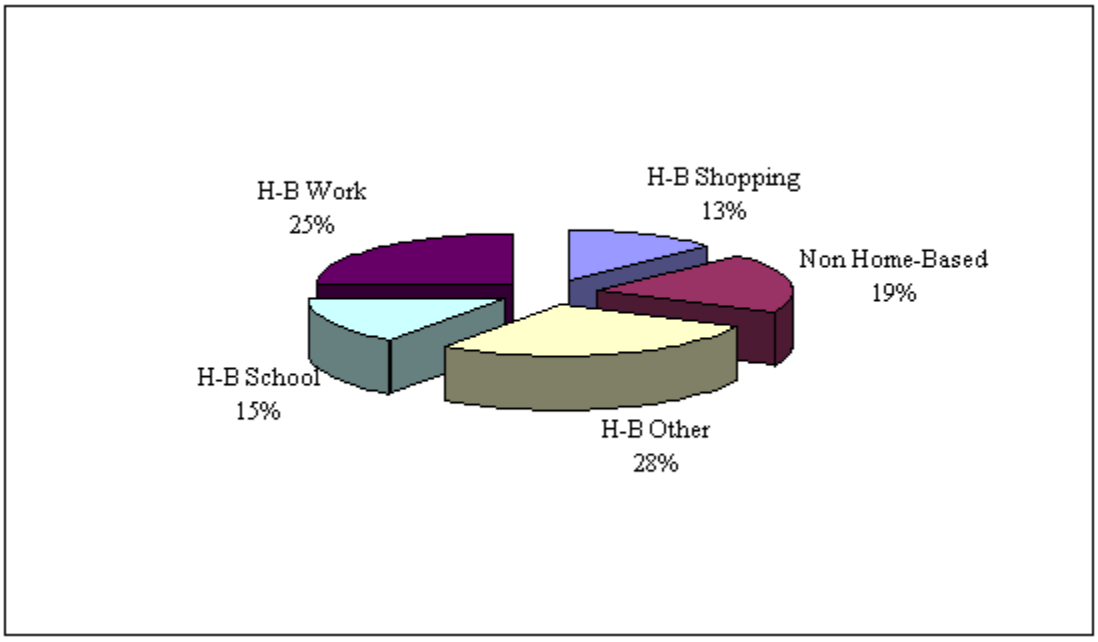
One important aspect of trip making behaviour is multipurpose trip making. A journey directly from work to home is an example of a single home-based work trip. However, a journey from work to home where the person stops at the supermarket to pick up some groceries is categorised as two trips. A non home-based trip (the trip from work to the supermarket), and a home-based shopping trip (the trip from the supermarket to home).

Table 3 and **Figure 2** presents the breakdown of all-day trips by trip purpose.

Table 3
Trips by Trip Purpose

Trip Purpose	Number of Trips	Percentage of Trips
Home-Based Shopping	45,986	13%
Non Home-Based	67,401	19%
Home-Based Other	100,759	28%
Home-Based School	54,499	15%
Home-Based Work	88,196	25%
Total	**356,841**	**100%**

Figure 2
Trips by Trip Purpose



2.1.3 Mode of Travel

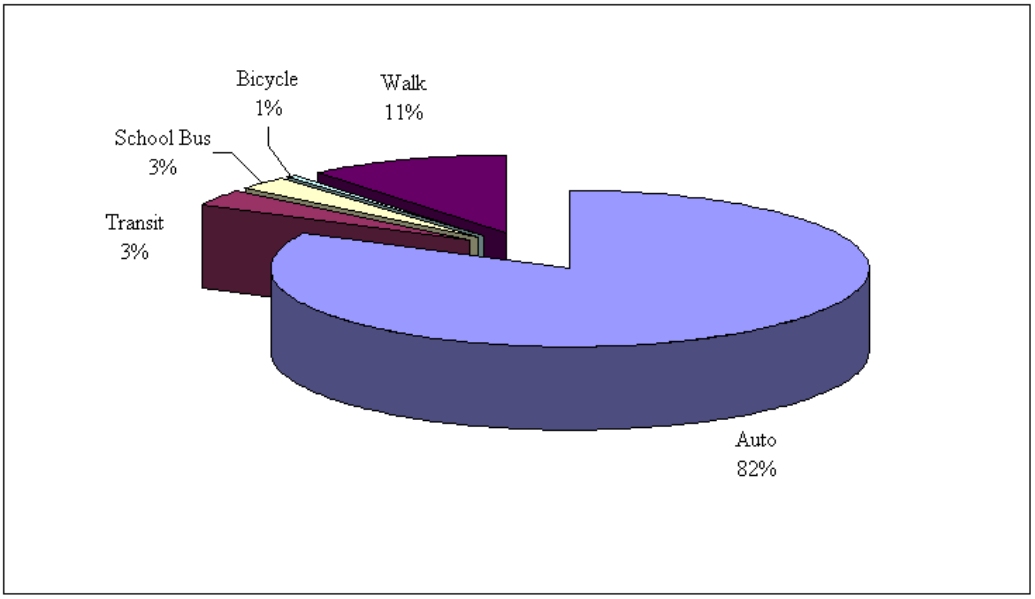
The various modes of transportation form the basic components of the transportation system. The proportion of daily trips made by different travel modes (automobile, transit, rail, bicycle, walking) vary from one city to another, and is in part affected by mode availability and convenience. For the City of Kingston, the automobile is the dominant mode of travel, accounting for over 80% of all person trips within the City.

Table 4 and **Figure 3** summarize the percentage of all-day person trips made by different travel modes.

Table 4
Mode of Travel

Trip Purpose	Number of Trips	Percentage of Trips
Automobile	293,810	82%
Transit	12,161	3%
School Bus	10,315	3%
Bicycle	1,823	1%
Walk	38,380	11%
Other	353	negligible
Total	**356,841**	**100%**

Figure 3
Mode of Travel



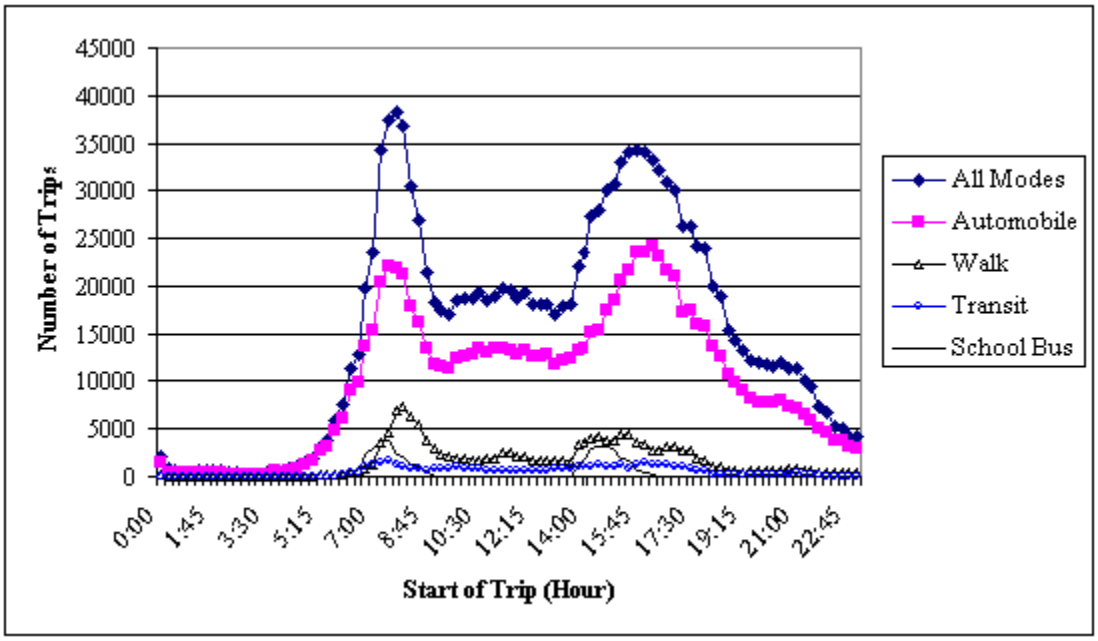
It should be noted that automobile trips includes auto driver, auto passenger, as well as taxi trips. It is acknowledged that the annual percentage of walking trips and bicycle trips are likely greater than that captured by the travel survey, given that the survey was undertaken during the winter.

2.1.4 Temporal Distribution of Trips

As noted earlier, transportation permits people to participate in community activities. It also facilitates the movement of goods through the community. It is reasonable to expect that these activities occur at different times of the day. Therefore, it is not surprising that the number of trips over the transportation network varies by time of day.

Figure 4 illustrates the distribution of trip start times by mode of travel.

Figure 4
Trip Start Times by Mode of Travel



The above figure clearly illustrates the 'spikes' in the trip profiles representing the morning and afternoon peak periods. The data indicated an A.M. peak period of 7:30 to 10:30, in which a total of 81,403 trips were made. The A.M. peak hour was noted to be between 7:45 and 8:45, in which a total of 38,169 trips were made. The data also indicated a P.M. peak period of 2:45 to 5:45, in which a total of 95,176 trips were made. The P.M. peak hour was noted to be between 3:45 and 4:45, in which a total of 34,181 trips were made. Looking at automobile trips only, a total of 24,117 trips were made in the P.M. peak hour from 4:15 to 5:15, and a total of 63,005 trips were made in the P.M. peak period between 3:00 to 6:00.

2.1.5 Trip Length

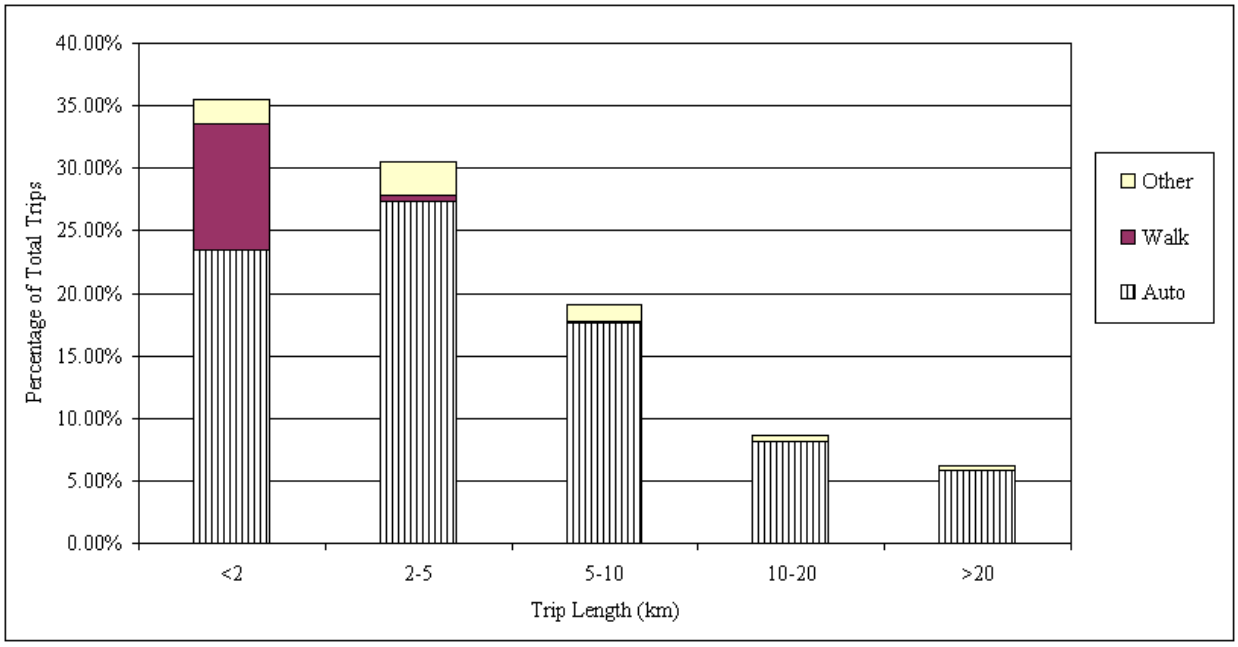
Trip length is another factor affecting travel. All other things being equal, people try to minimize their trip length. Trip length also has an influence on the mode of travel chosen by a traveller. The average all-day trip length for the City is 6.23 km. It should be noted that that trip lengths recorded in the survey is based on the straight-line trip length in kilometres rather than the actual length of the trip over the transportation network.

Table 5 and **Figure 5** the average trip lengths by mode of travel.

Table 5
Percentage of Trips by Length and Mode of Travel

Mode	Trip Length (km)					
	<2	**2-5**	**5-10**	**10-20**	**>20**	**Total**
Automobile	23.4%	27.4%	17.6%	8.1%	5.9%	**82%**
Transit	1.0%	1.6%	0.6%	0.2%	0%	**3%**
School Bus	0.5%	1.1%	0.7%	0.3%	0.2%	**3%**
Bicycle	0.4%	0.1%	0%	0%	05	**1%**
Walk	10.2%	0.5%	0.1%	0%	0%	**11%**
Other	0%	0%	0%	0%	0%	**0%**
Total	**36%**	**31%**	**19%**	**9%**	**6%**	**100%**

Figure 5
Percentage of Trips by Length and Mode of Travel

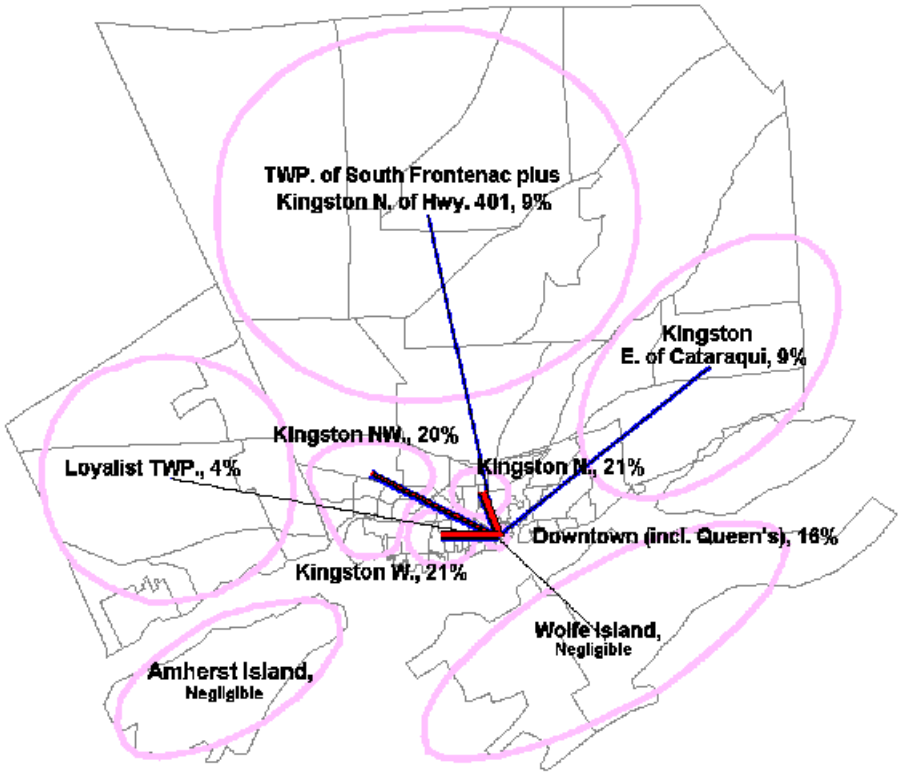


2.1.6 Geographic Distribution of Trips

The geographic distribution of trips over an urban area is directly related to the patterns of land use in relation to the transportation network.

Figure 6 Illustrates the percentage of auto trips to and from the Downtown (Including Queen's University) during the P.M. peak period.

Figure 6
Percentage of Auto Trips to and from the Downtown during the P.M. Peak Period



3.0 SURVEY DATA LIMITATIONS

The travel data collected by the survey provides indispensable data regarding the travel undertaken by City of Kingston residents. The survey was comprehensive and captured a great deal of information regarding households, persons, and trips within the City. There are however, a number of points that should be kept in mind when interpreting the data:

- The survey was undertaken in the month of January. This ensured that it was conducted in the middle of the Winter 2002 academic term.

- The survey does not capture seasonal variation in travel patterns of city residents.

- Given that the survey data was derived from household telephone interviews:
    - The survey did not capture data regarding heavy vehicle or commercial traffic within the City;
    - The survey did not capture data regarding trips to Kingston that were made by persons residing outside the study area;
    - The survey did not capture information regarding trips made by persons residing outside the study area and travelling through the study area, particularly, through trips along Highway 401; and
    - The extent of travel undertaken by the City's student population may be less than complete, given that students living in residences may be underrepresented in the survey. Resident students may not have permanent phone lines. They may reside at a particular location on a temporary basis and thus, may not be present in Bell Canada's directory for that area.

- While the level of co-operation given by interviewed persons was noted to be quite high, the level of completeness of the household trip data collected during the interview is dependent upon the interviewee's knowledge of the trips make by other household members on the previous day. It is expected that there may be some underreporting of trips, particularly discretionary travel. Discretionary travel is defined as all trips other that home-based work and home-based school trips. Home-based trips are those trips that either begin or end at home.

Each of the issues identified were addressed in developing the travel demand model for the City.