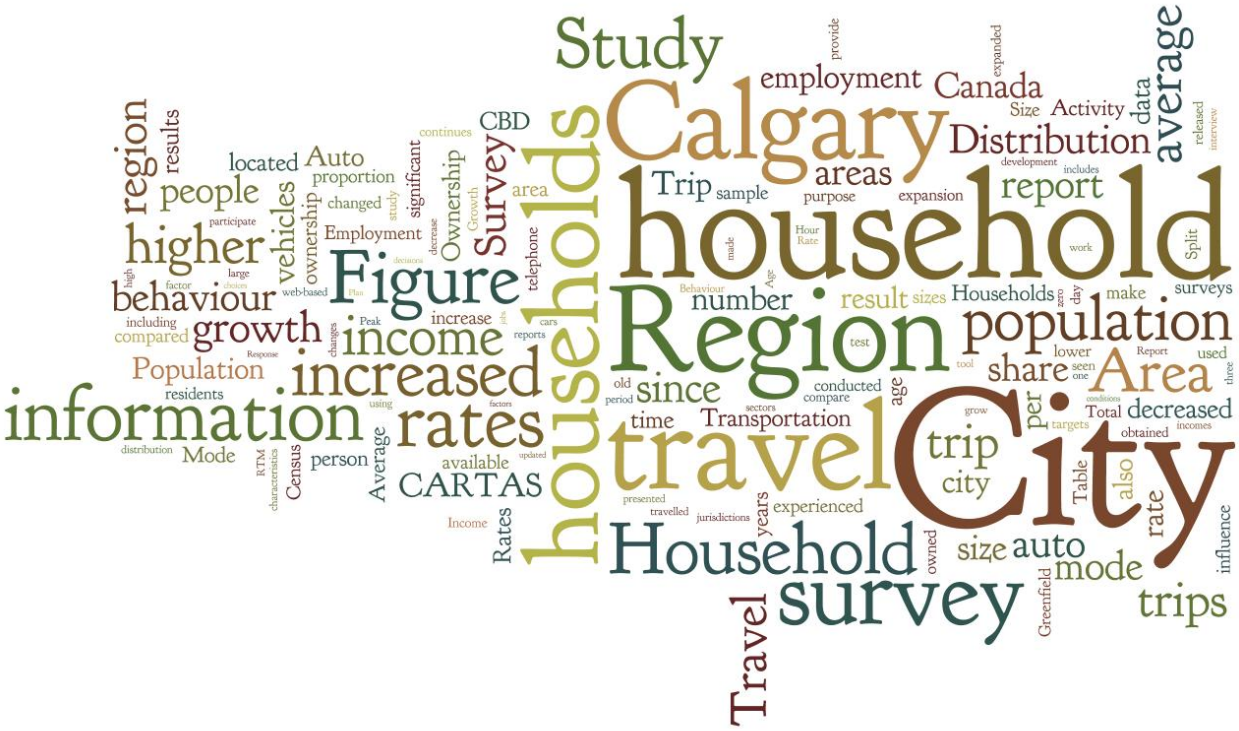

Changing Travel Behaviour in the Calgary Region

Travel Behaviour Report Series: Volume 2 October 2013

Executive Summary

This report is the second in a series developed to report the findings from the Calgary and Region Travel and Activity Survey (CARTAS) conducted in 2012. Household travel surveys have been conducted approximately every 10 years since 1964 and provide key information to decision makers on how travel behaviour and influences are changing over time. The primary purpose for the survey is to collect information to update the Regional Transportation Model (RTM), but these surveys offer a unique insight in the characteristics of travel in Calgary and the surrounding region.

This report will examine how the reasons for travel have changed with an in-depth examination of travel for work, school, and other purposes. It also includes detailed analysis of auto ownership and auto availability, which influence household travel decisions.

Key Findings

This report focused on travel for work, school, and other purposes and an analysis of auto ownership and availability.

1. Work trips have increased, but proportion of daily travel has decreased.

The number of trips made for work purposes in Calgary has increased from 976,300 trips in 2001 to 1,095,700 trips in 2011 representing a 12% increase in the number of work trips. However, the proportion of daily trips made for work purposes has declined from 29.1% to 27.7% in 2011. The number of workers making work trips on weekdays declined from 82% of workers in 2001 to 70% of workers in 2011. This suggests that more workers are working from home or using compressed or flexible work options.

2. Work location has a significant influence on travel mode

In 2011, 27% of work travel was to the Central Business District. Investments made in transit, pathways, and cycling improvements have impacted the mode share. Workers travelling by bike increased from 2.5% in 2001 to 4% in 2011. Walk mode share for workers increased from 10.9% in 2001 to 13.9% in 2011 and auto mode share decreased from 38.6% in 2001 to 29.1% in 2011.

Outside the CBD, the auto mode decreased from 80.9% to 78% and transit increased from 5.9% to 8.8% which could be a result of LRT and transit expansion projects.

3. Grade school student travel behaviour is changing

Grade school students, enrolled in kindergarten through grade twelve at the time of the survey, are staying at school for lunch and are staying at school longer. This could be a result of more parents working and more children enrolled in lunchroom and after school programs. This is also evidenced by the increase in trip rates for students travelling from school to other locations.

This has impacted grade school mode share as walk and bike trips have declined from 34.5% of trips to 28.4% of trips. Auto passenger trips have increased from 32.6% to 41.5% of trips and transit trips have increased from 30% of trips to 32.4% of trips. This suggests that students are not walking to school, but are being driven by parents or taking either a school bus or transit. This could be a result of an increase in the number of parents who are working, parents choosing to send their children to out of area schools, or a lack of schools located within newer communities.

4. Travel for other purposes is an increasing share of daily travel

The number of trips made for purposes other than work or school has increased by 24% from 2,304,300 in 2001 to 2,850,500 in 2011. The proportion of daily trips made for other purposes increased from 57.9% in 2001 to 61.2% in 2011 with minimal changes in travel modes. Auto driver mode has the highest proportion at 59.9% of travel. This suggests that Calgarians are making more trips for other purposes relative to work and school trips and that their mode choice for these trips has not been heavily influenced over the last 10 years.

5. The availability of autos has increased in Calgary

The availability of autos in a household is related to the number of vehicles owned by the household and the number of licensed drivers in the household and can be described in three categories:

- No Auto or Licence – household has no vehicles or no licensed drivers
- Insufficient Autos – fewer vehicles than licensed drivers
- Sufficient Auto – at least as many vehicles as licensed drivers.

The proportion of households with sufficient autos has increased from 74.2% in 2001 to 76.1% in 2011. The proportion of households with insufficient autos has decreased from 19.1% in 2001 to 16.8% in 2011. This suggests that households are increasing the number of vehicles they own to align with the number of drivers in the household.

Auto availability also influences travel characteristics. Households with no autos or no licensed drivers make fewer trips (2.91 trips per person in 2011) than households with sufficient autos (3.74 trips per person.) The primary mode of households with no vehicles or no licensed drivers was the walk mode at 57% while the primary mode of households with sufficient autos was vehicle driver at 61%. The primary mode of insufficient auto households was also vehicle driver, but at a much lower proportion, 48%. This suggests that as auto availability increases, the vehicle driver mode also increases.

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1 Report Purpose

This report is the second in a series of reports that will be released in 2013 and 2014 to communicate the preliminary results of the Calgary and Region Travel and Activity Survey (CARTAS) and compare those results to travel surveys conducted in the past. This report includes information on travel purposes and connects why people travel with how they travel. It also includes an in-depth analysis of household auto ownership characteristics, another key influence in household travel decisions.

This report builds upon the information in Volume 1 and continues with analysis into the who, what, when, where, why, and how of travel in the Calgary Region. The first report in the series, Travel Behaviour Report Series: Volume 1, can be found on the Travel Surveys website (www.calgary.ca/travelsurveys) and includes demographic information, household travel characteristics, trip rates, and city wide mode split.

CARTAS was conducted in 2012 and was expanded to a variety of demographic targets to represent to the total study area population. The demographic targets for this survey were obtained from the 2011 Calgary Civic Census and 2011 Census of Canada as that is what was available at the time. The result is that the information presented in this report represents travel behaviour conditions from 2011. This report will also examine travel from 1971, 1981, 1991, and 2001.

2 Background

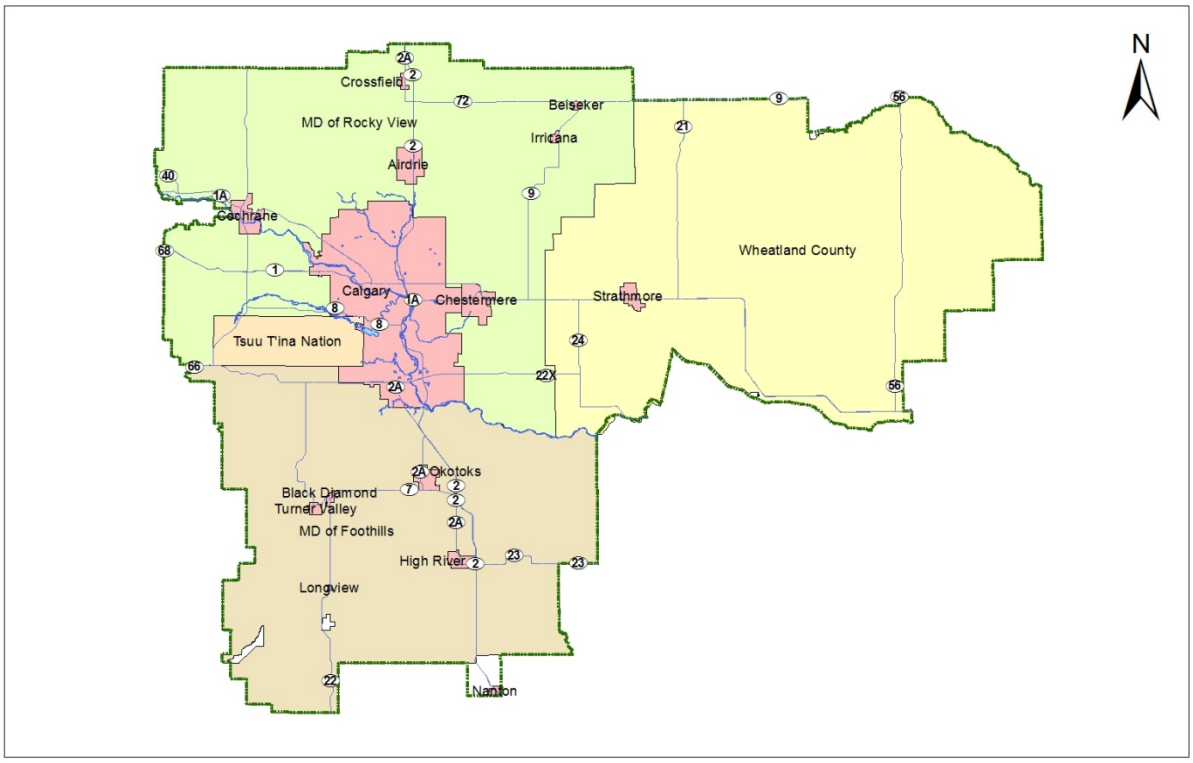
Approximately every 10 years, The City of Calgary conducts a comprehensive household travel and activity survey to collect travel behaviour information from City and Region residents. The CARTAS is the latest survey and was conducted from January to May 2012. Travel behaviour includes information about the trips people make, where they go, what they do, and any costs they incurred as well as a number of travel influences such as the number of people in the household, how old they are, how many vehicles they own, and the annual income of the household.

The travel behaviour information is used to update the Calgary Regional Transportation Model (RTM), a computer simulation of the city and surrounding region that is used to support transportation and land use planning decisions. The City of Calgary has maintained travel models since 1964 that have been updated approximately every 10 years. The data collected in CARTAS will be used to update the RTM to 2011 conditions so it can continue to support decision makers.

3 Study Area Description

The CARTAS study area includes The City of Calgary, the Municipal District of Foothills, Rockyview County, Wheatland County, and all the towns and villages within those boundaries including: Airdrie, Chestermere, Cochrane, High River, Okotoks, Nanton, and Strathmore. The Region is an important inclusion in the survey as regional travel, including travel between the City and the Region, continues to grow. For the purpose of this report, the Study Area refers to the entire area, the City refers to the city of Calgary, and the Region refers to the region surrounding Calgary. This report will focus on travel by Calgary residents only. Regional travel will be examined in a subsequent report.

Figure 1: Study Area



4 Data Sources

One purpose of this report is to look at how travel has changed over that time. This report compares information between surveys conducted in 1971, 1981, 1991, 2001 and 2011 CARTAS as appropriate. Data from 1971, 1981, and 1991 were obtained from historical results reports and are detailed in Appendix B. The 1991 survey was conducted during the AM peak hour which limits the results that are available or appropriate for comparison. The 2001 travel behaviour data was retrieved from the 2001 Household Activity Survey Database and the 2011 data was retrieved from the CARTAS database. For more information on these historical surveys, please see the report "Changing Travel Behaviour in the Calgary Region: Volume 1."

The data tables for all the charts in this report are shown in Appendix C.

5 Data Availability and Release

The household travel survey datasets contain significant amounts of personal information and are protected by the Freedom of Information and Protection of Privacy Act. The database and the individual data records cannot be released outside of The City of Calgary Forecasting Division. If additional analysis is required, requests may be submitted to tranplanforecast@calgary.ca and the request will be assessed appropriately.

6 Survey Limitations

CARTAS is a comprehensive and detailed survey that captures significant amounts of travel behaviour information. However, there are some limitations to the data that must be considered. The survey asked respondents to provide an arrival and departure time; however, respondents tend to round their arrival and departure times to the nearest 5, 10 or 15 minute intervals. As a result, travel times directly from the survey have limited accuracy and are only used to assign trips to broad time periods for modelling purposes.

CARTAS does not include any information on trip distance. Each location is geocoded, but respondents were not asked to provide travel route information. As a result, information on vehicle kilometres travelled (VKT) and VKT per capita are not a result that can be obtained from this survey.

This is a sample survey, not a census, and 2% of city and region households were sampled. This provides a statistically significant sample to develop travel models that are used to support decision making. However, sample sizes at fine geographies or for specific demographics may be too small to be able to provide statistically significant results. For example, trip rates may be possible for Downtown Calgary, but not for the community of Dalhousie.

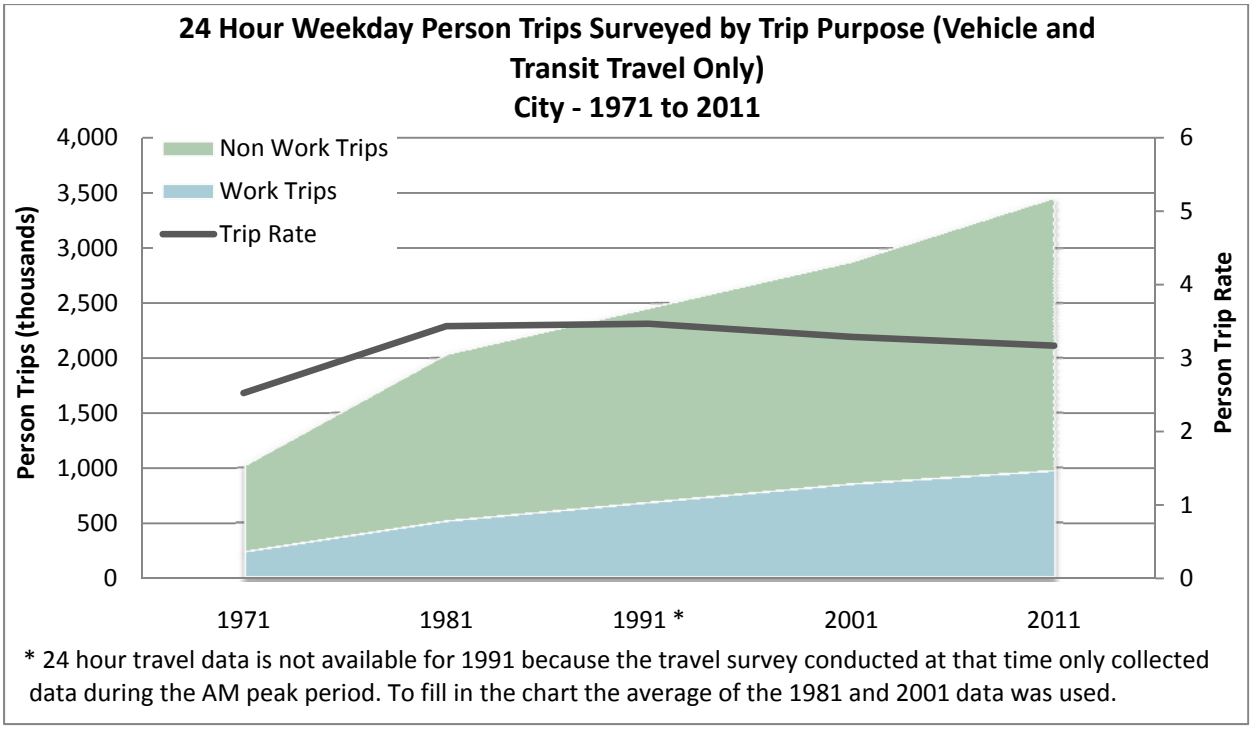
7 Trip Purpose and Mode Share of Calgary Travel

The purpose of this section is to look at trip purpose and mode share of Calgarians' travel using the data collected during the 2011 CARTAS and where possible compare it to previous travel surveys conducted by The City of Calgary Transportation Planning Department. For the purpose of this report trip purpose is defined by the activity conducted at either the origin or destination of a trip.

This report includes weekday travel made by individuals living in households located within the city of Calgary. Trips with durations over 180 minutes were excluded as the travel appeared inconsistent and may have been incorrectly entered.

Weekday travel within the city of Calgary is increasing however individuals are travelling less than in previous decades; see Figure 2 below. For the purpose of this graph work travel is defined as any travel with an origin and/or destination activity of work and non-work travel includes all other trips.

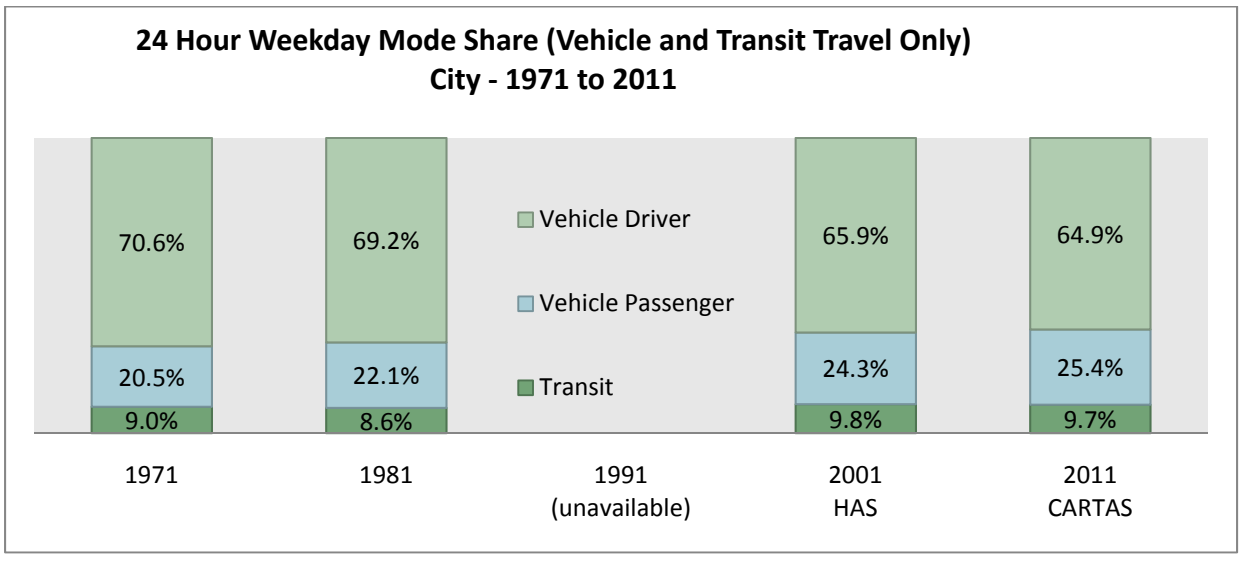
Figure 2: 24 Hour Weekday Person Trips Surveyed by Trip Purpose – City – 1971 to 2011[1]



* 24 hour travel data is not available for 1991 because the travel survey conducted at that time only collected data during the AM peak period. To fill in the chart the average of the 1981 and 2001 data was used.

The changes to mode share over the past 40 years can be seen in Figure 3 below. The 1971 and 1981 survey results available only included trips made by autos and transit so the changes to active mode share cannot be reported. The remainder of this section compares the results of the 2011 CARTAS to the data collected during the 2001 HAS.

Figure 3: 24 Weekday Mode Share (Vehicle and Transit Only) – City – 1971 to 2011[2]



[1] (City of Calgary Transportation Department, 1981)
[2] (City of Calgary Transportation Department, 1981)

7.1 Defining Trip Purpose

CARTAS respondents were asked to record all their activities and travel completed over a 24 hour period. Following the survey the activity and travel data was compiled to create a trip database. The trip database includes an origin activity and destination activity for each trip record which are defined by the activity immediately preceding and following the travel. In this report trip purpose is defined a few different ways using the origin and destination activities combined with the origin and destination location data.

The CARTAS survey included 28 different activity types which have been grouped into six categories (see Table 1 below). The activity types used in the 2001 HAS differed slightly from the 2011 CARTAS so there is some variation when comparing.

Table 1: Trip Purpose Categories

Purpose Category		Activity Type	
		2001 HAS	2011 CARTAS
Work		• Work • Work – Travel	• Working • Work related
School		• School/homework • Daycare	• Attend school • Attend daycare
Other	Shopping	• Shopping	• Shopping online, catalogue or by phone • Routine shopping • Shopping for major purchases
	Recreation, Social & Leisure	• Social • Eating • Entertainment/Leisure • Exercise	• Eating a meal • Drive-through • Outdoor recreation • Indoor recreation • Leisure / Entertainment • Social
	Personal Business	• Volunteer • Medical/Financial • Religious or Civic • Sleeping • Household (e.g. chores/responsibilities, child care) • Out of town	• Household Activities • Sleeping • Service private vehicle • Household errands • Personal business • Medical • Get gas • Homework • volunteer • Religious or Civic • Airport – business • Airport - personal • Out of Town
	Escort	• Pick someone up • Drop someone off	• Pick someone up • Drop someone off

7.2 Defining Mode

The trips compiled in the 2001 HAS and 2011 CARTAS databases include a number of travel modes which have been combined into 5 categories for this report as described in Table 2 below.

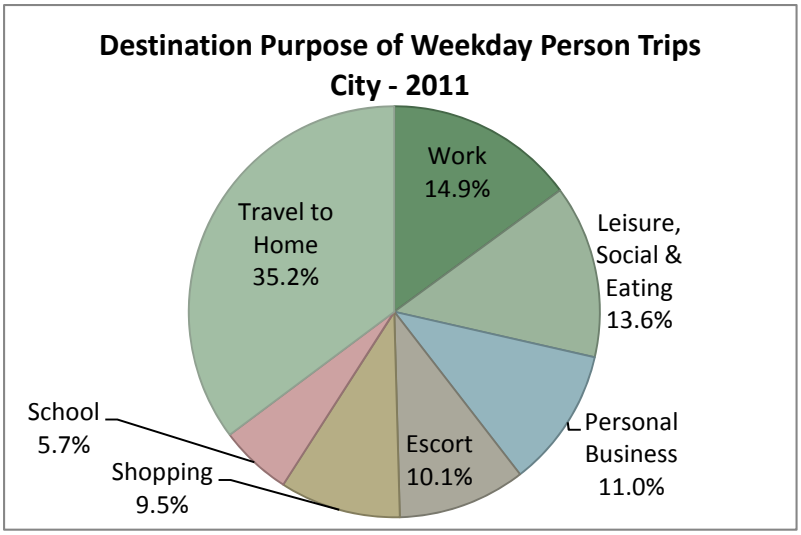
Table 2: Travel Mode Categories

Mode Category	Mode Type	
	2001 HAS	2011 CARTAS
Walk	• Walk	• Walk
Bike	• Bicycle • Other non-motorized	• Bicycle • Other non-motorized
Auto Driver	• Vehicle Driver • Other Motorized	• Auto or Small Truck Driver • Other Motorized
Auto Passenger	• Vehicle Passenger • Taxi	• Auto or Small Truck Passenger • Taxi
Transit	• Calgary Transit • School Bus (Calgary Transit) • School Bus (Not Calgary Transit) • Handi - Bus • Intercity Bus	• Light Rail • Bus Rapid Transit • Regular Bus • Access Calgary • Intercity Bus • School Bus (Calgary transit) • School Bus (not Calgary transit)

7.3 Why Calgarians Travel

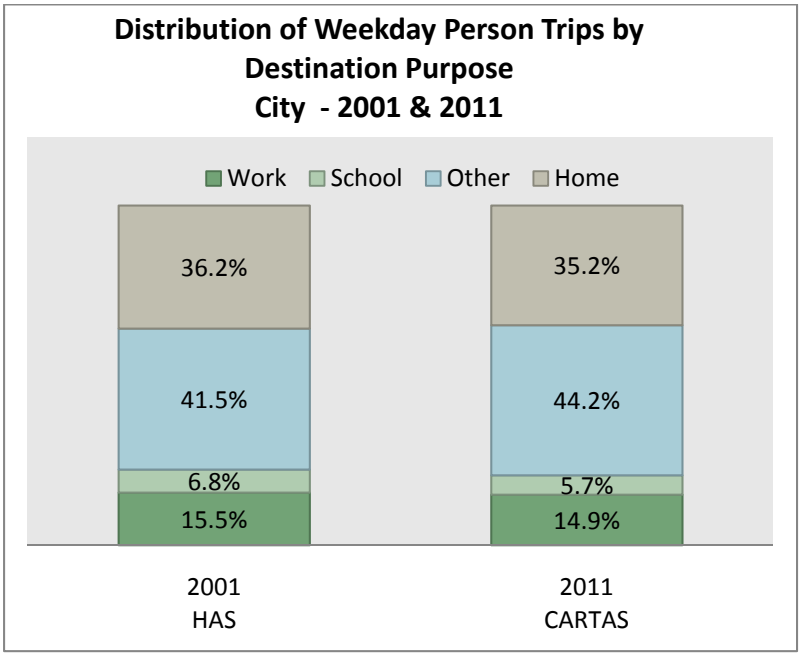
Individuals travel for a variety of reasons and their travel decisions are heavily influenced by the purpose of the travel. The destination activity purpose for all weekday travel collected in the 2011 CARTAS is displayed in Figure 4 below. In this figure any travel which is made to the individual's home is classified as "Travel to Home" regardless of the destination activity.

Figure 4: Destination Purpose of Weekday Person Trips – City - 2011



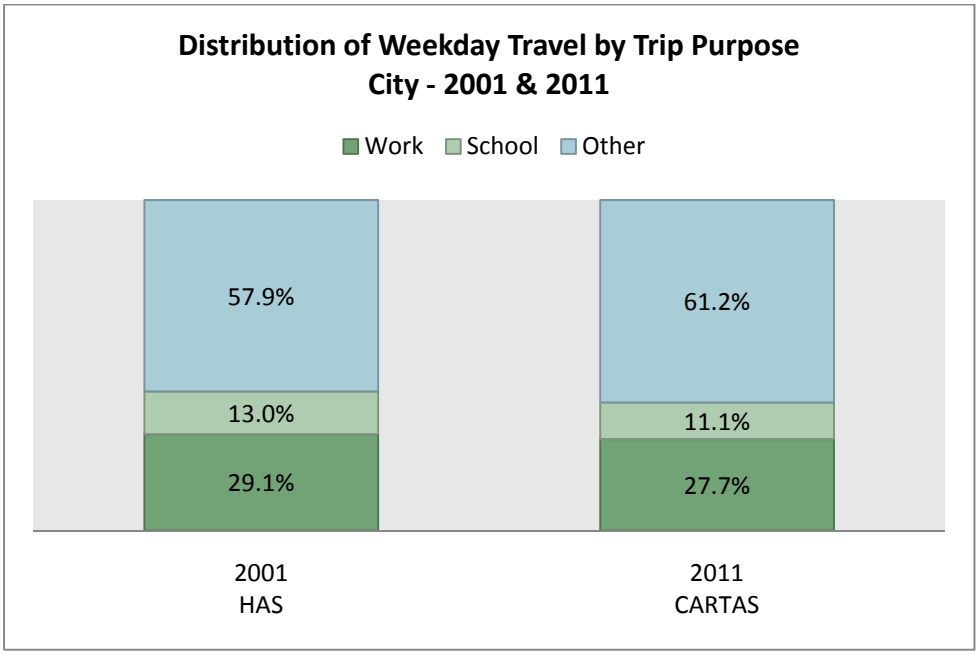
Due to the differing activity types collected in the 2001 HAS the travel purpose categories were combined further into work, school and other to provide an accurate comparison. The change in distribution of weekday travel by destination purpose between the 2001 HAS and 2011 CARTAS can be seen in Figure 5 below. While the changes appear small they are statistically significant.

Figure 5: Distribution of Weekday Travel by Destination Purpose – City - 2001 & 2011



An alternative look at travel by trip purpose can be seen in Figure 6 below. In this graph work trips include all trips which had an origin or destination activity of work that did not occur at the individual's home, school trips included any remaining trips which had an origin or destination activity of school and all remaining trips were classified as other. For further explanation on these definitions please see the Work and School sections of this report.

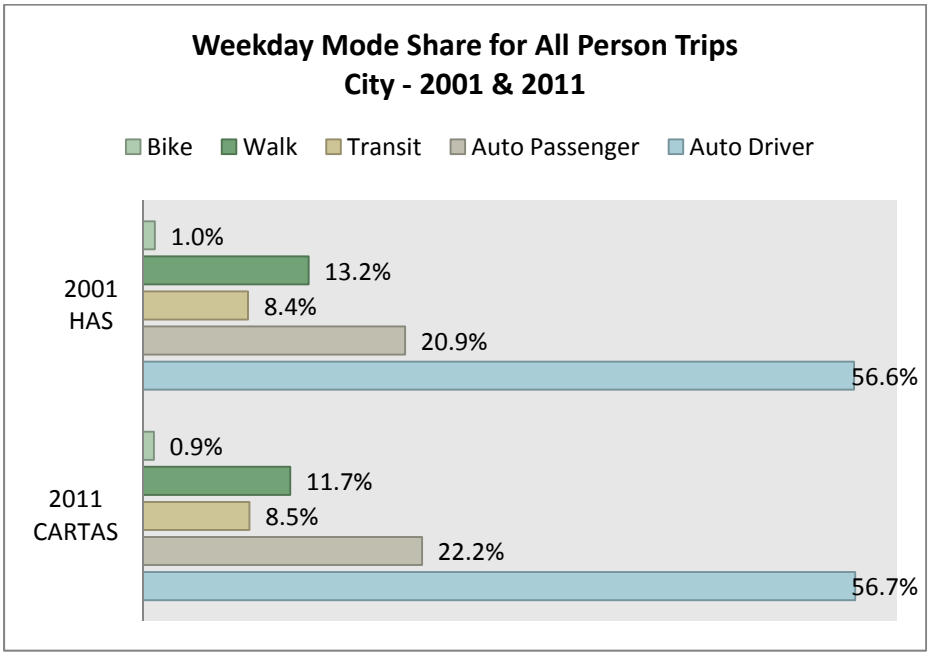
Figure 6: Distribution of Weekday Travel by Trip Purpose – City - 2001 & 2011



7.4 City Wide Mode Share

When looking at all city wide person trips there was very little change in mode share between the 2001 HAS and the 2011 CARTAS, which can be seen in Figure 7 below. The only modes that experienced a statistically significant change in share are walk and auto passenger.

Figure 7: Weekday Mode Share for All Person Trips – City - 2001 & 2011



7.5 Work Travel

Travel to and from the work place makes up a significant portion of weekday travel within Calgary, representing close to a third of all individual person trips. Additionally, on average work commute trips are longer than most other trips resulting in a higher percentage of person kilometres travelled. For the purpose of this section of the report work trips are defined as any trip which has an origin or destination purpose of work or work related, providing the work did not occur at the respondent's home. This includes the commuting trips between home and work but also additional trips such as going out for lunch or running work errands. Work trips have been divided into five trip types described in Table 3 below. No exclusions were made for trips made by individuals who classified themselves as non-workers or for age of respondent.

Please note that the results presented below are for workers who travelled, so the results may be different from previously reported results.

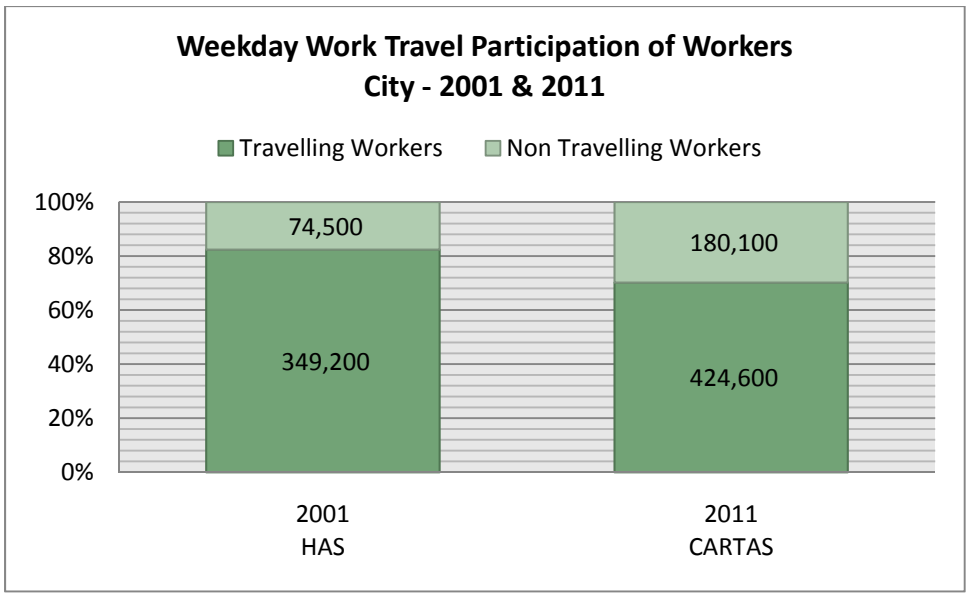
Table 3: Work Trip Types

Work Trip Type	Origin Location	Destination Location	Origin Activity Purpose	Destination Activity Purpose
Home to Work	Home	Not home	Anything	Work or work related
Other to Work	Not home	Not home	Not work or work related	Work or work related
Work to Work	Not home	Not home	Work or work related	Work or work related
Work to Home	Not home	Home	Work or work related	Anything
Work to Other	Not home	Not home	Work or work related	Not work or work related

7.5.1 Participation Rate of Workers

There was a 12.2% reduction in the number of workers who made a work trip on their survey day between 2001 and 2011. The change can be seen in Figure 8 below. This change could be related to an increase in home-based work, including Telework or a reduction in the amount of weekday full time workers.

Figure 8: Weekday Work Travel Participation of Workers – City - 2001 & 2011



7.5.2 Work Trips and Trip Rates

In 2001 Calgarians made a total of 976,300 weekday work trips daily and in 2011 that number increased to 1,095,700. The distribution of these work trips by trip type can be seen in Figure 9 below. In 2001 the weekday work trip rate was 2.67 trips per travelling worker and dropped to 2.56 in 2011. This change can be seen in Figure 10 below. As a result of the reduction in travelling workers the weekday trip rate for all workers including individuals who made no work trips dropped from 2.21 in 2001 to 1.80 in 2011.

Figure 9: City Wide Weekday Work Trips by Trip Type – City - 2001 & 2011

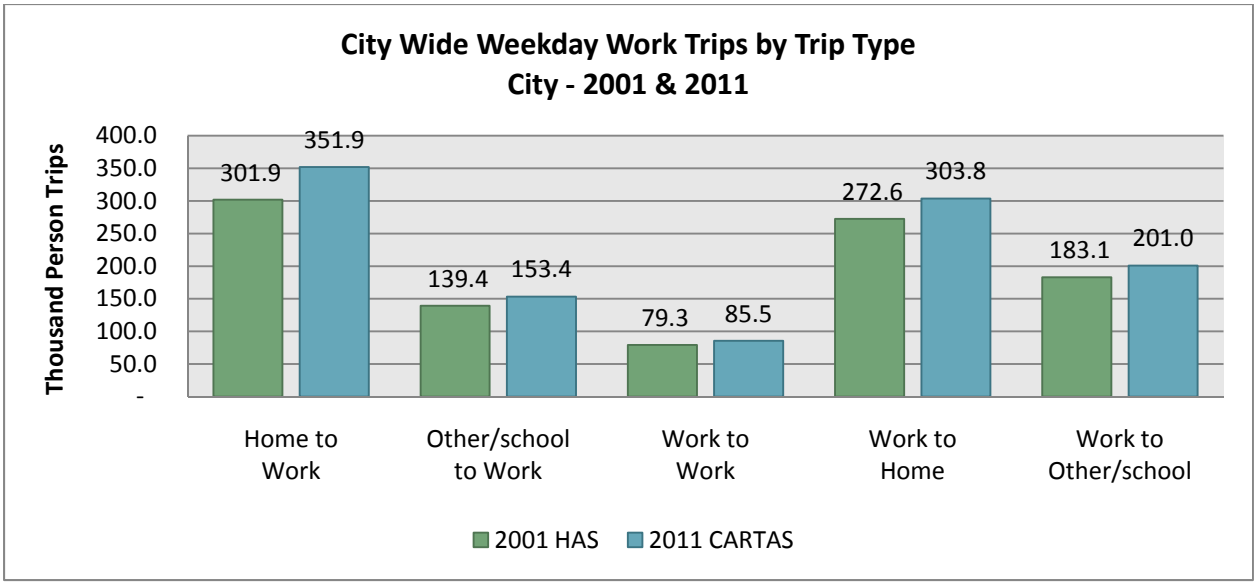
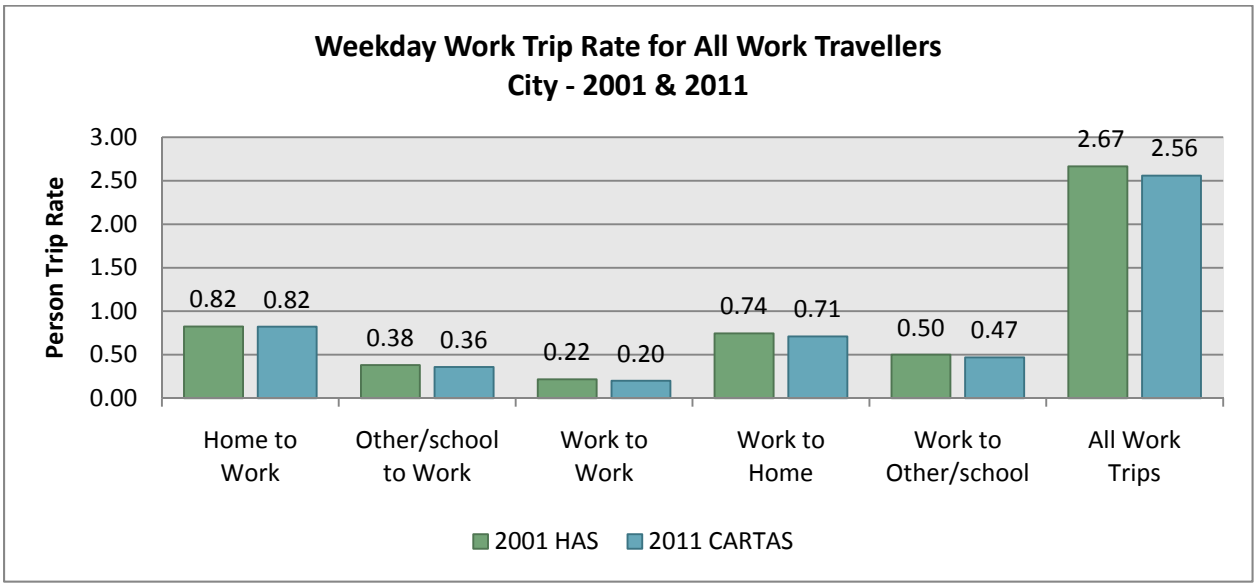


Figure 10: Weekday Work Trip Rate for All Work Travellers – City - 2001 & 2011



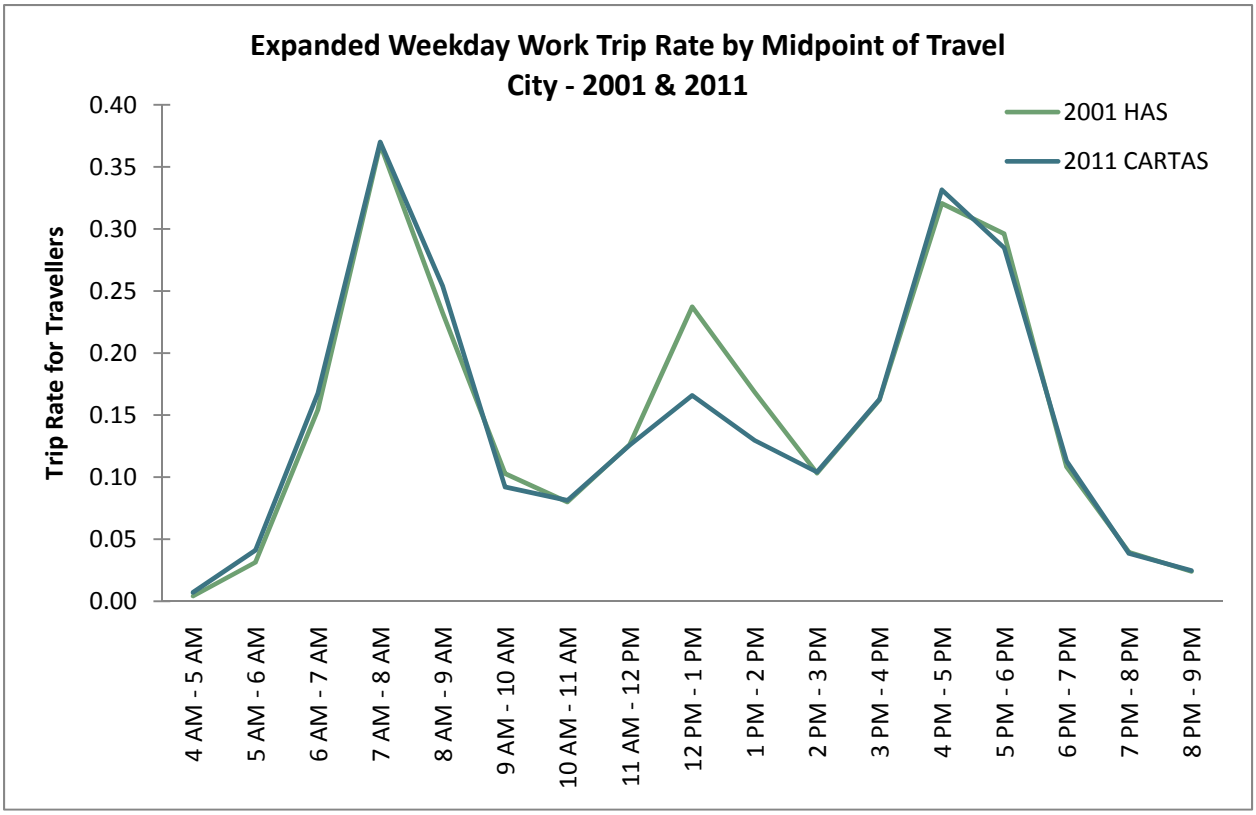
7.5.3 Time of Work Travel

The time distribution of weekday work travel data collected in both the 2001 HAS and 2011 CARTAS is consistent with what one would expect to see. Both datasets show an AM peak with work start times between 7 am and 9 am and a PM peak with work end times between 4 pm and 6 pm as seen in Figure 11. Over the ten year period there has been a small but statistically significant change to the AM peak travel period as a result of peak spreading. While visually there appears to be a more significant change in the PM peak period this change is not statistically significant.

The most significant change in work travel between the 2001 HAS and 2011 CARTAS surveys is the decrease in trips between 12 pm and 2 pm as seen in Figure 11 below. The reason for this decrease

cannot be explained with the survey data but two possible explanations include fewer workers taking offsite lunch breaks or differing survey methodologies between the surveys.

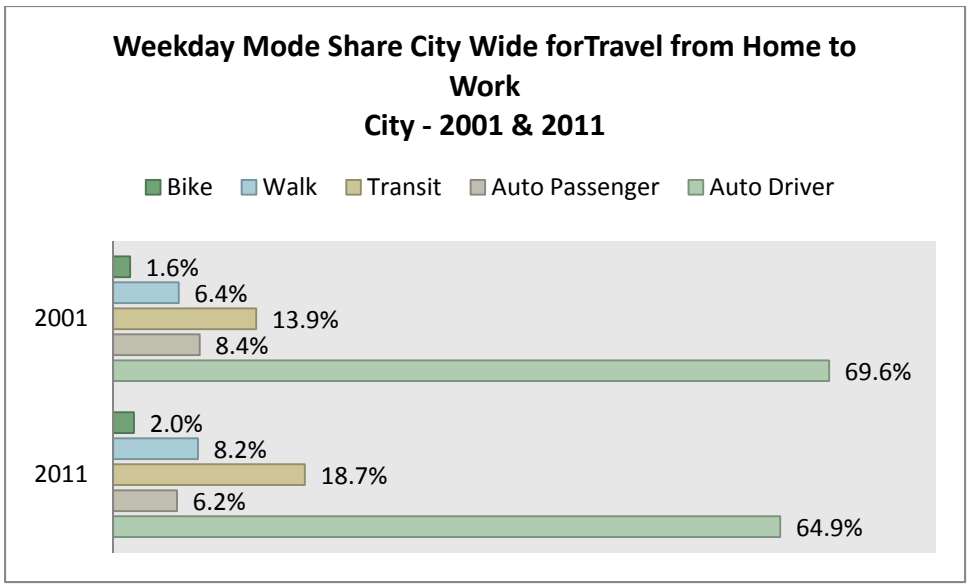
Figure 11: Weekday Work Trip Rates by Time of Day – City – 2001 & 2011



7.5.4 Mode Share of Work Travel

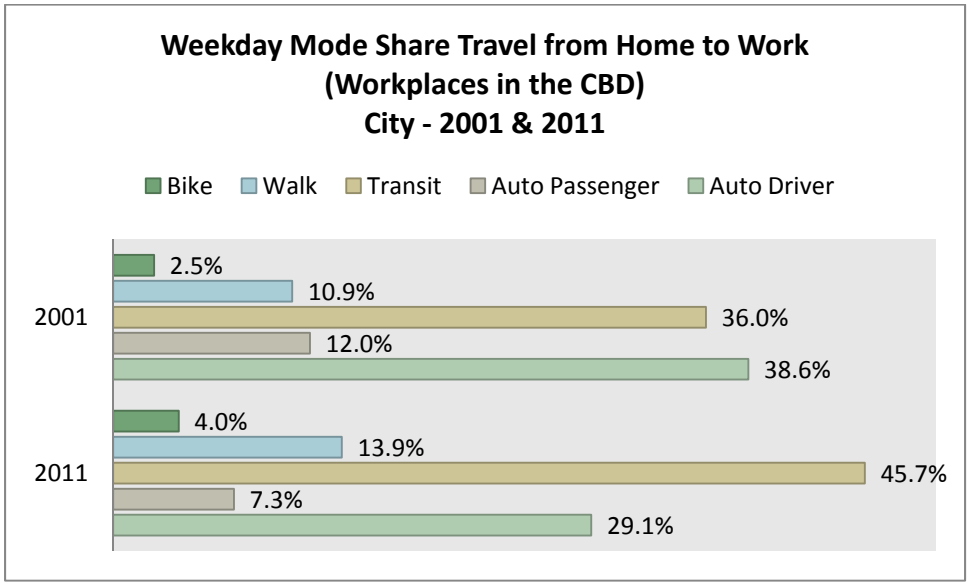
The mode share of all weekday travel from home to work can be seen in below. Between 2001 and 2011 there was a 7.0% shift in travel away from the auto passenger and auto driver modes combined. Due to the limited number of samples the change in bike mode share is not statistically significant.

Figure 12: Weekday Mode Share City Wide for Travel from Home to Work – City - 2001 & 2011



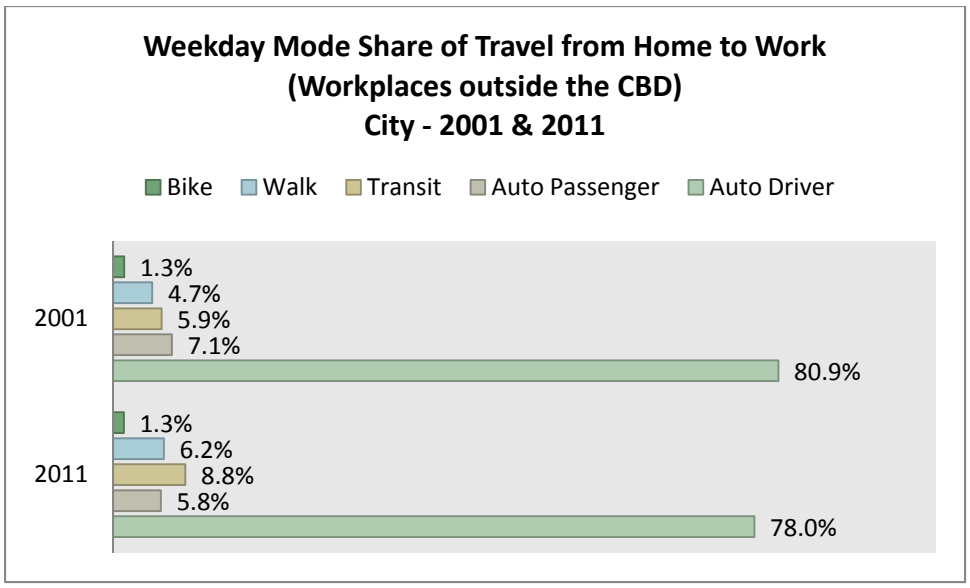
The changes to home to work mode share were most significant for workers travelling to the central business district (CBD), with 14.2% fewer workers taking auto modes in 2011 than in 2001 as seen in Figure 13 below. All changes in mode share including bike are statistically significant for workers travelling to the CBD. In both 2001 and 2011 travel to the CBD made up 27% of all home to work trips city wide.

Figure 13: Weekday Mode Share for Travel from Home to Work (Workplace is in the CBD) – City - 2001 & 2011



For workers travelling to workplaces outside the CBD there was a substatially smaller change in mode share with only 4.3% fewer workers travelling by auto modes between 2001 and 2011 as seen in Figure 14.

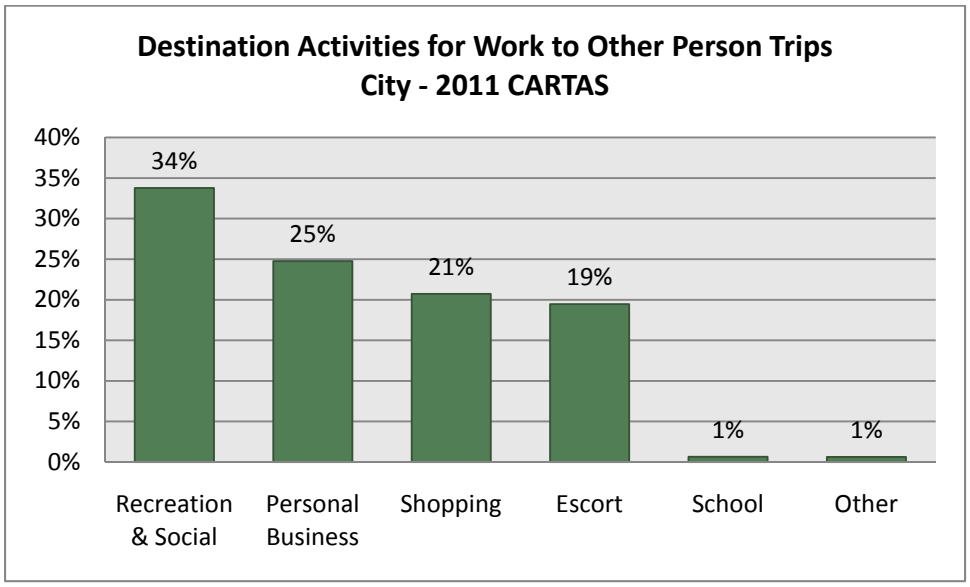
Figure 14: Weekday Mode Share for Travel from Home to Work (workplaces outside the CBD) – City - 2001 & 2011



7.5.5 Travel Destinations after Work

Close to one third of workers do not travel directly home when leaving work during the week. These additional trips likely influence many of the workers' travel decisions including mode and time of travel. The largest portions of these trips is for social and recreation activities as seen in Figure 15.

Figure 15: 2011 Destination Activities for Work to Other Person Trips – City - 2011



7.6 School Travel

For the purpose of this section of the report school travel was identified using a similar procedure as previously described for work trips. The types of school trips are listed in Table 4 below. Only travel made by individuals who classified themselves as grade school or post secondary students were included in this analysis.

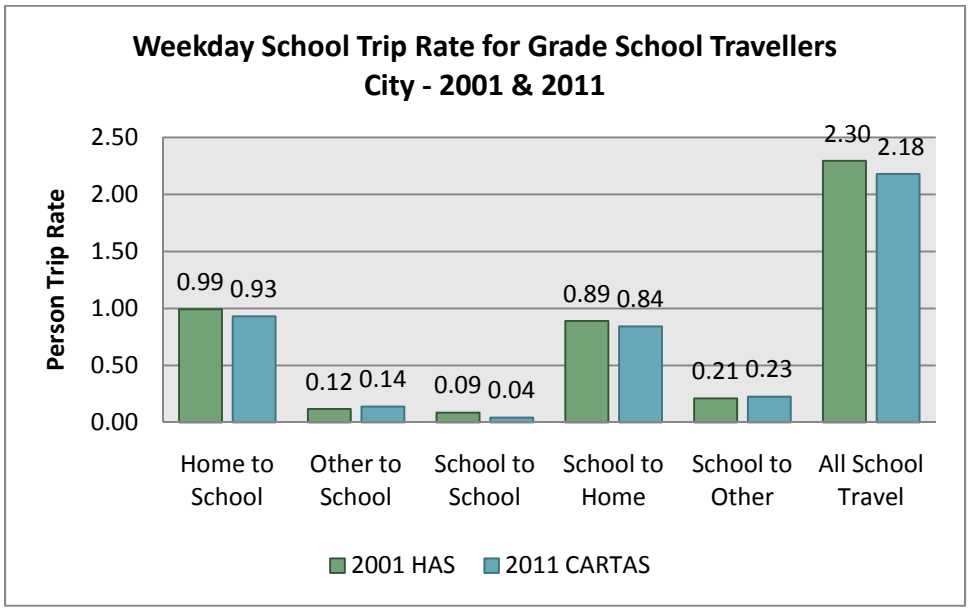
Table 4: School Trip Types

School Trip Type	Origin Location	Destination Location	Origin Activity Purpose	Destination Activity Purpose
Home to School	Home	Not home	Anything	Attend school or daycare
Work/Other to School	Not home	Not home	Not attend school or daycare	Attend school or daycare
School to School	Not home	Not home	Attend school or daycare	Attend school or daycare
School to Home	Not home	Home	Attend school or daycare	Anything
School to Work/Other	Not home	Not home	Attend school or daycare	Not attend school or daycare

7.6.1 Grade School Travel – Trip Rates

The school trip rates for grade school students can be seen in Figure 16 below. There was a 5% reduction in the overall daily trip rate for grade school students between 2001 and 2011. This reduction appears to be related to fewer students going home for lunch which can be seen in the following section.

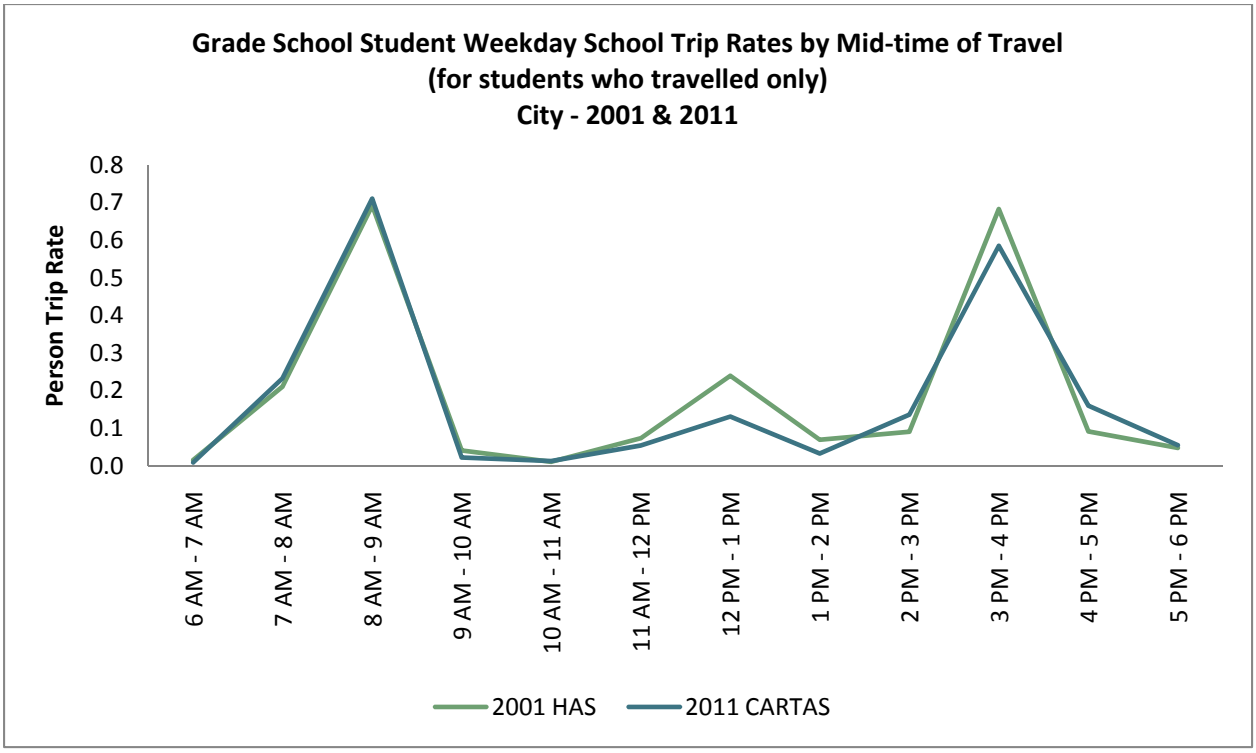
Figure 16: Weekday School Trip Rate for Grade School Travellers – City - 2001 & 2011



7.6.2 Grade School Travel – Time of Day

Figure 17 below shows the distribution of all school travel by time of day. There has been a decrease in trips during the lunch hour which may be related to fewer students going home for lunch. Another noticeable changed occurred at the end of the school day with the travel time spreading. This is may be related to more students attending before and after school programs or other extracurricular activities at the school.

Figure 17: Grade School Student Weekday School Trip Rates by Mid-time of Travel – City - 2001 & 2011



7.6.3 Grade School Travel – Mode Share

The changes in mode share for grade school travel can be seen in Figure 18. The reductions in active modes shown in this figure are heavily skewed by the lower trip rate and the reduction in travel around the lunch break. To better assess the change in mode share for grade school travel Figure 19 provides the mode share for all school trips made between 7 am and 10 am. There was a 10.1% drop in active modes between 2001 and 2011 for school trips made during this time. The 2 pm to 5 pm after school peak was not included because many Calgary schools have early dismissal on Fridays which would not be captured.

Figure 18: Weekday Mode Share for Grade School Travel City Wide – City - 2001 & 2011

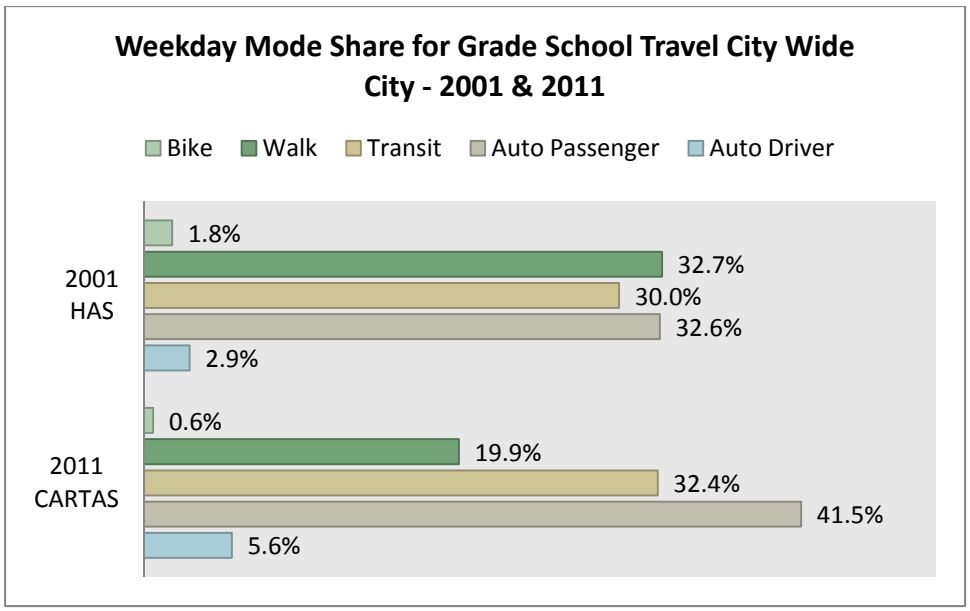
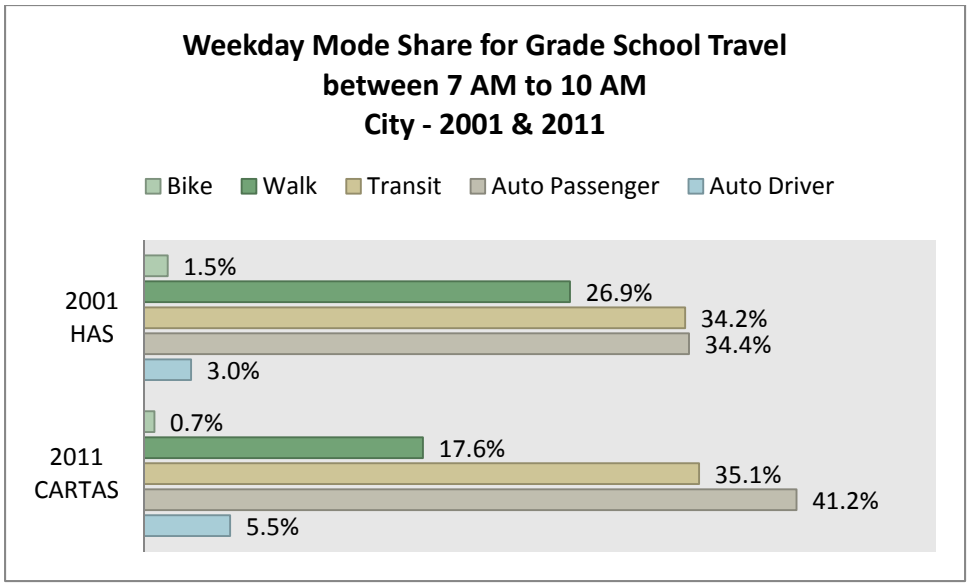


Figure 19: Weekday Mode Share for Grade School Travel between 7 AM to 10 AM – City - 2001 & 2011



7.6.4 School – Post Secondary Education

Due to limited post secondary education (PSE) travel data from both the 2001 and 2011 surveys there are very few statistically significant changes in PSE travel behaviour between the surveys; however, the individual survey results are statistically valid. All results presented in this section should be used for general information only.

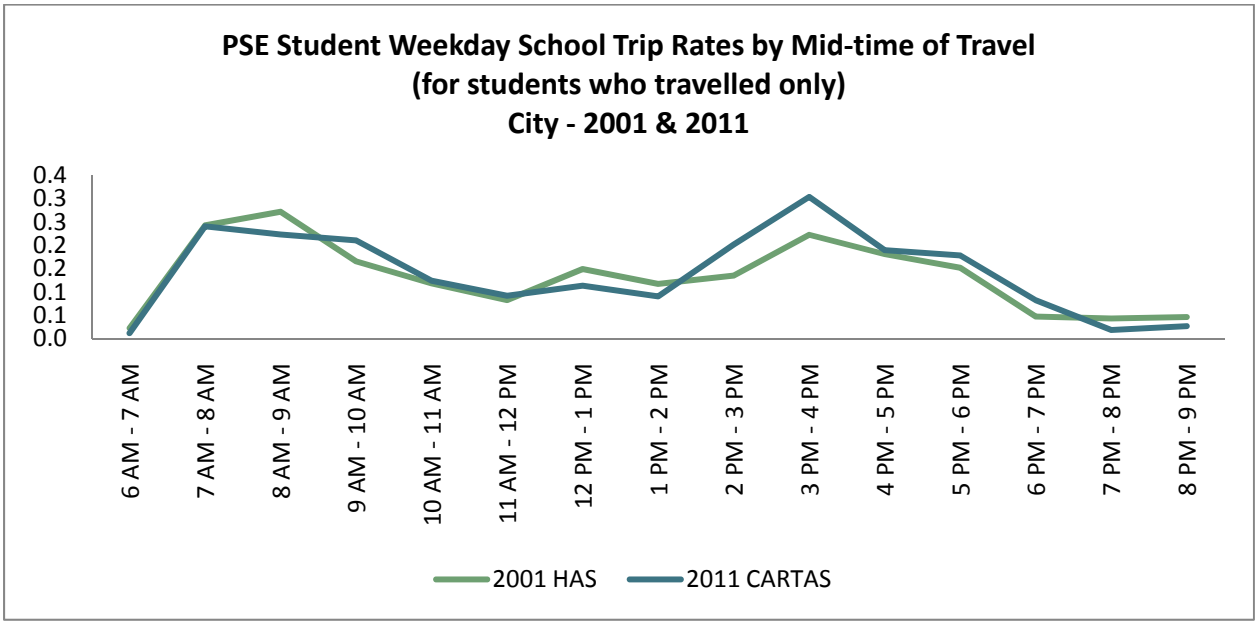
7.6.5 PSE Travel – Trip Rates

The school trip rate for PSE students who made one or more weekday school trips was 2.1 in 2001 and 2.2 in 2011; however, due to a limited sample size the difference is not statistically significant.

7.6.6 PSE Travel – Time of Day

The distribution of travel by time of day can be seen in Figure 20 below. The changes between 2001 and 2011 are only statistically significant for the 2 pm -3 pm and 7 pm – 8 pm time periods.

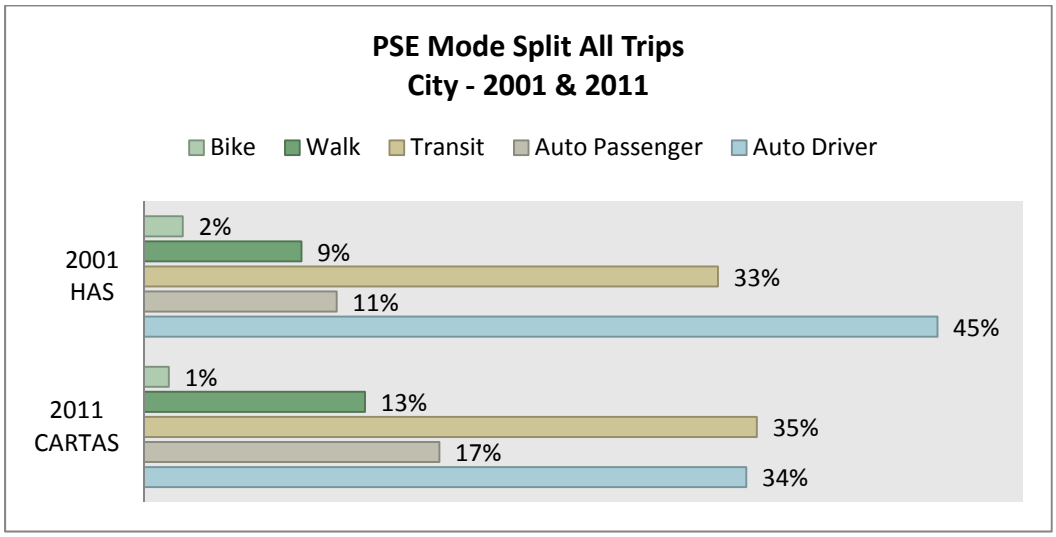
Figure 20: PSE Student Weekday School Trip Rates by Mid-time of Travel 2001 & 2011



7.6.7 PSE Travel – Mode Share

Unlike the other PSE data collected some of the changes in mode share between 2001 and 2011 were statistically significant, seen in Figure 21. There was an 11% reduction in auto driver trips during that time. It should be noted that the small changes in bike and transit mode share are not statistically significant.

Figure 21: PSE Mode Share All School Trips – City - 2001 & 2011



7.7 Other Travel Purposes

For the purpose of this section of the report other travel was identified using a similar procedure as previously described for work trips. The 5 types of other trips can be seen in Table 5 below. Loop Trips, trips originating and ending at the respondents' home (e.g. jogging around the neighbourhood) , are excluded from analysis. The activities which are included in other include shopping, recreation, social & leisure, personal business and escort. For more information on these activities refer to Table 1 located previously in this report.

Table 5: Other Trip Types

Other Trip Type	Origin Location	Destination Location	Origin Activity Purpose	Destination Activity Purpose
Home to Other	Home	Not home	Anything	Not work or school
Work/School to Other	Not home	Not home	Work or School	Not work or school
Other to Other	Not home	Not home	Not work or school	Not work or school
Other to Home	Not home	Home	Not work or school	Anything
Other to Work/School	Not home	Not home	Not work or school	Work or School

7.7.1 Other Travel Participation Rate

In 2001 66.0% of Calgarians made one or more weekday other trips. In 2011 this number dropped to 63.9%.

7.7.2 Other Trips and Trip Rates

In 2001 Calgarians made a total of 2,304,300 weekday other trips daily and in 2011 that number increased to 2,850,500. The distribution of these other trips can be seen in Figure 22 below. In 2001 the weekday other trip rate was 3.98 trips per traveller and increased to 4.09 in 2011. This change can be seen in Figure 23 below. Due to the decrease in participation rate the weekday other trip rate for all Calgarians dropped from 2.63 in 2001 to 2.61 in 2011, these results are statistically valid but the change in not significant.

Figure 22: City Wide Weekday Other Trips by Trip Type – City - 2001 & 2011

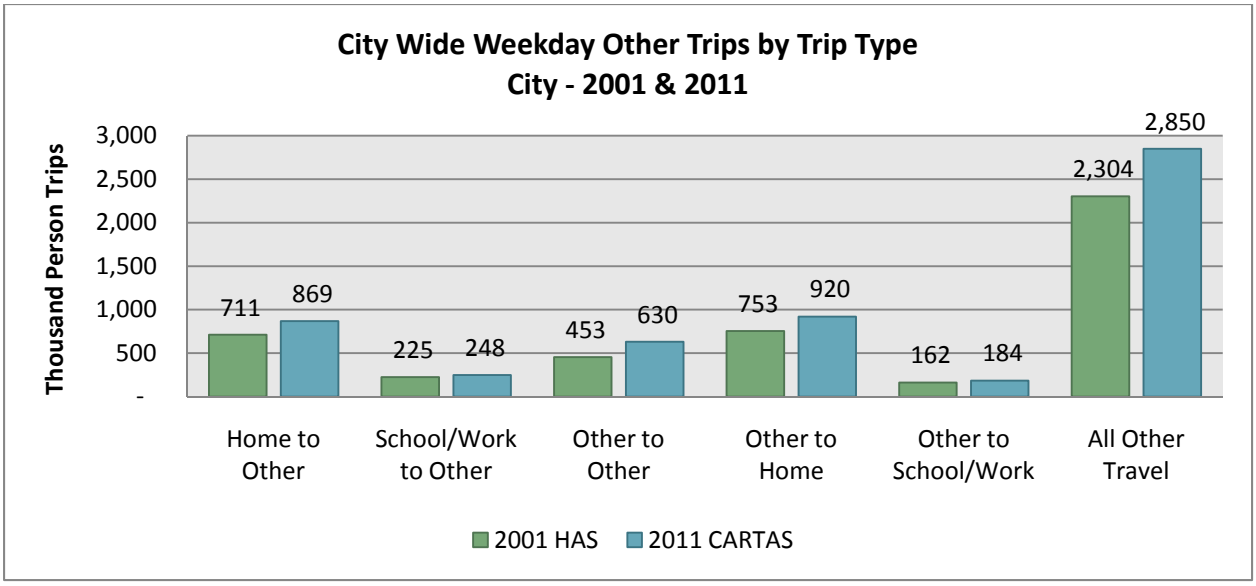
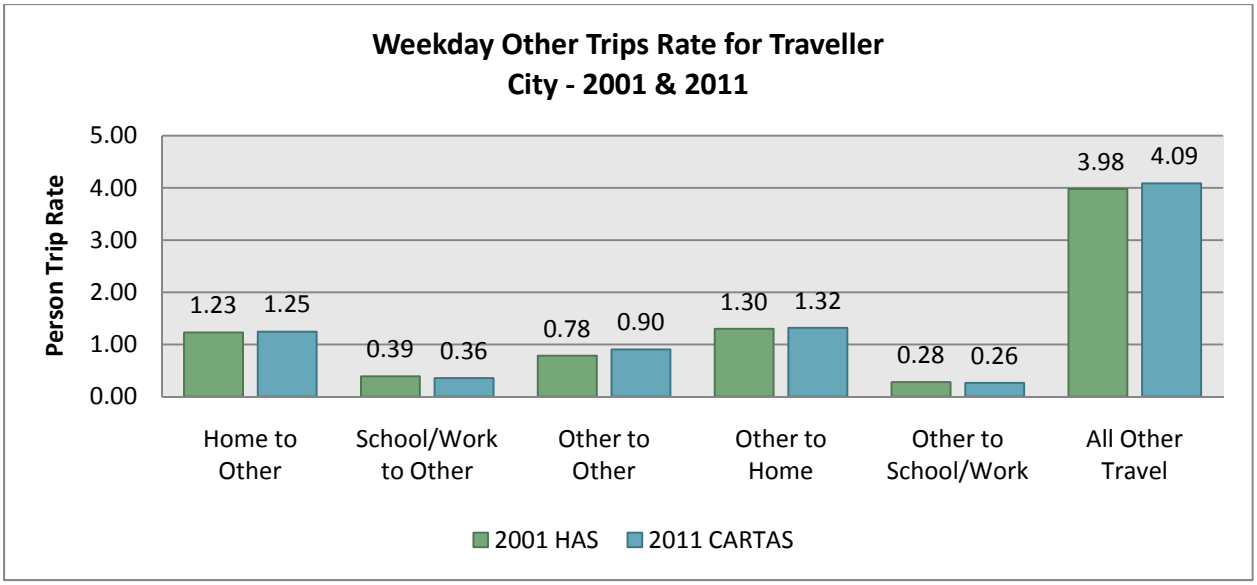


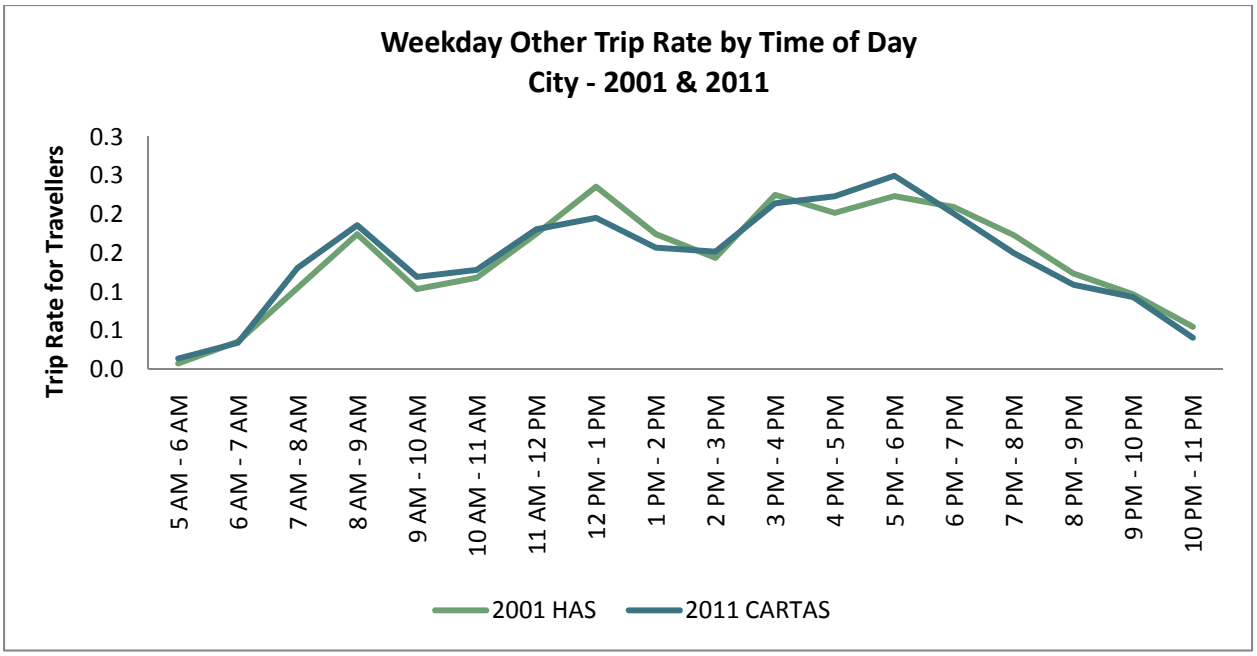
Figure 23: Weekday Other Trip rate for Travellers – City - 2001 & 2011



7.7.3 Time of Other Travel

The distribution of weekday other travel by time of day can be seen in Figure 24 below. The decrease in lunch trips seen in work and school travel can also been seen with other travel. The results also show that in 2011 Calgarians were making their other trips earlier in the day than in 2001, with an increase in travel in the morning and early afternoon and a reduction in trips after 7 pm.

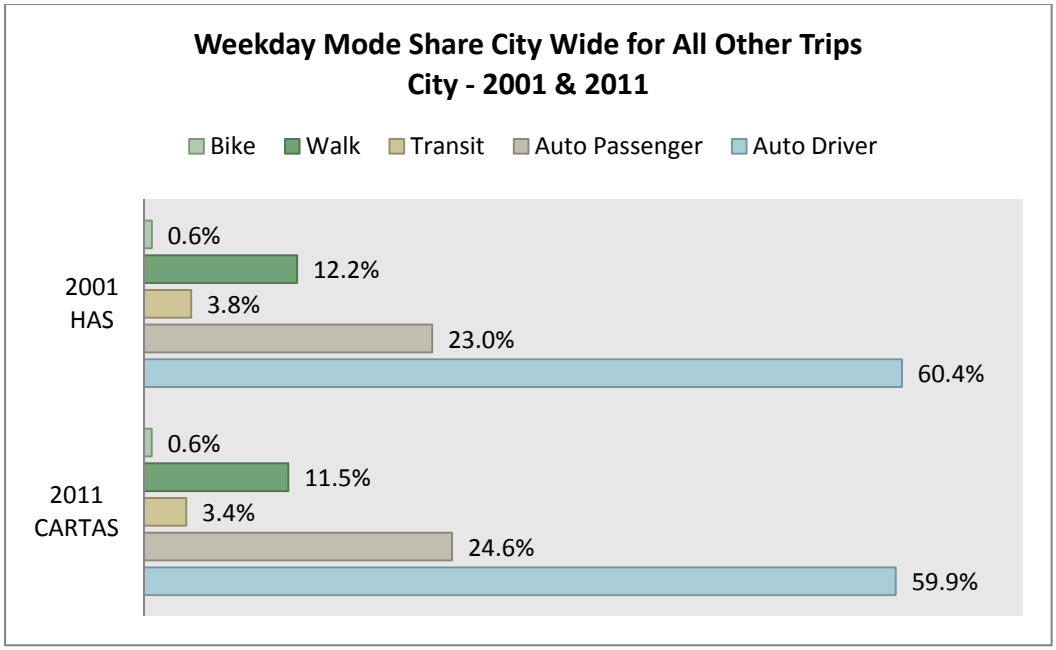
Figure 24: Weekday Other Trip Rate by Time of Day – City - 2001 & 2011



7.7.4 Mode Share of Other Travel

The weekday mode share for all other trips can be seen in Figure 25 below. There was very little change in mode share for Other trips over the 10 year period.

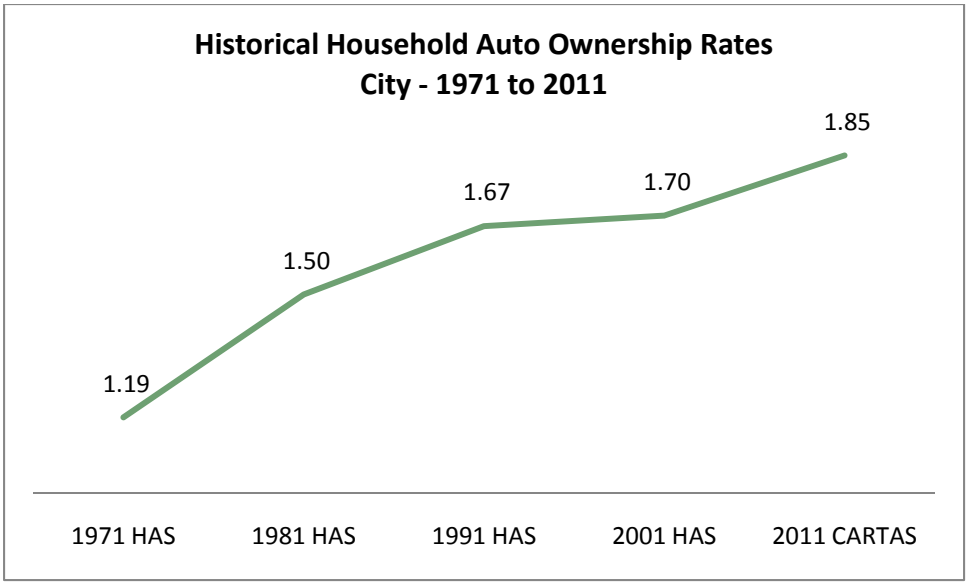
Figure 25: Weekday Mode Share City Wide for All Other Trips – City - 2001 & 2011



8 Changing Auto Ownership and the Impacts on Travel Behaviour

Household auto ownership is the number of vehicles owned by the household. A vehicle includes cars, vans, pickup trucks, and sport utility vehicles. As shown in the report "Changing Travel Behaviour in the Calgary Region: Volume 1," the average household auto ownership has increased from 1.50 vehicles per household in 1981 to 1.85 vehicles per household in 2011 (See Figure 27). This is a 23% increase in auto ownership despite a decline in the average household size (from 2.77 people per household in 1981 to 2.58 people per household in 2011.)

Figure 26: Historical Household Auto Ownership Rates - City - 1971 to 2011[3]



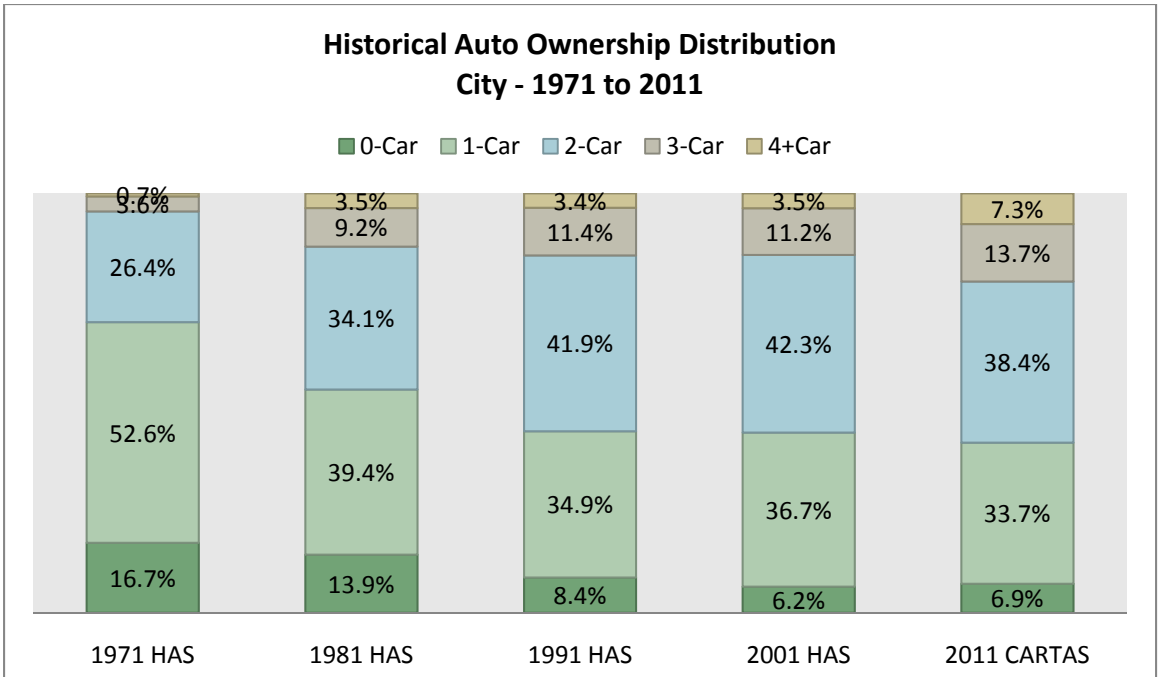
8.1 Auto Ownership Distribution

The auto ownership distribution has also changed over the last 30 years and is shown in Figure 28. The proportion of households that own more than 3 cars has increased from 46.8% in 1981 to 59.4% in 2011. This could be a result of households needing to have a car for every licensed driver or due to the high incomes in Calgary.

The data from 1971 to 1991 was obtained through a City of Calgary Transportation Department report, the changes from those years to 2011 are large enough that they are likely significant. However, the raw data is no longer available and the statistical significance cannot be verified. The information from 2001 and 2011 was retrieved directly from survey databases and it is possible to evaluate the statistical significance. This evaluation determined that the changes from 2001 to 2011 are significant, except for the change on 0-car households. This could indicate that the proportion of 0-Car households did not change or it could indicate that the sample of household with zero cars was not large enough to measure the change.

[3] (City of Calgary Transportation Department, 1993),

Figure 27: Historical Auto Ownership Distribution - City – 1981 to 2011[4]



The change in 0-Car households between 2001 and 2011 was found to be statistically insignificant.

8.2 Demographic Influences

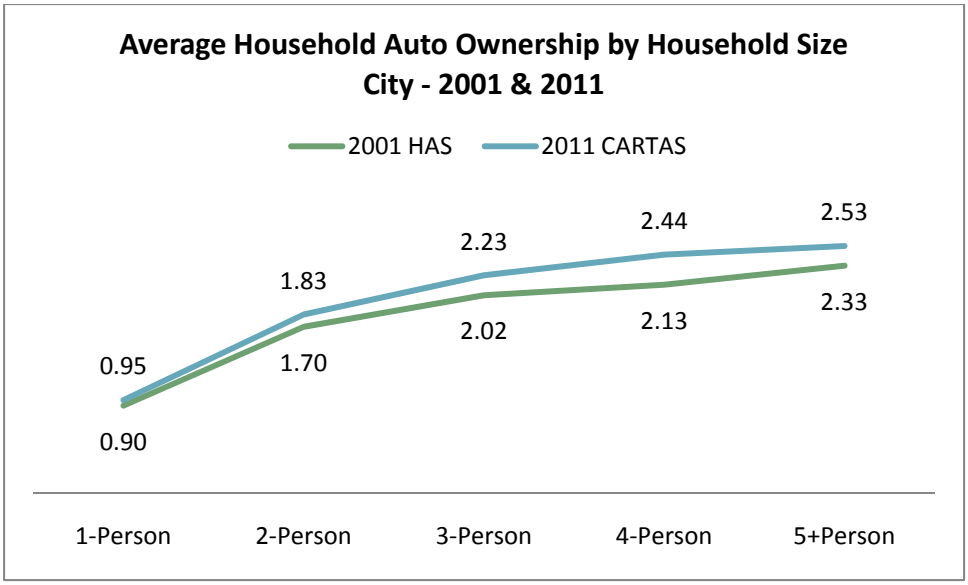
Auto ownership is influenced by demographic factors such as the number of people who live in the household, the age of the people in the household and the household income. This section will focus on the impacts these demographic characteristics have on auto ownership.

8.2.1 Household Size Impacts

The household size is the number of people living in the same dwelling that share a kitchen and may include people who are not related. On average, households with more people own more vehicles than smaller households as is show in Figure 29. A household with 4 people owns on average 2.44 vehicles in 2011 compared to a 2 person household which will only own 1.83 vehicles. The auto ownership in 2011 is higher than in 2001 in every household size category. This further supports the conclusion that Calgarians own more vehicles.

[4] (City of Calgary Transportation Department, 1993)

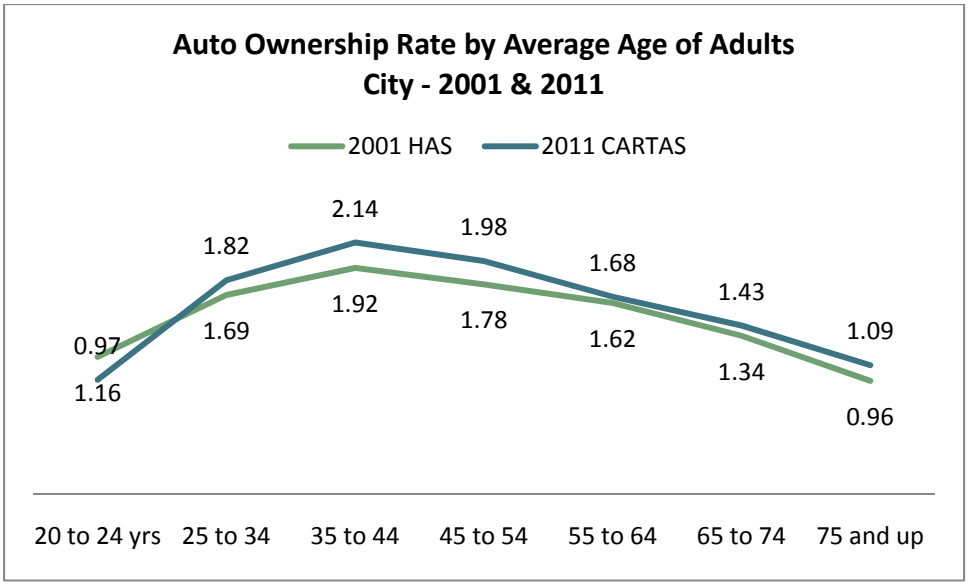
Figure 28: Household Auto Ownership Rate by Household Size - City – 2001 & 2011



8.2.2 Age Impacts

Investigating auto ownership by age categories is complex because auto ownership information was collected at a household level and the survey does not connect the ownership of the vehicle to a specific household member. To conduct the analysis, the average age of adults (a person 18 years of age or older) in a household was calculated. Using this average age of adults, the auto ownership rate was calculated. Auto ownership rates across all age categories increased from 2001 except for households with an average age of 20-24 and 55 – 64 where the change was not statistically significant. Adults aged 25 – 54 owned more vehicles than younger households or older households. This is likely due to the presence of children in the household which lead to an increase in household size. As adults age and children leave the family home, auto ownership declines to reflect the smaller household size. This is demonstrated in Figure 30.

Figure 29: Auto Ownership Rate by Average Age of Adults in Household - City – 2001 & 2011



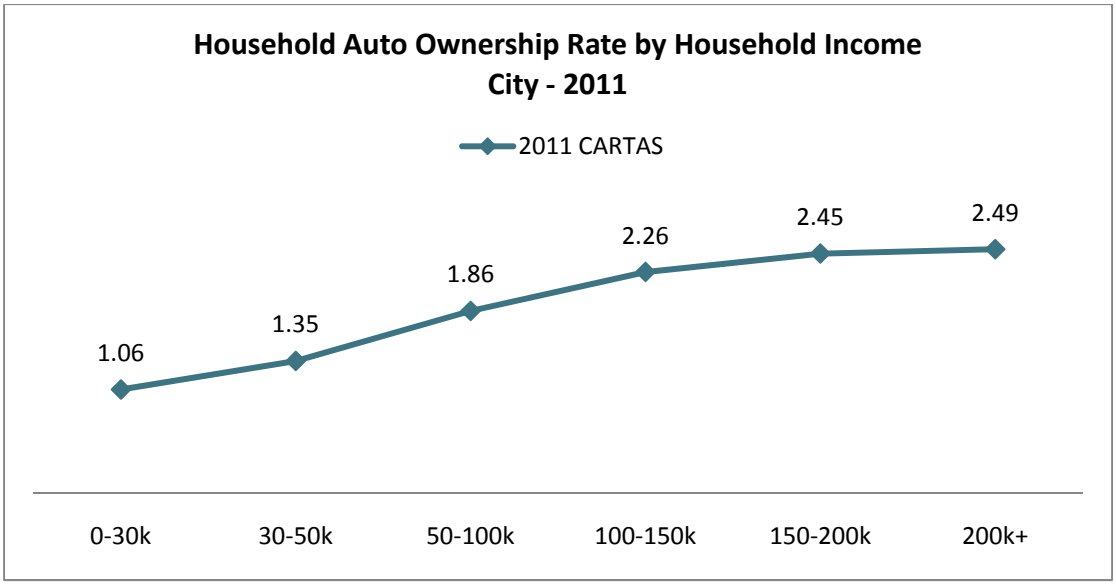
8.2.3 Household Income

Household income is the annual gross income (before taxes) of all member of the household. Household income has a strong influence on auto ownership which can be seen in Figure 31. Households with income over $200,000 own more than twice as many cars as households with incomes lower than $30,000. However, household income and household size are closely linked so households with lower incomes tend to be smaller therefore have fewer licensed drivers.

Statistics Canada indicates that household income in Calgary has increased by 38% since 2001 compared with 28% in Alberta and 9% in the rest of Canada. This suggests that people in the Calgary have higher incomes than households in other places in Canada and this increase in income contributes to the increase in auto ownership seen in the City.[5]

[5] (Statistics Canada, 2011)

Figure 30: Household Auto Ownership Rate by Household Income - City - 2011



8.3 Geographic Influences

8.3.1 Calgary Transportation Plan Land Use Typologies

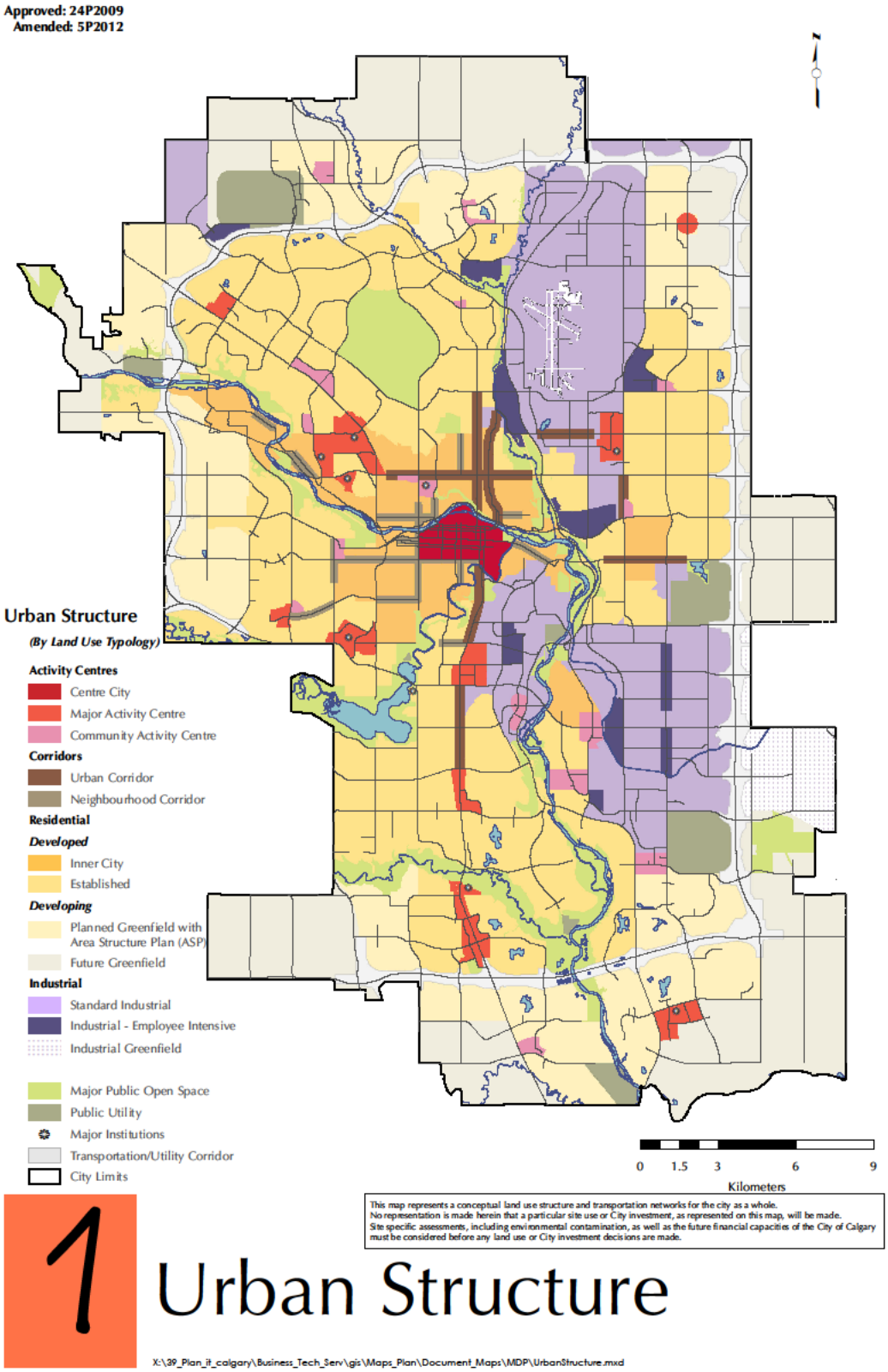
As part of the development of the Calgary Transportation Plan (CTP) and Municipal Development Plan (MDP) a series of broad geographic areas called typologies were developed to group areas with similar characteristics. Attributes like land use patterns, road layout, age, and stage of community lifecycle help to define an area and also influence travel behaviour patterns and decisions. Investigating how travel behaviour changes with respect to different typologies can provide insight into the progress that is being made towards CTP/MDP targets. Some of the typologies have a limited number of survey samples and were combined to ensure the results were statistically valid.

Table 6 contains information on the different typologies examined in this report and how they were combined to reduce sample error. Figure 32 shows the geographic area represented by each typology.

Table 6: CTP/MDP Typology Description

CTP/MDP Typology	Report Typology
Centre City	Centre City
MAC/CAC/Corridors	All Activity Centres and Corridors
Inner City	Inner City
Established	Established
Greenfield	Planned and future Greenfield
Industrial	Standard, Employee Intensive, and Greenfield Industrial

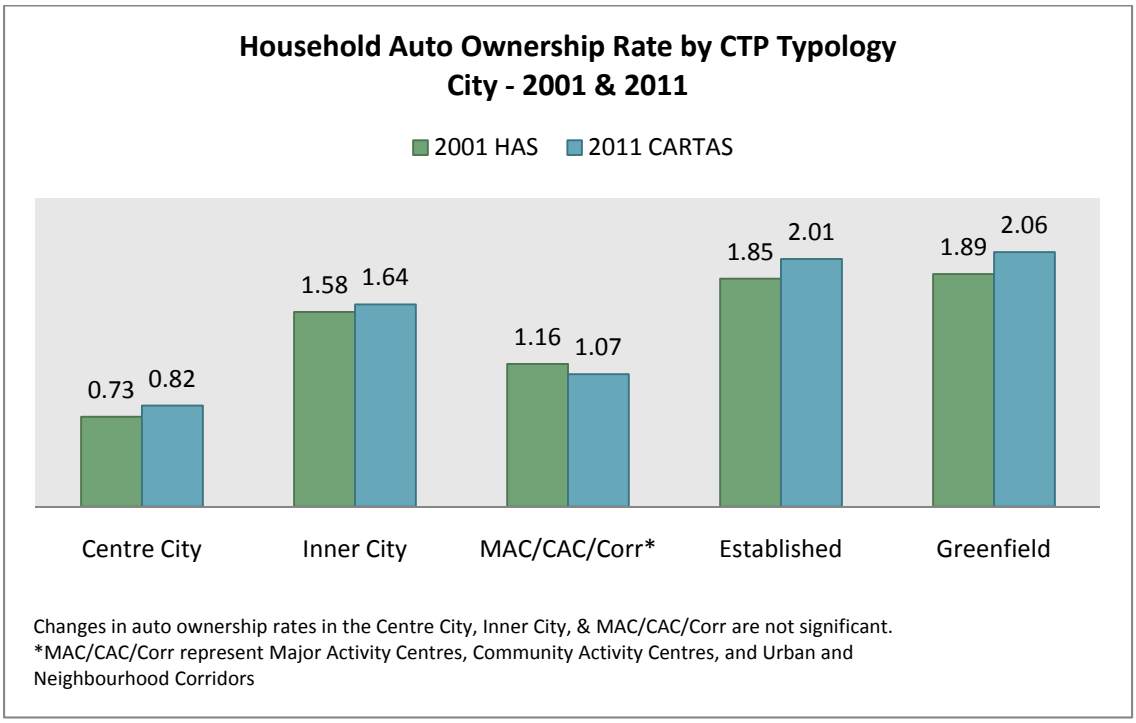
Figure 31: Map of CTP Typologies



8.3.2 Auto Ownership by CTP Typology

Auto ownership analysis by CTP Typology indicates that the Centre City, Inner City, Activity Centres, and Corridors have a lower auto ownership rate than households who live in Established or Greenfield communities as shown in Figure 33. Households in these areas are also smaller (see Figure 34) and have a higher proportion of people with incomes below $30,000 (See Figure 35). These factors also contribute to auto ownership so geography may influence auto ownership, but it is equally possible that auto ownership is determined through household size and income and that influences where people choose to live.

Figure 32: Auto Ownership rate by CTP Typology - City - 2001 & 2011



Changes in auto ownership rates in the Centre City, Inner City, & MAC/CAC/Corr are not significant.
*MAC/CAC/Corr represent Major Activity Centres, Community Activity Centres, and Urban and Neighbourhood Corridors

Figure 33: Average Household Size by CTP Typology - City – 2011

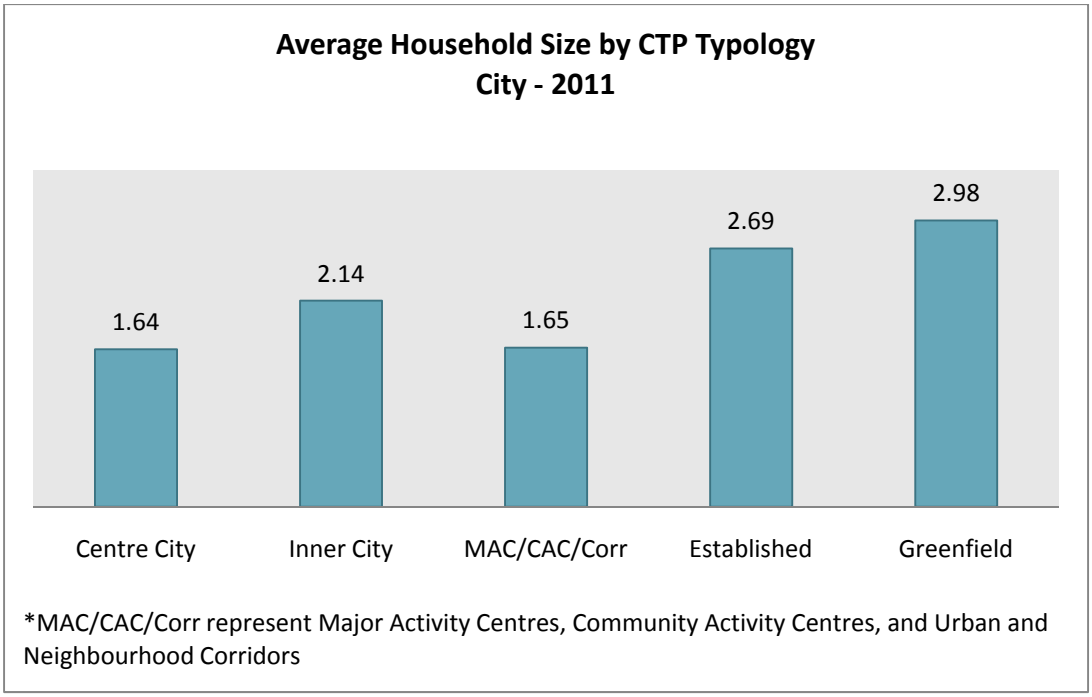
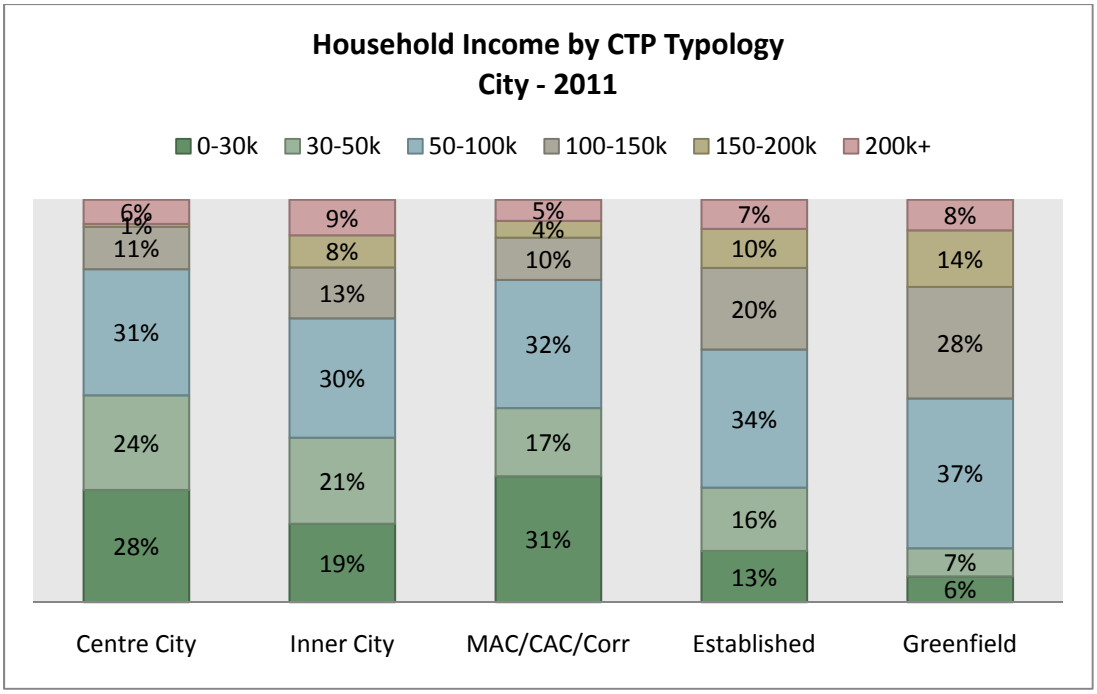


Figure 34: Household Income by CTP Typology - City - 2011



8.4 Auto Availability

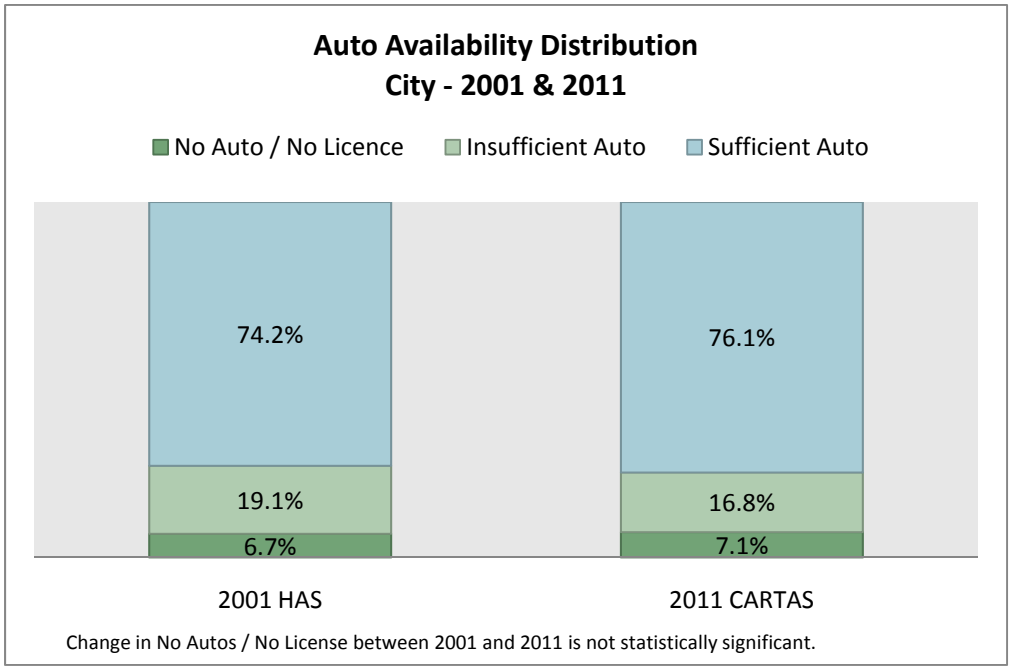
Auto availability is a combination of the number of vehicles in a household and the number of people in the household who have driver's licences. For analysis purposes, auto availability is divided into three categories explained in Table 7 below:

Table 7: Auto Availability Definitions

Category	Description
No Auto / No Licence	No vehicles or licensed drivers in the household
Insufficient Autos	More licensed drivers than vehicles in the household.
Sufficient Autos	1 or more vehicles per licensed driver in the household

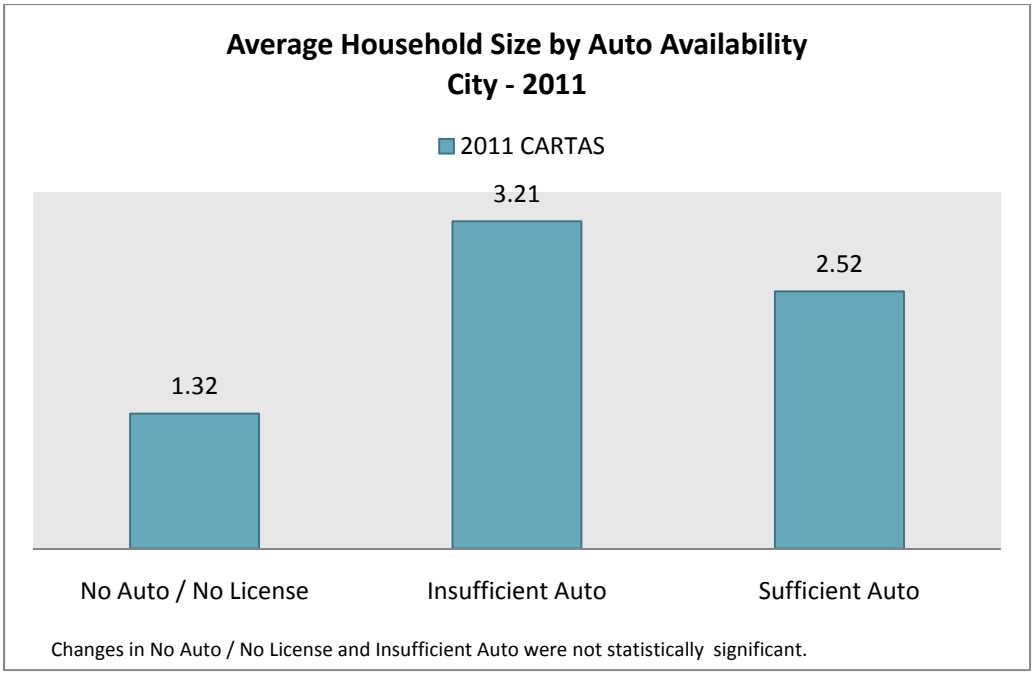
The distribution of auto availability at the household level has changed over the last 10 years as seen in Figure 36. With an increase in household auto ownership, there has been a 2% increase in the proportion of households with 1 or more cars for each driver. These households previously would have had fewer vehicles than drivers, but would have owned at least one vehicle as the proportion of households that own no cars has not changed.

Figure 35: Auto Availability Distribution - City - 2001 – 2011



Auto availability is also influenced by household size as households with no vehicles or licensed drivers are smaller than households with sufficient vehicles. This is demonstrated in Figure 37.

Figure 36: Auto Availability by Average Household Size - City - 2011



8.5 Impact of Auto Availability on Travel Behaviour

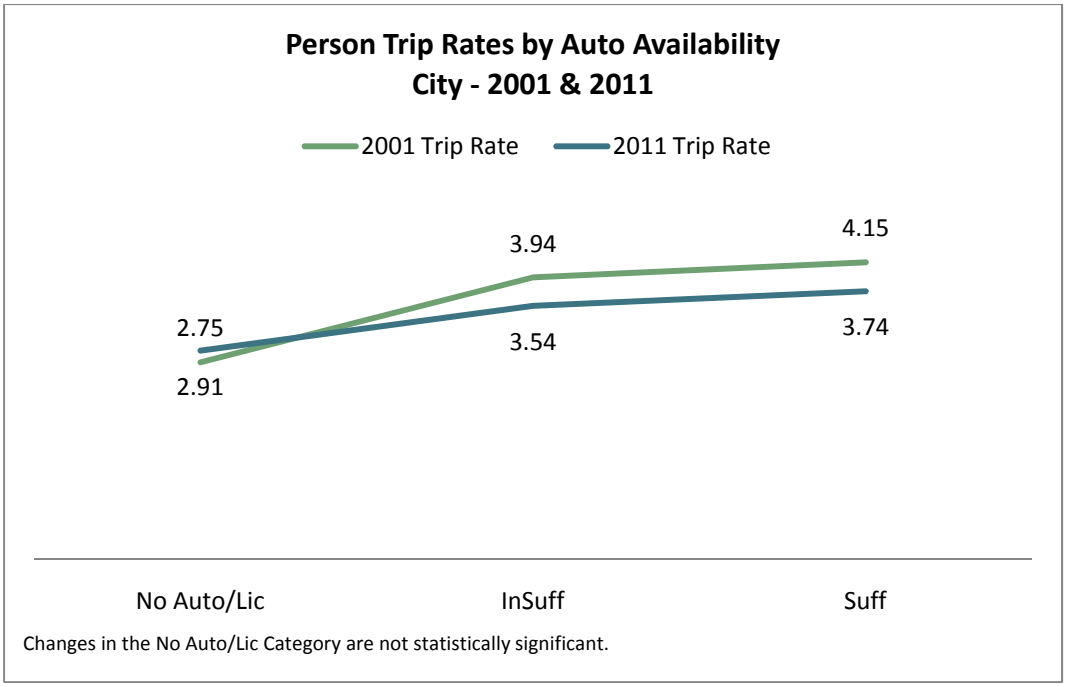
Auto availability influences travel behaviour as households with differing levels of auto access have different trip rates and different mode choices. Households with no vehicles have different options than households with more vehicles and this section will examine how those differences impact travel behaviour.

8.5.1 Trip Rates by Auto Availability

Trip rates are calculated by using the expanded total number of trips observed and dividing it by the number of people in each auto availability category. As expected, households with no vehicles or licensed drivers made much fewer trips than households with more vehicles and licensed drivers. This is shown in Figure 38 where in 2011, households with no vehicles or driver's licenses only made 2.91 trips per person while households with sufficient vehicles made 3.74 trips per person. This data suggests that households with sufficient autos for licensed drivers travel more than households with limited access to autos.

The trip rates for 2011 for both Insufficient and Sufficient Auto categories have declined since 2001. This is consistent with findings in "Changing Travel Behaviour in the Calgary Region: Volume 1," where the city wide trip rate has also declined from 2001 to 2011. There are many possible explanations for this decline such as smaller households, flexible work hours, communication technology, increased congestion on the transportation network, or survey respondents missing trips when completing their travel diaries.

Figure 37: Person Trip Rates by Auto Availability - City - 2001 - 2011



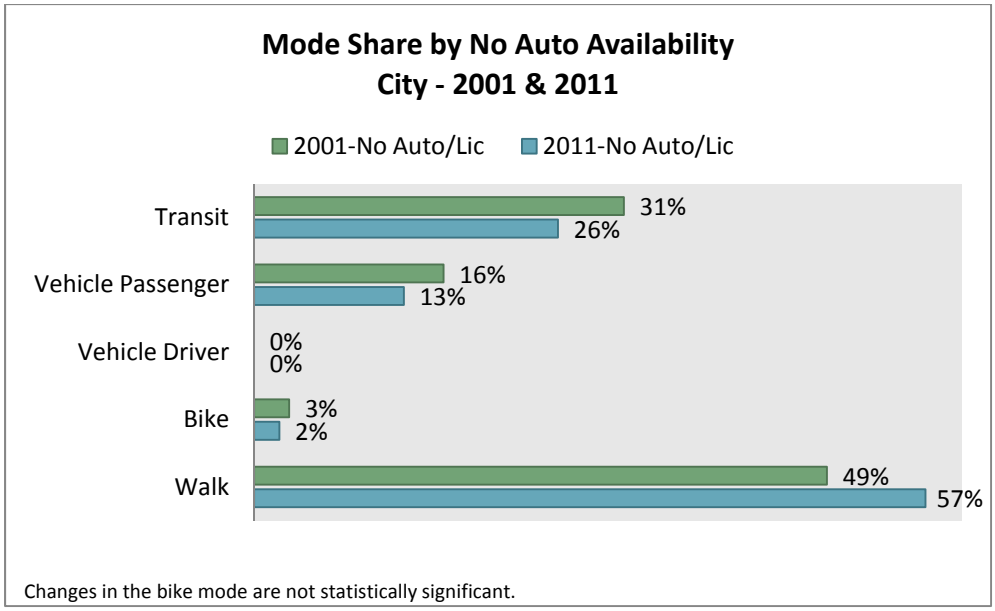
8.5.2 Mode Share by Auto Availability

The availability of vehicles within a household impacts the transportation mode household members use to go about their daily activities. The next section describes those changes.

8.5.2.1 No Auto / Driver's Licence

Households that do not own vehicles or have any household members with a driver's licence have fewer transportation options available to them. Figure 39 demonstrates the mode share for households with no autos available to them. The largest mode share in both 2001 and 2011 was the walk mode followed by the transit mode. In 2001, the walk mode share for these households increased from 49% to 57% in 2011. There was a decrease in vehicle passenger mode, as it decreased from 16% in 2001 to 13% in 2011. Transit mode share decreased from 31% in 2001 to 26% in 2011. This suggests that households that are choosing not to own a vehicle are living in places where they can meet their transportation needs independently so they are less reliant on others for rides. Small changes to the bike mode share were found to be statistically insignificant.

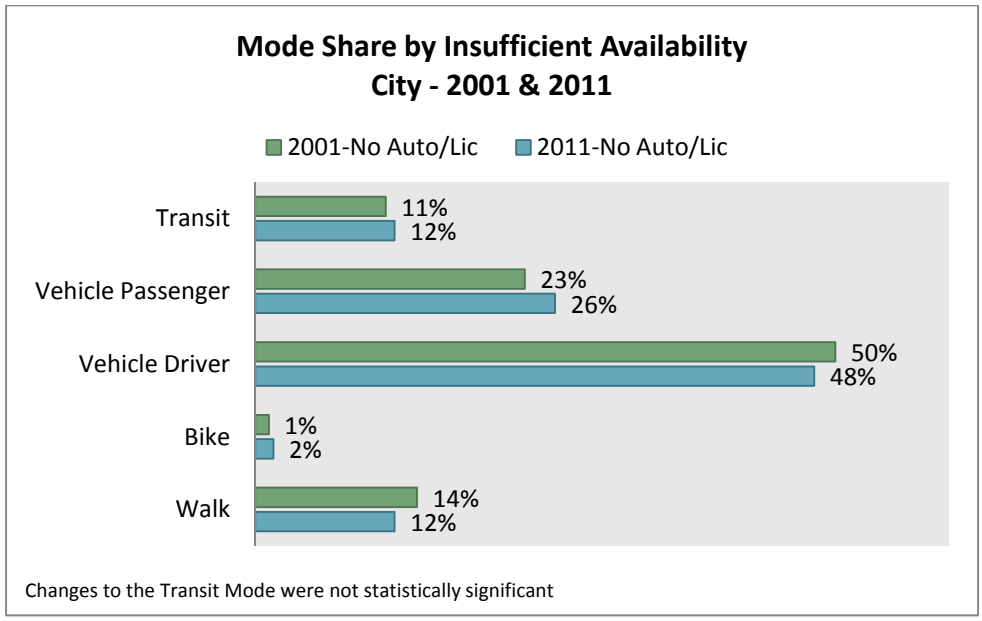
Figure 38: Travel Mode Share by No Auto Availability - City - 2001 & 2011



8.5.2.2 *Insufficient Autos*

In households with insufficient autos, there are more people in the household with driver's licences than vehicles for them to drive. In these households, the primary mode used for travel was the vehicle driver, which may include travel with passengers. Further analysis on group travel and carpooling will be available in a subsequent report. After vehicle driver, vehicle passenger was the next largest mode share. There were only small changes in mode share for these households between 2001 and 2011 as seen in Figure 40. Changes to the Transit mode were statistically insignificant.

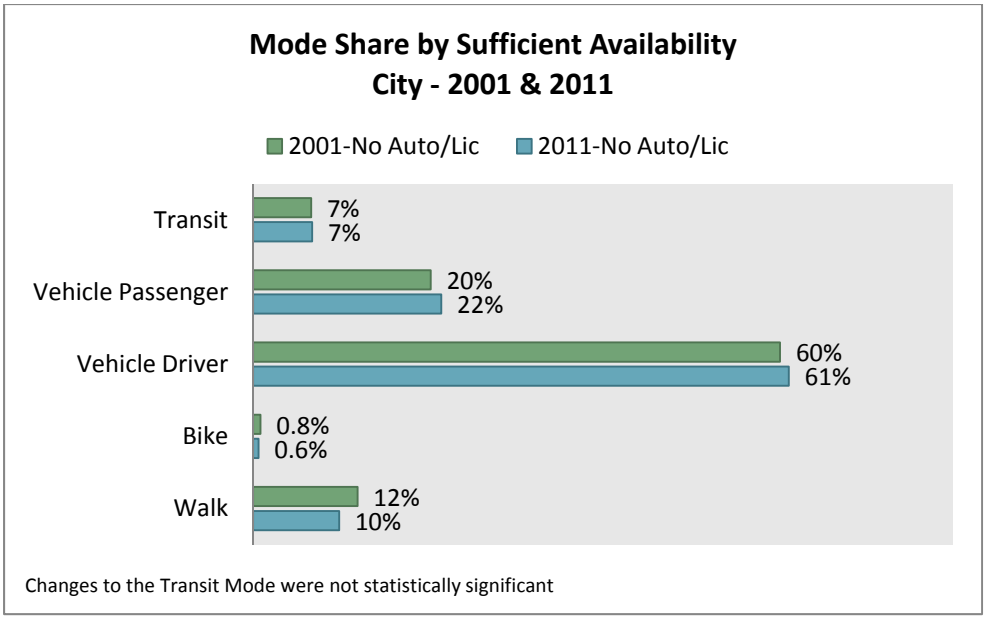
Figure 39: Travel Mode Share by Insufficient Auto Availability - City - 2001 & 2011



8.5.2.3 Sufficient Autos

These households have at least as many vehicles as licensed drivers and have the highest auto availability. These households have the highest vehicle driver mode share which increased from 60% in 2001 to 61% in 2011. The vehicle passenger share also increased from 20% in 2001 to 22% in 2011. The walk mode share decreased from 12% in 2001 to 10% in 2011 and the Bike mode decreased from 0.8% to 0.6%. The Transit mode share did not change significantly. This is shown in Figure 41.

Figure 40: Travel Mode Share by Sufficient Auto Availability - City - 2001 & 2011



9 Conclusions

CARTAS continues to offer a unique look into the travel characteristics of city and region residents. This report was the second in a series of reports developed to investigate how travel has changed since 1981 and to report the results of the current survey. This report covered how travel by different purposes has changed and how auto ownership and availability has changed.

Trips in all travel purpose categories have increased from 2001 to 2011, but the proportions are changing. In 2001 29.1% of trips made by workers were made for work purposes compared with 27.7% in 2011. Other trips have increased in proportion of daily travel from 57.9% in 2001 to 61.2% in 2011.

Mode share for work trips to the Central Business District (CBD) has changed over the last 10 years. Walk, bike, and transit mode shares have all increased while the auto driver mode has decreased. For work trips outside the CBD the mode share did not change significantly with the primary mode of travel remaining the auto driver mode.

There has been a shift in grade school travel in both time of day and mode share. Grade school students are travelling less at lunch time suggesting that more students are staying at school for lunch. The walk mode share for grade school students travelling to school has decreased significantly and auto

passenger and transit mode shares have increased. This could be a result of more parents working, parents choosing to send their children to schools outside of their community.

The number of households with sufficient vehicles has increased from 2001 to 2011. People who live in households with sufficient cars make more trips than households with insufficient or no cars. They also use Auto Driver as their primary mode where households with no vehicles have a primary mode of Walk. An increased number of households owning sufficient vehicles leads to a higher city-wide average auto ownership rate and contributes to the increase in auto mode share city wide.

10 Appendix A – Glossary of Terms

Term	Definition
24 Hour Trips	All trips that occurred in one day from 00:00 to 23:59
All Purpose Trips	Trips that are made for any purposes which may include work, school, shopping, pick up/drop off etc.
Auto Ownership	The number of cars, pick up trucks, SUVs, or motorcycles owned by a household as reported by the household. Does not include recreation vehicles, commercial vehicles or vehicles that are not operational
Average Household Size	The average number of people who live in the same household and share a kitchen.
Calgary Area	The city of Calgary and the surrounding Region. (See Region below)
CATI	Computer Aided Telephone Interview is a process used by survey companies to collect information from survey respondents over the telephone to ensure high quality data.
CBD	Central Business District
Census of Canada	A survey of all Canadians that is conducted by Statistics Canada every 5 years.
Central Business District	In Calgary, and for the purposes of this report this is the central area of the city bounded by the Bow River on the North and East, 17 Avenue to the South, and Bow Trail to the West.
City	Area located within the 2012 city of Calgary boundary.
Civic Census	An annual survey of all residents in Calgary conducted by The City of Calgary.
Cordon Study	A study that counts vehicles, bikes, and pedestrians as they cross a particular boundary.
CTP / MDP	The Calgary Transportation Plan and Municipal Development Plan approved by Calgary City Council in 2009.
Dataset	A collection of data, usually presented in tabular form, where each column represents a particular variable.
Demographics	Statistical data relating to the population and particular groups within it such as household size, income, age, and gender.
Downtown	The same area as the Central Business District
Employment	The number of people who are employed in an

	area.
Established Communities	Residential communities that were planned and developed between the 1950s and 1990s. They are primarily residential communities containing a mix of low- and medium-density housing with support retail in relatively close proximity as defined in the Municipal Development Plan.
Expanded Survey Results	Results obtained from the survey using expansion factors developed from demographic targets
Expansion Factor	Weighting factor developed from demographic targets so the survey distributions match the actual population distributions.
Greenfield Communities	Residential communities that have been planned since the 1990s and are still being developed as defined in the Municipal Development Plan.
Household Income	Total annual pre-tax income for all members of the household.
Household Size	The number of people that live at an address and share a kitchen.
Household Travel Survey	Survey to collect information from households describing their travel choices and travel influences.
Income	See Household Income
Industrial Area	Areas that include a broad variety of industrial uses and intensities that support business in Calgary as defined in the Municipal Development Plan..
Inner City	Residential communities that were primarily subdivided and developed prior to the 1950s as defined in the Municipal Development Plan..
Jobs Per Capita	The number of employed people divided by the total population.
Migration	Population increase or decrease due to people moving into or out of the Calgary Area.
Mode Share	The percentage of trips that are made by different travel modes.
Mode Split	The percentage of trips that are made by different travel modes.
New Communities	Residential communities that have been planned since the 1990s and are still being developed as defined in the Municipal Development Plan.
Peak Periods	Periods where travel demand in the study area is highest. Typically there is a peak in the morning from 6:00AM to 9:00AM and in the afternoon from 3:00PM to 6:00PM.
Place of Work Survey	Survey conducted in conjunction with the Civic

	Census that collects employment information including the work location, industry, and occupation.
Population	The number of people living in an area.
Region	The area surrounding the City of Calgary that includes the MD of Foothills, Rockyview County, Wheatland County. It also includes all the towns and villages within that area such as Airdrie, Chestermere, Cochrane, Okotoks, Strathmore, and High River.
Regional Transportation Model	Computer simulation of the city and surrounding region that is used to support transportation and land use decisions.
RTM	See "Regional Transportation Model"
Sample	A set of data collected and/or selected from a population by a defined procedure.
Statistically Significant	A statistical assessment of whether observations reflect a pattern rather than just chance.
Study Area	Includes The city of Calgary and the surrounding Region. (See Region above).
Travel Mode	Different methods of travelling about the Study Area. Includes walk, bike, transit, and auto.
Trip	Travel between two points by any mode. In cases of transit trips where the travel mode changed between two points, such as a park and ride trip or a walk to the bus stop, the trips were linked together to form one transit trip.
Trip Distance	The distance travelled on the road network when going between two points.
Trip Purpose	The reason the trip was made and includes, work, school, shopping, etc and is primarily defined by the destination purpose unless otherwise specified.
Trip Rate	The number of trips made per person or per household.
Vehicle Kilometres Travelled	The total number of kilometres travelled by all vehicles on the road network.
Vehicle Kilometres Travelled per Capita	The total number of kilometres travelled by all vehicles on the road network divided by total population.

11 Appendix B - Bibliography

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12 Appendix C – Data Tables

The figure numbers listed above each table in this section reference the figures within the report which the data is for. Note due to rounding totals may vary.

Figure 2: 24 Hour Weekday Person Trips Surveyed by Trip Purpose – City – 1971 to 2011; and

Figure 3: 24 Weekday Mode Share (Vehicle and Transit Only) – City – 1971 to 2011

Historical Calgary Daily Person Trips (Vehicle and Transit Travel Only)					
	1971[6]	1981[7]	1991[8]	2001	2011
Trips by Type					
Non Work	785,000	1,520,000		2,025,400	2,486,500
Work	233,000	513,000		850,100	971,600
Trips by Mode					
Transit	102,200	188,200		283,100	335,500
Vehicle	805,300	1511400		1,899,000	2,243,200
Vehicle Passenger	233,800	483,300		700,700	879,400
Total Person Trips	1,018,000	2,033,000		2,882,800	3,458,100
Calgary Population	403,320	591,855	708,593	876,519	1,090,936
Trip Rate	2.52	3.43		3.29	3.17

Figure 4: Destination Purpose of Weekday Person Trips – City - 2011

Destination Purpose	Number of Trips	Proportion
Work	590,900	14.9%
Leisure, Social & Eating	539,000	13.6%
Personal Business	433,600	11.0%
Escort	397,900	10.1%
Shopping	376,500	9.5%
School	225,500	5.7%
Travel to Home	1,393,300	35.2%
Total Trips	3,956,600	

[6] (City of Calgary Transportation Department, 1981)
[7] (City of Calgary Transportation Department, 1981)
[8] No data available

Figure 5: Distribution of Weekday Travel by Destination Purpose – City - 2001 & 2011

Destination Purpose	Number of Trips		Proportion of Trips		Statistical Analysis of Difference		
	2001 HAS	2011 CARTAS	2001 HAS	2011 CARTAS	Change 2001 to 2011	95% Confidence Limits +/-	Difference significant
Work	520,600	590,900	15.5%	14.9%	-0.6%	0.004	yes
School	227,000	225,500	6.8%	5.7%	-1.1%	0.003	yes
Other	1,389,300	1,747,000	41.5%	44.2%	2.7%	0.006	yes
Home	1,212,700	1,393,300	36.2%	35.2%	-1.0%	0.006	yes
Total Trips	**3,349,500**	**3,956,600**					

Figure 6: Distribution of Weekday Travel by Trip Purpose – City - 2001 & 2011

Trip Type	Number of Trips		Proportion of Trips	
	2001 HAS	2011 CARTAS	2001 HAS	2011 CARTAS
Work	976,300	1,095,700	29.1%	27.7%
School	434,200	438,000	13.0%	11.1%
Other	1,939,000	2,423,000	57.9%	61.2%
Total Trips	**3,349,500**	**3,956,600**		

Figure 7: Weekday Mode Share for All Person Trips – City - 2001 & 2011

Travel Mode	Number of Trips		Mode Share		Statistical Analysis of Difference		
	2001 HAS	2011 CARTAS	2001 HAS	2011 CARTAS	Change 2001 to 2011	95% Confidence Limits +/-	Difference significant
Walk	441,900	463,900	13.2%	11.7%	-1.5%	0.004	yes
Bike	32,100	34,600	1.0%	0.9%	-0.1%	0.001	no
Auto Driver	1,897,000	2,243,200	56.6%	56.7%	0.1%	0.006	no
Auto Passenger	699,300	879,400	20.9%	22.2%	1.4%	0.005	yes
Transit	280,300	335,500	8.4%	8.5%	0.1%	0.003	no
Total	3,350,700	3,956,600					

Figure 8: Weekday Work Travel Participation of Workers – City - 2001 & 2011

	2001 HAS		2011 CARTAS	
	Number	Portion	Number	Portion
Travelling Workers	349,200	82.4%	424,600	70%
Non Travelling Workers	74,500	18%	180,100	30%
Total Workers	**423,700**		**604,700**	

Figure 9: City Wide Weekday Work Trips by Trip Type – City - 2001 & 2011

	2001 HAS	2011 CARTAS
Home to Work	301,900	351,900
Other/school to Work	139,400	153,400
Work to Work	79,300	85,500
Work to Home	272,600	303,800
Work to Other/school	183,100	201,000
Total Work Trips	**976,300**	**1,095,700**

Figure 10: Weekday Work Trip Rate for All Work Travellers – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Trip Rate[9]	95% confidence limits +/-	Trip Rate	95% confidence limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference significant
Home to Work	0.82	0.012	0.82	0.013	-0.00	0.02	no
Other/school to Work	0.38	0.015	0.36	0.016	-0.02	0.02	yes
Work to Work	0.22	0.021	0.20	0.023	-0.02	0.03	no
Work to Home	0.74	0.013	0.71	0.014	-0.03	0.02	yes
Work to Other/school	0.50	0.016	0.47	0.018	-0.03	0.02	yes
All Work Trips	**2.67**	**0.034**	**2.56**	**0.037**	**-0.11**	**0.05**	**yes**

[9] Trips Rates for individuals who made one or more work trips

Figure 11: Weekday Work Trip Rates by Time of Day – City – 2001 & 2011

	2001 HAS Work Trip Rate	2011 CARTAS Work Trip Rate	Statistical Analysis of Difference		
			Change 2001 to 2011	95% Confidence Limits +/-	Difference significant
4 AM - 5 AM	0.00	0.01	0.00	0.00	no
5 AM - 6 AM	0.03	0.04	0.01	0.01	yes
6 AM - 7 AM	0.15	0.17	0.01	0.01	no
7 AM - 8 AM	0.38	0.38	0.00	0.02	no
8 AM - 9 AM	0.22	0.24	0.02	0.02	yes
9 AM - 10 AM	0.10	0.09	-0.01	0.01	no
10 AM - 11 AM	0.08	0.08	0.00	0.01	no
11 AM - 12 PM	0.13	0.13	-0.00	0.01	no
12 PM - 1 PM	0.24	0.17	-0.07	0.02	yes
1 PM - 2 PM	0.17	0.13	-0.04	0.01	yes
2 PM - 3 PM	0.10	0.10	0.00	0.01	no
3 PM - 4 PM	0.16	0.16	0.00	0.01	no
4 PM - 5 PM	0.32	0.33	0.01	0.02	no
5 PM - 6 PM	0.30	0.28	-0.01	0.02	no
6 PM - 7 PM	0.11	0.11	0.00	0.01	no
7 PM - 8 PM	0.04	0.04	-0.00	0.01	no
8 PM - 9 PM	0.02	0.02	0.00	0.01	no

Figure 12: Weekday Mode Share City Wide for Travel from Home to Work – City – 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	6.4%	0.006	8.2%	0.008	1.9%	0.011	yes
Bike	1.6%	0.003	2.0%	0.004	0.4%	0.005	no
Auto Driver	69.6%	0.012	64.9%	0.015	-4.8%	0.019	yes
Auto Passenger	8.4%	0.007	6.2%	0.007	-2.2%	0.010	yes
Transit	13.9%	0.009	18.7%	0.012	4.7%	0.015	yes

Figure 13: Weekday Mode Share for Travel from Home to Work (Workplace is in the CBD) – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	10.9%	0.016	13.9%	0.020	3.0%	0.025	yes
Bike	2.5%	0.008	4.0%	0.011	1.5%	0.014	yes
Auto Driver	38.6%	0.025	29.1%	0.026	-9.5%	0.036	yes
Auto Passenger	12.0%	0.016	7.3%	0.015	-4.6%	0.022	yes
Transit	36.0%	0.024	45.7%	0.029	9.7%	0.038	yes

Figure 14: Weekday Mode Share for Travel from Home to Work (workplaces outside the CBD) – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	4.7%	0.007	6.2%	0.009	1.4%	0.011	yes
Bike	1.3%	0.004	1.3%	0.004	0.0%	0.005	no
Auto Driver	80.9%	0.012	78.0%	0.015	-2.9%	0.019	yes
Auto Passenger	7.1%	0.008	5.8%	0.008	-1.4%	0.012	yes
Transit	5.9%	0.007	8.8%	0.010	2.9%	0.013	yes

Figure 15: 2011 Destination Activities for Work to Other Person Trips – City - 2011

Destination Activity	No. of Trips Daily	Percent of Work to Other Trips
Recreation & Social	67,900	34%
Personal Business	49,800	25%
Shopping	41,600	21%
Escort	39,100	19%
School	1,300	1%
Other	1,300	1%
Total Work to Other	**201,000**	

Figure 16: Weekday School Trip Rate for Grade School Travellers – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Home to School	0.99		0.93				
Other to School	0.12		0.14				
School to School	0.09		0.04				
School to Home	0.89		0.84				
School to Other	0.21		0.23				
All School Travel	**2.30**	**0.036**	**2.18**	**0.032**	**- 0.12**	**0.05**	**yes**

Figure 17: Grade School Student Weekday School Trip Rates by Mid-time of Travel – City - 2001 & 2011

	2001 HAS School Trip Rate	**2011** CARTAS School Trip Rate	Statistical Analysis of Difference		
			Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
6 AM - 7 AM	0.02	0.01	-0.01	0.006	no
7 AM - 8 AM	0.21	0.23	0.02	0.026	yes
8 AM - 9 AM	0.69	0.71	0.02	0.054	yes
9 AM - 10 AM	0.04	0.02	-0.02	0.012	no
10 AM - 11 AM	0.01	0.01	0.00	0.009	no
11 AM - 12 PM	0.07	0.05	-0.02	0.014	yes
12 PM - 1 PM	0.24	0.13	-0.11	0.021	yes
1 PM - 2 PM	0.07	0.03	-0.04	0.013	no
2 PM - 3 PM	0.09	0.14	0.05	0.019	yes
3 PM - 4 PM	0.68	0.59	-0.10	0.022	yes
4 PM - 5 PM	0.09	0.16	0.07	0.022	yes
5 PM - 6 PM	0.05	0.06	0.01	0.016	yes
6 PM - 7 PM	0.01	0.03	0.01	0.010	yes
7 PM - 8 PM	0.01	0.01	0.00	0.006	no
8 PM - 9 PM	0.00	0.00	0.00	0.005	yes
9 PM - 10 PM	0.00	0.00	0.00	0.006	yes

Figure 18: Weekday Mode Share for Grade School Travel City Wide – City – 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	32.7%	0.012	19.9%	0.015	-12.8%	0.019	yes
Bike	1.8%	0.003	0.6%	0.003	-1.2%	0.004	yes
Auto Driver	2.9%	0.004	5.6%	0.009	2.7%	0.010	yes
Auto Passenger	32.6%	0.012	41.5%	0.018	8.9%	0.022	yes
Transit	30.0%	0.012	32.4%	0.017	2.4%	0.021	yes

Figure 19: Weekday Mode Share for Grade School Travel between 7 AM to 10 AM – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	26.9%	0.018	17.6%	0.021	-9.3%	0.028	yes
Bike	1.5%	0.005	0.7%	0.005	-0.8%	0.007	yes
Auto Driver	3.0%	0.007	5.5%	0.013	2.5%	0.014	yes
Auto Passenger	34.4%	0.019	41.2%	0.027	6.8%	0.034	yes
Transit	34.2%	0.019	35.1%	0.027	0.9%	0.033	no

Figure 20: PSE Student Weekday School Trip Rates by Mid-time of Travel 2001 & 2011

	2001 HAS School Trip Rate	2011 CARTAS School Trip Rate	Statistical Analysis of Difference		
			Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
6 AM - 7 AM	0.01	0.01	-0.01	0.009	no
7 AM - 8 AM	0.12	0.11	-0.01	0.031	no
8 AM - 9 AM	0.13	0.10	-0.03	0.031	no
9 AM - 10 AM	0.08	0.10	0.02	0.028	no
10 AM - 11 AM	0.06	0.06	0.00	0.023	no
11 AM - 12 PM	0.04	0.04	0.00	0.019	no
12 PM - 1 PM	0.07	0.05	-0.02	0.023	no
1 PM - 2 PM	0.06	0.04	-0.02	0.021	no
2 PM - 3 PM	0.07	0.09	0.03	0.027	yes
3 PM - 4 PM	0.11	0.14	0.03	0.032	no
4 PM - 5 PM	0.09	0.09	0.00	0.028	no
5 PM - 6 PM	0.07	0.08	0.01	0.026	no
6 PM - 7 PM	0.02	0.04	0.02	0.017	no
7 PM - 8 PM	0.02	0.01	-0.01	0.011	yes
8 PM - 9 PM	0.02	0.01	-0.01	0.012	no
9 PM - 10 PM	0.02	0.02	0.00	0.013	no

Figure 21: PSE Mode Share All School Trips – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	9.0%	0.009	12.6%	0.024	3.6%	0.031	yes
Bike	2.2%	0.005	1.4%	0.009	-0.8%	0.013	no
Auto Driver	45.2%	0.016	34.3%	0.035	-10.9%	0.047	yes
Auto Passenger	11.0%	0.010	16.8%	0.028	5.8%	0.034	yes
Transit	32.7%	0.015	34.9%	0.035	2.2%	0.046	no

Figure 23: Weekday Other Trip rate for Travellers – City - 2001 & 2011

Data Table

	2001 HAS	2011 CARTAS
Home to Other	1.23	1.25
School/Work to Other	0.39	0.36
Other to Other	0.78	0.9
Other to Home	1.3	1.32
Other to School/Work	0.28	0.26
All Other Travel	**3.98**	**4.09**

Statistical Analysis of All Other Travel

	2001 HAS	2011 CARTAS	Statistical Analysis of Difference		
	95% Confidence Limits +/-	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
All Other Travel	0.047	0.044	0.11	0.065	yes

Figure 24: Weekday Other Trips by Time of Day – City – 2001 & 2011

	2001 HAS Other Trip Rate	2011 CARTAS Other Trip Rate	Statistical Analysis of Difference		
			Trip Rate Change 2001 to 2011	95% Confidence Limits +/-	Difference Significant
5 AM - 6 AM	0.00	0.01	0.00	0.001	yes
6 AM - 7 AM	0.01	0.01	- 0.00	0.002	no
7 AM - 8 AM	0.04	0.05	0.01	0.003	yes
8 AM - 9 AM	0.07	0.07	0.00	0.003	yes
9 AM - 10 AM	0.04	0.05	0.01	0.003	yes
10 AM - 11 AM	0.04	0.05	0.00	0.003	yes
11 AM - 12 PM	0.07	0.07	0.00	0.003	no
12 PM - 1 PM	0.09	0.07	- 0.01	0.004	yes
1 PM - 2 PM	0.07	0.06	- 0.01	0.003	yes
2 PM - 3 PM	0.05	0.06	0.00	0.003	yes
3 PM - 4 PM	0.09	0.08	0.00	0.004	yes
4 PM - 5 PM	0.08	0.09	0.01	0.004	yes
5 PM - 6 PM	0.09	0.10	0.01	0.004	yes
6 PM - 7 PM	0.08	0.08	0.00	0.004	no
7 PM - 8 PM	0.07	0.06	- 0.01	0.003	yes
8 PM - 9 PM	0.05	0.04	- 0.01	0.003	yes
9 PM - 10 PM	0.04	0.04	0.00	0.002	no
10 PM - 11 PM	0.02	0.02	- 0.01	0.002	yes

Figure 25: Weekday Mode Share City Wide for All Other Trips – City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Mode Share	95% Confidence Limits +/-	Mode Share	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	12.2%	0.003	11.5%	0.003	-0.70%	0.004	yes
Bike	0.6%	0.001	0.6%	0.001	0.00%	0.001	no
Auto Driver	60.4%	0.005	59.9%	0.004	-0.50%	0.006	no
Auto Passenger	23.0%	0.004	24.6%	0.004	1.59%	0.006	yes
Transit	3.8%	0.002	3.4%	0.002	-0.39%	0.002	yes

Figure 26: Historical Household Auto Ownership Rates - City - 1971 to 2011[10]

1971	1981	1991	2001 – HAS		2011 CARTAS		Statistical Analysis of Difference		
AO Rate	AO Rate	AO Rate	AO Rate	95% Confidence Limits +/-	AO Rate	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
1.19	1.50	1.67	1.70	0.019	1.85	0.025	9%	0.031	yes

** Statistical error for 1971 – 1991 is not calculated because information about the sample is not known.

Figure 27: Historical Auto Ownership Distribution - City – 1981 to 2011[11]

Data Table

	1971 HAS		1981 HAS		1991 HAS		2001 HAS		2011 CARTAS	
	# HH	% HH	# HH	% HH	# HH	% HH	# HH	% HH	# HH	% HH
0-Car	21,159	16.7%	29,600	13.9%	22,342	8.4%	20,732	6.2%	29,206	6.9%
1-Car	66,644	52.6%	84,047	39.4%	92,828	34.9%	121,932	36.7%	142,061	33.7%
2-Car	33,449	26.4%	72,678	34.1%	111,446	41.9%	140,554	42.3%	162,270	38.4%
3-Car	4,561	3.6%	19,662	9.2%	30,322	11.4%	37,077	11.2%	57,733	13.7%
4+Car	887	0.7%	7,436	3.5%	9,044	3.4%	11,678	3.5%	30,854	7.3%
Total	**126,700**	**100.0%**	**213,423**	**100.0%**	**265,982**	**100.0%**	**331,972**	**100.0%**	**422,124**	**100.0%**

Statistical Analysis (Statistical error for 1971 – 1991 is not calculated because information about the sample is not known.)

	2001 HAS	2011 CARTAS	Statistical Analysis of Difference		
	95% Confidence Limits +/-	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
0-Car	0.005	0.006	0.7%	0.008	no
1-Car	0.010	0.010	-3.1%	0.015	yes
2-Car	0.010	0.011	-3.9%	0.015	yes
3-Car	0.007	0.007	2.5%	0.010	yes
4+Car	0.004	0.006	3.8%	0.007	yes

[10] (City of Calgary Transportation Department, 1993)
[11] (City of Calgary Transportation Department, 1993)

Figure 28: Household Auto Ownership Rate by Household Size - City – 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	AO Rate	95% Confidence Limits +/-	AO Rate	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
1-Person	0.90	0.064	0.95	0.026	6.4%	0.033	yes
2-Person	1.70	0.074	1.83	0.026	7.4%	0.031	yes
3-Person	2.02	0.101	2.23	0.046	10.1%	0.061	yes
4-Person	2.13	0.144	2.44	0.041	14.4%	0.068	yes
5+Person	2.33	0.086	2.53	0.076	8.6%	0.118	yes

Figure 29: Auto Ownership Rate by Average Age of Adults in Household - City – 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	AO Rate	95% Confidence Limits +/-	AO Rate	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
20 to 24 yrs	1.16	0.128	0.97	0.205	-17%	0.242	no
25 to 34	1.69	0.044	1.82	0.079	7%	0.090	yes
35 to 44	1.92	0.033	2.14	0.052	11%	0.062	yes
45 to 54	1.78	0.043	1.98	0.055	11%	0.070	yes
55 to 64	1.62	0.052	1.68	0.045	3%	0.069	no
65 to 74	1.34	0.050	1.43	0.047	7%	0.068	yes
75 and up	0.96	0.072	1.09	0.057	14%	0.092	yes

Figure 30: Household Auto Ownership Rate by Household Income - City - 2011

	2011 CARTAS	95% confidence limits +/-	Statistically Valid Result
$0-$30,000	1.06	0.068	yes
$30,000 - $50,000	1.35	0.053	yes
$50 - $100,000	1.86	0.038	yes
$100,000 - $150,000	2.26	0.050	yes
$150,000 - $200,000	2.45	0.076	yes
Over $200,000	2.49	0.084	yes

Figure 32: Auto Ownership rate by CTP Typology - City - 2001 & 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	AO Rate	95% Confidence Limits +/-	AO Rate	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Centre City	0.73	0.079	0.82	0.123	12.3%	0.180	yes
Inner City	1.58	0.052	1.64	0.039	3.9%	0.098	yes
MAC/CAC/Corr*	1.16	0.060	1.07	-0.072	-7.2%	0.120	yes
Established	1.85	0.022	2.01	0.086	8.6%	0.047	yes
Greenfield	1.89	0.072	2.06	0.094	9.4%	0.141	no

*MAC/CAC/Corr represent Major Activity Centres, Community Activity Centres, and Urban and Neighbourhood Corridors

Figure 33: Average Household Size by CTP Typology - City – 2011

	2011 CARTAS	95% confidence limits +/-	Statistically Valid Result
Centre City	1.64	0.163	yes
Inner City	2.14	0.069	yes
MAC/CAC/Corr	1.65	0.091	yes
Established	2.69	0.034	yes
Greenfield	2.98	0.075	yes

*MAC/CAC/Corr represent Major Activity Centres, Community Activity Centres, and Urban and Neighbourhood Corridors

Figure 34: Household Income by CTP Typology - City - 2011

Data Table

	Centre City		Inner City		MAC/CAC/Corr		Established		Greenfield	
	# HH	% HH	# HH	% HH	# HH	% HH	# HH	% HH	# HH	% HH
$0-$30,000	5,987	28%	9,482	19%	9,235	31%	30,910	13%	5,114	6%
$30,000 - $50,000	5,057	24%	10,398	21%	4,989	17%	38,281	16%	5,562	7%
$50 - $100,000	6,728	31%	14,418	30%	9,388	32%	83,293	34%	29,657	37%
$100,000 - $150,000	2,268	11%	6,161	13%	3,097	10%	49,309	20%	22,054	28%
$150,000 - $200,000	152	1%	3,867	8%	1,230	4%	23,563	10%	11,207	14%
Over $200,000	1,289	6%	4,300	9%	1,552	5%	17,522	7%	6,054	8%
Totals	**21,480**	**100%**	**48,626**	**100%**	**29,491**	**100%**	**242,878**	**100%**	**79,650**	**100%**

Statistical Analysis

	Centre City	Inner City	MAC/CAC/Corr	Established	Greenfield
	95% Confidence Limits +/-	95% Confidence Limits +/-	95% Confidence Limits +/-	95% Confidence Limits +/-	95% Confidence Limits +/-
$0-$30,000	0.010	0.009	0.010	0.007	0.005
$30,000 - $50,000	0.009	0.009	0.008	0.008	0.006
$50 - $100,000	0.010	0.010	0.010	0.010	0.011
$100,000 - $150,000	0.007	0.007	0.007	0.009	0.010
$150,000 - $200,000	0.002	0.006	0.004	0.006	0.008
Over $200,000	0.005	0.006	0.005	0.006	0.006

** All results were stasticially valid.

Figure 35: Auto Availability Distribution - City - 2001 – 2011

	2001 HAS			2011 CARTAS			Statistical Analysis of Difference		
	# HH	% HH	95% Confidence Limits +/-	# HH	% HH	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
No Auto / No Licence	20,347	6.7%	0.003	29,993	7.1%	0.003	0.4%	0.00786	no
Insufficient Auto	58,190	19.1%	0.004	70,998	16.8%	0.004	-2.3%	0.011914	yes
Sufficient Auto	225,974	74.2%	0.005	321,133	76.1%	0.005	1.9%	0.013413	yes
Total	**304,511**	**100.0%**		**422,124**	**100.0%**				

*Note the total number of households in 2001 does not align in this case with the actual total number of households. This is because in 2001, there were a number of households where the stated number of people who lived in the household was larger than the number of travel diaries received. These missing people impacted the number of household driver's licenses so household with missing people were excluded from this analysis.

Figure 36: Auto Availability by Average Household Size - City - 2011

	2011 CARTAS		Statistical Analysis of Difference		
	Avg HH Size	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
No Auto / No Licence	1.32	0.066	-5%	0.189	no
Insufficient Auto	3.21	0.045	1%	0.122	no
Sufficient Auto	2.52	0.021	2%	0.060	yes

Figure 37: Person Trip Rates by Auto Availability - City - 2001 - 2011

	2001 HAS		2011 CARTAS		Statistical Analysis of Difference		
	Trip Rate	95% Confidence Limits +/-	Trip Rate	95% Confidence Limits +/-	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
No Auto / No Licence	2.75	0.050	2.91	0.086	6%	0.196	no
Insufficient Auto	3.94	0.020	3.54	0.088	-10%	0.177	yes
Sufficient Auto	4.15	0.012	3.74	0.029	-10%	0.061	yes

Figure 38: Travel Mode Share by No Auto Availability - City - 2001 & 2011

Data Table

	2001 HAS			2011 CARTAS		
	Trips	% Mode Share	95% Confidence Limits +/-	Trips	% Mode Share	95% Confidence Limits +/-
Walk	38,367	49%	0.029	66,878	57%	0.036
Bike	2,346	3%	0.010	2,519	2%	0.011
Vehicle Driver	820	1%	0.006	2,890	2%	0.011
Vehicle Passenger	12,689	16%	0.022	14,915	13%	0.024
Transit	24,770	31%	0.027	30,268	26%	0.032
Total	**78,991**	**100%**		**117,469**	**100%**	

Statistical Analysis

	Statistical Analysis of Difference		
	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	8%	0.047	yes
Bike	-1%	0.015	no
Vehicle Driver	1%	0.013	yes
Vehicle Passenger	-3%	0.032	yes
Transit	-6%	0.042	yes

Figure 39: Travel Mode Share by Insufficient Auto Availability - City - 2001 & 2011

Data Table

	2001 HAS			2011 CARTAS		
	Trips	% Mode Share	95% Confidence Limits +/-	Trips	% Mode Share	95% Confidence Limits +/-
Walk	102,305	14%	0.006	104,526	12%	0.007
Bike	8,682	1%	0.002	13,665	2%	0.003
Vehicle Driver	366,729	50%	0.009	419,033	48%	0.011
Vehicle Passenger	170,422	23%	0.007	224,797	26%	0.010
Transit	82,521	11%	0.006	104,436	12%	0.007
Total	**730,659**	**100%**		**866,457**	**100%**	

Statistical Analysis

	Statistical Analysis of Difference		
	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	-2%	0.009	yes
Bike	0%	0.003	yes
Vehicle Driver	-2%	0.014	yes
Vehicle Passenger	3%	0.012	yes
Transit	1%	0.009	no

Figure 40: Travel Mode Share by Sufficient Auto Availability - City - 2001 & 2011

Data Table

	2001 HAS			2011 CARTAS		
	Trips	% Mode Share	95% Confidence Limits +/-	Trips	% Mode Share	95% Confidence Limits +/-
Walk	277,309	12%	0.003	292,499	10%	0.003
Bike	19,561	1%	0.001	18,463	1%	0.001
Vehicle Driver	1,398,906	60%	0.005	1,821,263	61%	0.005
Vehicle Passenger	471,449	20%	0.004	639,695	22%	0.004
Transit	154,088	7%	0.002	200,796	7%	0.003
Total	**2,321,314**	**100%**		**2,972,716**	**100%**	

Statistical Analysis

	Statistical Analysis of Difference		
	Change from 2001 to 2011	95% Confidence Limits +/-	Difference Significant
Walk	-2%	0.004	yes
Bike	0%	0.001	yes
Vehicle Driver	1%	0.007	yes
Vehicle Passenger	1%	0.006	yes
Transit	0%	0.004	no