

*UBC TREK PROGRAM CENTRE  
THE UNIVERSITY OF BRITISH COLUMBIA*

*Transportation  
Data  
Collection  
Summary  
Report*

**URBAN**SYSTEMS®  
*October 2001*

**Transportation  
Data  
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# Summary

As one of the commitments made in the *UBC Official Community Plan* and the *GVRD/UBC Memorandum of Understanding*, UBC has undertaken a comprehensive transportation data collection and monitoring program. The data collection program officially began in 1997 with the creation of the UBC TREK Program Centre. The data that is collected through this program is used to assess the effectiveness of the UBC TREK Program Centre in achieving its goals of reducing single-occupant and heavy truck travel to and from the University, increasing transit ridership, and implementing a U-TREK program at UBC.

In the last four years a large amount of data has amassed and the purpose of this document is to present the results of the data collection program and discuss any trends or significant changes in travel patterns at UBC.

## *Total Number of Person Trips at UBC*

In 2000, the results of the data collection program indicated that approximately 107,000 person trips were made to and from UBC during a 24-hour period. For comparison, during the same time period 1.7 million person trips are made in the Vancouver/University Endowment Lands area, and 5.5 million person trips are made throughout the entire GVRD. Trips to and from UBC account for 2% of all trips in the GVRD.

The total number of person trips at UBC has increased by 1% between 1997 and 2000. During the same time, the population of UBC has increased 6%. This means that when the effects of growth are discounted, the number of person trips at UBC has decreased 5% since 1997.

**Table A** provides a summary of the number of trips at UBC by mode, in a 24-hour period.

**Table A: Total Person Trips at UBC by Mode  
(24hr period, 1997 vs. 2000)**

	1997	2000	Change	
			Net	Growth-Adjusted
Single occupant vehicles (SOV)	46,000	47,200	3%	- 3%
High occupant vehicles (Carpools and Vanpools)	36,200	29,600	- 16%	- 22%
Transit	19,000	24,400	28%	22%
Bicycles	2,700	3,200	19%	13%
Pedestrians	1,400	1,600	12%	6%
Other	875	875	0%	- 6%
<b>Total person trips</b>	<b>106,100</b>	<b>106,775</b>	<b>1%</b>	<b>- 5%</b>

Significant observations regarding various travel modes include:

***SOV Travel***

- The total number of person trips made by SOV has grown by 3% since 1997.
- When the effects of growth in UBC's population are discounted, the number of trips made by SOV per 10,000 people at UBC has actually decreased by 3% since 1997.
- Traffic counts conducted during the first week of the transit strike (April 2001) show a 4% decrease in the number of trips made by SOV, suggesting that if given the proper incentive, commuters would be willing to shift their mode of travel from SOV.

***HOV Travel***

- The total number of person trips made by HOV decreased by 18% between the years 1997 and 2000.
- The corresponding increase in transit ridership suggests that many commuters have shifted their mode of travel from carpools and vanpools to public transit.
- During the first week of the transit strike in April, the number of HOV trips increased by 85%, again suggesting that commuters could be encouraged to shift modes with the proper incentives.

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### ***Transit***

- The total number of person trips made by transit at UBC shows the largest change, at an increase of 28%.
- When the effects of growth in UBC's population are discounted, the number of trips made by transit per 10,000 people at UBC has increased by 21% since 1997.
- BC Transit, and subsequently TransLink, has increased their service to UBC by 30% in the same time period, indicating that transit ridership increases are driven by the available service. Current pass-ups suggest that there is still a latent demand for service to UBC.

### ***Bicycles***

- The number of trips made to and from UBC by bicycle has increased by 19% since 1997.
- The number of trips made by bicycle along University Boulevard has increased by almost 50% since 1997, mostly due to the conversion of this route from two lanes to 1 traffic lane and 1 bike lane in each direction.
- Bicycles now capture 7% of all trips made along University Boulevard.
- The bicycle mode share along University Boulevard is more than five times the average bicycle mode share for all trips to UBC.

### ***Pedestrians***

- The number of trips made daily to and from UBC by pedestrians has increased by 12%.
- Counts indicate that University Boulevard and W. 16<sup>th</sup> Avenue are the preferred routes to UBC for pedestrians. The latter is partially due to as many as 200 vehicle per day being parked on W. 16<sup>th</sup> Avenue by persons travelling to UBC, in order to avoid paying for parking on campus.

### ***Heavy Truck Travel***

- The total number of trips made in a 24hr period by heavy trucks has decreased by 20% since 1997.
- Reported decreases may be due to the varying amount of construction on the campus, and the TREK Program's efforts to encourage consolidation of truck trips.

# 1. Introduction

As one of the commitments made in the *UBC Official Community Plan* and the *GVRD/UBC Memorandum of Understanding*, UBC has undertaken a comprehensive transportation data collection and monitoring program. The data collection program officially began in 1997 with the creation of the UBC TREK Program Centre. The data that is collected through this program is used to assess the effectiveness of the UBC TREK Program Centre in achieving its goals of reducing single-occupant and heavy truck travel to and from the University, increasing transit ridership, and implementing a U-TREK program at UBC.

The collection program was initiated in 1997, the benchmark year, and has been undertaken annually. In the last four years a large amount of data has amassed and the purpose of this document is to present the results of the data collection program and discuss any trends or significant changes in travel patterns at UBC.

## 2. Annual Transportation Data Collection Program

A number of different methods have been used to collect data over the last five years and these methods have evolved since the benchmark year to provide a comprehensive annual program. The majority of the data are collected during the fall, providing a consistent basis for a year-by-year comparison of traffic volumes, travel patterns and mode split. Additional specialised data collection activities such as travel surveys) are used to obtain data regarding commuters' travel patterns and needs. Localized traffic counts are conducted as required to study issues not adequately addressed by the annual count program.

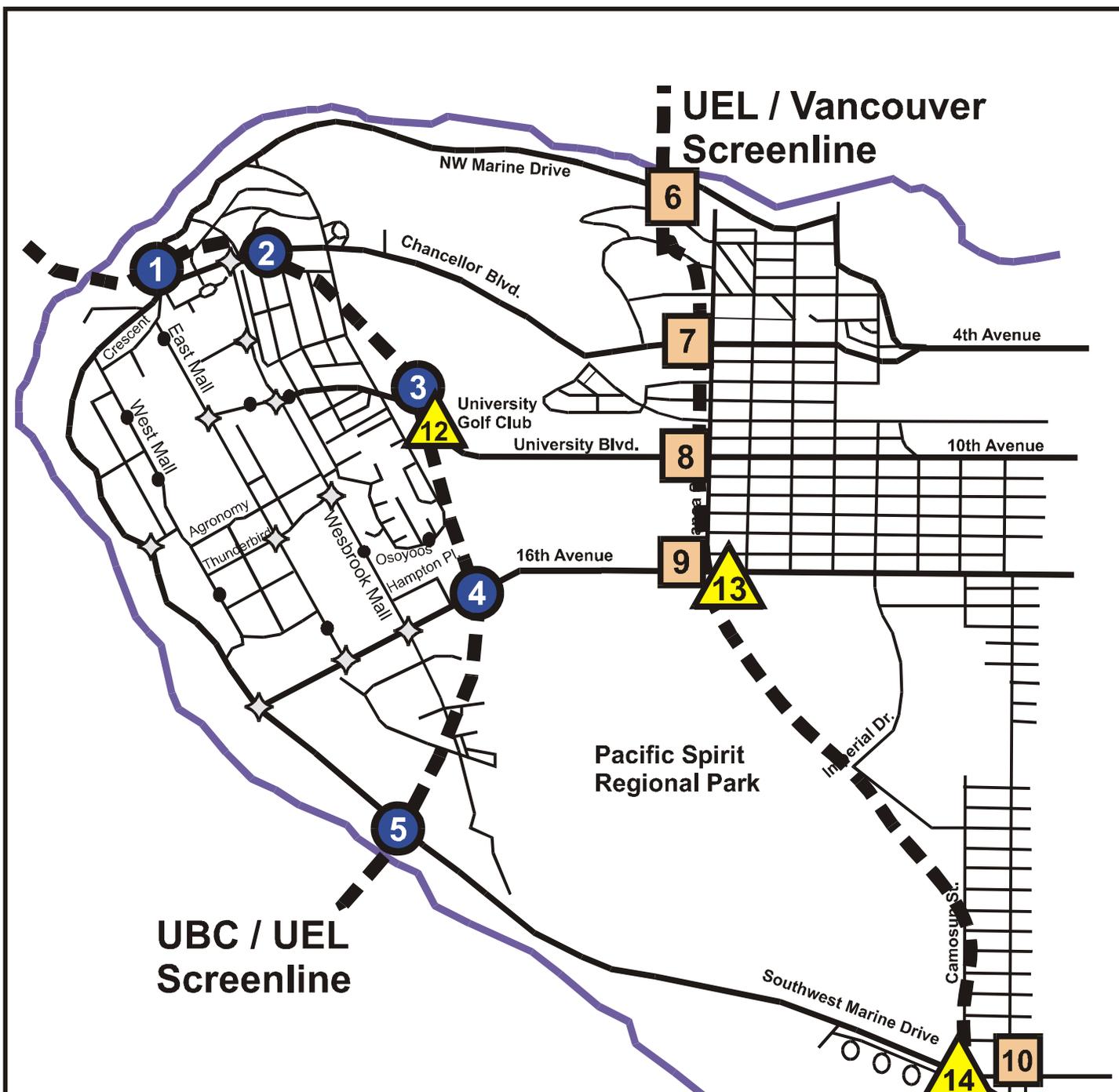
This information presented in this report is based primarily on data collected through the annual transportation data collection program, as the results of specialised data collection activities are typically published at the conclusion of each program.

### *Count Program Methodology*

In November 1997 screenline traffic counts were conducted in six locations along the Vancouver City and University Endowment Land (UEL) boundary. These counts collected data regarding travel patterns for all transit, SOV, HOV, bicycle and pedestrian modes. However, it was determined subsequently that data collected along this screenline did not accurately represent the traffic volumes going to and from the University exclusively and the data had to be extrapolated. Starting in the fall of 1998, the screenline count locations were adjusted and instead taken along the UBC/UEL boundary, as this screenline captures traffic directly related to UBC only. To provide a basis for comparison, the data collected in 1998 was also extrapolated, but this time, back to the Vancouver/UBC boundary. Annual counts have since only been conducted along the UEL/UBC screenline.

All count locations, on both screenlines, are as shown in **Figure 1**.

Also in 1998, six on-campus count locations were added to collect traffic volume data along major internal roads on the campus. Vehicle occupancy, detailed vehicle classification, bicycle and pedestrian counts were conducted each year as part of the program in these same locations. Manual intersection counts were also conducted starting that



**Figure 1 - UBC Data Collection Locations**

-  UBC vehicle, bicycle and pedestrian count locations - *TransTech*
-  Vehicle count locations - *City of Vancouver*
-  Transit count locations - *TransLink*
-  Campus volume/speed count locations - *Urban Systems Ltd.*
-  Campus intersection counts (vehicles, bicycles & pedestrians) - *Student Counters*



year to capture data regarding vehicle, bicycle and pedestrian volumes on campus.

On-campus count locations are also shown in **Figure 1**.

**Table 1** provides a summary of the annual count program up to the fall of 2000.

### *Spring Bicycle Counts*

Beginning in 1999, spring bicycle counts were added to the annual data collection program that had typically been conducted only in the fall. The spring counts were added to identify whether the warmer temperatures and improved weather conditions that can generally be expected in the spring affect bicycle travel patterns. As they coincide with the end of the school year, these counts also provide a basis to compare whether the bicycle mode share changes at all throughout the school year.

### *Transit Ridership Counts*

Independent of the UBC TREK Program, transit ridership counts have been conducted by BC Transit and subsequently the Coast Mountain Bus Company each year since 1997. Initially these counts were conducted over 14 and 16-hour periods, but were increased in 1998 to 18-hour count periods to reflect the changing spread of transit service. Ridership data is obtained from the Coast Mountain Bus Company each year and is included in the annual summary.

### *Transit Strike Counts – April 2001*

On April 2, 2001 Lower Mainland and Victoria transit operators walked off the job leaving these areas with no public transit, except for SkyTrain in the Lower Mainland. Being the Lower Mainland's second largest transit attractor, a special count program was organised at UBC to collect traffic volume and mode split data in order to analyse the impact of the strike. It is intended that this data will provide a basis for comparison of mode split before and after the strike, which will show any lasting impacts of the strike on travel behaviour.

Counts were conducted during the first week of the strike, in the same six locations that are counted each fall, and were performed using the same methods as the annual program. Data collected in April 2001 is

**Table 1: UBC Transportation Data Collection Program - 2000**

<b>Source</b>	<b>Data</b>	<b>Time Period</b>	<b>Timing</b>	<b>Locations</b>
<b>TransTech Data Services</b>  <i>Contact:</i> • Carol Smith P: (250) 381-3971 F: (250) 381-3972 E-mail: Transtec@islandnet. Com	<b>Traffic volumes</b> (automatic counts)	Weekdays (7 days) 24 hour periods	Oct. 23 to Nov. 10	<ul style="list-style-type: none"> <li>• NW Marine Dr. n/o Chancellor</li> <li>• Chancellor e/o Wesbrook Mall</li> <li>• University e/o Acadia</li> <li>• 16th Ave. e/o Hampton Place Rd.</li> <li>• SW Marine e/o 16th Ave.</li> </ul>
	<b>Vehicle occupancy</b> (manual checks)	3 hours AM (700 to 1000) 2 hours noon (1130 to 1330) 3 hours PM (1500 to 1800)	Oct. 23 to Nov. 10 (weekdays - one day per location - preferably Tuesday and Thursday as done in previous years)	<ul style="list-style-type: none"> <li>• NW Marine Dr. n/o Chancellor</li> <li>• Chancellor e/o Wesbrook Mall</li> <li>• University e/o Acadia</li> <li>• 41st Ave. e/o SW Marine Dr.</li> <li>• 16th Ave. e/o Hampton Place Rd.</li> <li>• SW Marine e/o 41st Ave.</li> </ul>
	<b>Detailed vehicle classification</b> (manual survey in coordination with vehicle occupancy)	3 hours AM (700 to 1000) 2 hours noon (1130 to 1330) 3 hours PM (1500 to 1800)	Oct. 23 to Nov. 10 (same as occupancy)	See vehicle occupancy locations above
	<b>Bicycle Counts</b> (manual survey in coordination with vehicle occupancy)	3 hours AM (700 to 1000) 2 hours noon (1130 to 1330) 3 hours PM (1500 to 1800)	Oct. 23 to Nov. 10 (same as occupancy)	See vehicle occupancy locations above
	<b>Pedestrian Counts</b> (manual survey in coordination with vehicle occupancy)	3 hours AM (700 to 1000) 2 hours noon (1130 to 1330) 3 hours PM (1500 to 1800)	Oct. 23 to Nov. 10 (same as occupancy)	See vehicle occupancy locations above

Source	Data	Time Period	Timing	Locations
<b>City of Vancouver</b>  <i>Contact:</i>  <ul style="list-style-type: none"> <li>Pat Ryan</li> <li>P: (604) 873-7424</li> <li>F: (604) 873-7212</li> <li>E-mail: Patrick_Ryan@city.Vancouver.bc.ca</li> </ul>	<b>Vehicle classification</b> (automatic classifiers)	4 weekdays total 24 hours per location	Timing of the City's counts is dependent on the outcome of the current labour dispute. The City has indicated that they will make every effort to complete the counts once the labour dispute has ended.	<ul style="list-style-type: none"> <li>NW Marine Dr.</li> <li>4th Ave. w/o Blanca</li> <li>10th Ave. w/o Blanca</li> <li>16th Ave. w/o Blanca</li> <li>41st Ave. e/o Camosun</li> <li>SW Marine e/o Camosun Dr.</li> </ul>
	<b>Traffic volumes</b> (automatic counts)	4 consecutive 24 hour periods		<ul style="list-style-type: none"> <li>NW Marine Dr.</li> <li>4th Ave. w/o Blanca</li> <li>10th Ave. w/o Blanca</li> <li>16th Ave. w/o Blanca</li> <li>41st Ave. e/o Camosun</li> <li>SW Marine e/o Camosun Dr.</li> </ul>
	<b>Manual intersection counts</b> (as resources permit)	AM and PM weekday peak periods – 1 day per location		<ul style="list-style-type: none"> <li>SW Marine Dr./Dunbar St.</li> <li>W.41<sup>st</sup> Ave./Dunbar St.</li> <li>W.16<sup>th</sup> Ave./Blanca St.</li> <li>W.10<sup>th</sup> Ave./Blanca St.</li> <li>W.4<sup>th</sup> Ave./Blanca St.</li> </ul>
<b>TransLink</b>  <i>Contact:</i>  <ul style="list-style-type: none"> <li>Brian Sagman</li> <li>P: (604) 453-4555</li> <li>F: (604) 453-4628</li> <li>E-mail: <a href="mailto:Brian_sagman@translink.bc.ca">Brian_sagman@translink.bc.ca</a></li> </ul>	<b>Transit load counts</b> (manual checks)  (includes check of bike racks on buses)	<b>2.1.1.1.1 Weekdays</b> <ul style="list-style-type: none"> <li>Tuesday – Oct. 31 06:00 to 15:00 in and out</li> <li>Thursday – Nov.2 06:00 to 15:00 in and out</li> <li>Tuesday – Nov.7 15:00 to 24:00 in and out</li> <li>Thursday – Oct. 9 15:00 to 24:00 in and out</li> </ul> <b>2.1.1.1.2 Weekends</b> <ul style="list-style-type: none"> <li>Saturday – Nov. 4 10:00 to 18:00 in and out</li> <li>Sunday – Nov. 5 10:00 to 18:00 in and out</li> <li>Saturday – Nov. 11 10:00 to 18:00 in and out</li> <li>Sunday – Nov. 12 10:00 to 18:00 in and out</li> </ul>	Oct. 30 to Nov. 17	<ul style="list-style-type: none"> <li>SW Marine at Camosun</li> <li>41st Ave. at S.W. Marine</li> <li>16th Ave. at Blanca</li> <li>University Blvd. at Allison Rd.</li> </ul>

Source	Data	Time Period	Timing	Locations
<p><b>Urban Systems Ltd.</b></p> <p><i>Contact:</i></p> <ul style="list-style-type: none"> <li>• Nikki Scott</li> <li>P: (604) 273-8700</li> <li>F: (604) 273-8752</li> <li>E-mail: nscott@urban-systems.com</li> </ul>	<p><b>Manual Intersection Counts</b></p> <p>(includes auto, truck, bicycle and pedestrians)</p>	<p>3 hours AM (7:00 to 10:00)  2 hours midday (11:30 to 13:30)  3 hours PM (15:00 to 18:00)</p>	<p>Oct. 23 to Nov. 10  (1 weekday per location)</p>	<ul style="list-style-type: none"> <li>• Chancellor Blvd. at Wesbrook Mall</li> <li>• University Blvd. at Wesbrook Mall</li> <li>• Thunderbird Blvd. at Wesbrook Mall</li> <li>• W.16<sup>th</sup> Ave. at Wesbrook Mall</li> <li>• W.16<sup>th</sup> Ave. at SW Marine Drive</li> <li>• University Blvd. at East Mall</li> <li>• Thunderbird Blvd. at East Mall</li> <li>• W.16<sup>th</sup> Ave. at East Mall</li> <li>• Wesbrook Mall at Student Union Blvd.</li> <li>• SW Marine Drive at Agronomy Road (also – stop sign violation survey)</li> </ul>
	<p><b>Automatic Daily On-Campus Traffic Counts</b></p> <p>(includes speed and classification data)</p>	<p>48-hours per location</p>	<p>Oct. 23 to Nov. 10</p>	<ul style="list-style-type: none"> <li>• University Blvd. e/o Wesbrook Mall</li> <li>• University Blvd. w/o Webrook Mall</li> <li>• East Mall s/o Crescent Road</li> <li>• West Mall s/o Crescent Road</li> <li>• West Mall s/o University Blvd.</li> <li>• West Mall s/o Thunderbird Blvd.</li> <li>• Wesbrook Mall n/o Hampton Pl. Rd.</li> <li>• Osoyoos Cres. w/o Revelstoke Ct.</li> <li>• East Mall n/o W. 16<sup>th</sup> Ave.</li> </ul>
	<p><b>Campus Shuttle Survey</b></p>	<p>3 consecutive survey days (i.e. Tuesday, Wednesday, Thursday)  – 8 hours per survey day</p>	<p>3 consecutive days during the Oct. 23 to Nov. 10 period</p>	<ul style="list-style-type: none"> <li>• 14 bus stop locations throughout the campus starting at Main Library</li> </ul>

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included in the annual data summary table, but does not replace the annual count program yet to be implemented this fall. The final report on this count program is included as **Technical Memo A** in the Appendix.

**Data Collection Summary Table**

A detailed data summary of all counts has been maintained since 1997. This table includes the results of the annual data collection program, in both person trips and traffic volumes, and has been organised by time period and route. The data summary table for 1997 through 2000 is shown in **Table 2**. (Refer to Table 2). All calculations and assumptions that have been applied to this data are documented in **Technical Memo B** in the Appendix.

### 3. Travel Patterns Today

The data collection program began in 1997, with the most recent program being completed in the fall of 2000. The data collected up to this point gives a clear picture of what travel patterns are like each day at UBC. This section will discuss these patterns as well as the general growth experienced in the last four years.

#### *Growth of the University and Daily Person Trips*

The UBC Planning and Institutional Research department has reported an increase in the total population of UBC (staff, faculty and students) of approximately 6% since 1997. This reflects an annual growth rate of 2% and is shown in **Table 3**, below.

*Table 3: Growth at UBC*

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
Total Population at UBC	42,275	43,430	44,750	44,700
Overall Growth	5.8%			

*\*Source: UBC Planning and Institutional Research Department*

The daily number of person trips to and from UBC reflects the total number of one-way trips crossing the UBC/UEL screenline in a 24 hour period. In 1997, approximately 106,000 person trips were made to and from the University each day. The total number of trips has fluctuated each year since. In fall 2000, there were approximately 107,000 daily person trips to and from UBC. In the City of Vancouver and the University Endowment Lands, 1.7 million person trips are made daily and 5.5 million person trips are made each day in the entire GVRD. The number of person trips to and from UBC accounts for approximately 2% of all person trips made each day in the GVRD.

**Table 4** summarises the total number of person trips by year and the overall growth since 1997.

**Table 4: Total Person Trips at UBC by Year (24 hour period)**

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
Total Daily Number of Person Trips	106,000	106,500	113,500	107,000
Overall Growth	1%			

The total number of person trips since the benchmark year has increased by 1%, which indicates that the total number of person trips per day has not changed significantly. Fluctuations from year to year are partly or entirely due to the daily variations in travel patterns. Because the travel data are only collected over a short period of time each year, these daily fluctuations can be expected to account for variations in travel numbers of 5% to 10%.

The results of the ongoing data collection program show various trends in the numbers and modes of travel at UBC. However, these increases and decreases do not reflect the growth that has occurred at UBC each year. Therefore, it is important to recognise that up to 6% of an increase in the number of trips from 1997 through to 2000 is likely due to growth in the UBC population, rather than increased trip-making.

Absolute increases and decreases are still important results, but in order to represent changes in travel patterns while taking into account the inherent growth, trips rates should also be considered. A trip rate expresses the number of trips as a rate per 10,000 population at UBC. In this manner, the effects of growth can be considered separately from changes in trip-making, and a comparison can be made of trip rates among years independent of population growth.

**Table 5** summarises trip rates for person trips to and from UBC over a 24 hour weekday period, since 1997.

**Table 5: Trip Rates To/From UBC  
(24hr period person trips per 10,000 population at UBC)**

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
Trip Rate	25,100	24,525	25,400	23,950
Change	- 4%			

It is interesting to note in **Table 5**, that the number of person trips per 10,000 population actually decreased by approximately 4%. It should

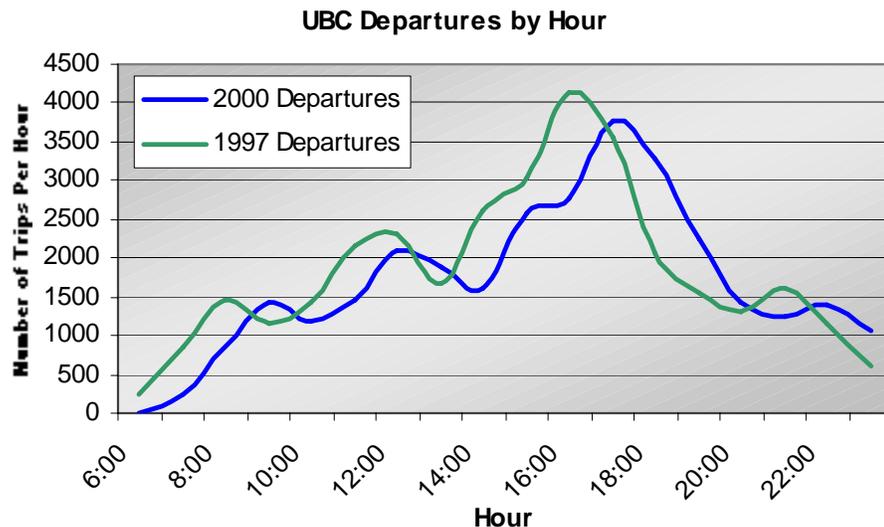
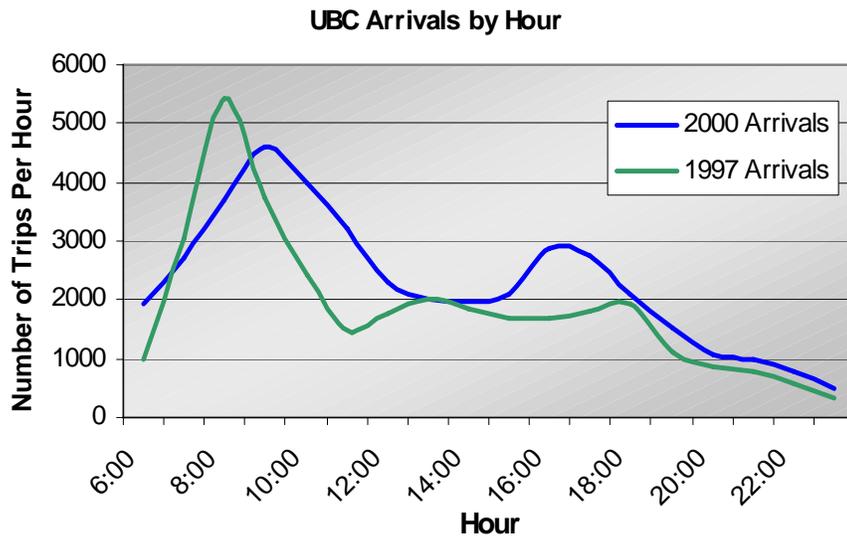
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be noted, however, that some or all of this apparent decrease could be due to normal fluctuations in data from year to year, and consequently it cannot be determined conclusively that trip rates have declined.

**How do Travel Patterns Vary Throughout the Day?**

While the majority of trips are made to and from the University during the daytime (7:00am to 6:00pm), roughly half of the number of person trips are made during the AM and PM peak hours. The graphs in **Figure 2** show the vehicle arrival and departure patterns by hour, throughout the day at UBC and how they have changed since 1997.

**Figure 2: Vehicle Arrival and Departure Patterns at UBC  
(6am – 12am, 1997 Vs. 2000)**



As shown in **Figure 2**, the number of vehicles arriving or departing is significantly higher during the AM and PM peak periods. This is evident from the sharp peaks that reach approximately 4,500 vehicles per hour in the AM and 3,750 vehicles per hour in the PM.

It is also interesting to note in Figure 2, that there is a late afternoon peak shown in the arrival data for the year 2000. While this late afternoon peak is not as large as that which occurs in the AM peak period, it is still dramatic and significant to the overall picture of travel patterns at UBC. This increase in the number of arrivals coincides with the start of evening classes and Continuing Education courses. This peak is most likely representative of the students who arrive at the University in order to attend these later classes. It can also be seen that there is a slight peak in the number of departures occurring around 10:00pm. This would peak is representative of students leaving UBC after Continuing Education and night classes have ended.

In an effort to reduce the magnitude of these peaks during the AM peak period, UBC class start times will be changed in September 2001 from 8:30 am to a combination of 8:00 am, 8:30 am and 9:00 am. This change will spread the number of students arriving and departing at the same time and thus, spread the travel demand during the AM peak periods. This change will also benefit transit services by spreading the peak demands over a longer period of time, and reducing overcrowding at peak times.

## 3.1 Trips by Mode

### *How do People Get to UBC?*

Comparing yearly travel data by mode presents a picture of how people are travelling to the University. When comparing the number of person trips made by mode, it is important to present both an absolute value (24-hour, two-way person trips) as well as the mode split percentages. This is because percentages alone may not accurately reflect changes if the total number of trips has changed as well, so the addition of absolute values will give a clear representation of how the total number of trips varies.

**Table 6** shows the total number of person trips by mode, made daily to and from the University in the fall of 2000.

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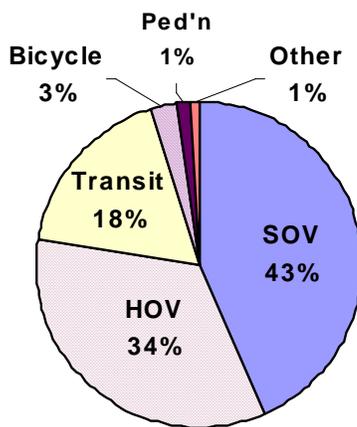
**Table 6: Total Person Trips at UBC by Mode  
(24hr period, Fall 2000)**

	<b>Total Number of Person Trips (24hr period)</b>	<b>Percentage of Total Person Trips (mode split)</b>
Single Occupant Vehicle (SOV)	47,200	44.2%
High Occupant Vehicles – Carpools/Vanpools	29,600	27.7%
Transit	24,300	22.8%
Bicycles	3,200	3.0%
Pedestrians	1,600	1.5%
Other	875	0.8%
<b>Total</b>	<b>106,775</b>	<b>100%</b>

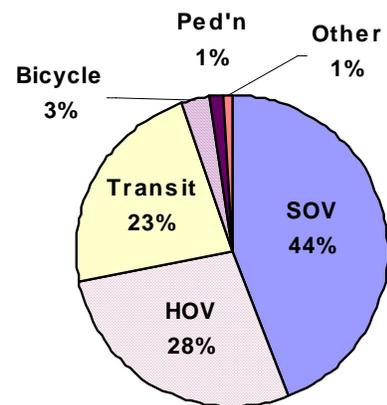
**Figure 3**, below, illustrates the modal shares of daily trips in 1997 and 2000. For the most part, modal shares have remained relatively the same.

**Figure 3: Total Person Trips at UBC by Mode  
(24hr period, 1997 Vs. 2000)**

**1997 Person Trips by Mode**



**2000 Person Trips by Mode**



The following results are reflected in **Figure 3**:

- Transit ridership to UBC has increased from 18% of all trips to 23%, corresponding to an increase of approximately 5,350 trips from 19,000 trips to 24,350 trips.
- SOV travel has retained approximately 44% of the mode share in 2000, while in 1997 the mode share was 43%. This corresponds to an increase from 46,000 trips to 47,200 trips
- HOV travel has decreased from 34% of all trips made to UBC to 28%, corresponding to a decrease from approximately 36,100 trips in 1997 to 29,600 trips in 2000.

When compared with the City of Vancouver/UEL and the rest of the region, it is interesting to note that UBC's transit mode share is currently 23% of all trips, whereas in Vancouver/UEL transit accounts for 19% and only 10% in the entire GVRD.

Trends for each mode of transportation are discussed in detail in following sections.

## 3.2 Vehicle Occupancy

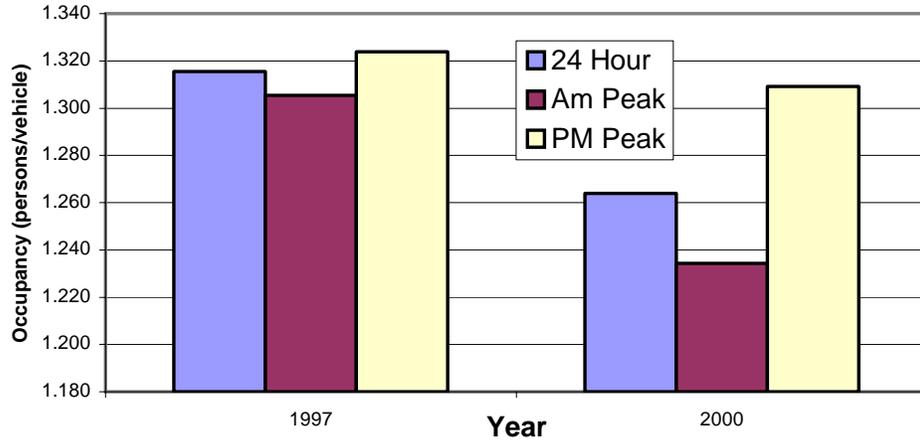
Vehicle occupancy is a measurement that reflects the number of people travelling per vehicle during a certain period of time.

### *Total Vehicle Occupancy*

Currently at UBC, the vehicle occupancy averaged over a 24-hour period is 1.26 persons/vehicle. This figure is slightly less than the occupancy calculated for the AM and PM peak periods combined, which is 1.42 persons/vehicle. This variance however, is due to a greater proportion of HOV travel being made during the peak hours. **Figure 4**, below shows how the occupancy has varied by time period for fall 1997 as compared with fall 2000.

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**Figure 4: Total Vehicle Occupancy by Time Period**



**Table 7** shows how UBC peak period vehicle occupancies compare across the region in the year 2000.

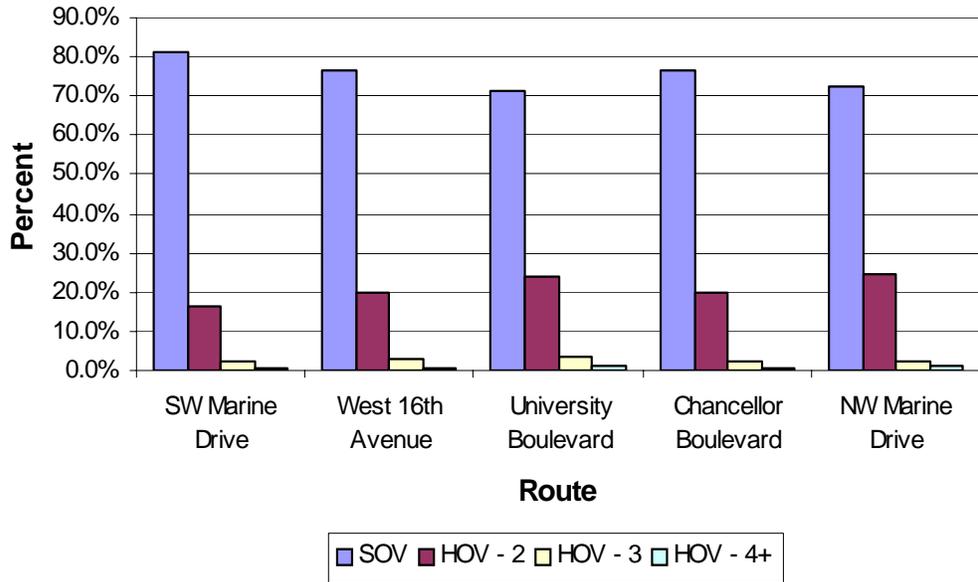
**Table 7: UBC Vehicle Occupancy Compared with the Region**

	UBC	Vancouver/UEL	GVRD
AM Peak Period Occupancy	1.23	1.28	1.3
PM Peak Period Occupancy	1.31	1.30	1.31

\*Source: UBC Data Collection Program and TransLink Strategic Planning Department

**Figure 5** shows vehicle occupancy (averaged over an 8-hour daytime period) calculated for each of the five routes leading in to the University.

**Figure 5: Vehicle Occupancy by Route  
(8hr period, Fall 2000)**



It is important to note from the above figure that a high proportion of the commuting vehicle traffic along SW Marine Drive is comprised of single occupant vehicles. SOV travel accounts for 81% of commuting traffic along this route, as compared to an average 74% SOV split among the remaining four routes.

Although 81% of the commuting vehicle traffic along SW Marine Drive is comprised of SOVs, it is also interesting to note the trends if vehicle occupancy by route is considered as a proportion of all single and multi-occupant travel. Approximately 41% of all SOV traffic to and from the University travels along SW Marine Drive. This is the highest percentage of any route and is shown in **Table 8**, below.

**Table 8: Vehicle Occupancy by Route as a Proportion of Total  
(8hr period, Fall 2000)**

	Fall 2000 - Both Directions			
	SOV	HOV - 2	HOV - 3	HOV - 4+
SW Marine Drive	40.8%	32.4%	31.1%	33.2%
West 16th Avenue	21.1%	21.8%	22.8%	18.8%
University Boulevard	18.9%	25.3%	27.6%	32.3%
Chancellor Boulevard	16.9%	17.6%	16.6%	13.1%
NW Marine Drive	2.2%	2.9%	1.9%	2.6%
	100.0%	100.0%	100.0%	100.0%

### 3.3 Travel Patterns on Campus

On-campus counts were added to the annual count program in order to investigate how people were travelling around the University campus. This section will illustrate which routes on, and surrounding, campus experience the most traffic during the AM and PM peak hours.

#### Campus Travel Patterns

Figure 6, shows average traffic volumes along major routes on campus and leading to the campus. These volumes are representative of the AM peak period and PM peak period combined.

Figure 6: Traffic Volumes by Route at UBC



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## ***Shortcutting Across Campus***

It should be recognised that there are large residential areas surrounding the campus and on the University Endowment Lands and many of these commuters choose routes through the campus to avoid potential congestion in the City of Vancouver. In the fall of 2000, a vehicle license plate survey was conducted in order to determine what proportion of daily traffic to and from UBC can be attributed to commuters 'short-cutting' through the campus.

This survey concluded that approximately 25% of PM peak period northbound traffic along SW Marine Drive is through traffic not destined to UBC. It is estimated from this result that approximately 2,500 vehicles per day (plus or minus 500 vehicles) are short-cutting through the campus. This accounts for approximately 4% of all vehicle trips at UBC.

## 4. Trends

This section identifies key trends in travel patterns at UBC from 1997 to 2000.

### 4.1 SOV Travel

Although the number of SOV trips increased by approximately 3,300 trips from 1997 to 1998, it has continued to decrease each year since then. The following table shows how the number of SOV trips made during a 24hr period has varied by year.

*Table 9: SOV Person Trips By Year  
(24hr period, 1997 – 2000)*

	1997	1998	1999	2000
Total Number of SOV Trips	46,000	49,300	47,800	47,200
Change				+3%

Key observations regarding the data in **Table 9** include:

- In terms of the total number of person trips made to and from UBC by SOV in a 24hr period, the number of trips has increased, from approximately 46,000 trips to 47,200 trips. This reflects an increase of 3% since 1997.
- Fluctuations among years in this data may be due, in part or in whole, to the inherent fluctuations present in the data.
- Given the relatively small growth noted since 1997, all of the increase in SOV trips from 1997 to 2000 can be attributed to growth at UBC. As discussed in Section 3, the population at UBC grew by 6% from 1997 to 2000, which exceeds the 3% increase in SOV trips during that time.
- When the data are considered on a trip rate basis, it should be noted that there has been a small decrease in the number of SOV trips made per 10,000 people at UBC – from 10,885 trips per 10,000 people in 1997 to 10,550 trips per 10,000 people in 2000. This represents a small decrease of 3%.

These results are less than the 5% to 10% variability which can be expected in the observed data, and consequently it can be concluded that

there have been no significant changes in the number of SOV trips since 1997.

**Table 10** provides a comparison of benchmark modal shares with modal shares during the first week of the transit strike in April, 2001.

*Table 10: Comparison of 1997 Vs. 2001 Transit Strike Data  
(24hr period)*

	2000		2001	
	Number of Trips by Mode	Mode Split	Number of Trips by Mode	Mode Split
SOV	47,200	44.2%	45,300	41.7%
HOV	29,600	27.7%	54,800	50.4%
Transit	24,350	22.7%	0	0%
Bicycle	3,200	3.0%	4,850	4.5%
Pedestrian	1,565	1.5%	2,550	2.3%
Other	900	0.8%	1,125	1.0%
Total	106,815	100%	108,625	100%

The data in Table 10 indicate that during the first week of the strike, commuters who had previously used transit shifted to HOV's cycling and walking, with no shift to SOV's. Key observations from the data presented in Table 10 include:

- SOV travel actually decreased by 4% during this time period, from approximately 47,200 person trips in the fall of 2000 to 45,300 person trips in spring of 2001
- During the first week of the strike, HOV travel increased by 85%, from 29,600 person trips in 2000 to 54,800 trips in April 2001
- The number of trips made to and from the University by bicycle increased by 52%, from 3,200 trips to 4,850 trips
- Pedestrian travel also increased significantly, from 1,565 person trips daily in 2000 to 2,550 person trips daily in April 2001, an increase of 63%

These results indicate that with a significant enough incentive (in this case, a transit strike) it is possible to shift commuters from SOV travel to other modes. At UBC, the most significant incentive for commuters to switch from SOV to other modes would be the introduction of the proposed U-TREK Card program, which would offer positive incentives for commuters to switch from SOV's to other modes.

## 4.2 HOV Travel

HOV travel to the University is comprised of carpools and vanpools with two to eight persons. Currently, HOV travel makes up approximately 28% of all trips made to and from UBC each day. **Table 11** shows how the number of HOV trips has varied by year and by type of carpool.

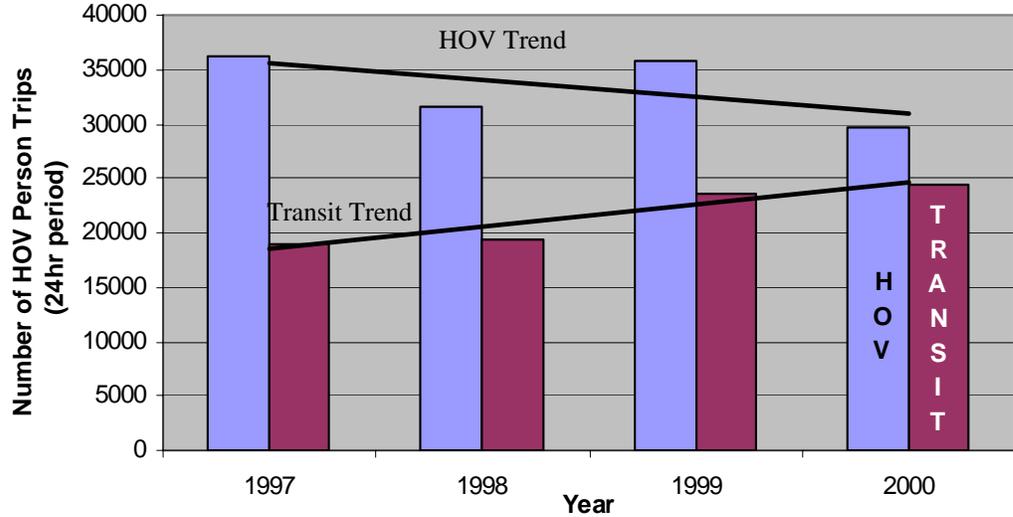
*Table 11: HOV Trips by Year (24hr period)*

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
2 person	28,000	24,700	27,600	23,500
3 person	5,700	4,500	4,800	4,300
4+ person	2,500	2,400	3,300	1,800
Total	36,200	31,600	35,700	29,600
Percent Mode Share	34%	30%	32%	28%
Change	- 18%			

These data show that the number of trips being made to and from UBC by HOVs has decreased by approximately 6,600 trips over four years. This reflects a decrease of 18% in the total number of person trips made by HOV, and a 23% decrease in the number of HOV trips per 10,000 people at UBC.

**Figure 5** illustrates how, despite the fluctuations from year to year, HOV travel has steadily declined. The corresponding increase in transit trips is also indicated in Figure 5.

**Figure 5: Changes in HOV and Transit Travel at UBC  
(24hr period, 1997 – 2000)**



The decrease in HOV travel and the corresponding increase in transit suggests that there has been a shift from HOV to transit since 1997. People who travel by HOV are more likely to switch to transit than SOV drivers, and therefore many of the increased transit trips are attributed to previous HOV passengers.

### 4.3 Transit

Travel by transit has increased each year since 1997. Currently 23% of all trips made to UBC — approximately 24,400 trips — are made by transit. This reflects an increase in ridership of approximately 28%, and an increase of 21% in the number of transit trips per 10,000 people at UBC. The following table illustrates the increase in person trips over the last four years.

**Table 14: Number of Daily Trips Made by Transit  
(24hr period)**

	1997	1998	1999	2000
Number of Daily Trips Made by Transit	19,000	19,400	23,700	24,400
Change	+28%			

It should be noted that during the same time that the number of transit trips increased by 28% , TransLink increased service to UBC by 30%. This would indicate that the increase in transit trips is driven by the amount of service available. Despite this increase however, pass-ups of waiting passengers still occur on some routes, which suggests that there is still significant latent demand for transit travel to UBC. It is estimated that as much as 25% more service to UBC would be required to meet this latent demand

## 4.4 Bicycles

The number of trips made to UBC by bicycle has also increased steadily since 1997. Currently 3,200 trips are made daily by bicycle as compared to the 2,700 trips reported in 1997. This represents an increase of 19% in the total number of person trips made by bicycle, as shown in **Table 15**,

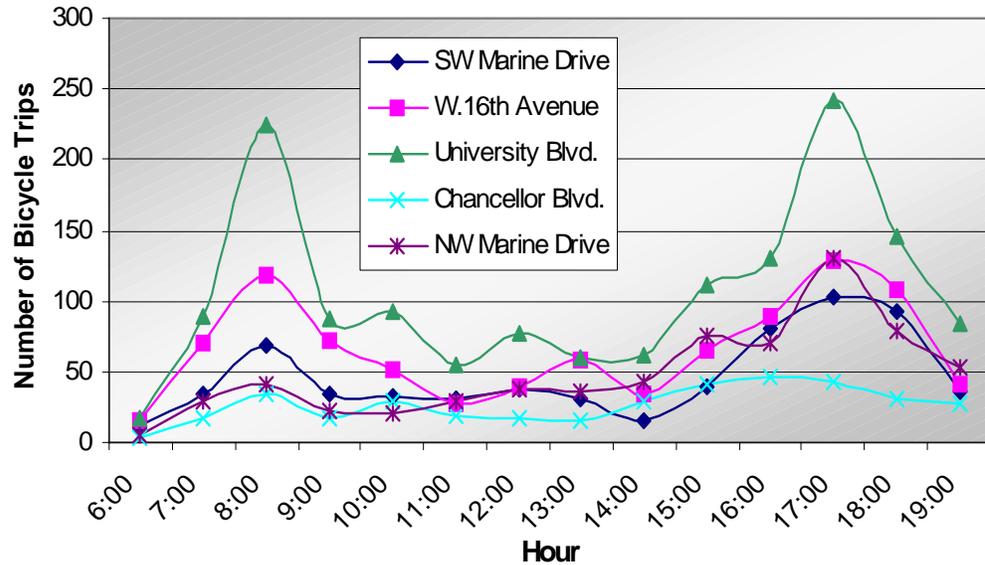
*Table 15: Person Trips by Bicycle at UBC  
(24hr period, 1997 Vs. 2000)*

	1997		2000	
	Number of Person Trips	% Mode Share	Number of Person Trips	% Mode Share
Number of Trips Made Daily by Bicycle Mode	2,700	2.5%	3,200	3.0%
Change	+19%			

This increase also represents an increase of 12% per 10,000 people at UBC. Based on recent campus-wide travel surveys, it is estimated that approximately 30% of UBC students use their bicycle daily, suggesting that there is the potential to increase the mode share even further.

**Figure 7** illustrates how the number of bicycle trips made in a 24hr period varies by route, giving an indication of which routes are preferred by cyclists.

Figure 7: Number of Bicycle Trips by Route  
(hourly data, Fall 2000)



The most notable trend is the high number of bicycle trips made along University Boulevard. In 1999 this route was converted from two narrow lanes in each direction, to one general purpose lane and one designated bicycle lane in each direction. **Table 16** shows the change in number of bicycle trips along this route since 1997.

Table 16: Bicycle Trips Along University Blvd.  
(Daytime period, 1997 - 2000)

Year	Total Person Trips on University Blvd.	Bicycle Trips	Cumulative Growth	% of Total Trips
1997	17,200	745	-	4%
1998	15,020	1,070	44%	7%
1999*	13,490	1,020	37%	8%
2000	15,190	1,100	48%	7%

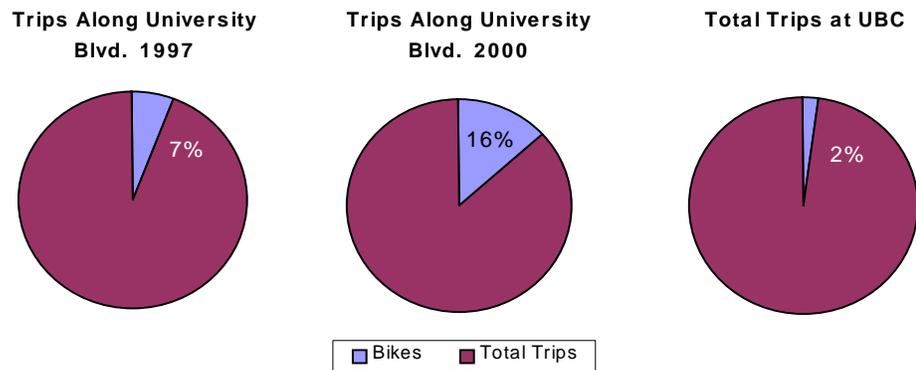
- Bicycle lanes opened in September of 1999, counts taken in October 1999
- Note: total trips on University Blvd. excludes person trips by transit

The above table shows the number of trips counted during daytime hours. It should be noted that the number of bicycle trips made along

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University Boulevard has increased by 8% since the lanes were opened. This reflects a 50% increase in trips made by bicycle along University Boulevard since 1997.

It should also be noted that 7% of all trips along University Boulevard are now made by bicycle as opposed to only 4% in 1997. The bicycle mode share on this route alone is more than five times greater than the percent bicycle mode share on all routes to and from the University.



## 4.5 Pedestrians

Pedestrian travel has increased since 1997, as shown in **Table 17**, below.

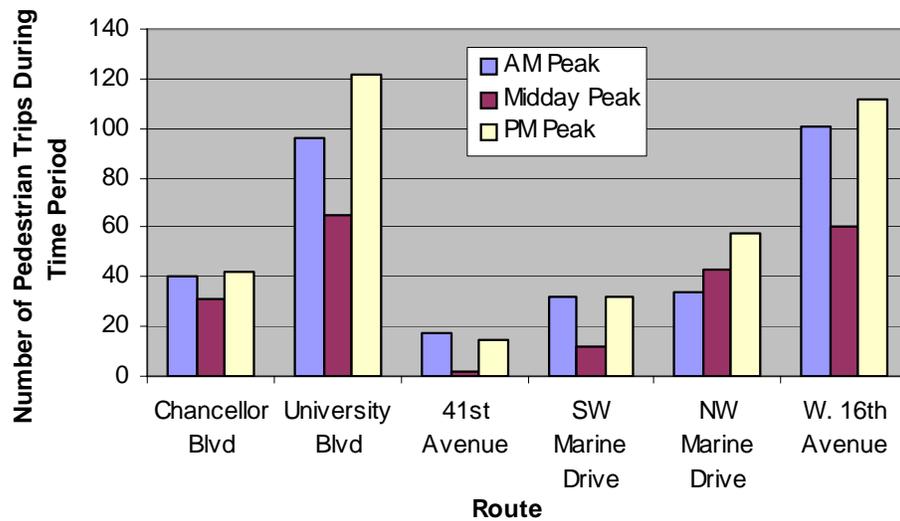
*Table 17: Number of Pedestrian Trips Made Daily (24hr period, fall data)*

	1997		2000	
	Number of Person Trips	% Mode Share	Number of Person Trips	% Mode Share
Number of Trips Made Daily by Pedestrian Mode	1,400	1.3%	1,565	1.5%
Change	+12%			

Increases in numbers of pedestrian trips from year to year were relatively small between fall 1997 and fall 2000. This is to be expected as the pedestrian mode relies heavily on the proximity of the commuter and their destination. In the case of UBC, pedestrian commuters would typically only be expected from within the University Endowment Lands, and no farther than the Vancouver City limits. Since there has

been no significant increase in the population of this area since 1997, it is expected that little increase will be seen in the pedestrian mode as well.

**Figure 8: Number of Pedestrian Trips by Route To UBC (peak periods)**



**Figure 8** indicates that the highest pedestrian volumes are experienced on University Boulevard and W. 16<sup>th</sup> Avenue, indicating that these routes are preferred by pedestrians. This is likely due to the following factors:

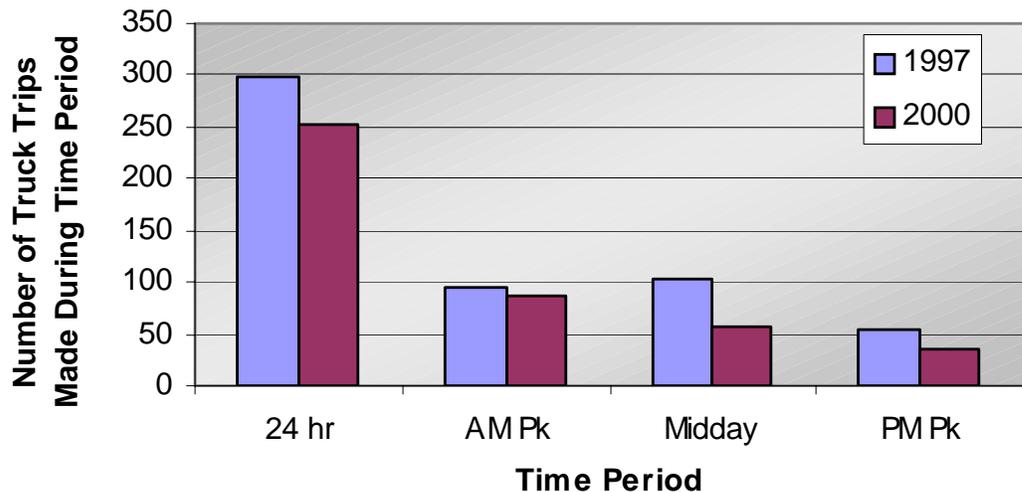
- Most pedestrians are expected to be originating from within the University Endowment Lands and no further than the Vancouver City Limits, with most of this area being located east of the campus. W. 16<sup>th</sup> Avenue and University Boulevard are both east-west serving routes.
- Up to 200 cars may be parked on W. 16<sup>th</sup> Avenue on a typical weekday. Although some of these cars have been parked there by persons using Pacific Spirit Park, the majority are parked by persons travelling to UBC, who wish to avoid paying for parking on campus. Some of the pedestrians observed along W. 16<sup>th</sup> Avenue are walking to campus after parking their vehicles.

## 4.6 Heavy Trucks

The number of daily trips made to and from the University by heavy truck has decreased since 1997 (As defined in the City of Vancouver Truck By-law, a heavy truck is one that has a gross vehicle weight (GVW) or more than 4,500 kg, and has three or more axles.). The benchmark data reported that 316 heavy truck trips were made in a 24hr period each day, comprising approximately 0.3% of all trips made daily. Year 2000 data shows that this number has decreased by roughly 50 trips to 252, reflecting a 20% drop in the number of trips made to the University by heavy truck. It should be noted that in addition to these truck trips, there are approximately equal numbers of trips made by light trucks (cube vans, courier vans etc.).

**Figure 9** shows how the number of heavy truck trips has decreased by time period throughout the day.

*Figure 9: Number of Daily Trips Made by Truck*



It should be noted that although the number of trips has decreased by 20% averaged over the whole day, truck trips have actually decreased by an average of 30% during peak AM, Midday and PM periods. The greatest decrease being during the midday peak period, where the number of trips has dropped by nearly half.

The reported decreases in heavy truck travel may be due to the following factors:

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- the TREK Program's efforts to promote consolidation of heavy deliveries
- the varying amount of construction activity on campus

The following table, **Table 18**, presents the proportions of heavy truck trips made daily, by route to and from the University in 2000. As shown, the route that reports the highest number of heavy trips is SW Marine Drive.

*Table 18: Daily Heavy Truck Trips at UBC  
(24hr period, Year 2000)*

<b>Route</b>	<b>2000</b>
Chancellor	9%
University Blvd.	2%
41 <sup>st</sup> Avenue	13%
W. 16 <sup>th</sup> Avenue	5%
SW Marine Drive	67%
NW Marine Drive	4%
	100%

## 5. Appendix

1. Technical Memo A – UBC Transportation Data Collection Comparison
2. Technical Memo B – Calculations and Assumptions

# UBC Transportation Data Collection Comparison

## *Fall 2000 (Transit) vs. Spring 2001 (No Transit)*

April 2001

Urban Systems Ltd.

This report summarises the results of recent transportation data collection activities undertaken at the University of British Columbia, on behalf of the UBC Trek Program Centre. In addition to the annual comprehensive data collection effort undertaken each fall by the Trek Program Centre (October/November 2000 for the most recent effort), a second data collection exercise was completed during the first week of April 2001 to determine the effects of the current transit strike on travel patterns at UBC.

The results of the comparison indicate that the transit strike did not result in an increase in single occupant vehicle (SOV) trips to and from UBC. In fact, SOV numbers actually decreased. Trips that were previously made on transit shifted to carpooling, cycling and walking. Although vehicle traffic to and from UBC increased (5,000 additional vehicles per day in each direction), all of this increase in vehicle traffic is the result of increased carpooling.

### *Methodology*

As with previous comprehensive data collection efforts, transportation activity was surveyed via both manual and automatic means for both the Fall 2000 and Spring 2001 exercises.

- **24-hour automatic vehicle counts** – Collected via automatic tube counters from TransTech Data Services Ltd. The counts were collected at 15-minute intervals and summarised for various peak hours and periods throughout a typical day.
- **Manual occupancy counts** – Collected via manual count personnel from TransTech Data Services and/or student traffic counters. Occupancy classifications included 1, 2, 3 and 4 or more persons per vehicle.
- **Manual vehicle classification counts** – Collected via manual count personnel from TransTech Data Services and/or student traffic counters. Passenger cars, trucks, bicycles, pedestrians, motorcycles and buses are identified by counters.

It is important to note that bus passenger counts – which are typically undertaken each fall – have not been included in this summary, as the April 2001 data collection effort did not include any bus passenger data, due to the transit strike.

Counts were undertaken along all of the five access routes to and from UBC at specific cordon locations at the border of UBC and the University Endowment Lands. These routes include:

- SW Marine Drive
- West 16<sup>th</sup> Avenue
- University Boulevard
- Chancellor Boulevard
- NW Marine Drive

### *Results*

The results discussed below illustrate the impacts of having no public transit service to or from UBC. Fall 2000 trip data (when transit services were operating) are compared directly with April 2001 trip data (when the transit strike was in effect), with key travel pattern changes identified in the discussion.

#### *A. Total Person Trips*

- For the past four years (1997 to 2000), the total number of person trips to and from UBC on a typical weekday has ranged between 106,000 to 112,000 trips. During the first week of April 2001, a total of 108,500 trips were made in one weekday. This results indicates that no significant number of trip makers were deterred from travelling to or from UBC, despite the transit strike.
- No significant differences in numbers of person trips to and from UBC were observed for specific time periods throughout the day.

#### *B. Total Vehicle Trips*

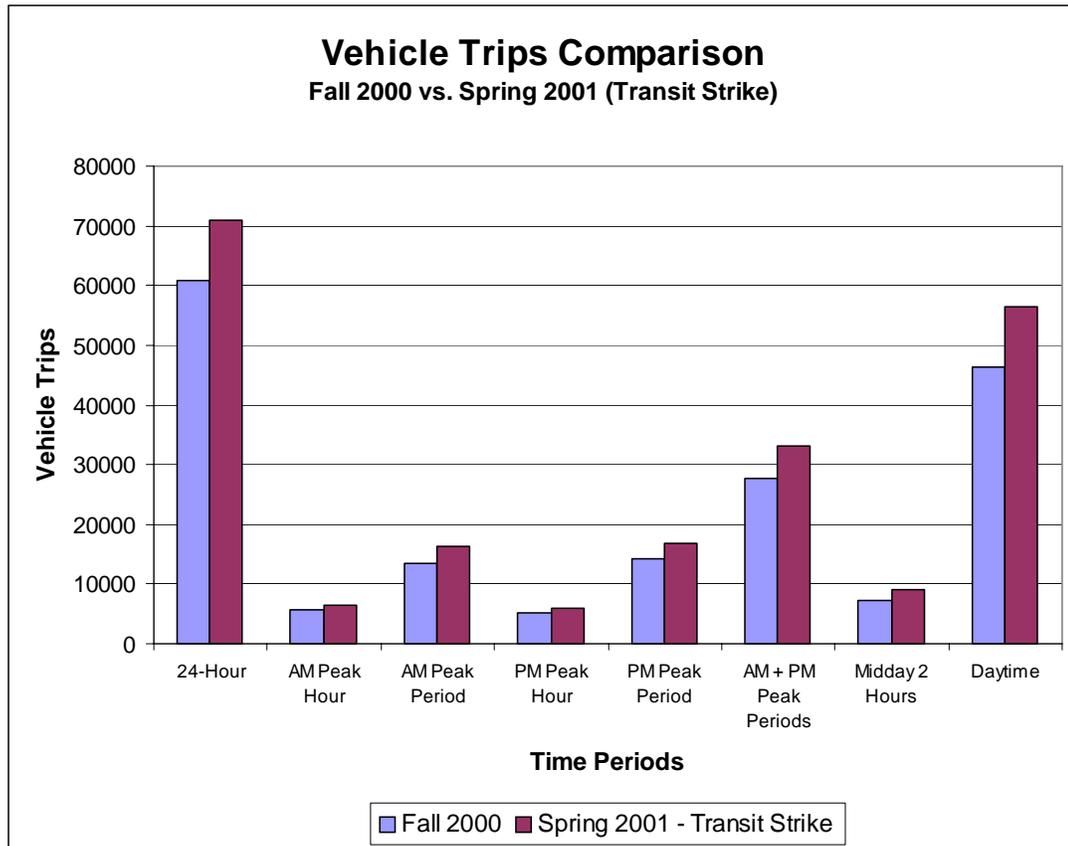
- Vehicle volumes, summarised in **Table 1**, indicate that approximately 10,000 more vehicles travelled to UBC on a typical weekday during the first week of April 2001, as compared with fall 2000. This increased vehicle volume occurred in relatively equal proportions during all time periods of the day.

*Table 1: Total Vehicle Volumes (both directions) – Fall 2000 vs. April 2001*

Vehicle Trips	Fall 2000	April 2001 – Transit Strike
---------------	-----------	-----------------------------

24-Hour	60896	70901
AM Peak Hour	5583	6491
AM Peak Period	13364	16379
PM Peak Hour	5065	5986
PM Peak Period	14287	16706
AM + PM Peak Periods	27651	33085
Midday 2 Hours	7351	9056
Daytime	46374	56399

Figure 1 – Comparison of Vehicle Trips to and from UBC



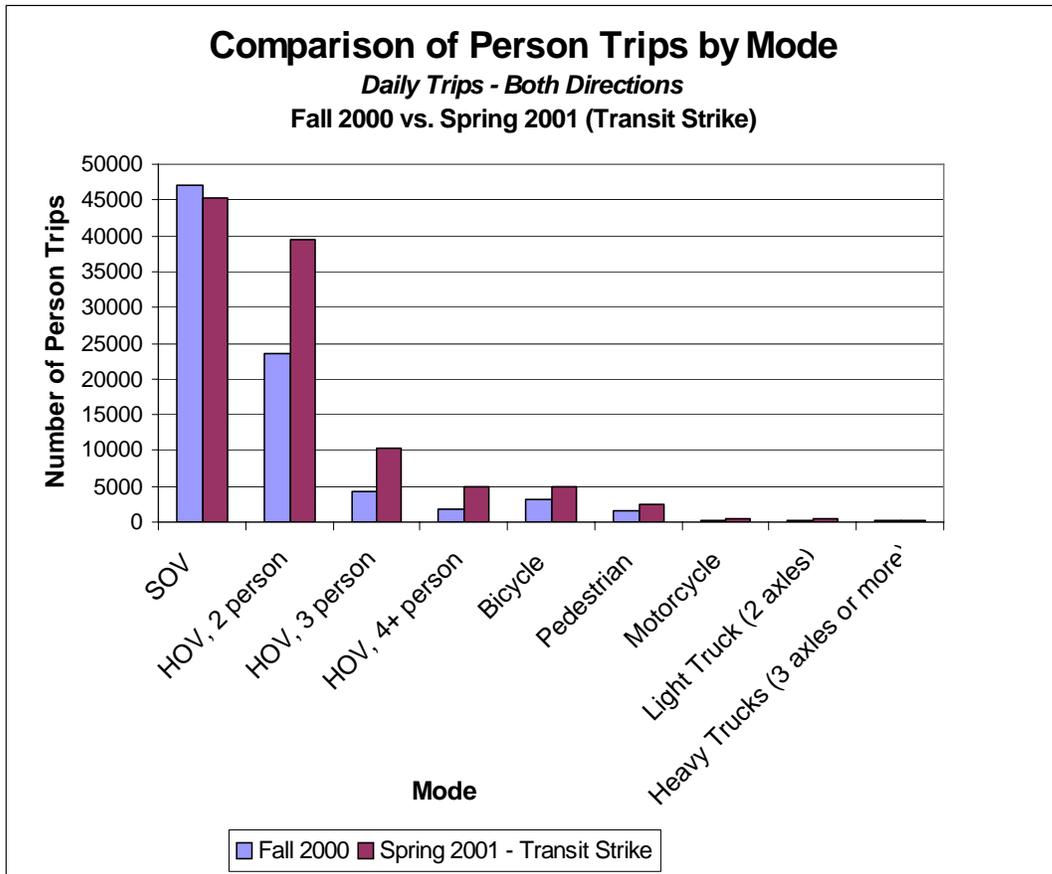
*C. Trips by Mode*

- There was no significant increase in single-occupant vehicle travel to UBC during the transit strike. In fact, SOV use declined slightly — approximately 1,860 fewer SOV’s were used for travel to and from UBC during the transit strike, as summarized in **Table 2**.
- The increased vehicle volumes to UBC during the transit strike were entirely multiple-occupant vehicles. During the first week of April 2001, an additional 16,000 persons travelled via two-person carpools, 6,000 more people travelled via three-person carpools, and 3,000 more people travelled in carpools and vanpools with four or more passengers.
- An additional 2,600 persons either cycled, walked or in-line skated to and from UBC during the first week of April 2001, as compared with fall 2000.
- Motorcycle use also increased during the transit strike, with an additional 160 persons travelling by motorcycle, scooter or moped.

*Table 2 – Comparison of Daily Person Trips by Mode (both directions)  
Fall 2000 vs. April 2001*

<b>Mode</b>	<b>Fall 2000</b>	<b>April 2001 Transit Strike</b>
SOV	47165	45308
HOV, 2 person	23478	39494
HOV, 3 person	4304	10382
HOV, 4+ person	1822	4878
Bicycle	3198	4843
Pedestrian	1565	2528
Motorcycle	283	448
Light Truck (2 axles)	331	469
Heavy Trucks (3 axles or more)	254	209

Figure 2 – Comparison of Daily Person Trips by Mode (both directions)



# Calculations and Assumptions

## 1997 and 1998 UBC Transportation Data

Traffic counts are undertaken using two methods — with automatic counters (machines) and with observers (people). In general, traffic volume data are collected with automatic counters, over a minimum continuous period of seven days (168 hours). Other data — such as vehicle classification, vehicle occupancy, transit ridership and numbers of bicycles and pedestrians — can only be reliably collected using observers.

Because traffic counts using observers cost considerably more than counts using automatic counters, all transportation agencies in the region undertake counts using observers for a limited number of hours, and use automatic traffic count data to expand these data and develop estimates for 24-hour, daily, weekly and annual time periods. This is an accepted approach which is considered to provide reliable data for planning and decision-making purposes. This same approach has been used for UBC's data collection program, which meets or exceeds the extent of data collection efforts undertaken by other transportation agencies. Summarized below are the key assumptions and calculations made to estimate total person trips by mode and time period at UBC, as documented in Tables B-3 and B-4 in the Appendices.

### **Traffic Volumes**

Actual traffic volumes were collected for 24-hour periods over 7-days using automatic counting equipment from TransTech Data Services Ltd. (hose counters), the Ministry of Transportation and Highways (in-pavement loop counters) and the City of Vancouver (hose counters). Estimates for traffic volumes were only required for the 1997 UBC screenline, since no counting equipment was placed at this screenline at this time. The 1997 UBC screenline volumes were calculated as follows:

$$1997 \text{ UBC vols.} = 1997 \text{ Vancouver vols.} * (1998 \text{ UBC vols.} / 1998 \text{ Vancouver vols.})$$

The traffic volume data plays a significant role in estimating 24-hour person trips by mode, with the exception of transit ridership data, because only peak period data was collected for individual modes.

### **Person Trips by Individual Modes**

Person trip data for individual modes (i.e. SOV, HOV, bicycle pedestrian, motorcycle and truck) was manually collected for only the peak periods of the day as follows:

- AM Peak Period – 7:00am to 10:00am
- Midday Peak Period – 11:30am to 1:30pm

- PM Peak Period – 3:00pm to 6:00pm

The cost of undertaking these counts also limited manual data collection to only one screenline per year. For example, in 1997 these manual counts were undertaken at the Vancouver screenline. In 1998, however, the counts were undertaken at the UBC screenline to more accurately monitor travel to and from the UBC campus. Thus, the number of person trips for the 1997 UBC screenline and the 1998 Vancouver screenline had to be estimated in order to provide a full picture for both screenlines in 1997 and 1998.

For both the 1997 UBC screenline and the 1998 Vancouver screenline data, volumes were calculated using ratios derived from automatic traffic volumes. For example, the 1998 Vancouver screenline data for Single Occupant Vehicles (SOVs) was calculated as follows:

$$1998 \text{ Vancouver (SOVs)} = 1998 \text{ UBC (SOVs)} * (1998 \text{ Vancouver vols./}1998 \text{ UBC vols.)}$$

Similarly, 1997 UBC screenline data by mode was calculated by comparing 1997 UBC screenline traffic volumes with 1997 Vancouver screenline traffic volumes. However, a greater degree of estimation was used in this case because 1997 UBC screenline traffic volumes were originally derived by estimation. It is also important to note that some direction totals for individual modes were factored up to achieved a balance between inbound and outbound totals. The imbalance in directional totals, particularly for trucks and HOVs, is likely the result of surveying inbound and outbound traffic on different days.

For person trips by transit, automatic traffic volumes were not used to calculate estimates. Similar to all other mode data, transit data was collected manually by BC Transit employees at the Vancouver screenline in 1997 and the UBC screenline in 1998. However, transit load data was collected for 18-hour periods, rather than only peak periods, between 6:00am and 12 midnight. In order to determine person trips by transit for the screenlines that were not manually surveyed, a degree of estimation was required.

For the 1997 UBC screenline, it was estimated that only 5% of transit trips (1,000 trips) made to and from UBC and the University Endowment Lands (UEL) were actually UEL based transit trips. Thus, it was assumed that 19,000 transit trips were UBC based. Directional trip values were calculated using the proportions obtained from the manually collected 1997 Vancouver screenline transit load counts. Using the newly calculated 1997 UBC screenline load data, 1998 Vancouver screenline transit loads were estimated as follows:

$$1998 \text{ Vancouver loads} = 1998 \text{ UBC loads} * (1997 \text{ Vancouver loads/}1998 \text{ UBC loads})$$

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With the exception of transit trips, all 24-hour person trip estimates by mode were calculated for all screenlines as follows:

$$24\text{-hr. SOV} = \text{AM+PM Peak Period SOV} * (24\text{-hr. Traffic Volume} / \text{AM+PM Peak Period Traffic Volume})$$

### ***Total Person Trips – Modes Combined***

Total person trips for both screenlines and both years were calculated in the same manner. For all of the time periods – with the exception of the 24-hour period and the daytime period – total trips were calculated by adding up person trips for individual modes by time period. For motorcycle and truck trips, only one person per vehicle was assumed.

Total trips for the daytime period (7:00am to 6:00pm) were estimated as follows:

- It was assumed that the 6-hours of non-peak period traffic between the AM and PM peak periods (10:00am and 3:00pm) comprises two-thirds of the total non-peak period traffic.
- To calculate total non-peak period traffic (18 hours), total peak period traffic (AM+PM peak periods) was subtracted from 24-hour traffic.
- Two-thirds of total non-peak period traffic was then added to total peak period traffic to yield a value for the daytime period between 7:00am and 6:00pm.

For 24-hour trip totals for both screenlines in both years, 24-hour person trip totals for individual modes were added together.