

Zenith Model Recalibration and  
Validation Version 3.0.0

# Review of VISTA

February 2014

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## Zenith Model Recalibration and Validation Version 3.0.0

### Review of VISTA

### Draft Report

Project No. ZML-VIC-Year4

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## Executive Summary

The Zenith Model of Victoria is one of a family of models developed by Veitch Lister Consulting (VLC) for transport planning in Australian cities and regions. This document is one in a series of working papers that collectively describe the calibration and validation of the Zenith Model of Victoria.

The Zenith Model of Victoria has been developed using household travel surveys collected by the Victorian State Government between 2007 and 2010. These household travel surveys – referred to as the *Victorian Integrated Survey of Travel and Activity (VISTA)* – are a fundamental input to the behavioural models underpinning Zenith, and therefore it is important to understand how the results of VISTA survey compare with other surveys of travel in Victoria, and to identify any limitations or biases which might be present in the survey.

VLC has performed such a comparison by expanding the VISTA survey to population control totals, adding to it the Zenith model's estimates of commercial vehicle and visitor traffic volumes, and then comparing the resulting travel demands with:

- VicRoads 2011 screenline traffic counts and other traffic counts for 2011;
- PTV estimates of train station entries for 2010/11; and
- PTV estimates of tram boardings for 2011.

In respect of traffic volumes, it was found that:

- Across the entire day, the *VISTA+ZenithCV&Visitor* traffic volumes were lower than counted traffic volumes by approximately 10%;
- Differences between the *VISTA+ZenithCV&Visitor* traffic volumes and counted traffic volumes were highly temporal, with the *VISTA+ZenithCV&Visitor* traffic volumes higher than counted traffic volumes in the peak (by approximately 12% in the AM peak (7-9am) and 6% in the PM peak (4-6pm)), but lower in the off peak (by approximately 16% in the interpeak (9am-4pm) and 27% in the off peak (6pm to 7am));
- Differences between *VISTA+ZenithCV&Visitor* traffic volumes and counted traffic volumes were not highly spatial, with the above temporal patterns applying consistently over a wide range of screenlines and traffic count locations;

In respect of public transport patronage it was found that:

- VISTA train station entries were lower than PTV's estimated train station entries by approximately 8-9% in the AM and PM peaks, and by 23% in the off peak (6pm to 7am);
- VISTA rail patronage at the CBD cordon in the AM peak was 7% higher than estimated by PTV; and
- VISTA tram patronage was lower than PTV's estimated tram patronage by approximately 22-27% in the peaks and by approximately 45% in the off peak (6pm to 7am).



In both traffic and public transport, the differences between VISTA and independent measures of travel appear to be highly temporal, with large differences observed during the off peak periods.

There are a number of possible explanations for the above differences:

- **Travel which is outside the sample frame of VISTA** – VISTA is limited to surveying Victorian residents living in private dwellings, and therefore excludes all travel made by visitors to Victoria (i.e. overseas / interstate visitors). VISTA also does not record travel made by professional drivers (taxis, couriers, etc.), as well as travel made by commercial vehicles. VISTA also does not include public transport vehicles (i.e. buses), which would be counted as part of road traffic counts. As part of this analysis, an effort has been made to mitigate this difference by adding the Zenith model's estimates of commercial vehicle and visitor traffic to the VISTA traffic volumes. However, no such adjustment has yet been made to the VISTA public transport volumes;
- **Sample bias** – VISTA has a response rate of approximately 47%. Therefore, it is possible that the VISTA sample is biased in ways which contribute the differences noted above. For example, one hypothesis is that the VISTA survey “oversamples” workers who commute in the peak periods, and conversely “undersamples” workers who commute during the off peak. This would explain why the *VISTA+ZenithCV&Visitor* traffic volumes exceed counted traffic volumes during the peak periods, but are lower during the off peak; and
- **Erroneous reporting** – respondents to the VISTA survey may not correctly fill out the survey form. For example, respondents might forget or deliberately omit some trips, either by accident or in order to reduce the effort involved in completing the survey. Where the survey form has been filled out “*by proxy*” the proxy may not have full knowledge of the trips made by their housemate.

It is beyond the scope of this report to conclusively identify which of the above causes are responsible for the differences observed in this report. It is, however, the author's view that further research in this area is both necessary and important.

Finally, the results of the VISTA07 and VISTA09 survey were compared to each other. It was found that the results of the two surveys are highly consistent in terms of overall trip rate, trip rate by time of day, trip rate by trip purpose and trip rate by mode.

However, it was observed that the average trip length reduced between VISTA07 and VISTA09 by approximately 1km (or ~10%). No explanation has yet emerged for this reduction in trip length, and the authors suggest that further research in this area would be valuable. It will be interesting to see whether the trend continues in the next edition of the VISTA survey.



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# 1 Introduction

## 1.1 Background

The Zenith Model of Victoria is one of a family of models developed by Veitch Lister Consulting (VLC) for transport planning in Australian cities and regions. This document is one in a series of working papers that collectively describe the calibration and validation of the Zenith Model of Victoria.

The Zenith Model of Victoria has been developed using household travel surveys collected by the Victorian State Government between 2007 and 2010. These household travel surveys – referred to as the *Victorian Integrated Survey of Travel and Activity* (VISTA) – are a fundamental input to the behavioural models underpinning Zenith, and therefore it is important to understand how the results of VISTA survey compare with other surveys of travel in Victoria, and to identify any limitations or biases which might be present in the survey.

This working paper will review the results of the VISTA survey in comparison to a number of independent data sources, including:

- VicRoads Traffic Counts;
- PTV estimates of train station entries; and
- PTV estimates of tram boardings.

This working paper will also provide some analysis comparing the results of the VISTA09 survey with the previous VISTA07 survey.

## 1.2 Report Structure

The balance of this report is structured as follows:

**Section 2:** provides an overview of the VISTA survey and its methodology;

**Section 3:** compares the results of the VISTA survey to a series of independent data sources, including VicRoads traffic counts and PTV estimates of public transport patronage; and

**Section 4:** compares the results of the VISTA07 and VISTA09 surveys.



## 2 VISTA Survey Overview

### 2.1 Overview

The VISTA survey began in June 2007. The first edition of the survey (VISTA07) was collected between June 2007 and June 2008, with a sample of 17,115 Victorian households completing the survey. The second edition of the survey (VISTA09) was collected between July 2009 and July 2010 with a similar sample of 16,269 households. The current VISTA survey programme began in July 2012 and is not currently available for transport modelling purposes. Therefore VISTA07 and VISTA09 represent the latest Victorian household travel surveys.

In combination, the two editions of the VISTA survey provide a total sample of 33,384 households, which for the purposes of developing travel models is an acceptable sample size.

In this document, the term “VISTA” is used to refer to the “*pooled*” survey data set, consisting of both VISTA07 and VISTA09.

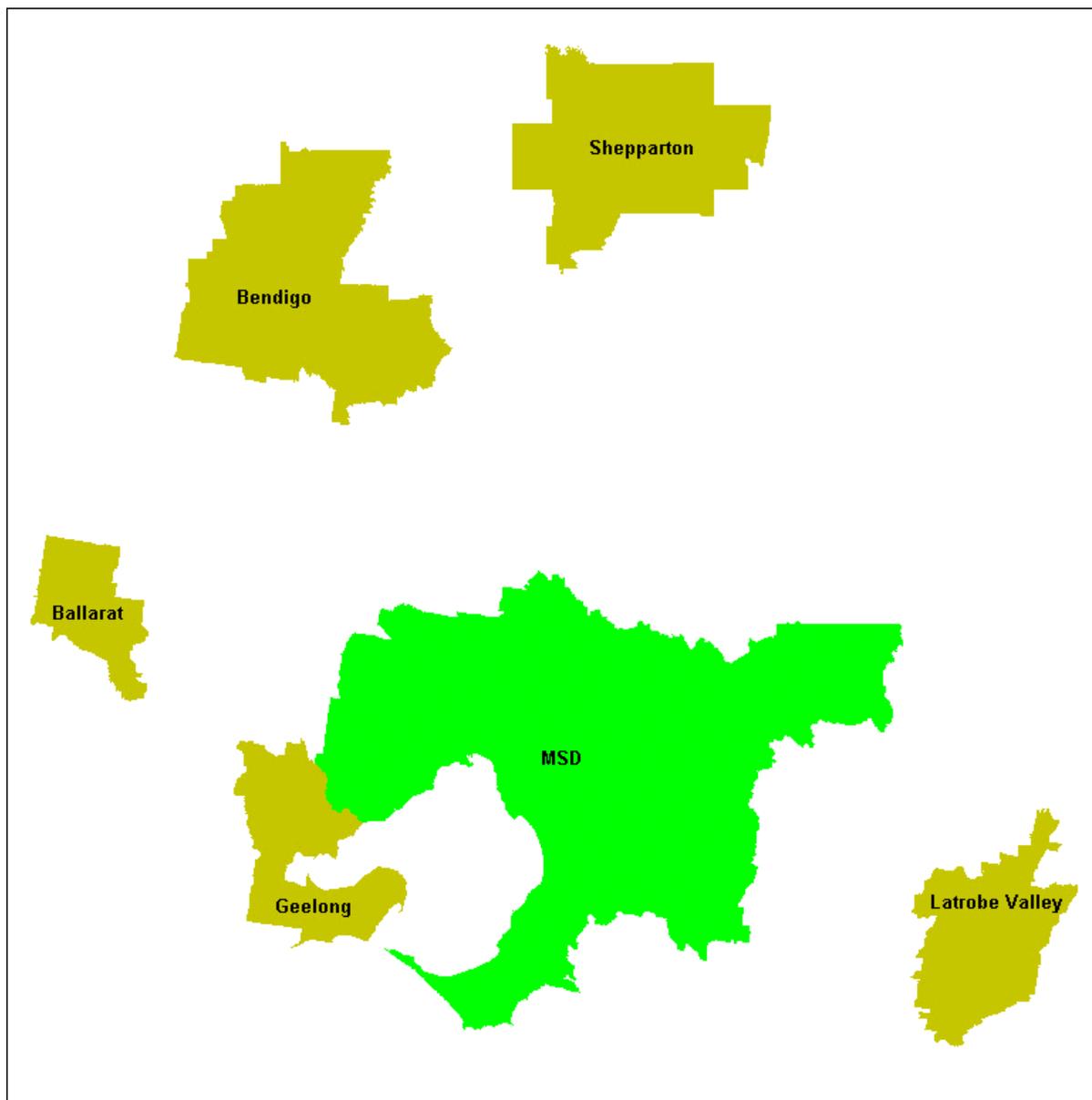
Both editions of the VISTA survey were collected by The Urban Transport Institute (TUTI) on behalf of the Victorian Department of Transport. The methods and procedures used to collect the VISTA survey are documented in the following documents:

- “*VISTA07 Survey Procedures and Documentation v1.3*” (TUTI, 2009); and
- “*VISTA07 Survey Procedures and Documentation v1.0*” (TUTI, 2011);

Based upon these reports, a brief summary of the VISTA survey methodology is now provided.

### 2.2 Methodology

The VISTA survey was conducted in the regions shown in Figure 1 below, consisting of Melbourne, Geelong, Ballarat, Bendigo, Shepparton and the Latrobe Valley.



**Figure 1 - VISTA Study Areas**

*Source: Figure 2.1, VISTA07 Survey Procedures and Documentation v1.3 (TUTI, 2009)*

Based upon the VISTA documentation referred to above, VLC understands that:

- The sample frame was restricted to residents of the above study areas, aged 5 and above, and living in occupied private dwellings. The survey did not include travel made by:
  - Visitors to the region;
  - Commercial vehicles (i.e. light and heavy trucks);
  - Professional drivers (i.e. couriers, taxi drivers).
- The survey was “self-completed” by survey respondents, with survey forms hand-delivered and hand-collected by survey staff. Telephone motivational calls, and telephone and postal reminders were also undertaken to maximise the response rate. Where necessary, follow up telephone calls were also made to clarify survey responses, or to fill in missing information;



- Because of the cost of hand-delivering and collecting survey forms, a multi-stage sampling process was employed. This involved first randomly selecting Census Collector Districts (CCDs), and then randomly selecting a sample of households from each CCD. This enabled survey staff to visit a number of selected households within the same CCD in quick succession. The CCDs were chosen to provide a reasonable sample within each LGA; and
- All residents of the household were asked to complete the survey.

The questionnaire itself was designed to capture a wide array of demographic variables, together with details of all trips made by residents of the household, including:

#### Demographics

- Age
- Gender
- Employment status
- Educational status
- Other activity status
- Occupation
- Industry
- Personal income

#### Trip Attributes

- Origin location
- Destination location
- Type of place – origin
- Type of place - destination
- Activity undertaken - origin
- Activity undertaken - destination
- Mode of travel
- Start and end time of trip

The average response rate of both the VISTA07 and VISTA09 surveys was 47%. This response rate is potentially problematic (in that it may lead to sample bias), but is typical of self-completion household travel surveys.



## 3 Comparing VISTA with Other Measurements of Travel in Victoria

### 3.1 Overview

In this section the results of the VISTA survey are compared with other measurements of travel in Victoria, including:

- 2011 VicRoads Screenline Traffic Counts;
- Other Traffic Counts for 2011 (various sources);
- 2009 Metlink Rail Origin / Destination (OD) Survey; and
- 2011 Tram Origin / Destination (OD) Survey.

The purpose of these comparisons is to:

- Understand the degree to which the results of VISTA agree with and are consistent with other measurements of travel in Victoria;
- The identify any biases that might exist in the VISTA survey; and
- To assess the suitability of the VISTA survey for use in developing strategic travel models (such as Zenith).

While the VISTA survey contains respondents from regional areas such as Shepparton and Bendigo the magnitude of response is much lower than the main metropolitan area. This document does not include analysis of the validation of VISTA for these regional areas *specifically* due to this lack of sample.

### 3.2 Methodology

The methodology used to compare the VISTA survey to other measurements of travel in Victoria consisted of the following steps:

1. A subset of the VISTA survey was extracted, consisting of households which:
  - a. fully completed their travel diaries; and
  - b. completed the survey for weekdays during school term time and not on public holidays.
2. This subset of the VISTA survey was “expanded” so that the expanded survey:
  - a. matched population control totals by age group and by SA3, based on “estimated resident population” (ERP) data obtained from the 2011 Census; and
  - b. matched population control totals by gender and by SA3, based on “estimated resident population” (ERP) data obtained from the 2011 Census.

The outcome of the expansion process was a set of “household expansion factors”.

3. The VISTA survey subset was then combined with:
  - a. Commercial vehicle trips as produced by the Zenith Model of Victoria; and
  - b. Visitor trips as produced by the Zenith Model of Victoria.

This was necessary because VISTA does not collect commercial vehicle travel or travel made by visitors to the region. The resulting data set is hereafter referred to as the “VISTA+ZenithCV&Visitors” dataset.

4. Each trip was then “assigned” to the Zenith multi-modal network of Victoria, as follows:



- a. vehicle trips (car, motorcycle, etc.) were grouped into four separate time periods (AM peak, PM peak, inter-peak and off peak), representing the start time of the trip and were then assigned to the Zenith 2011 road network using the Zenith Traffic Assignment Model;
- b. public transport trips were grouped by mode (train, bus, tram) and by time period (AM peak, PM peak, inter-peak and off peak), and were then assigned to the Zenith 2011 transit network using the Zenith Transit Assignment Model.

When assigning the trips recorded in VISTA, the number of trips assigned to the network was determined by the household expansion factors calculated in step 2.

5. The results of the expanded and assigned VISTA survey were then compared with the other measures of travel in Victoria listed in subsection 3.1.

When analysing the results of the expanded and assigned VISTA survey, it is important to remember that the VISTA survey collects data from only a small sample of households in Victoria. The subset of VISTA households used in this analysis (16,963 households) represents only 0.9% of the Victorian population in the regions covered by the VISTA survey.

The expansion factors required to expand a 0.9% sample to a representative total population are significant (mean 109), and therefore the results of assigning the expanded VISTA survey to the network are understandably “lumpy”, and should not be expected to closely match other measurements of travel at a highly disaggregate level (i.e. for individual count locations, individual routes, or individual stops).

However, at an aggregate level (i.e. screenlines), the results of VISTA can be meaningfully compared with other data sources.

### 3.3 Traffic Counts

The *VISTA+ZenithCV&Visitor* data set was assigned to the Zenith 2011 road network, and the resulting loads compared with VicRoads 2011 Screenline Traffic Counts and other traffic counts for 2011 in three different ways:

- By hour of the day;
- By screenline, by time period; and
- By individual count location, by time period.

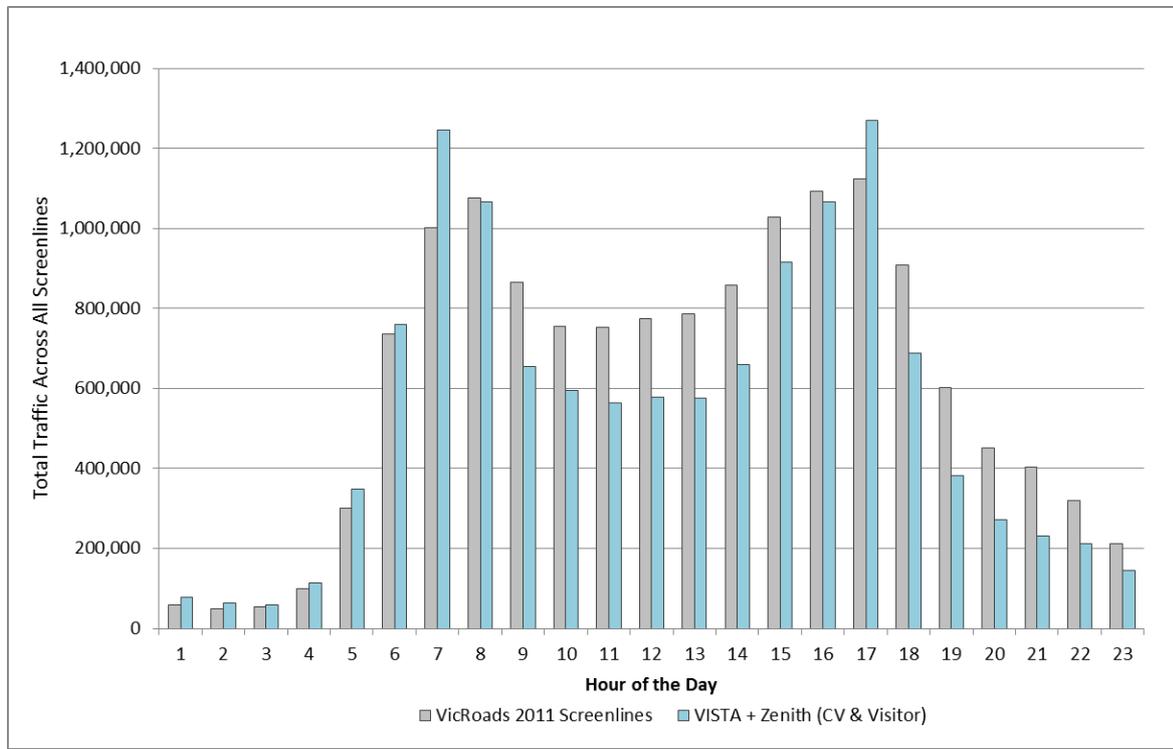
In all of the comparisons, VISTA has been expanded to 2011 population control totals, making for a fair comparison.

#### 3.3.1 By Hour of the Day

VLC has access to *hourly traffic counts* at 1,017 locations for the year 2011. Figure 2 presents the *total counted traffic volume* summed across all 1,017 locations (in grey), compared with the total volume of cars estimated to drive via these locations as a result of assigning the *VISTA+ZenithCV&Visitor* data set to the Zenith 2011 road network (in blue).



The comparison is performed by hour of the day where each VISTA trip is allocated to a single hour using its start time, and gives an indication of whether the overall amount of vehicle travel recorded in VISTA is comparable to the volume of traffic actually counted on Victoria's roads.



**Figure 2 - Comparison of Total Counted Traffic Volume and VISTA+ZenithCV&Visitors**

Referring to Figure 2, it is evident that:

- Between midnight and 7am, there is a close match between overall counted traffic volumes (by hour), and *VISTA+ZenithCV&Visitor* traffic volumes. On average, *VISTA+ZenithCV&Visitor* traffic volumes are 9.5% higher during this period;
- Between 7am and 8am, overall *VISTA+ZenithCV&Visitor* traffic volumes exceed counted traffic volumes by 24%;
- Between 8am and 9am, overall *VISTA+ZenithCV&Visitor* traffic volumes closely match counted traffic volumes;
- Between 9am and 3pm, overall *VISTA+ZenithCV&Visitor* traffic volumes are consistently lower than counted traffic volumes by between 21-27% (average 24%). The consistency of this difference hints at some systematic effect;
- Between 3pm and 6pm (the school and work peak), *VISTA+ZenithCV&Visitor* traffic volumes again closely match counted traffic volumes, being only 0.1% higher across the period;
- Between 6pm and midnight, overall *VISTA+ZenithCV&Visitor* traffic volumes are again lower than counted traffic volumes by 25-45% (average 35%). As with the inter-peak period (9am-3pm), the hour-by-hour consistency of this relationship hints at some systematic effect.



Based on these comparisons, it appears that the overall scale of *VISTA+ZenithCV&Visitor* traffic volumes closely matches counted traffic volumes during the peak periods, and during the early morning (midnight to 7am).

However, during the remainder of the day, consisting of the interpeak (9am-3pm), and the period from 6pm to midnight, it is clear that the traffic volumes produced by assigning the *VISTA+ZenithCV&Visitor* data set are significantly lower than counted traffic volumes (by an average of 24% in the interpeak, and by an average of 35% between 6pm and midnight).

Possible explanations for this discrepancy are described in the next Section.

### 3.3.2 By Screenline

In the previous section it was concluded that the traffic volumes captured by the *VISTA+ZenithCV&Visitor* data set are systematically and substantially lower than counted traffic volumes (at the 1,017 locations where VLC has access to hourly count data) during particular periods of the day –especially between 9am-3pm and between 6pm and midnight.

In this subsection the analysis takes on a spatial dimension, to determine whether the apparent discrepancy between VISTA and counted traffic volumes is spatial in character.

In 2011, VicRoads collected hourly traffic counts on 22 screenlines (by direction). The total counted traffic across each screenline has been compared with the corresponding *VISTA+ZenithCV&Visitor* traffic flow.

The scatter plots contained in Figure 3, Figure 4, Figure 5 and Figure 6 below present the total traffic crossing each of VicRoads' 22 screenlines by direction (inbound / outbound), resulting in 44 data points in each figure. In each figure the x-axis records the total *counted* traffic volumes crossing each screenline (by direction), and the y-axis records the same information derived from the *VISTA+ZenithCV&Visitors* data set. The four Figures correspond to the four periods by which the data has been grouped: the AM peak (7-9am), interpeak (9am-4pm), PM peak (4-6pm) and off peak (6pm-7am).

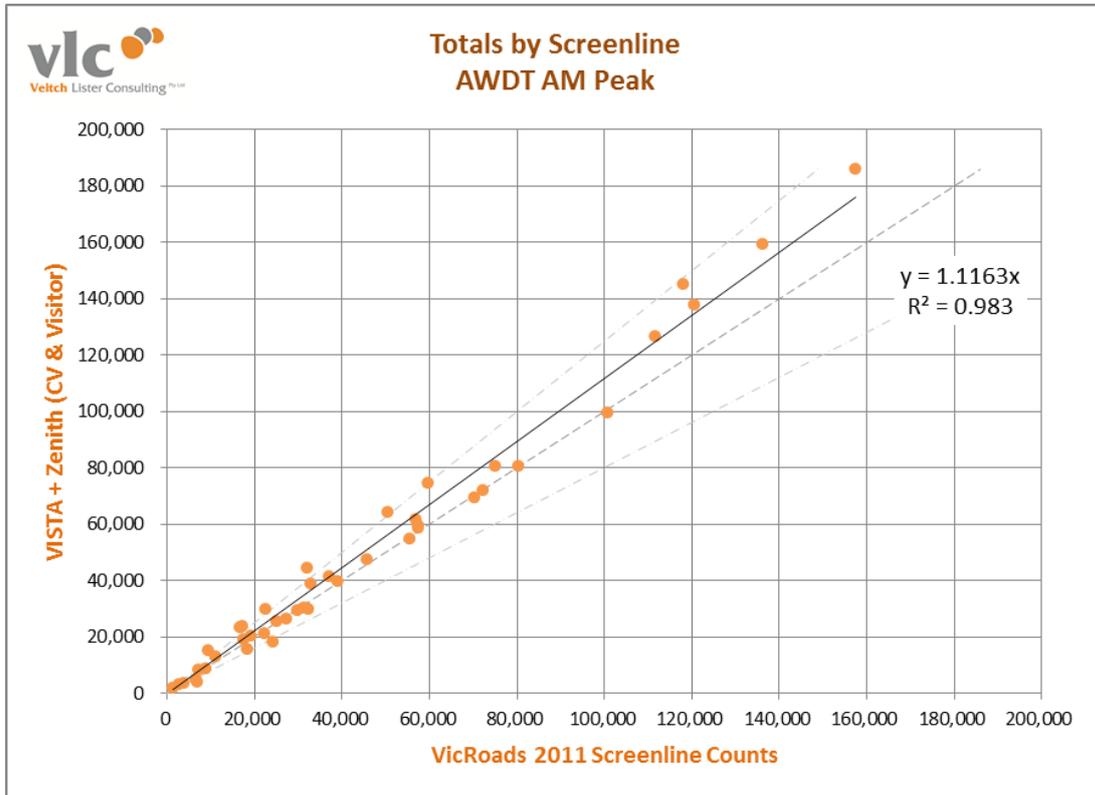
Referring to Figure 3, Figure 4, Figure 5 and Figure 6 it can be observed that:

- In all time periods there is a very high level of correlation between the counted screenline totals, and the *VISTA+ZenithCV&Visitor* screenline totals, as evidenced by the R-Squared statistics:
  - AM peak: 0.983
  - PM peak: 0.9851
  - Interpeak: 0.9878
  - Off peak: 0.9819
- In the AM peak and PM peak, the *VISTA+ZenithCV&Visitor* screenline totals tend to exceed the counted screenline totals, while in the interpeak and off peak *VISTA+ZenithCV&Visitor* screenline totals are typically much lower than the counted screenline totals. This is evidenced in each case by the gradient of the line of best fit:
  - AM peak: 1.1163
  - PM peak: 1.0685
  - Interpeak: 0.8416



- Off peak: 0.732

It is noteworthy that the level of correlation between counted screenline totals and *VISTA+ZenithCV&Visitor* screenline totals is very high even in the interpeak and off peak where there is a substantial discrepancy between the total amount of counted traffic and the total amount of traffic recorded in the *VISTA+ZenithCV&Visitor* data set. This would indicate that the source of this discrepancy – whatever it is – tends to occur systematically across the full set of screenlines.



**Figure 3 - Comparison of VicRoads VISTA Screenline Totals AM Peak (7-9am)**

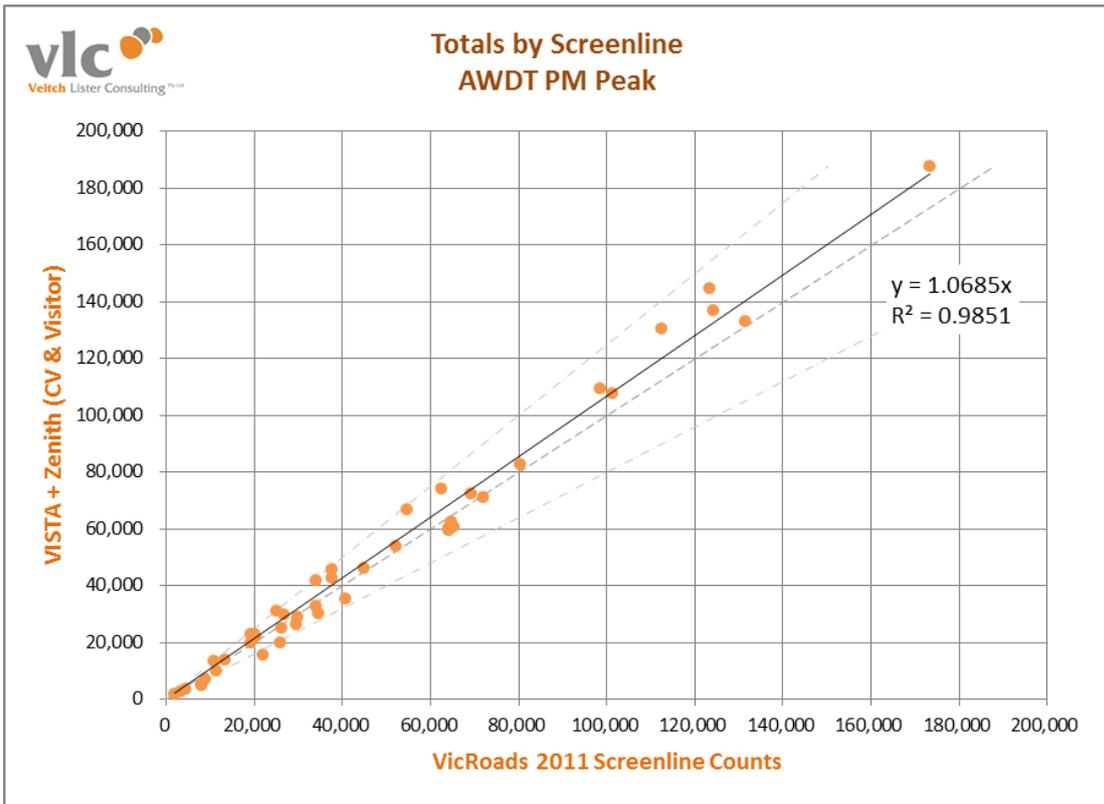


Figure 4 - Comparison of VicRoads and VISTA Screenline Totals PM Peak (4-6pm)

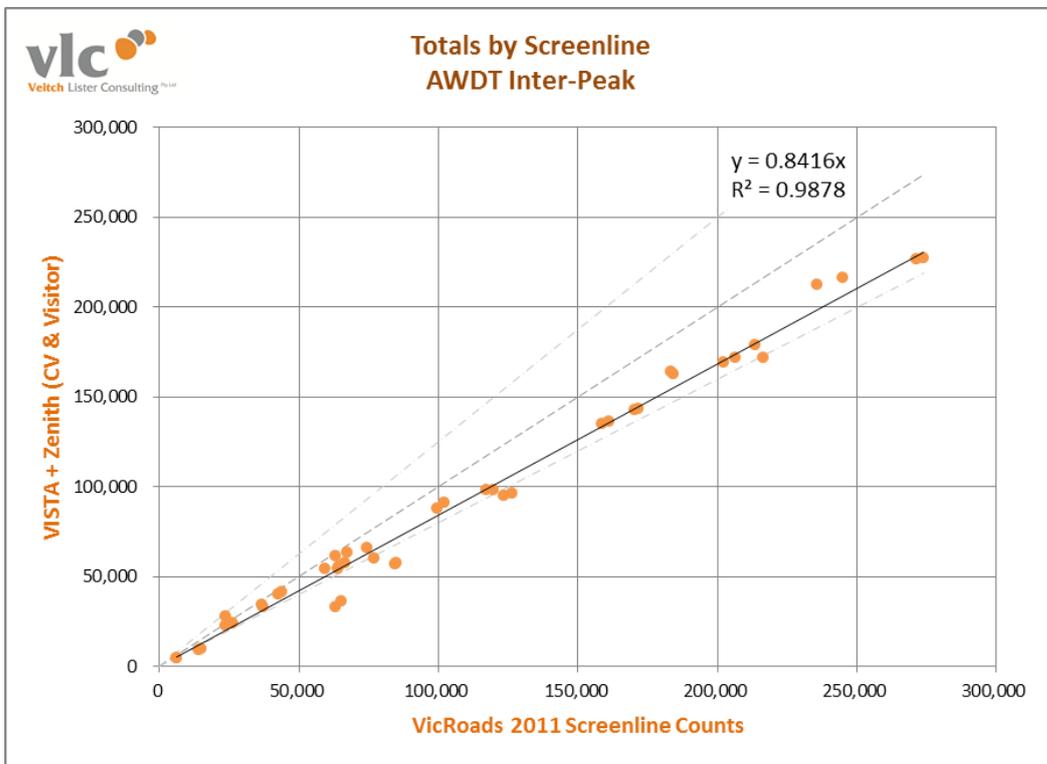
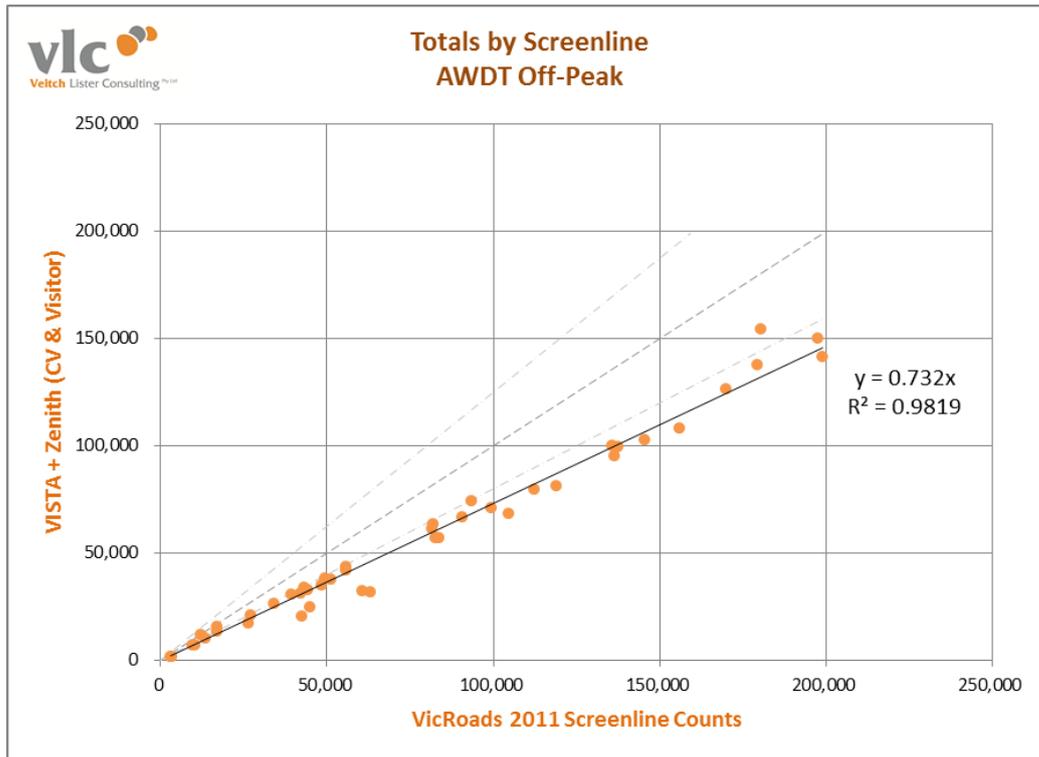


Figure 5 - Comparison of VicRoads and VISTA Screenline Totals Inter-Peak (9am-4pm)



**Figure 6 - Comparison of VicRoads and VISTA Screenline Totals Off-Peak (6pm-7am)**

Further analysis has been conducted whereby the 22 screenlines (by direction) have been grouped according to their CBD orientation.

Figure 7, Figure 8, Figure 9 and Figure 10 present the sum total of all screenline totals, grouped by direction (inbound / outbound), for both the VicRoads screenline traffic counts (in grey) and the *VISTA+ZenithCV&Visitor* dataset (in blue).

Referring to Figure 7, it can be observed that in the AM peak (7-9am), the *VISTA+ZenithCV&Visitor* traffic flows exceed the VicRoads screenline traffic counts in both the inbound and outbound directions (by 10.8% inbound, and 8.6% outbound). The degree of difference is marginally higher in the peak direction (inbound).

In the PM peak (Figure 8), the *VISTA+ZenithCV&Visitor* traffic flows again exceed the VicRoads screenline traffic counts by 8.0% in the peak direction (outbound). However, in the counter-peak (inbound) direction the scale of discrepancy is much lower (1.7%).

In the interpeak and off peak (Figure 9 and Figure 10), the *VISTA+ZenithCV&Visitor* traffic flows are much lower than VicRoads screenline traffic counts in both directions by approximately the same amount.

Based on this analysis, it appears that in the peak periods, the degree by which *VISTA+ZenithCV&Visitor* traffic flows exceed VicRoads screenline traffic counts is larger in the peak direction, but not dramatically so.

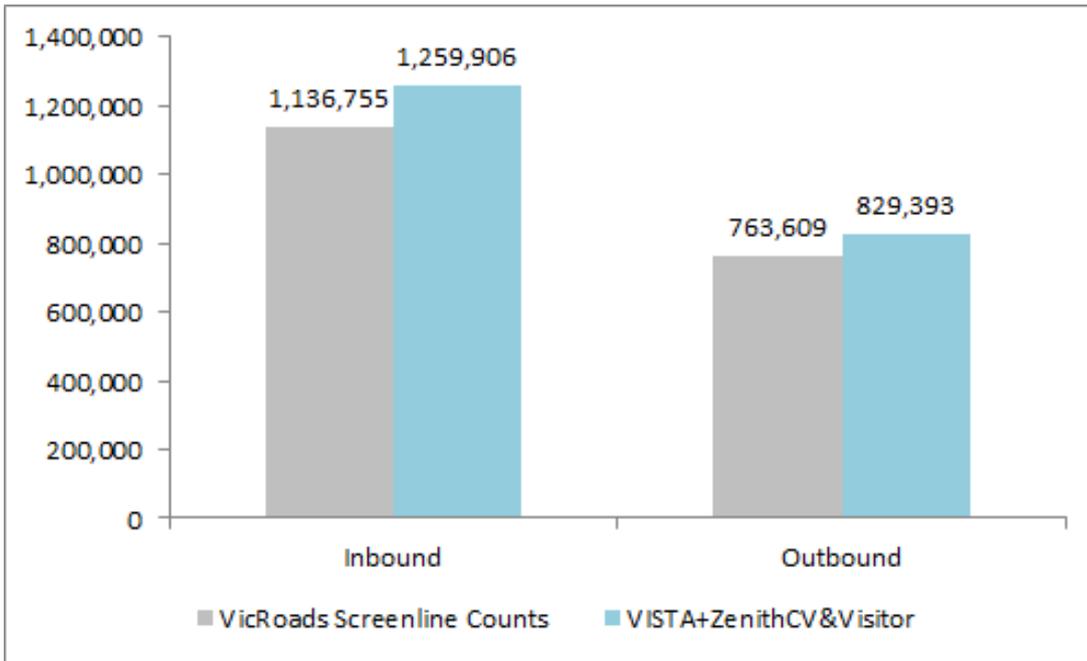


Figure 7: Comparison of AM peak inbound and outbound screenline totals (7am-9am)

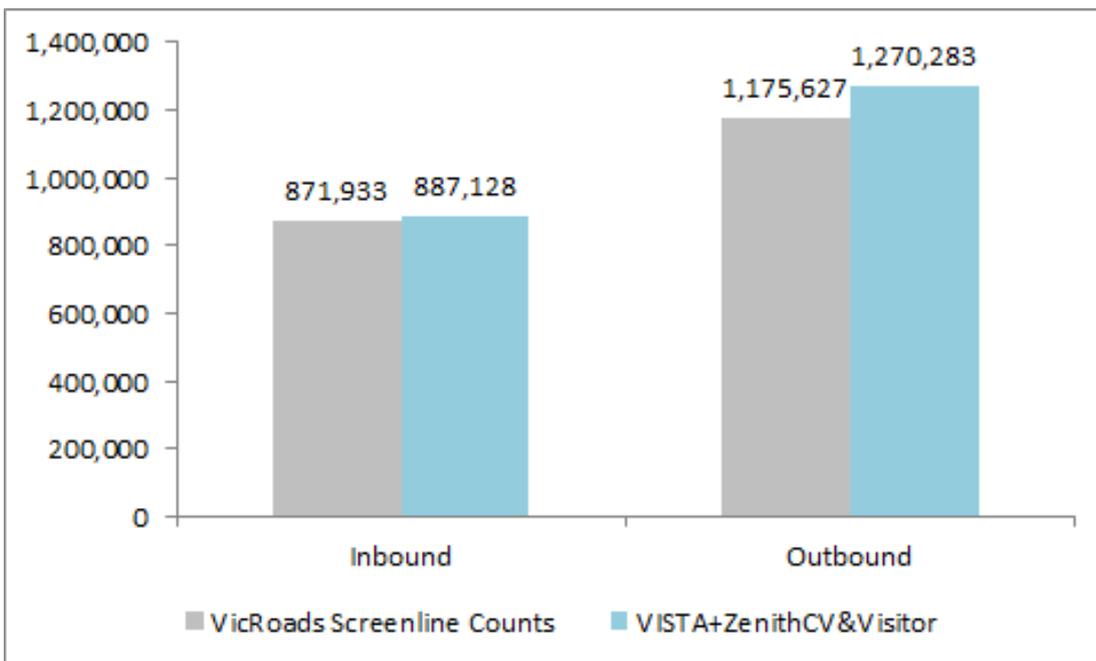


Figure 8: Comparison of PM peak inbound and outbound screenline totals (4pm-6pm)

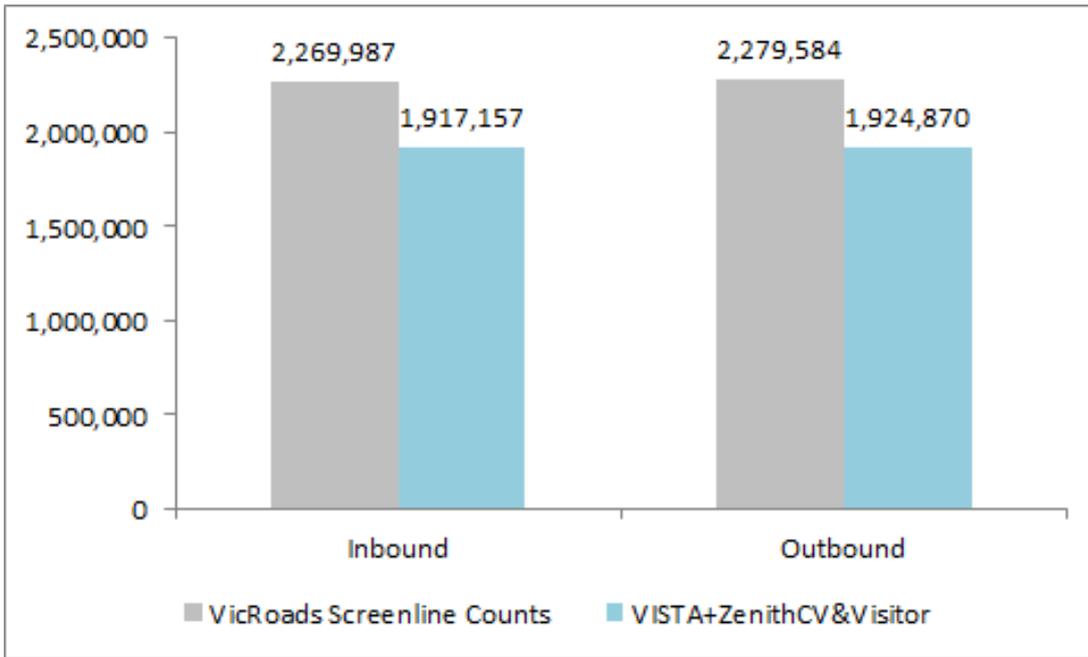


Figure 9: Comparison of interpeak inbound and outbound screenline totals (9am-4pm)

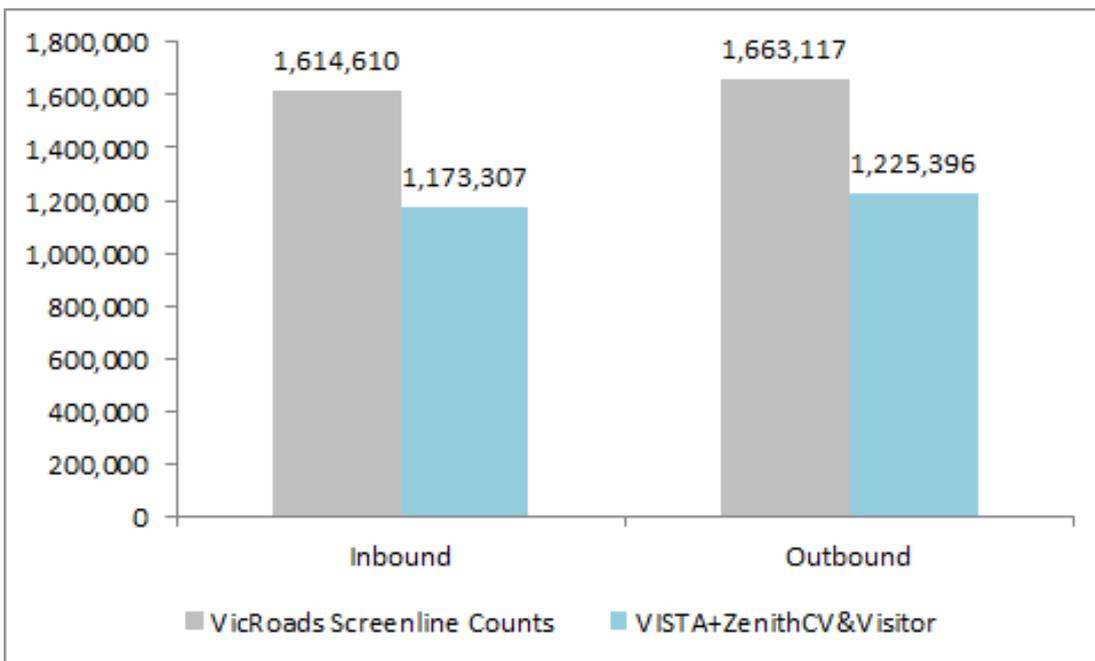


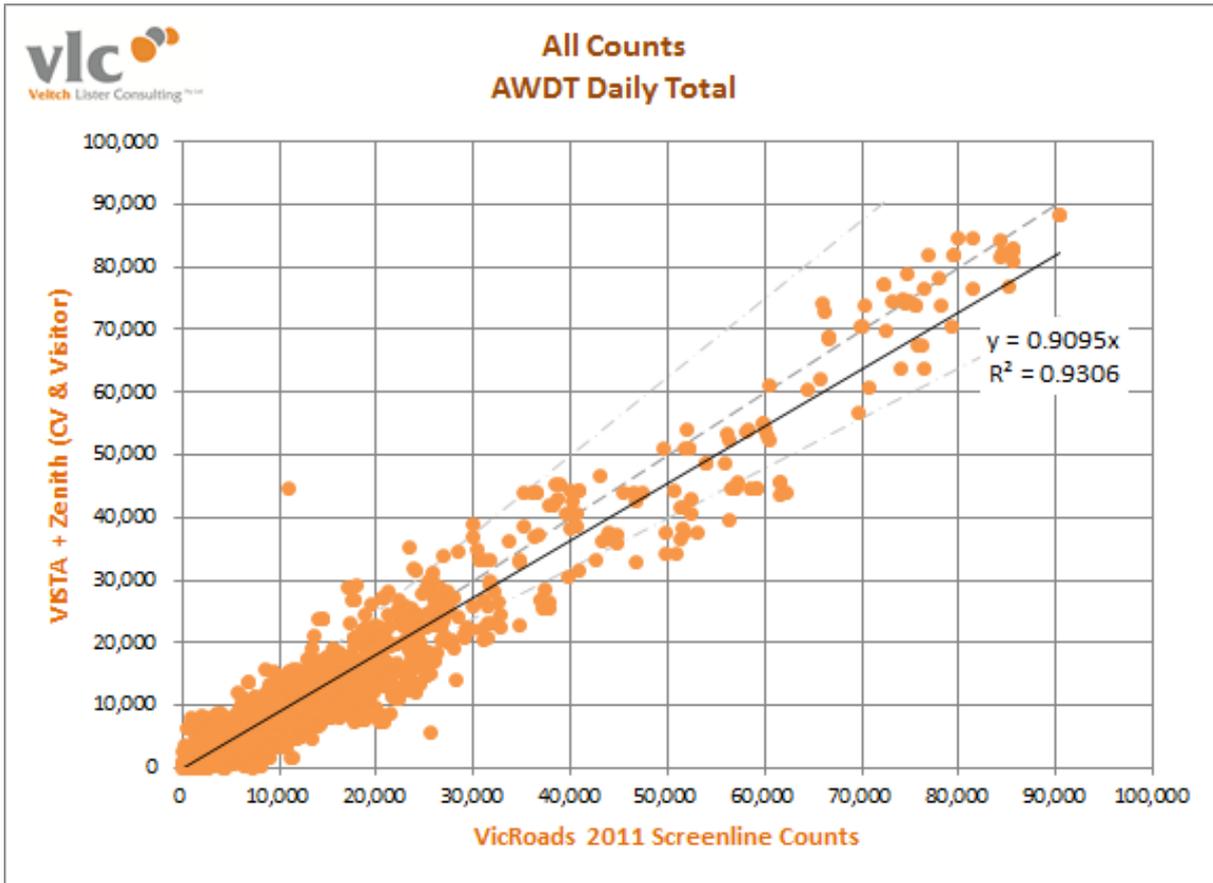
Figure 10: Comparison of off peak inbound and outbound screenline totals (6pm-7am)



### 3.3.3 By Count Location

Out of curiosity, we have also compared the *VISTA+ZenithCV&Visitor* traffic flows with counted traffic volumes at all of the 1,664 count locations for which VLC has 2011 daily traffic count data.

Given that VISTA is only a small sample (~1% once school holidays, weekends and public holidays are removed), it would not be surprising if there was considerable variation at the level of individual counts. However, it turns out that the level of correspondence is surprisingly high, as shown in Figure 11 below.



**Figure 11: Comparison of daily traffic flows at individual count locations**

Referring to Figure 11 it can be observed that the level of correlation between counted traffic volumes and *VISTA+ZenithCV&Visitor* traffic volumes is high (R-Squared 0.93). The gradient of 0.91 again indicates that at a daily level, *VISTA+ZenithCV&Visitor* traffic volumes tend to be lower than counted traffic volumes. Summing together all count locations, *VISTA+ZenithCV&Visitor* traffic volumes are 12% lower than counted traffic volumes.

## 3.4 Rail Patronage

The expanded set of VISTA rail journeys has been assigned to the network, and compared at various levels of aggregation with observed rail patronage data for 2010/2011 provided by PTV. In conducting this analysis, no allowance has been made for visitors. Therefore, the VISTA



numbers are “*pure VISTA*”, in that they do not include any allowance for trips which are outside the sample frame of VISTA (such as visitors).

Three comparisons are provided here:

- By period (to explore temporal patterns);
- By line corridor (to explore spatial patterns); and
- On the CBD cordon (to examine rail trips entering the CBD loop).

### 3.4.1 By period

Table 1 below provides a comparison of estimated station entries for 2011 (provided by PTV) with station entries as recorded in VISTA (expanded to 2011 population control totals).

Referring to Table 1 it is evident that in the AM and PM peaks, the station entries recorded in VISTA are approximately 8-9% lower than the estimated station entries for 2011 provided by PTV. In the off peak (9am-4pm + 6pm-7am), VISTA station entries are approximately 23% lower than the estimated patronage provided by PTV.

This temporal pattern is consistent with that observed in relation to traffic volumes.

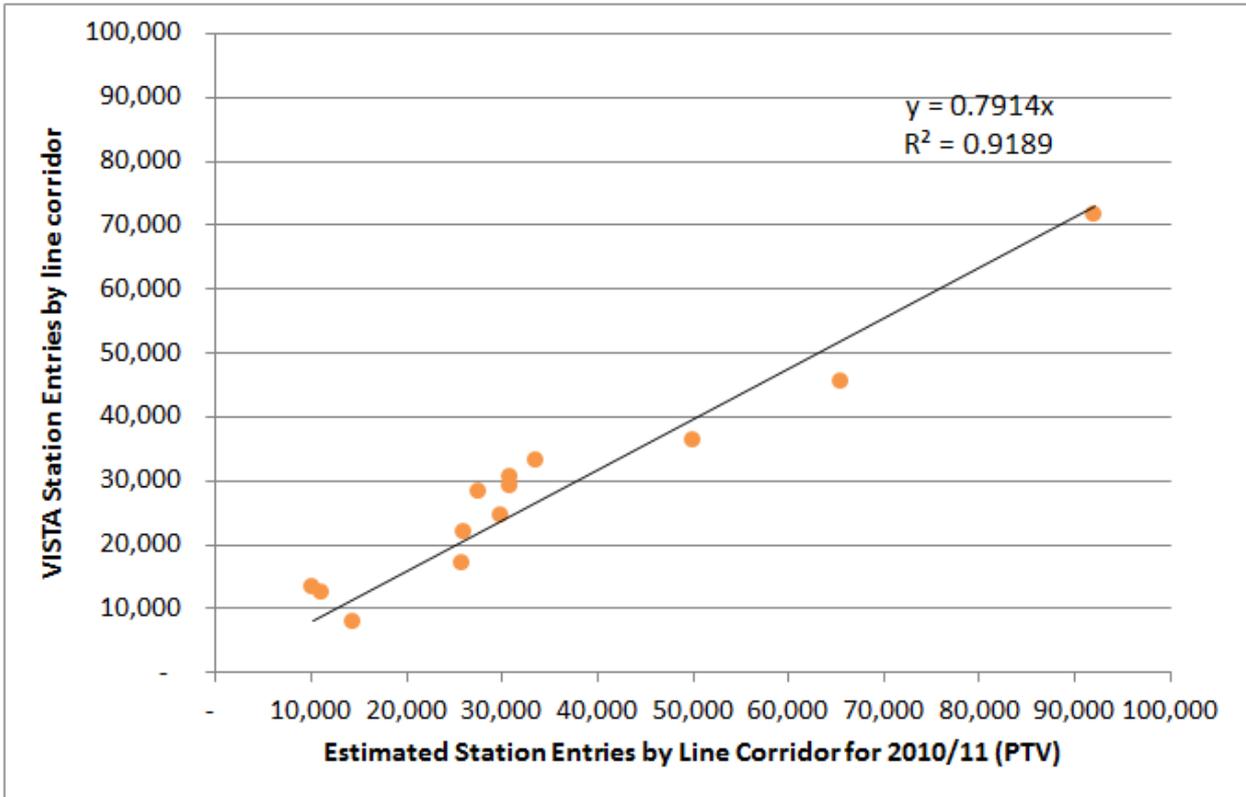
Period	Estimated Station Entries (2010/2011)	VISTA Station Entries	% difference
AM peak (7-9am)	183,618	168,577	- 8%
PM peak (4-6pm)	176,246	161,178	- 9%
Off peak (remainder)	565,957	437,398	- 23%
<b>Total daily</b>	<b>749,576</b>	<b>605,975</b>	<b>- 19%</b>

**Table 1: Comparison of station entries by time of day**

Source: PTV - Network Planning Division 26/03/2012, Estimated Station Entries at Metropolitan Stations 2010-11

### 3.4.2 By line corridor

Figure 12 below presents a comparison of estimated daily train station entries (provided by PTV) with VISTA train station entries, grouped by line corridor. The R-Squared of 0.92 indicates a high level of correlation between the PTV estimates and the VISTA estimates. However, the gradient of 0.79 indicates that the VISTA station entries are systematically lower than the PTV estimates by approximately 20%.



**Figure 12: Comparison of total station entries by line corridor (24 hour)**

Source: PTV - Network Planning Division 26/03/2012, Estimated Station Entries at Metropolitan Stations 2010-11

### 3.4.3 CBD Cordon

Table 2 presents a comparison of estimated train passenger loads entering the CBD cordon during the AM peak (7-9am). In total, the VISTA survey produces an estimate of approximately 135,000 passengers, compared with approximately 126,000 passengers as estimated by the Metro Load Standards Survey.



Line	PTV Estimates (2011)	VISTA Estimates (2011)
Williamstown	2,727	1,458
Werribee	11,129	15,415
Sydenham	10,303	13,631
Craigieburn	12,279	10,205
Upfield	3,547	2,668
Epping	6,935	8,791
Hurstbridge	10,346	11,992
Camberwell	22,752	29,534
Glen Waverley	7,788	6,528
Dandenong	16,471	15,591
Frankston	13,559	13,488
Sandringham	8,120	5,677
<b>TOTAL</b>	<b>125,956</b>	<b>134,977</b>

**Table 2: Comparison of CBD Cordon Loads by Line Corridor (AM peak, 7-9am)**

Source: PTV - Network Planning Division 03/04/2012, May Metro Load Standards Survey

### 3.5 Tram Patronage

The expanded set of VISTA tram journeys has been compared (in aggregate) with 2011 estimates of tram patronage provided by PTV (derived from the 2011 Tram OD Survey). In conducting this analysis, no allowance has been made for visitors. Therefore, the VISTA numbers are “pure VISTA”, in that they do not include any allowance for trips which are outside the sample frame of VISTA (such as visitors).

The resulting comparison is presented by time of day in Table 3 below.

Referring to Table 3 it is evident that in the peak periods, VISTA tram patronage is approximately 22-25% lower (in aggregate) than the PTV estimates of tram patronage derived from the 2011 Tram OD survey.

In the off peak (9am-4pm + 6pm-7am), VISTA tram patronage is approximately 45% lower than PTV’s estimates.

Across the entire day, VISTA tram patronage is 37% lower than PTV’s estimates.



Period	Estimated Tram Passengers (2011)	VISTA Tram Passengers (2011)	% difference
AM peak (7-9am)	100,409	78,415	- 22%
PM peak (4-6pm)	113,023	84,394	- 25%
Off peak (remainder)	386,868	212,812	- 45%
<b>Total daily</b>	<b>600,300</b>	<b>375,621</b>	<b>- 37%</b>

**Table 3: Comparison of tram passenger demands by time of day**

Source: PTV - Network Planning Division 25/05/2012, Tram 2011 OD data

### 3.6 Summary and conclusions

In the preceding three subsections, the results of the expanded VISTA survey have been compared with alternative measures of travel in Victoria, including traffic counts, train station entries, and tram boardings.

In summary,

- After combining the VISTA vehicle traffic with Zenith estimates of commercial vehicle and visitor traffic, it was observed that:
  - Across the entire day, the *VISTA+ZenithCV&Visitor* traffic volumes were lower than counted traffic volumes by approximately 10%;
  - Differences between the *VISTA+ZenithCV&Visitor* traffic volumes and counted traffic volumes were highly temporal, with the *VISTA+ZenithCV&Visitor* traffic volumes higher than counted traffic volumes in the peak (by approximately 12% in the AM peak (7-9am) and 6% in the PM peak (4-6pm)), but lower in the off peak (by approximately 16% in the interpeak (9am-4pm) and 27% in the off peak (6pm to 7am));
  - Differences between *VISTA+ZenithCV&Visitor* traffic volumes and counted traffic volumes were not highly spatial, with the above temporal patterns applying consistently over a wide range of screenlines and traffic count locations;
- VISTA train station entries were lower than PTV's estimated train station entries by approximately 8-9% in the AM and PM peaks, and by 23% in the off peak (6pm to 7am);
- VISTA rail patronage at the CBD cordon in the AM peak was 7% higher than estimated by PTV; and
- VISTA tram patronage was lower than PTV's estimated tram patronage by approximately 22-27% in the peaks and by approximately 45% in the off peak (6pm to 7am).

There are a number of possible explanations for the above differences between the quantum of travel recorded in VISTA and the other measurements of travel such as traffic counts, train station counts and tram boarding counts.



Such explanations might include:

- **Travel which is outside the sample frame of VISTA** – VISTA is limited to surveying Victorian residents living in private dwellings, and therefore excludes all travel made by visitors to Victoria (i.e. overseas / interstate visitors). VISTA also does not record travel made by professional drivers (taxis, couriers, etc.), as well as travel made by commercial vehicles. VISTA also does not include public transport vehicles (i.e. busses), which would be counted as part of road traffic counts. As part of this analysis, an effort has been made to mitigate this difference by adding the Zenith model's estimates of commercial vehicle and visitor traffic to the VISTA traffic volumes. However, no such adjustment has yet been made to the VISTA public transport volumes;
- **Sample bias** – VISTA has a response rate of approximately 47%. Therefore, it is possible that the VISTA sample is biased in ways which contribute the differences noted above. For example, one hypothesis is that the VISTA survey “oversamples” workers who commute in the peak periods, and conversely “undersamples” workers who commute during the off peak. This would explain why the *VISTA+ZenithCV&Visitor* traffic volumes exceed counted traffic volumes during the peak periods, but are lower during the off peak;
- **Erroneous reporting** – respondents to the VISTA survey may not correctly fill out the survey form. For example, respondents might forget or deliberately omit some trips, either by accident or in order to reduce the effort involved in completing the survey. Where the survey form has been filled out “*by proxy*” the proxy may not have full knowledge of the trips made by their housemate.

It is beyond the scope of this report to conclusively identify which of the above causes are responsible for the differences observed in this report. It is, however, the author's view that further research in this area is both necessary and important.

Following the recalibration of the Zenith model using the VISTA survey, it is anticipated that the results produced by the Zenith model will exhibit many of the same traits as the VISTA survey itself, particularly:

- Under-estimation of off peak travel for all modes;
- Over-estimation of peak period vehicular travel; and
- General under-estimation of public transport passenger demands, especially for tram.

In order to address these issues, a series of calibration factors will be developed. It is anticipated that these calibration factors can be limited to temporal factors (adjustment to the amount of travel occurring in each period), and an adjustment to the total amount of travel occurring by each mode. These factors will be documented in the final model validation report.



## 4 Comparing VISTA07 with VISTA09

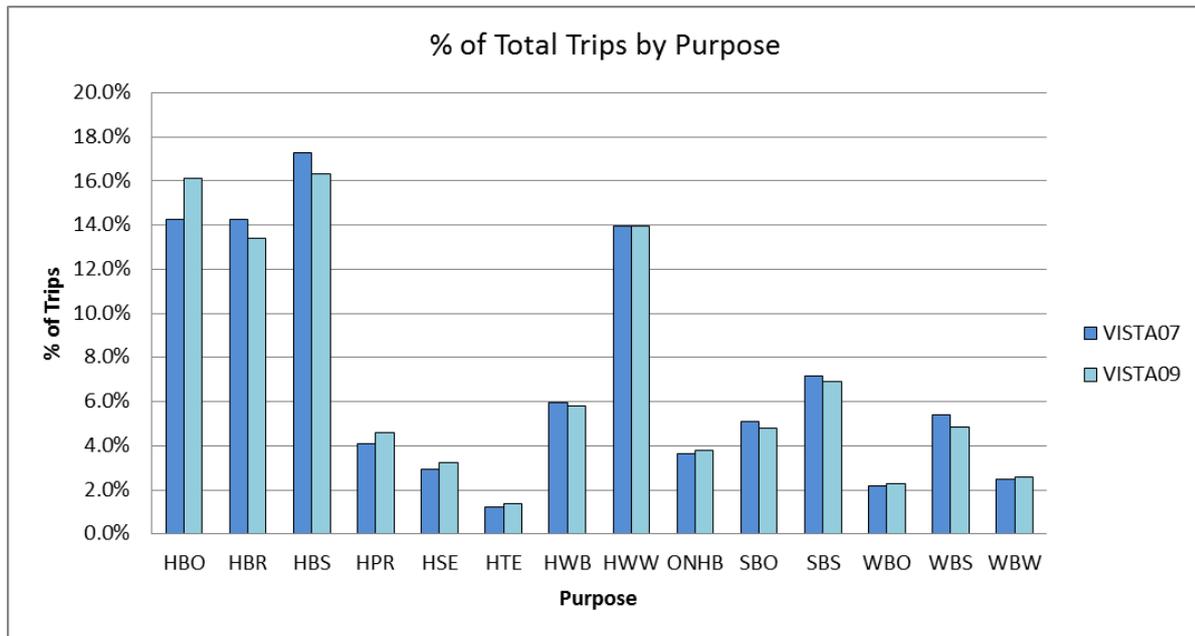
In this section the results of the VISTA07 and VISTA09 surveys are compared.

### 4.1 Trip rate per person

Overall, the trip rate per person has stayed approximately the same between the VISTA07 and VISTA09 surveys (3.26 trips / person / day in VISTA07 compared with 3.32 trips / person / day in VISTA09).

### 4.2 Trips by purpose

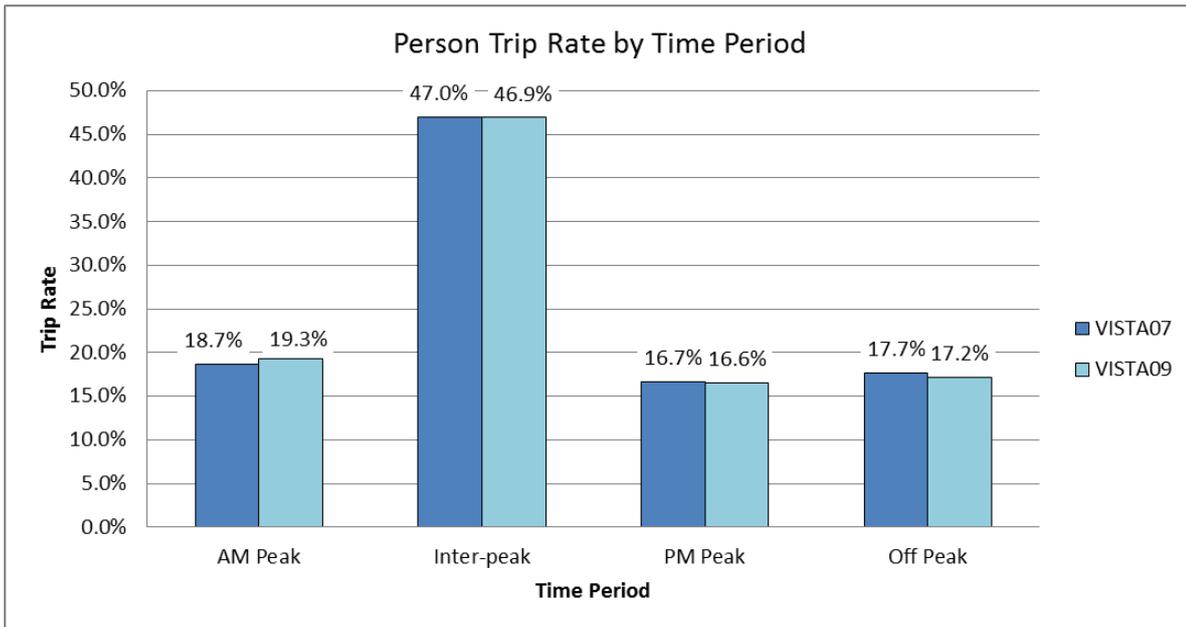
Figure 13 presents the distribution of trips across trip purposes in both the VISTA07 and VISTA09 surveys. The number of trips made by each trip purpose has not dramatically changed between the two surveys.



**Figure 13: Trips by trip purpose**

### 4.3 Trips by time of day

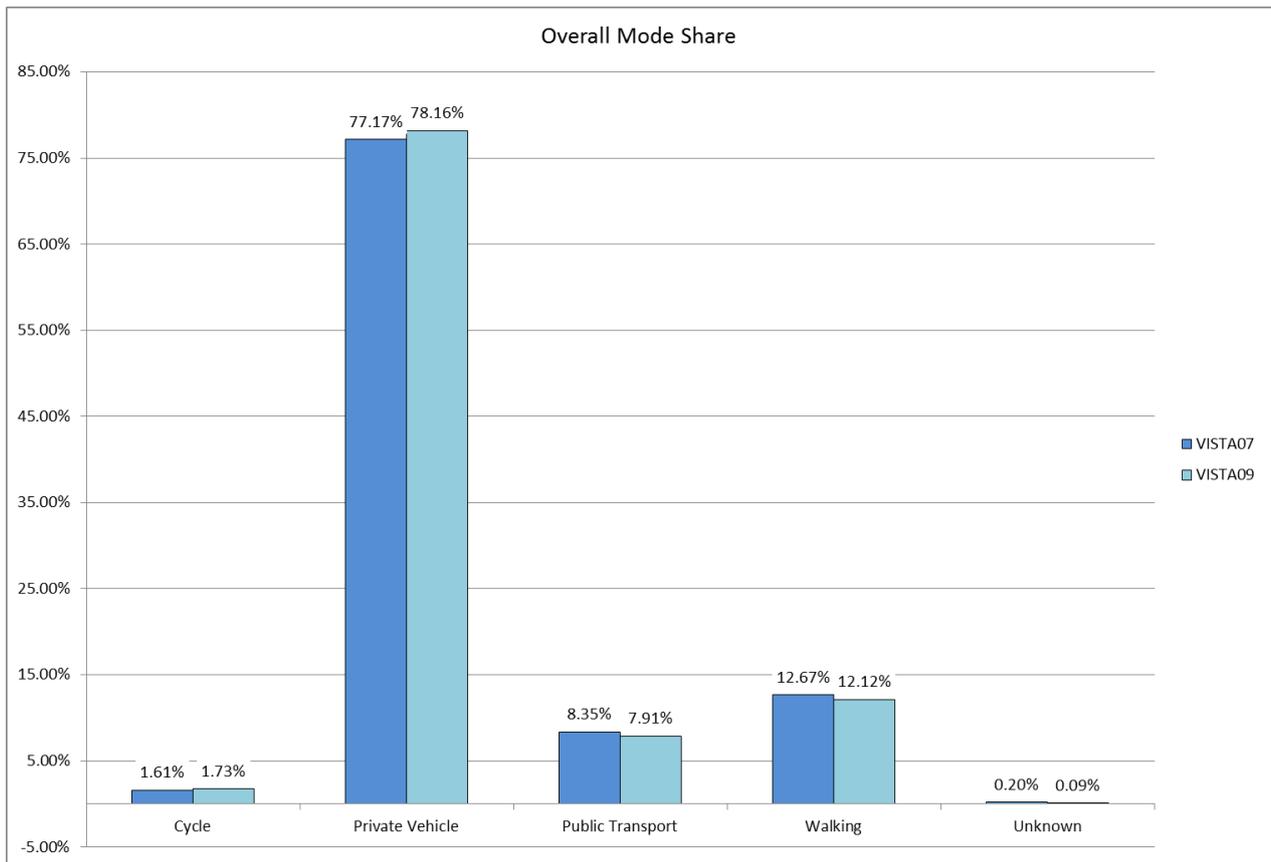
Figure 14 presents the distribution of trips across time periods in both the VISTA07 and VISTA09 surveys. The number of trips occurring in each period has not dramatically changed between the two surveys.



*Figure 14: Trips by time of day*

#### 4.4 Trips by mode

Figure 15 presents a comparison of the trips by various modes between the VISTA07 and VISTA09 surveys. Overall, there appears to be no significant difference in mode share between VISTA07 and VISTA09, with only a slight increase in private vehicle mode share of about 1% from 77% in VISTA07 to 78% in VISTA09, and a slight decline in mode share for public transport and walking.



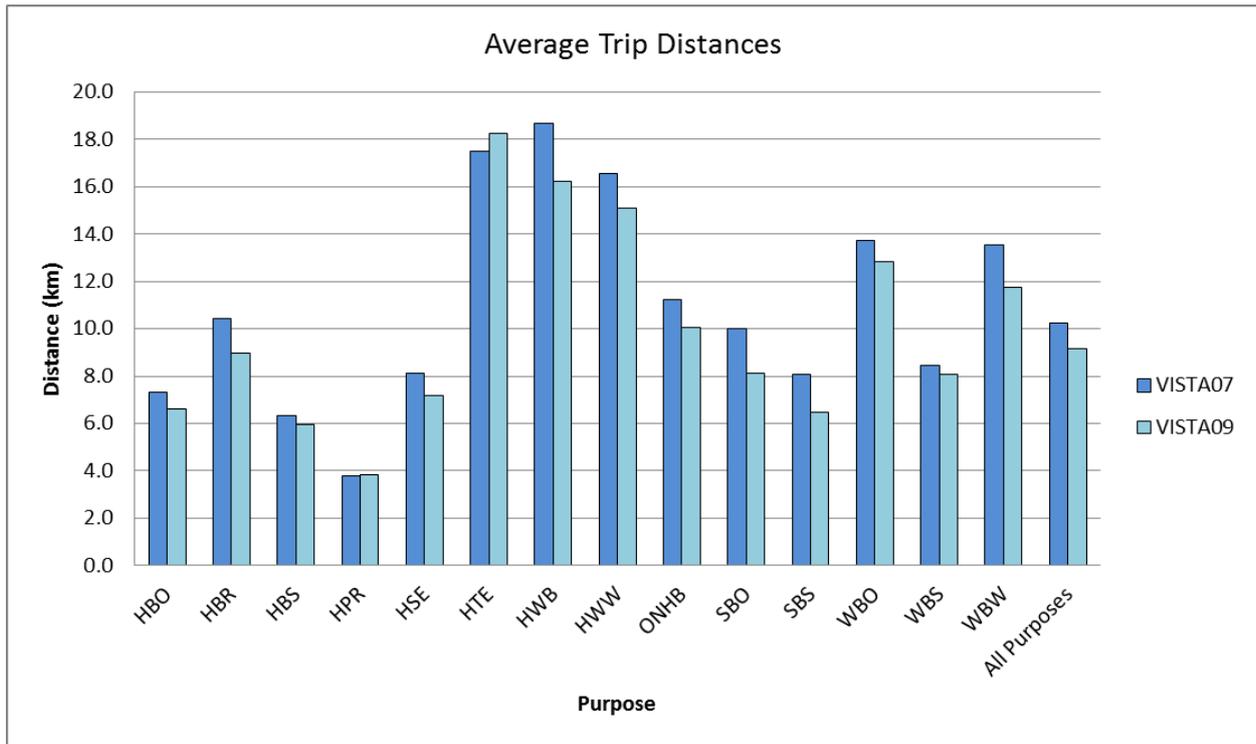
**Figure 15: Trips by mode**

## 4.5 Trip length by purpose

Figure 16 presents a comparison of average trip lengths by trip purpose in the VISTA07 and VISTA09 surveys.

Overall, there appears to be some reduction in average trip lengths from VISTA07 to VISTA09, with overall average trip lengths reducing by approximately 1km, and average trip lengths reducing in 12 out of 14 trip purposes.

No explanation has yet emerged for this reduction in trip length, and the authors suggest that further research in this area would be valuable. It will be interesting to see whether the trend continues in the next edition of the VISTA survey.



**Figure 16: Average trip length by trip purpose**

## 4.6 Summary and conclusions

Overall, the VISTA07 and VISTA09 surveys appear to provide consistent results. The one point of difference between the surveys is the average trip length, which appears to reduce from VISTA07 to VISTA09 by approximately 1km (or 10%).