



ROADS AND TRAFFIC AUTHORITY

TRIP GENERATION SURVEYS

LOW DENSITY RESIDENTIAL DWELLINGS

ANALYSIS REPORT



in association with

**GENNAOUI CONSULTING
 PTY LTD**


Report Document Control	
<i>Title</i>	TRIP GENERATION SURVEYS LOW DENSITY RESIDENTIAL DWELLINGS
<i>Date</i>	25 June 2010
<i>Author(s)</i>	F Gennaoui / O Sannikov
<i>Client</i>	ROADS AND TRAFFIC AUTHORITY
<i>Job No.</i>	10014
<i>Quality Control Reviewer</i>	S Samuels
<i>Keywords</i>	Trip generation/residential/low density/NSW/Roads and Traffic Authority
<i>Disclaimer</i>	This report is believed to be true and correct at the time of writing. It is based on the information and data provided by the client and other relevant organisations during preparation. TEF Consulting does not accept any contractual, tortuous or other form of liability for any consequences arising from its use. People using the information in the report should apply and rely on their own skill and judgement to a particular issue they are considering.

TABLE OF CONTENTS

1	INTRODUCTION.....	1
1.1	Study Brief / Outcomes	1
1.2	Low Density Residential	1
1.3	Approach.....	1
1.4	Report Structure	2
2	SURVEY METHODOLOGY	4
2.1	Selection of survey areas.....	4
2.2	Survey area Selection Methodology.....	4
2.3	Survey Process	8
3	SURVEY ANALYSIS	9
3.1	Survey Output Requirements	9
3.2	Average Trip Rates per dwelling.....	9
3.3	Simple Linear Regression	11
3.4	Trip distribution by direction of travel	16
3.5	Modes of travel	19
3.6	Car occupancy.....	19
4	COMPARISON OF NSW FINDINGS WITH OTHER NATIONAL & OVERSEAS DATABASES.....	20
4.1	Introduction.....	20
4.2	Australian Documents.....	20
4.3	Other Countries	22
4.4	Residential Vehicle Trip Generation - International Databases.....	23
5	SUMMARY	27

Appendix

Detached Dwellings Survey in UK (source TRICS)

Tables

Table 2-1	Survey area selection criteria	4
Table 2.2	Survey area Details of the Selected Survey areas.....	6
Table 3.1	Traffic survey results summary	9
Table 3.2	Trips rate summary	10
Table 3.3	Directional trip distribution.....	16
Table 3.4	Directional trip distribution summary.....	17
Table 3.5	Daily modes of travel	19
Table 3.6	Car occupancy results.....	19
Table 3.7	Car occupancy summary.....	19
Table 4-1	Sources of Trip Generation Rate Information	20

Figures

Figure 1.1	Study Approach.....	3
Figure 2.1	Survey area locations - Sydney	7
Figure 2.2	Survey area locations – Regional centres	7
Figure 3.1	Daily trip rates.....	10
Figure 3-2	Person Trips – Survey area AM Peak Hour	11
Figure 3-3	Person Trips – Survey area PM Peak Hour	11
Figure 3-4	Vehicle Trips – Survey area AM Peak Hour	11
Figure 3-5	Vehicle Trips – Survey area PM Peak Hour.....	11
Figure 3-6	Person Trips – Daily.....	12
Figure 3-7	Vehicle Trips – Daily.....	12
Figure 3-8	Person Trips – Network AM Peak	12
Figure 3-9	Person Trips – Network PM Peak	12
Figure 3-10	Vehicle Trips – Network AM Peak.....	12
Figure 3-11	Vehicle Trips – Network PM Peak.....	12
Figure 3-12	Person trip rates – Survey area AM Peak Hour.....	13
Figure 3-13	Person trip rates – Survey area PM Peak Hour.....	13
Figure 3-14	Vehicle trip rates – Survey area AM Peak Hour	13
Figure 3-15	Vehicle trip rates – Survey area PM Peak Hour	13
Figure 3-16	Person Trip rates – Daily.....	14
Figure 3-17	Vehicle Trip rates – Daily	14

Figure 3-18	Person trip rates – Network AM Peak	14
Figure 3-19	Person trip rates – Network PM Peak	14
Figure 3-20	Vehicle trip rates – Network AM Peak	14
Figure 3-21	Vehicle trip rates – Network PM Peak	14
Figure 3-22	Person trip rates – survey area AM peak hour	15
Figure 3-23	Person trip rates – survey area PM peak hour	15
Figure 3-24	Vehicle trip rates – survey area AM peak hour	15
Figure 3-25	Vehicle trip rates – survey area PM peak hour	15
Figure 3-26	Person trip rates – daily	16
Figure 3-27	Vehicle trip rates – daily	16
Figure 3.28	Person-based trip distribution – PM Peak	17
Figure 3.29	Vehicle-based trip distribution – AM Peak	18
Figure 3.30	Vehicle-based trip distribution – PM Peak	18
Figure 3.31	Daily modes of travel	19

1 INTRODUCTION

1.1 Study Brief / Outcomes

The RTA published its Guide to Traffic Generating Developments (“*Guide*”) in the mid-1990s. This document drew on the results of a number of trip generation and parking demand surveys covering a range of land uses. These surveys had been progressively conducted since 1979. Since the original publication of the *Guide*, there have been numerous changes to single dwelling residential subdivisions including lot sizes and major development in areas not adequately served by public transport. Residences circumstances have changed as well, with improved access to private vehicles and higher disposable incomes.

TEF Consulting in association with Gennaoui Consulting (the consultants) were appointed to undertake a detailed trip generation analysis of low density (single dwellings) residential land use. The study includes surveys of traffic characteristics relating to vehicle and person trips.

The collected information was then compared to equivalent data in overseas traffic generation databases. This assessment may help identify an alternative source of trip generation databases that could have relevance to Australian conditions.

1.2 Low Density Residential

Low density residential areas has been defined as areas where by the majority of dwellings are on separate lots; on larger lots the provision of large duplexes has also been assumed to be low density generating dwellings. Public transport accessibility in such areas is often limited.

Within new subdivisions, where *standard* lots are given, some additional allowance may be made for dual occupancy and group homes, where there are sufficient numbers of these types of residences. The number of such dwellings in the surveyed areas was small and therefore not considered substantial to affect the overall trip generation of low density residential.

1.3 Approach

The approach to this trip generation study is described below:

The Contractor is required to prepare a list of **15 candidate areas**. A list of required attributes and other criteria for the area selection is provided in the Brief. These attributes and criteria are hereby acknowledged.

To identify 10 areas in Sydney and five in regional centres for each type of land use required initially the identification of approximately 20 areas in Sydney and 10 areas in regional areas, generally based on visual inspections of aerial photographs using facilities like Google Maps.

- The Consultants prepared a list of around 21 residential areas (13 in greater Sydney / Wollongong / Central Coast and eight in regional centres) by using aerial photos and online information and submitted these to RTA for review.
- A list of six (6) urban and five (5) regional survey areas were then selected in consultation with RTA (note that the survey area in Farmborough Heights, located near Wollongong, was initially grouped with the urban areas, but after the data analysis was grouped with the regional sites as it displayed very similar characteristics).
- The consultants then undertook a detailed assessments of all selected residential areas to identify the actual number of dwellings, secondary land uses such as schools and neighbourhood centres and accessibility to public transport.

- The Consultants then arranged traffic counts on a weekday at all areas. The surveys were undertaken on either a Tuesday, Wednesday or Thursday. The survey data included vehicle counts and person counts entering and exiting each area. Areas that had a smaller number of access roads were preferred.
- Where no existing / suitable RTA data was available, automatic traffic counters were placed on adjacent major roads to determine the network morning and evening peak hour periods on the survey day.
- The Consultants analysed the data using linear regression and considered the generated data as a function of the key variable, the number of dwellings.
- The Consultants then compared the generation rates established with information from other databases from Australia and overseas.
- The Consultants prepared a report to summarise the findings of the survey and data analysis.
- The reporting is presented in two documents. The first, this report, contains the analysis covering all of the calculations and comparisons. The second report contains the raw data from the surveys and other data such as survey area plans and tabulated person-trip data.

The analysis process is captured in the flowchart in Figure 1.1.

1.4 Report Structure

This analysis report has the following structure:

- **Chapter 1: Introduction** – This contains the background to the study, approach and report structure;
- **Chapter 2: Survey methodology** – This contains a description of the survey and survey area selection process;
- **Chapter 3: Survey analysis** – This section analyses the survey results using linear regression;
- **Chapter 4: Comparison of survey results with overseas databases** – This section compares the NSW survey results with other country's databases such as TRICS (United Kingdom), NZTDB (New Zealand) and ITE (United States) and assesses the validity of comparing the different databases
- **Chapter 5 : Summary**

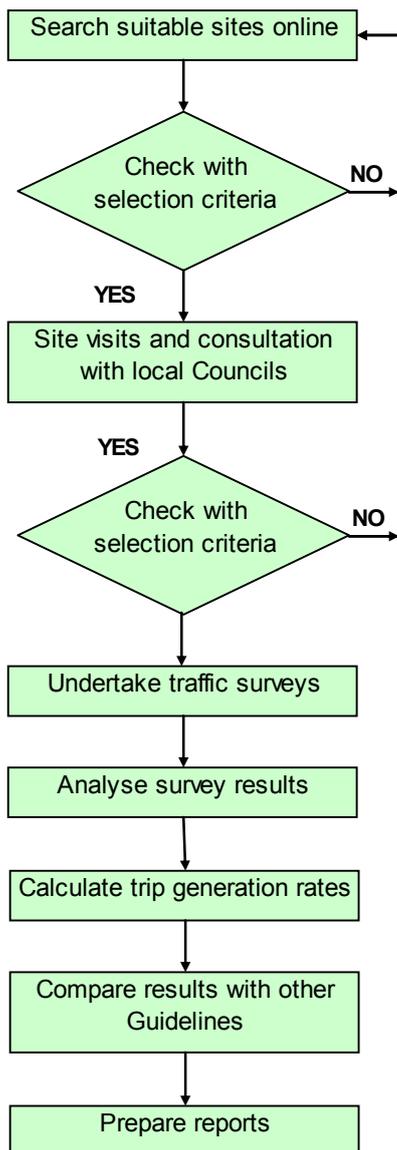


Figure 1.1 Study Approach

2 SURVEY METHODOLOGY

2.1 Selection of survey areas

The selection of suitable survey areas was the critical task in the project.

Table 2.1 lists the criteria for the survey area selection as set out in the RTA Brief.

Table 2-1 Survey area selection criteria

Selection Criteria	Description
Fairly recent development	Mostly residential areas developed within the last 15-20 years, with a small number of more established areas to provide a comparison.
Well-bounded structure	Survey areas with a relatively low number of access points into the area, for ease of observing external trips
Accessibility Score	Survey areas with a range of Accessibility Scores
Reasonable geographic spread	Survey areas are well distributed in Metropolitan Sydney and regional NSW
Homogenous development	No significant traffic generating developments (eg large schools, shopping centres, etc) within the survey area.
Size of the area	Sufficient number of dwellings for statistical analysis, in the order of 500 to 1,500 dwellings

2.2 Survey area Selection Methodology

Initial search

- Google Earth / Google Maps
- Consultations with traffic engineers/transport planners at local Councils
- Information collected in the course of past projects
- Information search on the internet
- Compilation of an initial list of 25 survey areas

Refinement of the initial list of survey areas

- Detailed examination of cadastral maps and aerial photographs
- Identification of survey area characteristics
 - Survey area boundaries
 - Identification of access points
 - Count of the number of dwellings
 - Developments other than private dwellings

- Public transport availability
- Initial survey planning to check suitability in terms of ease of observations
- Compilation of a list of 21 suitable survey areas ranked in the order of preference

Final survey area selection

- Consultation with the RTA
- Confirmation of six (6) survey areas within the Sydney Area (LDR1 to LDR6) and five (5) survey areas in NSW regional centres (non-Sydney, LDR7 to LDR11).
 - Survey area visits and collection of specific details
 - Physical count of the number of dwellings
 - Photographic and video records of access locations
 - Collection of details of non-residential developments

The details of the selected survey areas are summarised in **Table 2.2**. The locations of the survey areas are shown on **Figures 2.1** and **2.2**.

Table 2.2 Survey area Details of the Selected Survey areas

	Survey area ID											
	LDR1	LDR2	LDR3	LDR4	LDR5	LDR6	LDR7	LDR8	LDR9	LDR10	LDR11	
Area Characteristics:												
Suburb	Beaumont Hills	Longueville	North Epping	Werrington Downs	West Hoxton	Westleigh	Coffs Harbour	Goonellabah	Calare	Glenfield Park	Farmborough Heights	
Local Government Area	Baulkham Hills	Lane Cove	Hornsby	Penrith	Liverpool	Hornsby	Coffs Harbour	Lismore	Orange	Wagga Wagga	Wollongong	
Typical housing type	two-storey	two-storey	one - & two-storey	one-storey	large two-storey	one-storey	one-storey	one - & two-storey	one-storey	one-storey	one - & two-storey	
Indicative Public Transport Accessibility Score	6	30	11	8	5	6	3	2	2	3	2	
Traffic generating developments within the area	1 School, 2 Childcare centres	1 Private Hospital	1 School, 2 Childcare centres, 1 Shopping Village, 1 Local shop, 1 Retirement Village	1 Childcare centre	1 School, 3 Childcares, 1 Medical Centre	1 School, 1 Childcare	None	1 Function Centre	2 Childcare centres, 1 Aged Care facility	None	None	
No. of dwellings	956	676	1495	669	1235	1335	509	556	697	554	905	
Population	3,346	2,084	4,295	2,095	4,552	4,024	1,250	1,378	2,037	1,391	2,685	
Date of survey	04-May-10	28-Apr-10	28-Apr-10	04-May-10	06-May-10	28-Apr-10	13-May-10	12-May-10	06-May-10	05-May-10	06-May-10	
Day of survey	Tuesday	Wednesday	Wednesday	Tuesday	Thursday	Wednesday	Thursday	Wednesday	Thursday	Wednesday	Thursday	
Duration of survey	06:00-19:00 (13 hours) - All survey areas											
Weather	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Overcast, light morning showers	Fine	
Surrounding roads- AM peak period	08:00-09:00	08:00-09:00	06:00-07:00	08:00-09:00	08:00-09:00	07:00-08:00	08:00-09:00	08:00-09:00	08:00-09:00	08:00-09:00	08:00-09:00	08:00-09:00
Surrounding roads - PM peak period	17:00-18:00	17:00-18:00	15:00-16:00	15:30-16:30	17:00-18:00	16:00-17:00	15:00-16:00	17:00-18:00	16:00-17:00	16:00-17:00	15:00-16:00	
Person Trips:												
o Peak 1-hour person-trips	2170	1083	1390	1286	2807	1207	735	631	1018	733	892	
o Time of peak 1-hour person-trips	15:00-16:00	07:15-08:15	07:30-08:30	16:30-17:30	08:00-09:00	17:00-18:00	15:15-16:15	15:30-16:30	08:00-09:00	15:30-16:30	07:45-08:45	
o Peak person-trips per dwelling	2.27	1.60	0.93	1.92	2.27	0.90	1.44	1.13	1.46	1.32	0.99	
o Peak person-trips per resident	0.65	0.52	0.32	0.61	0.62	0.30	0.59	0.46	0.50	0.53	0.33	
o Total daily person-trips	14389	9699	11276	9753	17668	11489	4955	5099	7356	4878	6672	
o Total daily person-trips per dwelling	15.05	14.35	7.54	14.58	14.31	8.61	9.73	9.17	10.55	8.81	7.37	
o Total daily person-trips per resident	4.30	4.65	2.63	4.65	3.88	2.86	3.96	3.70	3.61	3.51	2.49	
o Person-trips in network AM peak	1880	917	401	1046	2807	1042	639	629	1018	569	851	
o Person-trips in network PM peak	1517	939	1169	1068	1732	1085	675	557	896	655	854	
Vehicle Trips:												
o Peak 1-hour vehicle-trips	1170	710	875	932	1625	944	384	446	627	480	555	
o Time of peak 1-hour vehicle-trips	08:00-09:00	17:30-18:30	07:30-08:30	17:00-18:00	08:00-09:00	17:00-18:00	08:00-09:00	17:00-18:00	16:45-17:45	17:15-18:15	07:45-08:45	
o Peak vehicle-trips per dwelling	1.22	1.05	0.59	1.39	1.32	0.71	0.75	0.80	0.90	0.87	0.61	
o Peak vehicle-trips per resident	0.35	0.34	0.20	0.44	0.36	0.23	0.31	0.32	0.31	0.35	0.21	
o Total daily vehicle-trips	9237	6962	7816	6914	11983	8888	3325	3635	4962	3521	4670	
o Total daily vehicle-trips per dwelling	9.66	10.30	5.23	10.33	9.70	6.66	6.53	6.54	7.12	6.36	5.16	
o Total daily vehicle-trips per resident	2.76	3.34	1.82	3.30	2.63	2.21	2.66	2.64	2.44	2.53	1.74	
o Vehicle-trips in network AM peak	1170	598	297	649	1625	790	384	368	591	372	543	
o Vehicle-trips in network PM peak	1070	709	653	744	1271	808	334	446	552	460	485	
o Car Occupancy (average over survey period)	1.25	1.24	1.30	1.28	1.38	1.21	1.35	1.28	1.42	1.32	1.33	
% of total trips by mode:												
o % Car (as driver)	61.2%	68.7%	67.7%	68.6%	65.3%	75.2%	65.6%	68.2%	66.7%	70.2%	67.1%	
o % Car (as passenger)	15.2%	16.8%	20.5%	18.9%	25.0%	16.1%	23.2%	19.0%	27.9%	22.1%	21.9%	
o % Train	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
o % Bus	16.9%	4.5%	5.2%	5.6%	4.0%	3.5%	4.3%	7.0%	2.9%	5.9%	6.2%	
o % Cycle	0.3%	0.4%	0.7%	0.7%	0.2%	0.3%	1.3%	0.5%	0.3%	0.1%	0.3%	
o % On foot	5.4%	6.8%	4.3%	4.9%	3.5%	3.0%	4.4%	3.6%	1.8%	1.0%	2.6%	
o % Other	1.0%	2.9%	1.6%	1.3%	2.0%	1.8%	1.3%	1.7%	0.4%	0.6%	1.8%	

2.2.1 Survey area selection and survey conduct issues

- It was difficult to find sufficiently large suitable areas without schools. Four of the survey areas contained public schools whose trip generation had to be identified and extracted from the overall area trip generation. All schools were approached with requests for information; however some schools chose not to participate. The consultants carried out separate surveys of trip generation of such schools and assumptions had to be made with regard to the number of children living outside the survey area.
- In the early hours of the morning, mainly between 6 am and 7 am, traffic observers had some difficulties identifying vehicle occupancies due to dark conditions and headlight glare at some locations. In particular, it was difficult to identify whether vehicles carried little children.
- Assumptions had to be made with regard to the numbers of transit bus passengers (trips not generated within the survey areas).

2.3 Survey Process

Conduct of surveys

Survey period	April – May 2010
	Outside school holidays and public holidays
Day of the week	Tuesday, Wednesday or Thursday
	One survey day for each of the survey areas
Survey times	6.00 am to 7.00 pm

Data Recorded by traffic surveyors

- Weather on the survey day
- Number of vehicles (*cars, commercial vehicles and buses*) entering and leaving the survey area
- Vehicle occupancy
- Number of pedestrians / cyclists entering and leaving the Survey area
- Trips generated by land uses other than low density residential dwellings (questionnaires and surveys)
- Hourly traffic volumes on the adjacent major road were also collected to determine main road peak hours using either automatic traffic counters or existing RTA traffic count stations.

3 SURVEY ANALYSIS

3.1 Survey Output Requirements

The data was analysed with the key parameters needing to be established being

- Weekday survey area peak hour generation
- Weekday hourly generation in adjacent network AM peak
- Weekday hourly generation in adjacent network PM peak
- Weekday daily trip generation

3.2 Average Trip Rates per dwelling

The trip generation calculation that was to be performed would depend upon the variable that was interrogated, in this case the total number of dwellings.

The summary of the survey data for each of the preferred survey areas is shown in the tables below. The detailed results are contained in a separate “Data Report”.

Table 3.1 Traffic survey results summary

Survey area ID	Sydney areas						Non-Sydney areas				
	LDR1 Beaumont Hills	LDR2 Longueville	LDR3 North Epping	LDR4 Werrington Downs	LDR5 West Hoxton	LDR6 Westleigh	LDR7 Coffs Harbour	LDR8 Lismore	LDR9 Orange	LDR10 Wagga Wagga	LDR11 Wollongong
Number of dwellings	956	676	1495	669	1235	1335	509	556	697	554	905
Person-based trips											
Survey area AM peak hour	1880	1083	1390	1046	2807	1138	639	629	1018	582	892
Trips per dwelling	1.97	1.60	0.93	1.56	2.27	0.85	1.26	1.13	1.46	1.05	0.99
Survey area PM peak hour	2170	1020	1308	1286	2666	1207	735	631	1012	733	854
Trips per dwelling	2.27	1.51	0.87	1.92	2.16	0.90	1.44	1.13	1.45	1.32	0.94
Vehicle network AM peak hour	1880	917	401	1046	2807	1042	639	629	1018	569	851
Trips per dwelling	1.97	1.36	0.27	1.56	2.27	0.78	1.26	1.13	1.46	1.03	0.94
Vehicle network PM peak hour	1517	939	1169	1068	1732	1085	675	557	896	655	854
Trips per dwelling	1.59	1.39	0.78	1.60	1.40	0.81	1.33	1.00	1.29	1.18	0.94
Daily total person trips											
0600 to 1900	14389	9699	11276	9753	17668	11489	4955	5099	7356	4878	6672
24 hours	17685	12077	13612	12256	21525	14112	5591	5831	8149	5984	8010
Trips per dwelling (24 hrs)	18.50	17.87	9.10	18.32	17.43	10.57	10.98	10.49	11.69	10.80	8.85
Vehicle-based trips											
Survey area AM peak hour	1170	673	875	649	1625	806	384	368	591	374	555
Trips per dwelling	1.22	1.00	0.59	0.97	1.32	0.60	0.75	0.66	0.85	0.68	0.61
Survey area PM peak hour	1070	710	802	932	1403	944	372	446	627	480	548
Trips per dwelling	1.12	1.05	0.54	1.39	1.14	0.71	0.73	0.80	0.90	0.87	0.61
Network AM peak hour	1170	598	297	649	1625	790	384	368	591	372	543
Trips per dwelling	1.22	0.88	0.20	0.97	1.32	0.59	0.75	0.66	0.85	0.67	0.60
Network PM peak hour	1070	709	653	744	1271	808	334	446	552	460	485
Trips per dwelling	1.12	1.05	0.44	1.11	1.03	0.61	0.66	0.80	0.79	0.83	0.54
Daily total vehicle trips											
0600 to 1900	9237	6962	7816	6914	11983	8888	3325	3635	4962	3521	4670
24 hours	11353	8669	9435	8689	14599	10918	3752	4157	5497	4319	5607
Trips per dwelling (24 hrs)	11.88	12.82	6.31	12.99	11.82	8.18	7.37	7.48	7.89	7.80	6.20

Table 3.2 Trips rate summary

Survey area ID	Sydney areas				Non-Sydney areas				All survey sites				Avg Non-Sydney / Sydney %
	LDR1 to LDR6				LDR7 to LDR11				LDR1 to LDR11				
Trips per dwelling	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	
Person-based trips													
Survey area AM peak hour	0.85	2.27	1.53	0.56	0.99	1.46	1.18	0.19	0.85	2.27	1.37	0.45	77%
Survey area PM peak hour	0.87	2.27	1.61	0.61	0.94	1.45	1.26	0.22	0.87	2.27	1.45	0.49	78%
Vehicle network AM peak hour	0.27	2.27	1.37	0.74	0.94	1.46	1.16	0.20	0.27	2.27	1.27	0.55	85%
Vehicle network PM peak hour	0.78	1.60	1.26	0.37	0.94	1.33	1.15	0.17	0.78	1.60	1.21	0.29	91%
Daily total person trips	9.10	18.50	15.30	4.27	8.85	11.69	10.56	1.05	8.85	18.50	13.15	3.96	69%
Vehicle-based trips													
Survey area AM peak hour	0.59	1.32	0.95	0.30	0.61	0.85	0.71	0.09	0.59	1.32	0.84	0.26	75%
Survey area PM peak hour	0.54	1.39	0.99	0.31	0.61	0.90	0.78	0.12	0.54	1.39	0.90	0.26	79%
Network AM peak hour	0.20	1.32	0.86	0.42	0.60	0.85	0.71	0.10	0.20	1.32	0.79	0.31	82%
Network PM peak hour	0.44	1.12	0.89	0.29	0.54	0.83	0.72	0.12	0.44	1.12	0.82	0.24	81%
Daily total vehicle trips	6.31	12.99	10.67	2.76	6.20	7.89	7.35	0.68	6.20	12.99	9.16	2.64	69%

A review of the data reveals a number of observations

- The surveys were undertaken on a range of the number of dwellings from 509 to 1,495.
- The survey area peak hour trip generation rate varied from 0.54 to 1.39 vehicle trips per dwelling with an average of 0.9 trips.
- The daily trip rate varied from 6.20 to 12.99 vehicle trips per dwelling with an average of 9.16 trips.
- The non-Sydney survey areas generally had lower trip rates than the Sydney survey areas.
- Slightly higher trips rates were observed during PM network peak than during AM network peak.

A summary of the daily trip rates is shown below.

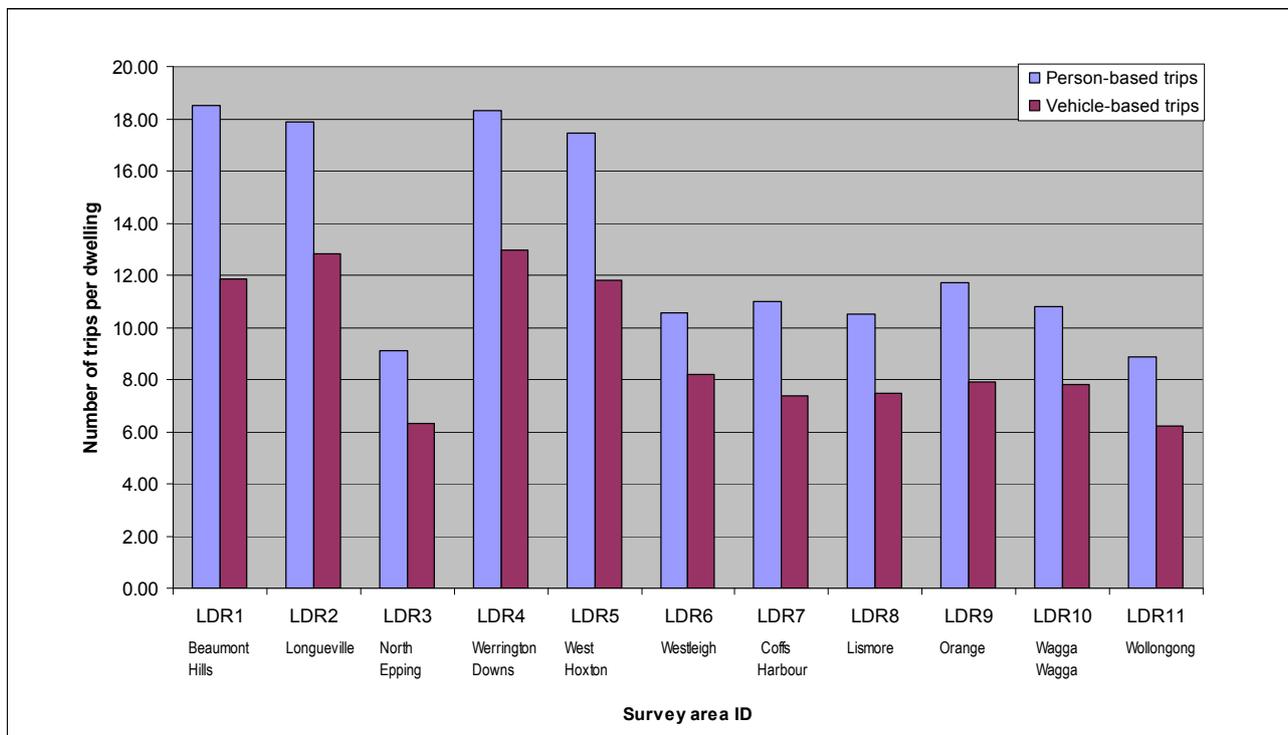


Figure 3.1 Daily trip rates.

3.3 Simple Linear Regression

As agreed in the project brief, the data has been analysed to determine the most consistent measure of trip generation, using a simple linear regression approach that is the highest R^2 value.

The coefficient of determination (R^2) has been used to provide a measure of the usefulness of the regression equation. It measures the proportion of variation in Y (trip behaviour) that is explained by the independent variable X (such as gross floor area) in the regression model. The values vary from 0 to 1 with higher value represents higher degree of correlation. In this study, this correlation coefficient (R^2) above 0.8 is preferred in order to accept the results to the desired level of correlation. In other words, at least 80% of the variation in trip behaviour can be explained by the variability in the independent variable in the acceptable level.

3.3.1 Relationship between the number of trips and the number of dwellings

The number of dwellings was used as the key independent variable for this regression analysis. The total number of trips in the following periods is plotted against the number of dwellings. 'Person' trips and 'vehicle' trips are plotted separately.

Survey area Peak Hour

- For the person trips, R^2 is 0.27 to 0.37
- For the vehicle trips, R^2 is 0.33 to 0.45
- R^2 for the survey area peak hour is low and indicates little correlation between the number of dwellings and the number of trips.

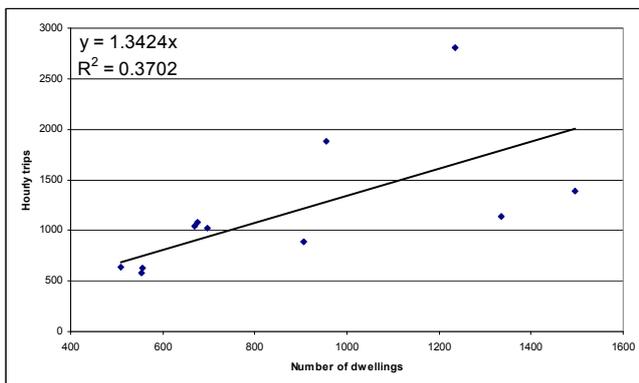


Figure 3-2 Person Trips – Survey area AM Peak Hour

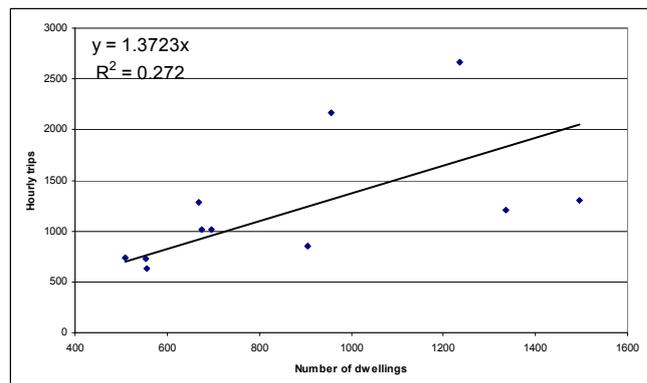


Figure 3-3 Person Trips – Survey area PM Peak Hour

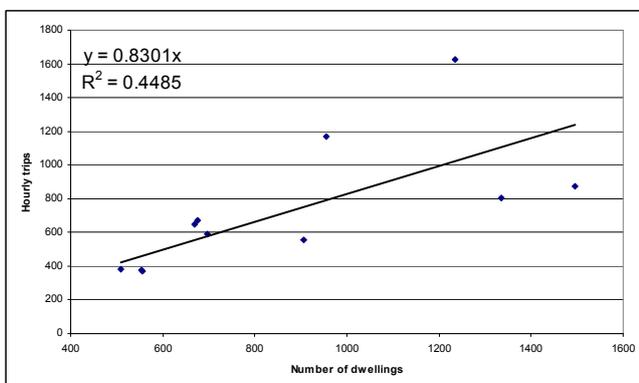


Figure 3-4 Vehicle Trips – Survey area AM Peak Hour

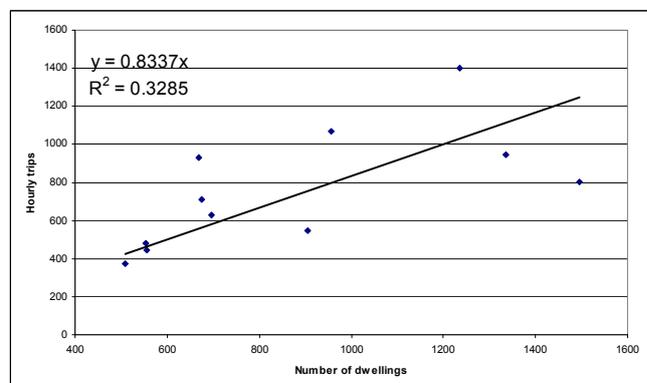


Figure 3-5 Vehicle Trips – Survey area PM Peak Hour

Daily Total Trips

- For the person trips, R^2 is 0.47
- For the vehicle trips, R^2 is 0.52
- R^2 for daily total trips indicates low correlation between the number of dwellings and the number of trips.

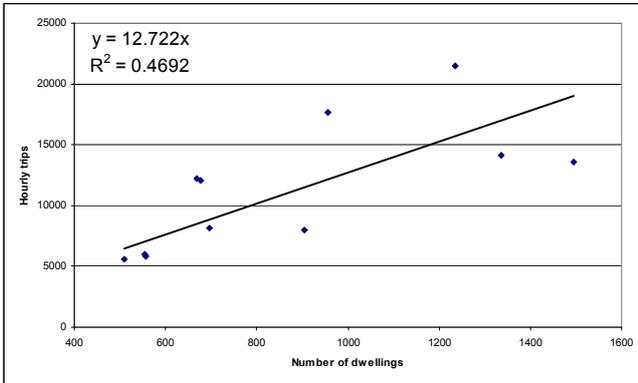


Figure 3-6 Person Trips – Daily

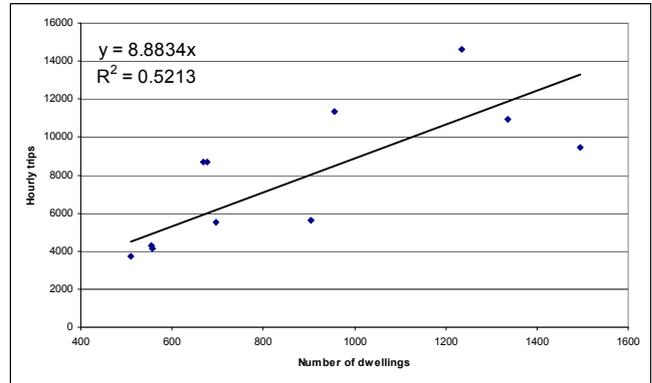


Figure 3-7 Vehicle Trips – Daily

Road Network Peak

- For the person trips, R^2 is between 0.03 and 0.28
- For the vehicle trips, R^2 is between 0.08 and 0.2
- R^2 for road network peak hour trips is very low and indicates little or no correlation between the number of dwellings and the number of trips.

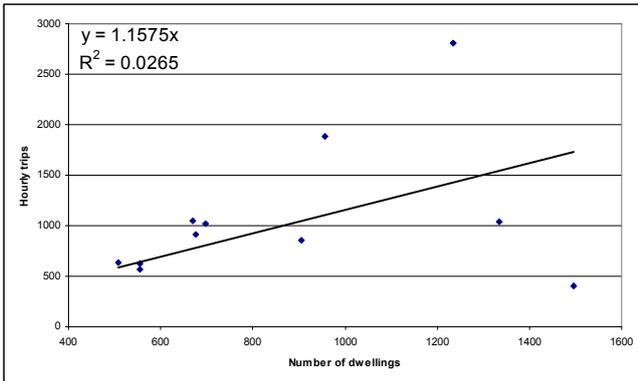


Figure 3-8 Person Trips – Network AM Peak

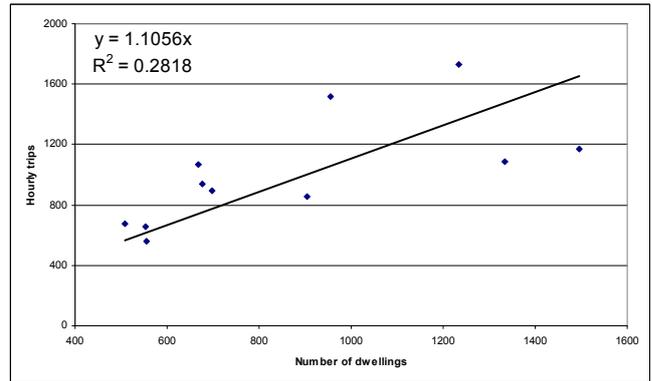


Figure 3-9 Person Trips – Network PM Peak

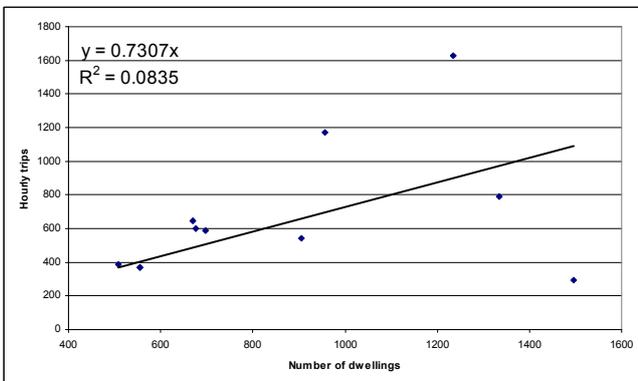


Figure 3-10 Vehicle Trips – Network AM Peak

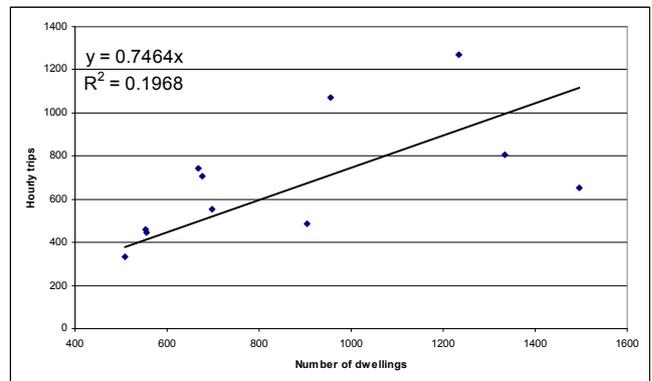


Figure 3-11 Vehicle Trips – Network PM Peak

3.3.2 Relationship between the trip rates and the number of dwellings

The relationship between the trip rates (number of trips per dwelling) and the number of dwellings was also analysed. ‘Person’ trips and ‘vehicle’ trips are plotted separately.

Survey area Peak Hour

- For the person trips, R^2 is 0.0004 to 0.025
- For the vehicle trips, R^2 is 0.0002 to 0.078
- R^2 for the survey area peak hour is very low and indicates practically no correlation between the number of dwellings and the number of trips per dwelling.

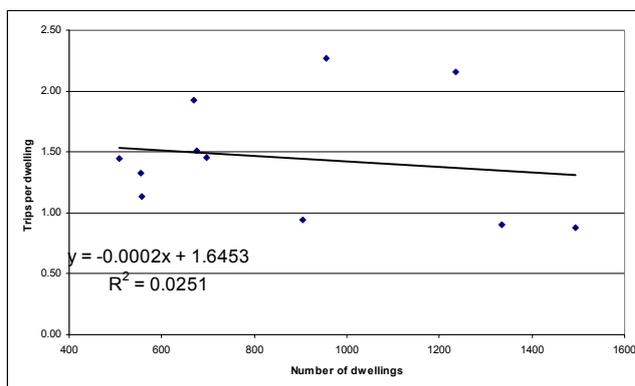
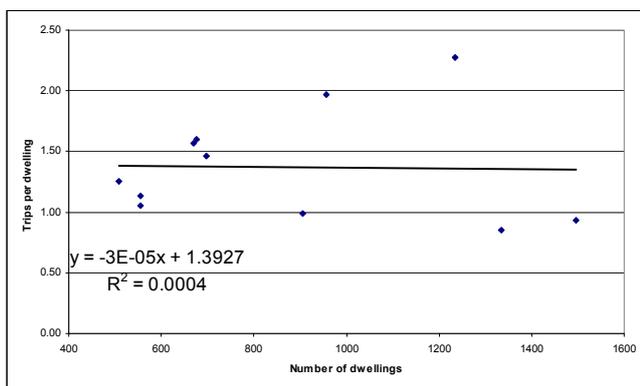


Figure 3-12 Person trip rates – Survey area AM Peak Hour Figure 3-13 Person trip rates – Survey area PM Peak Hour

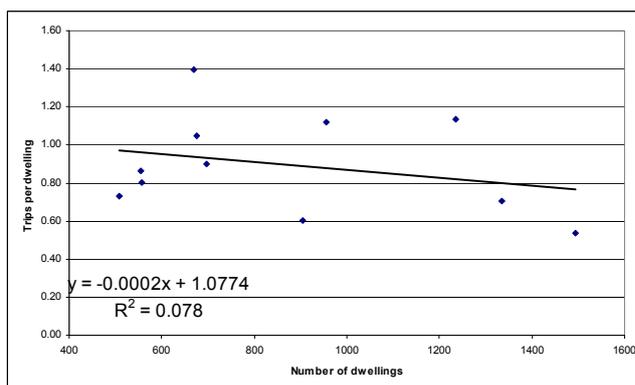
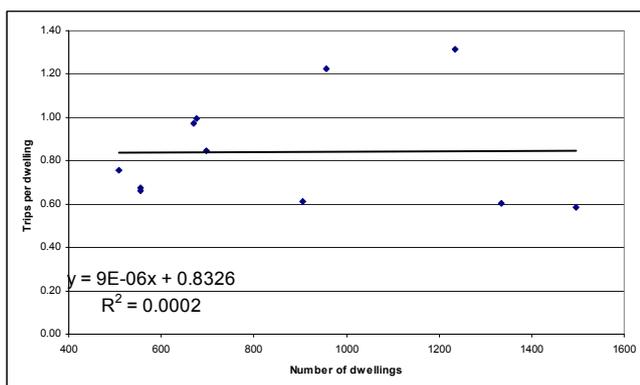


Figure 3-14 Vehicle trip rates – Survey area AM Peak Hour Figure 3-15 Vehicle trip rates – Survey area PM Peak Hour

Daily Total Trips

- For the person trips, R^2 is 0.0077
- For the vehicle trips, R^2 is 0.0075
- R^2 for daily total trips is very low and indicates practically no correlation between the number of dwellings and the number of trips per dwelling.

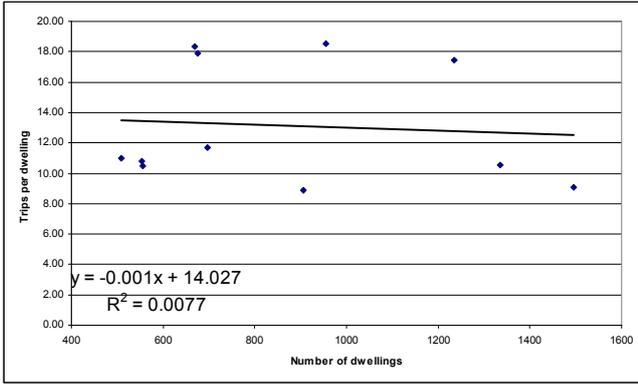


Figure 3-16 Person Trip rates – Daily

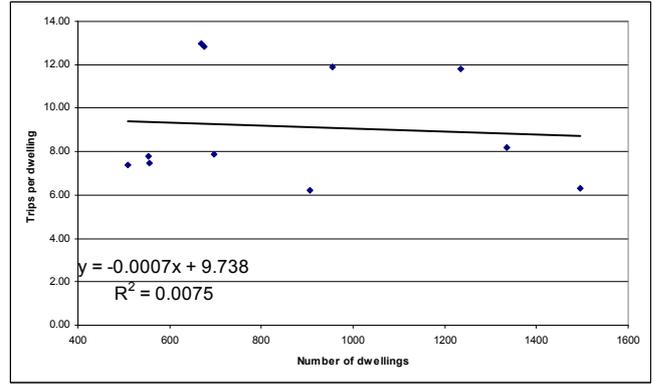


Figure 3-17 Vehicle Trip rates – Daily

Road Network Peak

- For the person trips, R^2 is between 0.05 and 0.2
- For the vehicle trips, R^2 is between 0.04 and 0.12
- R^2 for road network peak hour trips is very low and indicates little or no correlation between the number of dwellings and the number of trips per dwelling.

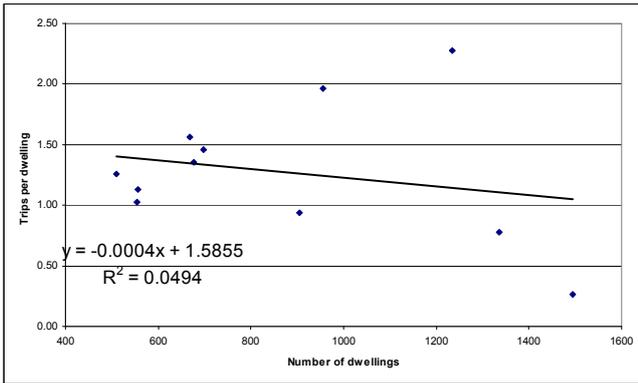


Figure 3-18 Person trip rates – Network AM Peak

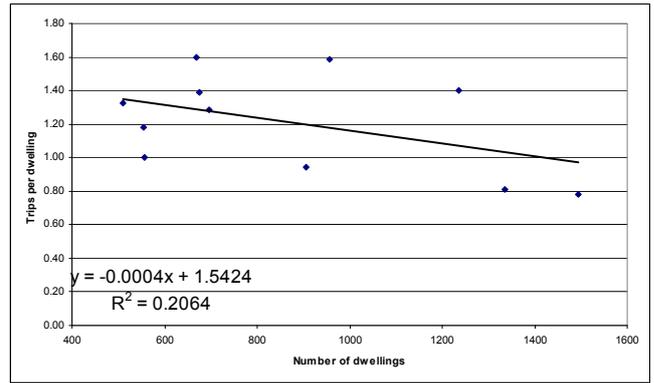


Figure 3-19 Person trip rates – Network PM Peak

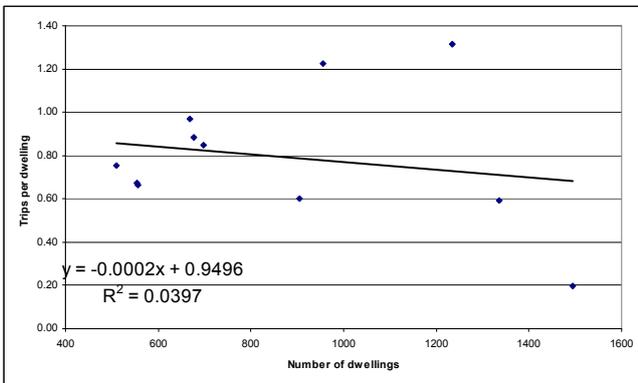


Figure 3-20 Vehicle trip rates – Network AM Peak

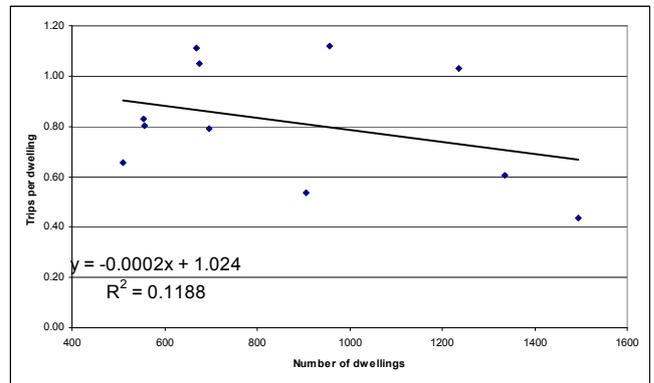


Figure 3-21 Vehicle trip rates – Network PM Peak

3.3.3 Trip rates and Accessibility Score

The trip rates in the following periods are plotted against the Accessibility Score. ‘Person’ trip rates and ‘vehicle’ trip rates are plotted separately.

Survey area Peak Hour

- For the person trips, R^2 is 0.005 to 0.03
- For the vehicle trips, R^2 is 0.05
- R^2 for the survey area peak hour is very low and indicates practically no correlation between the Accessibility Score and the trip rates.

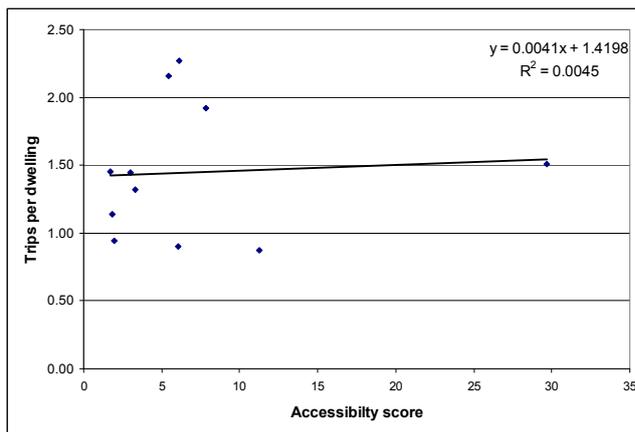
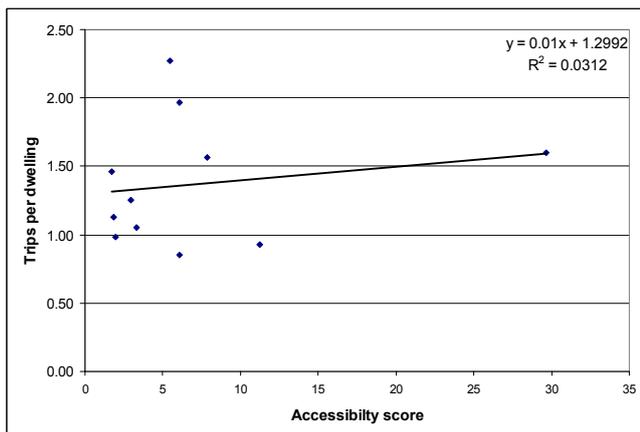


Figure 3-22 Person trip rates – survey area AM peak hour Figure 3-23 Person trip rates – survey area PM peak hour

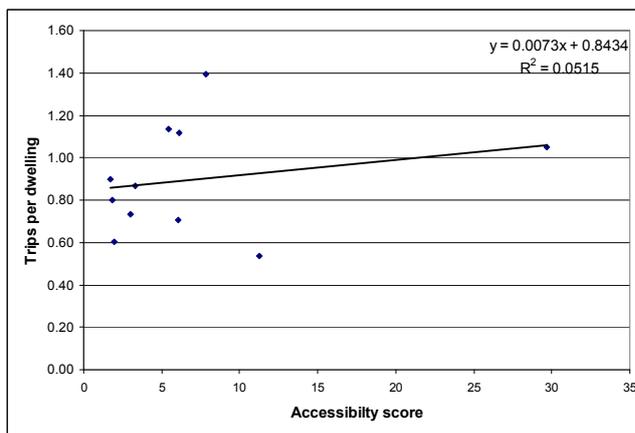
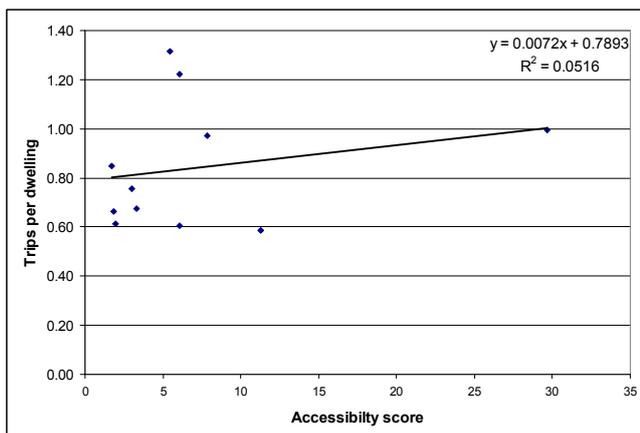


Figure 3-24 Vehicle trip rates – survey area AM peak hour Figure 3-25 Vehicle trip rates – survey area PM peak hour

Daily Total Trips

- For the person trips, R^2 is 0.21
- For the vehicle trips, R^2 is 0.27
- R^2 for daily total trips is low and indicates practically no correlation between the Accessibility Score and the trip rates.

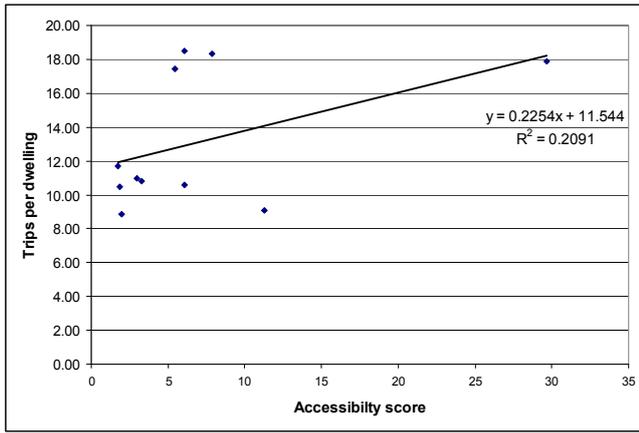


Figure 3-26 Person trip rates – daily

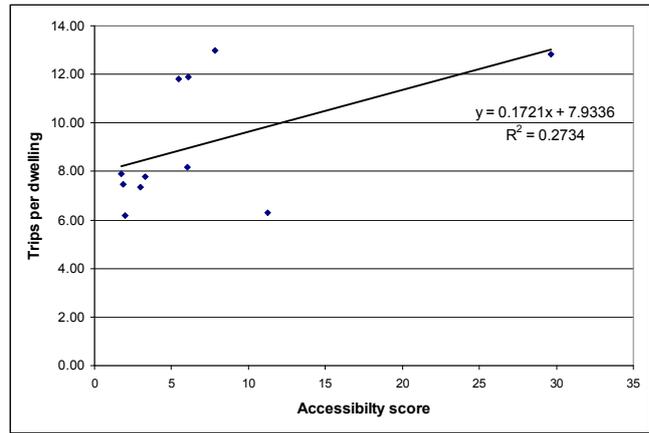


Figure 3-27 Vehicle trip rates – daily

3.3.4 Conclusions about Linear Regression analysis

In general, the trip behaviour for all the low density residential survey areas has a very low correlation with the number of dwellings. It is recommended that average or survey area specific trip rates be utilised for planning purposes.

The analysis showed no dependency of the trip rates from the survey area Accessibility Score.

3.4 Trip distribution by direction of travel

The results of the trip distribution analysis are shown below.

Table 3.3 Directional trip distribution.

Survey area ID	Sydney areas						Non-Sydney areas				
	LDR1 Beaumont Hills	LDR2 Longueville	LDR3 North Epping	LDR4 Werrington Downs	LDR5 West Hoxton	LDR6 Westleigh	LDR7 Coffs Harbour	LDR8 Lismore	LDR9 Orange	LDR10 Wagga Wagga	LDR11 Wollongong
Number of dwellings	956	676	1495	669	1235	1335	509	556	697	554	905
Person-based trips											
Survey area AM peak hour	1880	1083	1390	1046	2807	1138	639	629	1018	582	892
incoming trips	680	308	261	364	743	225	188	125	166	98	223
% incoming / total trips	36.2%	28.4%	18.8%	34.8%	26.5%	19.8%	29.4%	19.9%	16.3%	16.8%	25.0%
outgoing trips	1200	775	1129	682	2064	913	451	504	852	484	669
% outgoing / total trips	63.8%	71.6%	81.2%	65.2%	73.5%	80.2%	70.6%	80.1%	83.7%	83.2%	75.0%
Survey area PM peak hour	2170	1020	1308	1286	2666	1207	735	631	1012	733	854
incoming trips	1339	563	802	739	1574	795	445	412	679	515	581
% incoming / total trips	61.7%	55.2%	61.3%	57.5%	59.0%	65.9%	60.5%	65.3%	67.1%	70.3%	68.0%
outgoing trips	831	457	506	547	1092	412	290	219	333	218	273
% outgoing / total trips	38.3%	44.8%	38.7%	42.5%	41.0%	34.1%	39.5%	34.7%	32.9%	29.7%	32.0%
Vehicle-based trips											
Survey area AM peak hour	1170	673	875	649	1625	806	384	368	591	374	555
incoming trips	436	218	209	240	661	146	117	93	127	86	166
% incoming / total trips	37.3%	32.4%	23.9%	37.0%	40.7%	18.1%	30.5%	25.3%	21.5%	23.0%	29.9%
outgoing trips	734	455	666	409	964	660	267	275	464	288	389
% outgoing / total trips	62.7%	67.6%	76.1%	63.0%	59.3%	81.9%	69.5%	74.7%	78.5%	77.0%	70.1%
Survey area PM peak hour	1070	710	802	932	1403	944	372	446	627	480	548
incoming trips	645	398	514	556	804	617	202	306	420	324	347
% incoming / total trips	60.3%	56.1%	64.1%	59.7%	57.3%	65.4%	54.3%	68.6%	67.0%	67.5%	63.3%
outgoing trips	425	312	288	376	599	327	170	140	207	156	201
% outgoing / total trips	39.7%	43.9%	35.9%	40.3%	42.7%	34.6%	45.7%	31.4%	33.0%	32.5%	36.7%

Table 3.4 Directional trip distribution summary.

Survey area ID	Sydney areas					Non-Sydney areas					All survey areas				
	LDR1 to LDR6					LDR7 to LDR11					LDR1 to LDR11				
Proportion of trips	Min	Max	Avg	St Dev	85th %ile	Min	Max	Avg	St Dev	85th %ile	Min	Max	Avg	St Dev	85th %ile
Person-based trips															
% incoming / total trips AM peak	19%	36%	27%	7%	35%	16%	29%	21%	6%	27%	16%	36%	25%	7%	32%
% outgoing / total trips AM Peak	64%	81%	73%	7%	80%	71%	84%	79%	6%	83%	64%	84%	75%	7%	82%
% incoming / total trips PM peak	55%	66%	60%	4%	63%	61%	70%	66%	4%	69%	55%	70%	63%	5%	68%
% outgoing / total trips PM Peak	34%	45%	40%	4%	43%	30%	39%	34%	4%	37%	30%	45%	37%	5%	42%
Vehicle-based trips															
% incoming / total trips AM peak	18%	41%	32%	9%	38%	21%	30%	26%	4%	30%	18%	41%	29%	7%	37%
% outgoing / total trips AM Peak	59%	82%	68%	9%	78%	70%	79%	74%	4%	78%	59%	82%	71%	7%	78%
% incoming / total trips PM peak	56%	65%	60%	4%	64%	54%	69%	64%	6%	68%	54%	69%	62%	5%	67%
% outgoing / total trips PM Peak	35%	44%	40%	4%	43%	31%	46%	36%	6%	40%	31%	46%	38%	5%	43%

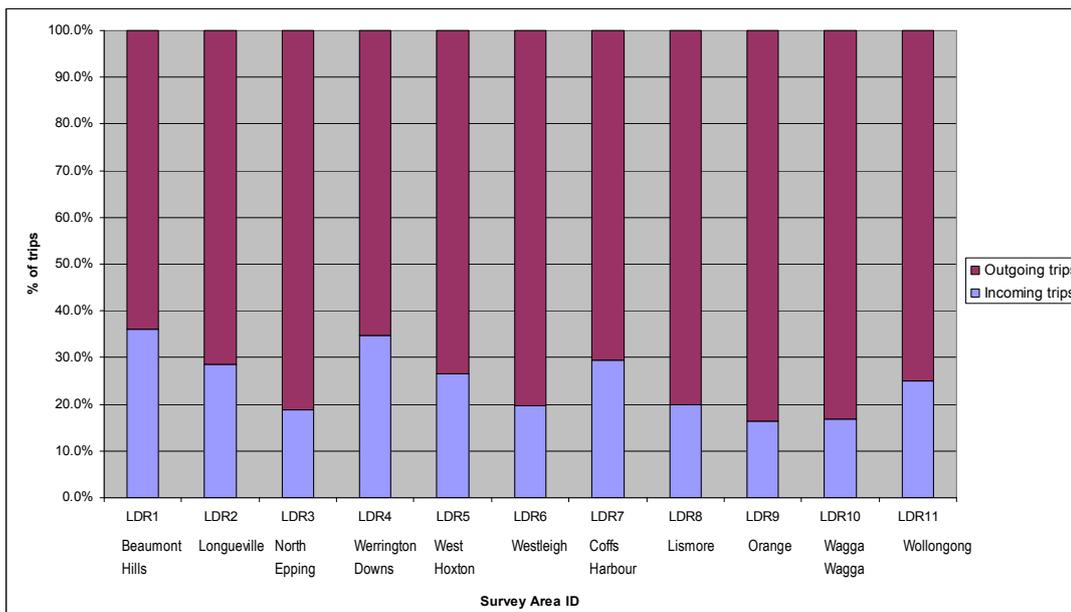


Figure 3.18 Person-based trip distribution – AM Peak

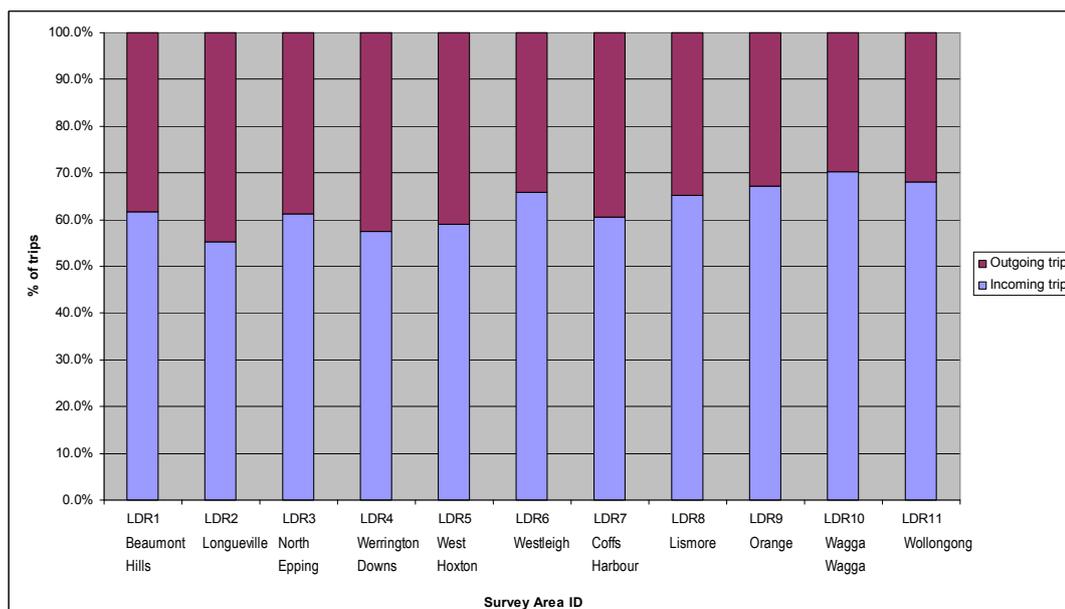


Figure 3.28 Person-based trip distribution – PM Peak

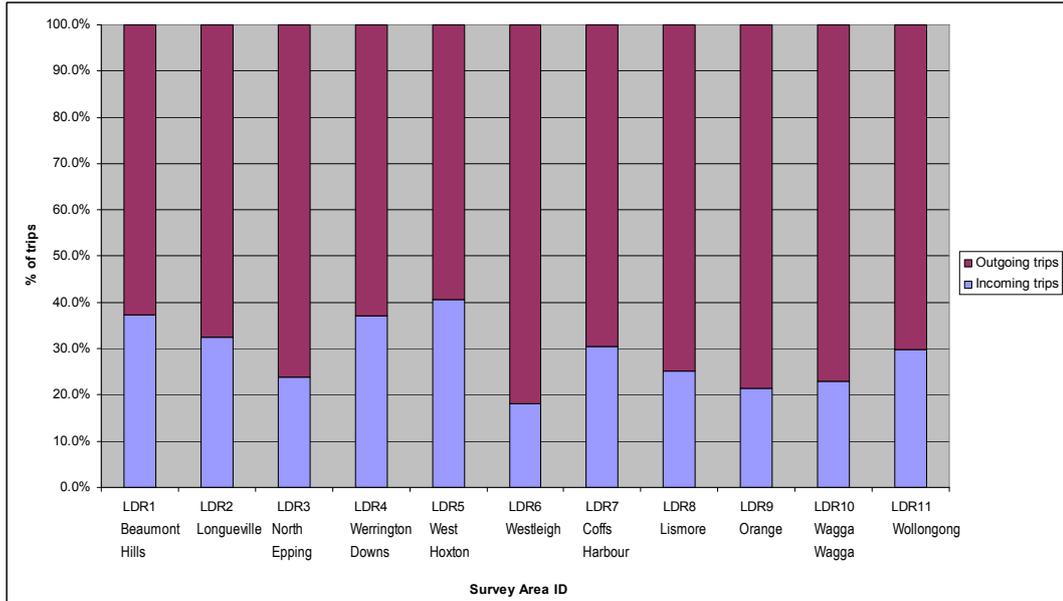


Figure 3.29 Vehicle-based trip distribution – AM Peak

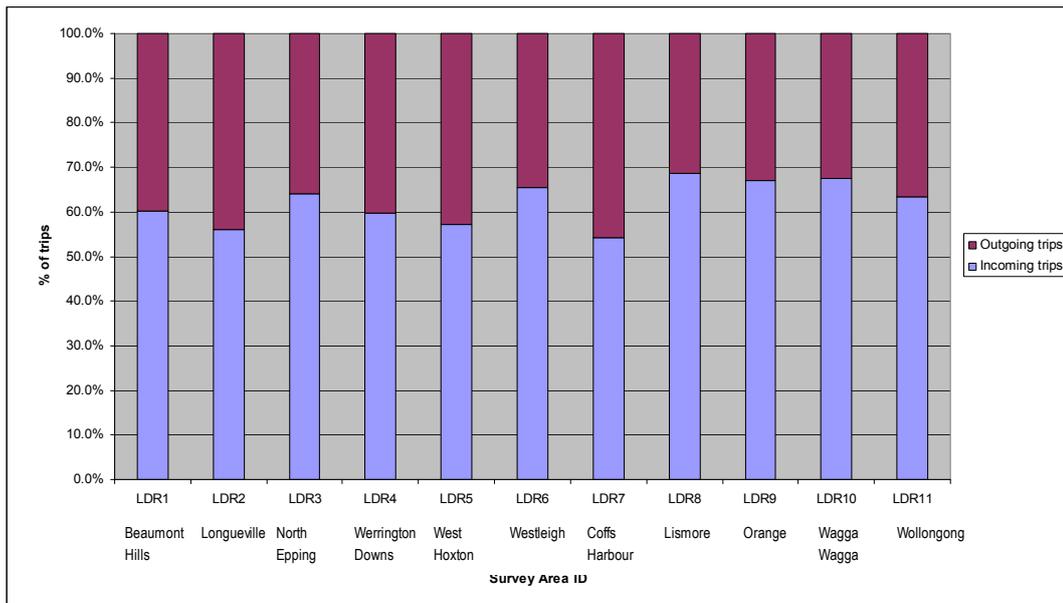


Figure 3.30 Vehicle-based trip distribution – PM Peak

3.5 Modes of travel

Modes of travel were calculated for daily person-based trips. The results are presented below.

Table 3.5 Daily modes of travel.

Survey area ID	Sydney areas							Non-Sydney areas					Average all sites	
	LDR1 Beaumont Hills	LDR2 Longueville	LDR3 North Epping	LDR4 Werrington Downs	LDR5 West Hoxton	LDR6 Westleigh	Average	LDR7 Coffs Harbour	LDR8 Lismore	LDR9 Orange	LDR10 Wagga Wagga	LDR11 Wollongong		Average
Travel mode														
Car driver	61.2%	68.7%	67.7%	68.6%	65.3%	75.2%	67.8%	65.6%	68.2%	66.7%	70.2%	67.1%	67.6%	67.7%
Car passenger	15.2%	16.8%	20.5%	18.9%	25.0%	16.1%	18.8%	23.2%	19.0%	27.9%	22.1%	21.9%	22.8%	20.6%
Bus	16.9%	4.5%	5.2%	5.6%	4.0%	3.5%	6.6%	4.3%	7.0%	2.9%	5.9%	6.2%	5.3%	6.0%
Commercial vehicle	0.8%	2.8%	1.6%	1.2%	2.0%	1.8%	1.7%	1.3%	1.5%	0.3%	0.6%	1.8%	1.1%	1.4%
Bicycle	0.3%	0.4%	0.7%	0.7%	0.2%	0.3%	0.4%	1.3%	0.5%	0.3%	0.1%	0.3%	0.5%	0.5%
Walk	5.4%	6.8%	4.3%	4.9%	3.5%	3.0%	4.7%	4.4%	3.6%	1.8%	1.0%	2.6%	2.7%	3.8%
Other	0.2%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.2%	0.1%	0.0%	0.0%	0.1%	0.1%

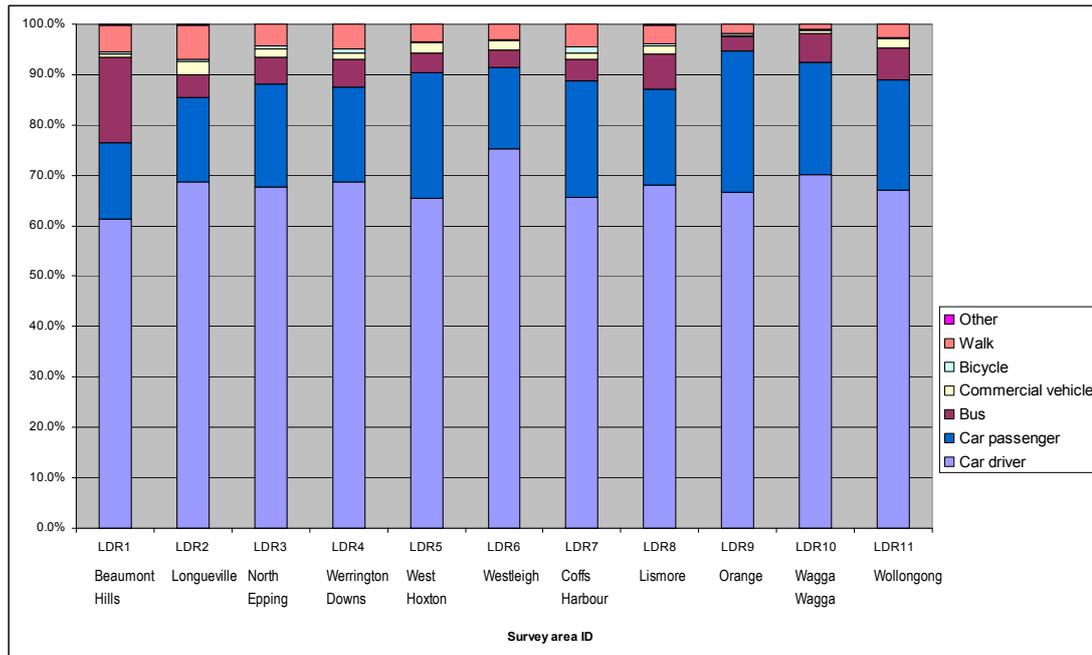


Figure 3.31 Daily modes of travel

3.6 Car occupancy

Car occupancy was calculated for peak hour and daily vehicle-based trips. The results are presented below.

Table 3.6 Car occupancy results.

Survey area ID	Sydney areas						Non-Sydney areas				
	LDR1	LDR2	LDR3	LDR4	LDR5	LDR6	LDR7	LDR8	LDR9	LDR10	LDR11
Car Occupancy											
Survey area AM peak hour	1.20	1.36	1.42	1.36	1.59	1.25	1.46	1.42	1.62	1.52	1.43
Survey area PM peak hour	1.23	1.18	1.20	1.28	1.70	1.21	1.56	1.23	1.48	1.30	1.32
Daily total vehicle trips	1.25	1.24	1.30	1.28	1.38	1.21	1.35	1.28	1.42	1.32	1.33

Table 3.7 Car occupancy summary.

Survey area ID	Sydney areas				Non-Sydney areas				All survey sites				Avg Non-Sydney / Sydney %
	LDR1 to LDR6				LDR7 to LDR11				LDR1 to LDR11				
Car occupancy	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	Min	Max	Avg	St Dev	
Survey area AM peak hour	1.20	1.59	1.36	0.14	1.42	1.62	1.49	0.08	1.20	1.62	1.42	0.13	109%
Survey area PM peak hour	1.18	1.70	1.30	0.20	1.23	1.56	1.38	0.14	1.18	1.70	1.34	0.17	106%
Daily total vehicle trips	1.21	1.38	1.28	0.06	1.28	1.42	1.34	0.05	1.21	1.42	1.31	0.06	105%

4 COMPARISON OF NSW FINDINGS WITH OTHER NATIONAL & OVERSEAS DATABASES

4.1 Introduction

A number of Australian and overseas guidance documents and traffic generation databases have been examined to determine whether they are comparable to the results established from this study. These are examined below.

4.2 Australian Documents

4.2.1 National Documents

Austroads has published a document titled “The Guide to Traffic Management Part 12 – Traffic Impact of Developments”. It sets the scene for traffic impact assessment and includes processes for

- Traffic and access management for developments
- Traffic impact assessment of developments
- Assessment of impacts on pavement and road safety

Austroads Guide does not contain any specific trip generation rates. It recommends using trip rates established in the previous surveys, with preference given to the rates derived locally. It also recommends using information from consultant reports, local government files and documents like RTA (2002) Guide to Traffic Generating Developments.

4.2.2 State Documents

Most of the Australian states produce a document(s) which shows how to undertake traffic / transport impact assessments. Most of these documents refer to sources of traffic generation data. The documents, and other anecdotal information, are discussed below for each of the states.

Table 4-1 Sources of Trip Generation Rate Information

NSW	The RTA “Guide to Traffic Generating Developments” is generally used. The latest version of the document was published in 2002 but much of its data is around 20 years old and more. A number of consultancies use their own data collection efforts to argue variations to the RTA Guide (both up and down) but invariably use the RTA guide as the starting point.
Queensland	Queensland use the RTA guidelines as well as the Dept of Transport and Main Roads <i>Road Planning and Design Manual</i> . A number of Councils generally use the trip generation rates specified in the Queensland Department of Transport and Main Roads (TMR) Road Planning and Design Manual Chapter 3 Appendix 3A. For low density residential, a number of sources are quoted including RTA, QT, AMCORD and Qld Streets.
Victoria	The RTA Guide to Traffic Generating Developments is used extensively and some documents refer to a Victorian document “Guidelines for Transport Impact Assessment Reports for major land use and development proposals (2006)” often referred to as “The Transport Impact Assessment Report (TIAR) Guidelines”. To a lesser extent, the Institute of Transportation Engineers (ITE) Trip Generation, 8th Edition publication is also used. Again, consultancies tend to use their own data collection efforts to assemble traffic generation figures.
South Australia	It appears that traffic assessments generally use the RTA Guide to Traffic Generating Developments

Western Australia	Transport Assessment Guidelines for Developments were issued in 2006 for trial and evaluation. The document is divided into 5 volumes with the final volume giving more detailed considerations. The document was endorsed by the Western Australia Planning Commission Transport Committee as a “working” document for voluntary trial and evaluation. Transport officers within the Dept for Planning and Infrastructure are using the guidelines to assist them in assessing the transport implications of land use development proposals and officers within local government are being encouraged to do the same.
Australian Capital Territory	The ACT generally uses the RTA Guide to Traffic Generating Developments.
Northern Territory	Unknown
Tasmania	Tasmania generally uses the RTA guidelines when assessing traffic generating developments. This only varies when contemporary and relevant traffic count data that supports using other figures is available.

Each of the key Australian documents is described below

NSW

The RTA Guide (2002) includes both traffic generation and parking impact information for a wide range of land uses. Even so, some of the uses range across a broad spectrum of developments. The Guide includes trip generation for four (4) types of residential development namely; dwelling houses, medium density residential flat building including town houses, high density residential flat buildings and Housing for Aged and Disable persons. The Guide defines a trip as a one way vehicular movement from one point to another excluding the return journey; therefore, a return trip to / from a land use is counted as two trips.

The document is widely used in NSW although its validity is sometimes called into question, particularly at Land and Environment Court cases, when developers often submit their own traffic count data. This situation is in compliance with the Guide which states that “surveys of existing developments similar to the proposal can also be undertaken and comparisons may be drawn”.

Queensland

Council generally adopts (or 'accepts' in terms of development traffic impact reports) the trip generation rates specified in the Queensland Department of Transport and Main Roads (TMR) Road Planning and Design Manual Chapter 3 Appendix 3A. For low density residential, a number of sources apart from the TMR are also referred to including the following documents:

- BCC Brisbane Plan Traffic Generation and Parking Guidelines
- AMCORD
- Queensland Streets

Single lot are usually assumed to have generation rates of 8-10 trips /day per dwelling with 0.8 -1.0 trip in the peak hour.

Victoria

The Guidelines for Preparation of Transport Impact Assessment Report document (which is part of the VicRoads Toolkit for managing access to Arterial Roads and Freeways) discusses the provision of traffic generation information but gives no indication as to where such trip generation information might be obtained.

Western Australia

The DPI (now DoP and DoT) issued the Transport Assessment Guidelines for Developments in 2006. The guidelines suggest the adoption of the following generation rates for low density residential dwellings.

	Daily Trips	AM Peak	PM Peak
Trips per dwelling	8.00	0.80	0.80
Directional Distribution IN/OUT	50%/50%	25%/75%	67%/33%

Also used in WA is data on household trips that the Strategic Transport Evaluation Model (STEM) based on travel surveys. Those trip generation rates are geared to number of persons per house, number of employees per house, number of children, etc. Some professionals have worked their own variation from estimated persons per dwelling (1.6-3.0) which varies according to zoning and dwelling type, trips per day per person (3.0 or thereabouts), the driver mode share (60%-85% typically) which depends on public transport and mixed use factors. A percentage for the non-home based trips and commercial vehicle trips is also added based on local knowledge. Average figures for new urbanism projects work out in the range between about 5.5 to 8.0 veh-trip per dwelling per day. The 5.5 vehicle-trips per day occur in medium-high density areas with good public transport and nearby employment; the 7-8 vehicle-trips per day occur further out. Finally, consultants also refer to the RTA NSW guidelines.

South Australia

The 1987 South Australia document *Land use traffic generation guidelines* states that the ‘trip rates’ used in the document are appropriate for the 1980’s and “*care should be taken in applying them after 1980*”. It does however contain simplistic trip generation rates for a large number of land uses. It appears that more recently traffic assessments generally use the RTA Guide to Traffic Generating Developments.

4.3 Other Countries

4.3.1 New Zealand

The New Zealand Trips and Parking Database Bureau is now known as the Trips Database Bureau. The Bureau was formed in New Zealand in 2002 using an initial database of around 500 survey sites. The Bureau continues to collect surveys of trip rates, parking demand and travel information relative to different land uses from across the country. In addition to developing the trips and parking database, the Bureau also undertakes government sponsored transportation research on travel profiles, trip generation and transportation assessment guidelines. Members of the Bureau include New Zealand organisations such as Transit NZ, consultants and councils and recently some Australian councils and consultants. The Roads and Traffic Authority of NSW is also a subscriber to the NZTDB.

4.3.2 USA

The Institution of Transportation Engineers (ITE) “Trip Generation” book consists of two data volumes with land use descriptions, trip generation rates, equations and data plots. Data is included from more than 4,800 sites and 162 land uses. The most recent (8th) edition was published in 2008. The USA document is produced in book format only which means it is not possible to select the most appropriate site data and it encourages the use of average values.

4.3.3 UK

TRICS is the UK national standard trip generation database and is used as an integral and essential part of the Transport Assessment process. The system is marketed and managed by JMP Consultants Limited on behalf of the TRICS® Consortium of 6 County Councils: Surrey, Kent, East Sussex, West Sussex, Hampshire and Dorset. JMP regularly ask for input from consultants and local authorities with regard to the additional land uses that require additional information. It contains transport generation data for a wide variety of development types, across all regions of the UK and Ireland. The current annual data collection programme consists of 170 multi-modal surveys across all regions, plus another 100 traffic surveys. The database in which 5,900 days of survey data are held uses a flexible system of filtering, to allow users to interrogate trip rates for sites (including a very specialised range of land use categories) which meet their own compatibility criteria. Also, individual trip rates for a given time period for a number of surveys can be calculated and ranked, displaying the worst and best case scenarios.

Nevertheless, with the wide range of data, it is often the case that developers and development control officers fail to agree on the most relevant site data which in turn often leads to disagreements and this often forms the basis of planning appeals (which are the UK equivalent of Land & Environment Courts).

TRAVL

TRAVL (Trip Rate Assessment Valid for London) is a multi-modal trip generation database designed specifically for use in the capital. It is used by planners working on projects across Greater London to estimate the effect of proposed changes in land use on transport patterns and, in particular, on the amount of road traffic in an area. The TRAVL database contains surveys of over four hundred sites across the capital. There are several types of surveys provided for each site which cover all aspects of traffic and people movement at the specific sites.

Summary

It is clear that the TRAVL database is primarily used in city centre London which has heavily constrained traffic movements and very high levels of public transport accessibility. Consequently, it is not considered that it is a useful database in the context of this study. Elsewhere in the UK, TRICS is the accepted database for nearly all councils and traffic consultancies.

4.4 Residential Vehicle Trip Generation - International Databases

The following databases have been examined:

- RTA Guide to Traffic Generating Developments (2002)
- New Zealand Trips Database Bureau (NZTDB)
- United States Institute of Transportation Engineers (ITE)
- Trip Rate Information Computer Systems (TRICS) UK

4.4.1 RTA Guide to Traffic Generating Developments

The RTA Guide (2002) suggests a daily generation rate of 9.0 trips per dwelling and weekday peak hour vehicle trips of 0.85 trips per dwelling. The Guide suggests that these generation rates include up to 25% of trips *internal* to the subdivision, involving local shopping, schools and local social visits. When reviewing the impact of the traffic generated on sub-regional and regional roads, some adjustment is necessary, depending on the location of shops, schools and recreational facilities.

4.4.2 New Zealand Trips Database Bureau (NZTDB)

The surveys available in the New Zealand database for residential land use are normally for the morning and afternoon peak hours and weekday daily trips. The published survey results were analysis and summarised in **Table 4.1**.

Table 4.1 Trip Generation Rates of Residential Dwellings (NZTDB)

	Daily Trips	AM Peak	PM Peak
Trips per dwelling	8.37	0.79	0.98
Range	5.95-14.19	0.67-0.92	0.80-1.29
Directional Distribution	50%/50%	29%/71%	60%/40%

4.4.3 US Institute of Transportation Engineers (ITE)

The Institute of Transportation Engineers (ITE) Trip Generation Manual (8th Edition 2008) include trip generations for single-family detached housing (referred to as N^o 210). The information contained in this document is summarised in **Table 4.2**.

Table 4-2: Trip Generation of Single-Family Detached Housing – ITE (2008)

	Period	Vehicle Trips / Dwelling	Range	Directional Distribution %Arr/%Dep
WEEKDAY TRIP GENERATION				
	Daily	9.57	4.31-21.85	50%/50%
Network Peak	AM	0.75	0.33-2.27	25%/75%
	PM	1.01	0.42-2.98	63%/37%
Generator Peak	AM	0.77	0.33-2.27	26%/74%
	PM	1.02	0.42-2.98	64%/36%
WEEKEND				
Saturday	Daily	10.08	5.32-15.25	50%/50%
	Peak	0.93	0.50-1.75	53%/47%
Sunday	Daily	8.77	4.74-12.31	50%/50%
	Peak	0.86	0.55-1.48	53%/47%

4.4.4 Trip Rate Information Computer Systems (TRICS) London

The TRICS data base included trip information for residential areas. Some 36 areas with densities between 10 to 40 dwellings per hectare were filtered on the basis of day of the week - Tue – Thursday. Flats were excluded but detached and semi-detached dwellings were included providing an average density of 27.6 dwellings/hectare. Survey data from 2000 to 2010 were selected. This approach was adopted to identify factors that are relevant to the comparability with Australian conditions. The results of the surveyed sites are summarised in the **Appendix**. A summary of the information extracted from the database is summarised in **Table 4.3**.

TRICS data shows that the daily trip generation on weekdays is considerably lower than on Saturdays.

Table 4-3: Summary of TRICS Analysis for Low Density Residential Development

	Trip Rate per day	AM peak Hour	PM peak Hour
Vehicle Trips			
Weekday	5.79	0.60	0.64
Saturday	8.25	0.63	
Person Trips			
Weekday	9.72	1.17	1.06
Saturday	12.35	1.47	

4.4.5 Comparison of Databases - Vehicle Trip Generation

A comparison of trip rates between these databases is summarised in **Table 4.4**.

Table 4-4 Summary Trip Generation Comparison – Low Density Residential (vehicle trips per dwelling)

SOURCE	WEEKDAYS			SATURDAYS		SUNDAYS	
	AM Peak	PM Peak	Daily	Peak	Daily	Peak	Daily
RTA Guide	0.85	0.85	9.0				
NZTDB	0.79	0.98	8.37				
ITE	0.77	1.02	9.57	0.93	10.08	0.86	8.77
TRICS	0.60	0.64	5.79	0.63	8.25		
STUDY RESULTS (External Trips Only)							
All Survey areas	0.84	0.90	9.16				
Sydney	0.95	0.99	10.67				
Non-Sydney	0.71	0.78	7.35				

It should be noted that the result of this current study do not include trips *internal* to the subdivision, involving local social visits and where appropriate trips to local shops, schools, child care centres and recreational facilities such as tennis courts.

The weekday generation rates derived from the TRICS database are much lower than those established in this study. They reflect the generally higher density of dwellings in England, and are not appropriate for NSW.

The daily weekday ITE trip generation is about 11 percent lower than the average rates determined for the Sydney surveyed sites. It would therefore be appropriate to use the ITE weekend generation rates when and if required for Sydney.

The daily generation rate in the NZTDB is about 22 percent lower than those derived for Sydney. The morning and afternoon peak generation rates are about 17 and 1 percent respectively less than those derived for Sydney. In general, the application of NZTDB rates in the NSW context would produce considerably lower trip generation estimates.

In regional centres, the only appropriate generation rates to use are those established in this study; the use of information from any other databases would not be appropriate.

5 SUMMARY

Since the original publication of the *Guide to Traffic Generating Developments*, there have been numerous changes to single dwelling residential subdivisions including lot sizes and major development in areas not adequately served by public transport. Residences circumstances have changed as well, with improved access to private vehicles and higher disposable incomes.

The RTA is concerned that the traffic generation data in its guide contains data that was collected prior to the document's initial issue in 1993, and that does not reflect current traffic patterns.

A list of six (6) urban and five (5) regional sites were then selected in consultation with RTA.

There were a number of issues encountered in selecting the sites and conducting the surveys.

- It was difficult to find sufficiently large suitable areas without schools and then to discount the observed trips by the number of school trips attracted from outside of the survey area.
- In the early hours of the morning, mainly between 6 am and 7 am, traffic observers had some difficulties identifying vehicle occupancies due to dark conditions and headlight glare at some locations. In particular, it was difficult to identify whether vehicles carried little children.
- Assumptions had to be made with regard to the numbers of transit bus passengers (trips not generated within the survey areas).

Surveys of trips generation were carried out in April-May 2010, outside school holidays. Traffic counts (all travel modes and vehicle occupancy) were undertaken at each entry and exit of each survey area between 6 am and 7 pm on either Tuesday, Wednesday or Thursday.

A review of the survey data revealed a number of observations

- The surveys were undertaken on a range of the number of dwellings from 509 to 1,495.
- The site AM peak hour trip generation rate varied from 0.59 to 1.32 vehicle trips per dwelling with an average of 0.84 trips.
- The site PM peak hour trip generation rate varied from 0.54 to 1.39 vehicle trips per dwelling with an average of 0.90 trips.
- The daily trip rate varied from 6.2 to 12.99 vehicle trips per dwelling with an average of 9.16 trips.
- The non-Sydney survey areas generally had lower trip rates than those in Sydney.
- Slightly higher trips rates were observed in PM network peak than AM network peak. Therefore, low-density residential developments may have a slightly higher traffic impact in the PM peak than the AM peak.

The trip generation rates were analysed in terms of their dependency on the number of dwellings and the Accessibility Score. The regression analysis did not reveal any correlation between the above variables.

In terms of car occupancy, regional areas showed greater car occupancy rates than those within the Sydney Metropolitan Area, with a lesser standard deviation from the mean value.

The survey results confirmed that private car is by far the main mode of travel in all areas, with the regional sites having a slightly higher proportion of car use than that at the Sydney Metropolitan Area sites.

A review of existing traffic generation guides and databases, suggests that throughout Australia

- The RTA "Guide to Traffic Generating Developments" seems to be the main source of traffic generation data, with some States (QLD, VIC and WA) complementing its use by their own guidelines.
- The ITE books are used but in a very limited way.
- Many practitioners use the RTA Guide as a starting point but then do their own surveys to establish traffic generation characteristics at similar sites / land uses.

In summary, although other documents are used, and many companies seem to undertake their own surveys to establish the traffic generating capabilities of a particular site, the RTA Guide seems to be the first point of reference.

International guides are available such as

- The New Zealand Trips Database Bureau.
- The Institution of Transportation Engineers (ITE) “Trip Generation” book.
- UK - TRICS & TRAVL - TRICS is the UK national standard trip generation database and is used as an integral and essential part of the Transport Assessment process. TRAVL is primarily used in Greater London.

A comparison of trip rates between these databases is summarised in **Table 5.1**.

Table 5.1: Summary Trip Generation Comparison – Low Density Residential (vehicle trips per dwelling)

SOURCE	WEEKDAYS			SATURDAYS		SUNDAYS	
	AM Peak	PM Peak	Daily	Peak	Daily	Peak	Daily
RTA Guide	0.85	0.85	9.0				
NZTDB	0.79	0.98	8.37				
ITE	0.77	1.02	9.57	0.93	10.08	0.86	8.77
TRICS	0.60	0.64	5.79	0.63	8.25		
STUDY RESULTS (External Trips Only)							
All Survey areas	0.84	0.90	9.16				
Sydney	0.95	0.99	10.67				
Non-Sydney	0.71	0.78	7.35				

The results of this study do not include trips internal to the subdivision, involving local social visits and where appropriate trips to local shops, schools, child care centres and recreational facilities such as tennis courts. It should further be noted that the derived generation rates in the Sydney Metropolitan Area are higher than those in the RTA (2002) Guide. That is the total trip generation of a dwelling in Sydney has increased since the original surveys over 30 years ago.

It is important to note that the RTA (2002) Guide suggests that internal trips, involving trips to local shops, schools and social visits may account for up to 25% of trips. In this regard it is important to consider that half of the survey areas in the present study did not have internal trip generation attractors other than residential dwellings. On the other hand, it is noted that where such attractors exist, they generate not only internal, but also external trips.

The proportion of additional social trips between residences within a subdivision would depend on the size of the subdivision. Trip rates generated by land uses other than residential dwellings vary significantly due to differences in their sizes and levels of accessibility by different travel modes. Where available both schools and child care centres in the survey areas catered for both internal and external children; no similarities were determined with regard to the proportion of local/non-local children.

Similar conclusions were drawn with regard to local shops and recreational facilities. Internal and external trips to and from these land uses need to be considered separately in each case.

The daily weekday ITE trip generation is about 11 percent lower than the average rates determined for the Sydney surveyed sites. It would therefore be appropriate to use the ITE weekend generation rates when and if required for Sydney.

The weekday generation rates derived from the TRICS database are not appropriate for NSW. Similarly, it would not be appropriate to use the NZTDB in NSW as it would result in considerably less traffic.

In regional centres, the only appropriate generation rates to use are those established in this study; the use of information from any other databases would not be appropriate.

APPENDIX

Detached Dwellings Survey in UK (source TRICS)

Description	Density	Dwelli ngs	AM Trips			PM Trips			Daily Trips		
			Arr	Dep	Tot	Arr	Dep	Tot	Arr	Dep	Tot
MIXED HOUSES, ROSCOMMON	11.11	80	12	38	50	48	25	73	227	233	460
DETACHED, BROMSGROVE	12.5	10	5	6	11	5	6	11	36	36	72
BUNGALOWS, CORK	14.12	48	10	15	25	27	25	52	199	208	407
MIXED HOUSING, KILKENNY	14.29	70	22	46	68	44	25	69	243	253	496
BUNGALOWS, BLACKPOOL	15.24	98	17	33	50	34	17	51	350	284	634
MIXED HOUSES,NORTHALLERTON	18.31	52	9	9	18	8	12	20	106	101	207
SEMI DETACHED, BRENT	18.55	82	34	40	74	36	35	71	275	280	555
HOUSING, INVERNESS	18.75	9	5	4	9	3	3	6	34	37	71
TERRACED, KILKENNY	18.75	30	17	23	40	20	21	41	186	189	375
SEMI-DET./BUNGALOWS,CREWE	23.29	129	21	31	52	17	18	35	248	238	486
SEMI DETACHED, COCKFOSTERS	23.47	10	3	6	9	3	4	7	39	30	69
SEMI DETACHED, WORKINGTON	25	40	9	18	27	19	10	29	113	89	202
TERRACED, SHREWSBURY	25.12	108	31	49	80	50	32	82	248	237	485
SEMI DETACHED,KIRKBY-IN-ASHFD	25.5	166	18	52	70	66	51	117	419	432	851
DETACHED, SLIGO	26.92	35	12	23	35	21	18	39	153	140	293
SEMI DETACHED, LUTON	27.33	82	26	44	70	19	22	41	274	276	550
DETACHED, MELTON MOWBRAY	27.5	11	1	4	5	3	2	5	37	34	71
DETACHED/SEMI D., BLACKBURN	28.03	185	24	97	121	102	64	166	537	540	1077
SEMI D./DETACHED, TRURO	28.08	73	7	24	31	31	16	47	173	159	332
DETACHED, POOLE	28.98	51	5	19	24	26	17	43	145	144	289
SEMI DETACHED, LUTON	30.47	131	19	55	74	46	24	70	367	356	723
TERRACED/SEMI-D., NEWBRIDGE	30.6	71	14	20	34	29	24	53	220	215	435
MIXED HOUSES, LINCOLN	30.74	150	28	66	94	62	32	94	384	357	741
TERRACED, GALWAY	31.36	185	23	29	52	47	38	85	383	381	764
SEMI-DET., STANFORD-LE-HOPE	34.65	237	42	124	166	104	65	169	675	616	1291
DET./SEMI-DET., WATERFORD	35	70	10	20	30	7	4	11	109	114	223
SEMI D./TERRACED, DRONFIELD	35.71	20	4	2	6	2	3	5	39	31	70
DETACHED, CREWE	35.8	17	4	10	14	6	7	13	45	51	96
SEMI DETACHED, GALWAY	36.18	123	17	82	99	47	32	79	301	330	631
SEMI DETACHED, IPSWICH	37.4	77	8	32	40	19	13	32	171	177	348
MIXED HOUSES, PETERBOROUGH	38.21	363	73	123	196	80	69	149	730	716	1446
DETACHED, KILMARNOCK	39	39	9	14	23	26	7	33	104	80	184
SEMI DET./TERRACED, IPSWICH	39.18	230	56	113	169	110	57	167	719	675	1394
DETACHED/SEMI D., STRBRIDGE	40	12	1	3	4	1	4	5	27	29	56
SEMI DET./TERRACED, GALWAY	40	24	4	9	13	13	4	17	49	48	97
SEMI DETACHED, REDDITCH	48	48	5	16	21	22	11	33	123	120	243

1. TRICS Version 2010(a) v6.5.2

Last update:	08/05/10
Number of sites on system:	3366
Number of Days of data:	5913

The database is supported by an Annual data collection programme consisting of multi-modal and vehicle traffic surveys.

The Database is supported by Good Practice Guides that are updated periodically. The Good Practice Guides are designed to minimise debate between developers and development control officers regarding the most relevant site data. The site selection process as recommended within the Good Practice Guides reduces the instances where such disagreements form issues included within planning appeals (which are the UK equivalent of Land & Environment Courts).

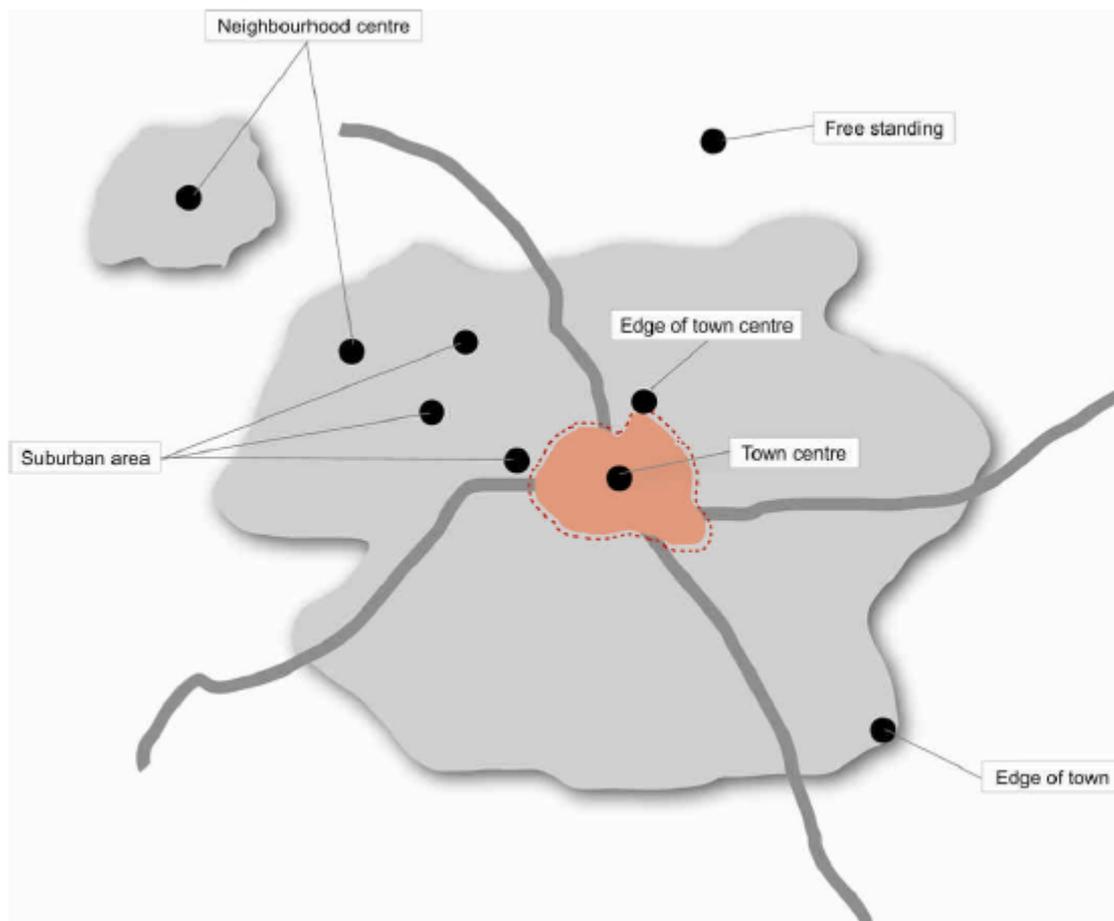
2. Site Selection

Approximately 240 Sites were filtered on the basis of day of the week - Tue - Thursday and a separate Saturday Analysis
Dwelling Type - Low density (10- 40 units/HA) excluding flats providing an average density of 27.6 dwellings/ha
Most Recent Surveys were selected
Survey data from 2000 - 2010.

3.

TRICS MAIN MENU ▶ SITE SELECTION												
Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED												
<div style="display: flex; justify-content: space-between; align-items: center;"> <div> Select All Clear Selections Geographic Map Copy Data Help Previous Screen Confirm & Return </div> <div> <input type="text" value="Search"/> </div> <div> Sort By Reference Order Normal </div> </div>												
Select	Reference	Description	Area	Location	SITE AREA	DWELLS	DENSITY	TOTBED	Survey Type	Most Recent Survey	Status	Travel Plan
<input checked="" type="checkbox"/>	BD-03-A-01	SEMI DETACHED, LUTON	BEDFORDSHIRE	Suburban Area (PPS)	5.20	131	30.47		MULTI-MODAL	08/07/04	One-Off	
<input checked="" type="checkbox"/>	BD-03-A-02	SEMI DETACHED, LUTON	BEDFORDSHIRE	Suburban Area (PPS)	3.40	82	27.33		MULTI-MODAL	06/07/04	One-Off	
<input checked="" type="checkbox"/>	BN-03-A-01	SEMI DETACHED, COCKFOSTERS	BARNET	Suburban Area (PPS)	0.45	10	23.47	30	MULTI-MODAL	20/10/05	One-Off	
<input checked="" type="checkbox"/>	BT-03-A-01	SEMI DETACHED, BRENT	BRENT	Suburban Area (PPS)	4.42	82	18.55	180	MULTI-MODAL	20/11/07	One-Off	
<input checked="" type="checkbox"/>	CA-03-A-02	MIXED HOUSES, PETERBOROUGH	CAMBRIDGESHIRE	Edge of Town Centri	11.25	363	38.21		MULTI-MODAL	13/05/04	One-Off	
<input checked="" type="checkbox"/>	CB-03-A-03	SEMI DETACHED, WORKINGTON	CUMBRIA	Edge of Town	1.80	40	25.00	120	MULTI-MODAL	20/11/08	Re-Survey	
<input type="checkbox"/>	CH-03-A-02	HOUSES/FLATS, CREWE	CHESHIRE	Edge of Town	6.42	174	35.80	440	VEHICLES	14/10/08	One-Off	
<input checked="" type="checkbox"/>	CH-03-A-05	DETACHED, CREWE	CHESHIRE	Edge of Town	0.84	17	23.29	67	MULTI-MODAL	14/10/08	One-Off	
<input checked="" type="checkbox"/>	CH-03-A-06	SEMI-DET./BUNGALOWS, CREWE	CHESHIRE	Suburban Area (PPS)	5.32	129	29.72	318	MULTI-MODAL	14/10/08	One-Off	
<input checked="" type="checkbox"/>	CR-03-A-01	BUNGALOWS, CORK	CORK	Suburban Area (PPS)	3.40	48	14.12	145	MULTI-MODAL	08/12/05	One-Off	
<input checked="" type="checkbox"/>	CS-03-A-02	DETACHED, SLIGO	SLIGO	Suburban Area (PPS)	1.85	35	26.92	157	MULTI-MODAL	14/06/07	One-Off	
<input checked="" type="checkbox"/>	CW-03-A-02	SEMI D./DETACHED, TRURO	CORNWALL	Suburban Area (PPS)	3.35	73	28.08	222	MULTI-MODAL	18/09/07	One-Off	
<input checked="" type="checkbox"/>	DC-03-A-01	DETACHED, POOLE	DORSET	Suburban Area (PPS)	1.84	51	28.98	204	VEHICLES	16/07/08	One-Off	
<input checked="" type="checkbox"/>	DS-03-A-01	SEMI D./TERRACED, DRONFIELD	DERBYSHIRE	Neighbourhood Cent	0.80	20	35.71		MULTI-MODAL	22/06/06	One-Off	
<input checked="" type="checkbox"/>	EA-03-A-01	DETACHED, KILMARNOCK	EAST AYRSHIRE	Edge of Town	1.80	39	39.00	156	MULTI-MODAL	05/06/08	One-Off	
<input checked="" type="checkbox"/>	EX-03-A-01	SEMI-DET., STANFORD-LE-HOPE	ESSEX	Edge of Town	6.84	237	34.65	717	MULTI-MODAL	13/05/08	One-Off	
<input checked="" type="checkbox"/>	GA-03-A-01	SEMI DETACHED, GALWAY	GALWAY	Edge of Town	5.10	123	36.18	492	MULTI-MODAL	20/09/06	One-Off	
<input checked="" type="checkbox"/>	GA-03-A-02	TERRACED, GALWAY	GALWAY	Suburban Area (PPS)	7.00	185	31.36	393	MULTI-MODAL	19/09/06	One-Off	
<input checked="" type="checkbox"/>	GA-03-A-03	SEMI DET./TERRACED, GALWAY	GALWAY	Suburban Area (PPS)	0.90	24	40.00	58	MULTI-MODAL	20/09/06	One-Off	
<input checked="" type="checkbox"/>	HI-03-A-13	HOUSING, INVERNESS	HIGHLAND	Edge of Town	0.48	9	18.75	38	MULTI-MODAL	21/05/09	One-Off	
<input checked="" type="checkbox"/>	KD-03-A-02	TERRACED/SEMI-D., NEWBRIDGE	KILDARE	Suburban Area (PPS)	2.74	71	30.60	210	MULTI-MODAL	12/05/09	One-Off	
<input checked="" type="checkbox"/>	KK-03-A-03	MIXED HOUSING, KILKENNY	KILKENNY	Edge of Town	6.50	70	14.29	176	MULTI-MODAL	26/11/08	One-Off	
<input checked="" type="checkbox"/>	KK-03-A-04	TERRACED, KILKENNY	KILKENNY	Edge of Town Centri	1.60	30	18.75	60	VEHICLES	27/11/08	One-Off	
<input checked="" type="checkbox"/>	LC-03-A-22	BUNGALOWS, BLACKPOOL	LANCASHIRE	Edge of Town	6.43	98	15.24		MULTI-MODAL	18/10/05	One-Off	
<input checked="" type="checkbox"/>	LC-03-A-29	DETACHED/SEMI D., BLACKBURN	LANCASHIRE	Edge of Town	7.60	185	28.03		MULTI-MODAL	10/06/04	One-Off	
<input checked="" type="checkbox"/>	LE-03-A-01	DETACHED, MELTON MOWBRAY	LEICESTERSHIRE	Edge of Town	0.40	11	27.50	33	MULTI-MODAL	03/05/05	One-Off	
<input checked="" type="checkbox"/>	LN-03-A-01	MIXED HOUSES, LINCOLN	LINCOLNSHIRE	Edge of Town	6.00	150	30.74	520	MULTI-MODAL	15/05/07	One-Off	
<input checked="" type="checkbox"/>	NT-03-A-03	SEMI DETACHED, KIRKBY-IN-ASHFD	NOTTINGHAMSHIRE	Edge of Town	7.53	166	25.50	498	MULTI-MODAL	28/06/06	One-Off	
<input checked="" type="checkbox"/>	NY-03-A-01	MIXED HOUSES, NORTHALLERTON	NORTH YORKSHIRE	Suburban Area (PPS)	3.30	52	18.31	152	MULTI-MODAL	25/09/07	One-Off	
<input checked="" type="checkbox"/>	RO-03-A-01	MIXED HOUSES, ROSCOMMON	ROSCOMMON	Edge of Town	7.20	80	11.11	305	MULTI-MODAL	07/05/09	One-Off	
<input type="checkbox"/>	SC-03-A-04	HOUSES & FLATS, NEAR FRIMLEY	SURREY	Neighbourhood Cent	11.00	288	28.80	1028	MULTI-MODAL	10/02/10	One-Off	
<input checked="" type="checkbox"/>	SF-03-A-01	SEMI DETACHED, IPSWICH	SUFFOLK	Suburban Area (PPS)	2.40	77	37.40	234	MULTI-MODAL	23/05/07	One-Off	
<input checked="" type="checkbox"/>	SF-03-A-02	SEMI DET./TERRACED, IPSWICH	SUFFOLK	Edge of Town	7.10	230	39.18	606	MULTI-MODAL	24/05/07	One-Off	
<input checked="" type="checkbox"/>	SH-03-A-04	TERRACED, SHREWSBURY	SHROPSHIRE	Suburban Area (PPS)	5.30	108	25.12	329	MULTI-MODAL	11/06/09	One-Off	
<input type="checkbox"/>	TV-03-A-01	MIXED HOUSES/FLATS, HARTLEPL	TEES VALLEY	Suburban Area (PPS)	6.90	225	38.14	362	MULTI-MODAL	14/04/05	One-Off	
<input checked="" type="checkbox"/>	WA-03-A-01	DET./SEMI-DET., WATERFORD	WATERFORD	Suburban Area (PPS)	2.30	70	35.00	162	MULTI-MODAL	18/11/08	One-Off	
<input checked="" type="checkbox"/>	WM-03-A-02	DETACHED/SEMI D., STRBRIDGE	WEST MIDLANDS	Suburban Area (PPS)	0.40	12	40.00		MULTI-MODAL	26/04/06	One-Off	
<input checked="" type="checkbox"/>	WO-03-A-01	DETACHED, BROMSGROVE	WORCESTERSHIRE	Suburban Area (PPS)	1.00	10	12.50	26	MULTI-MODAL	23/06/05	One-Off	
<input checked="" type="checkbox"/>	WO-03-A-02	SEMI DETACHED, REDDITCH	WORCESTERSHIRE	Edge of Town	2.20	48	28.24		MULTI-MODAL	02/05/06	One-Off	

4. Identify factors that are relevant to the comparability between Australian and UK low density residential trip rates:
- Location type - the density parameters effectively filters out Town Centre Sites therefore the sensitivity of trip rates to location is addressed through the density filter
 - Privately owned units show a higher trip generation rate than rented units. The higher trip generating privately owned units are more comparable to NZ sites (NZTA Research Report 374, 2009) as such privately owned units were assumed to be the closest comparable housing type to the Australian situation.



5. Equivalent of Appendix C - Residential

Note the following screen shot includes 39 sites, 3 of which include 'flats' that were excluded from the trip rate analysis for a total of 36 sites.

TRICS		MAIN MENU																																																										
Land Use		03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED																																																										
Next Stage	Reset Stage 2 Selections	Help	Previous Screen																																																									
TRAFFIC/ MULTI-MODAL	FILTERING STAGE 1	FILTERING STAGE 2	FILTERING STAGE 3																																																									
FILTERING STAGE 4	COUNT TYPE	RESULTS																																																										
Main selection <table border="1"> <thead> <tr> <th>Description</th> <th>No. of surveys</th> <th>Include</th> </tr> </thead> <tbody> <tr> <td>Site area</td> <td>444</td> <td><input type="radio"/></td> </tr> <tr> <td>Number of dwellings</td> <td>475</td> <td><input type="radio"/></td> </tr> <tr> <td>Housing density</td> <td>82</td> <td><input checked="" type="radio"/></td> </tr> <tr> <td>Total Bedrooms</td> <td>91</td> <td><input type="radio"/></td> </tr> </tbody> </table>		Description	No. of surveys	Include	Site area	444	<input type="radio"/>	Number of dwellings	475	<input type="radio"/>	Housing density	82	<input checked="" type="radio"/>	Total Bedrooms	91	<input type="radio"/>	Week days to include <table border="1"> <thead> <tr> <th>Day of week</th> <th>No. of surveys</th> <th>Include</th> </tr> </thead> <tbody> <tr> <td>Monday</td> <td>11</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Tuesday</td> <td>15</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Wednesday</td> <td>8</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Thursday</td> <td>16</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Friday</td> <td>4</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Saturday</td> <td>2</td> <td><input type="checkbox"/></td> </tr> <tr> <td>Sunday</td> <td>6</td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		Day of week	No. of surveys	Include	Monday	11	<input type="checkbox"/>	Tuesday	15	<input checked="" type="checkbox"/>	Wednesday	8	<input checked="" type="checkbox"/>	Thursday	16	<input checked="" type="checkbox"/>	Friday	4	<input type="checkbox"/>	Saturday	2	<input type="checkbox"/>	Sunday	6	<input type="checkbox"/>																		
Description	No. of surveys	Include																																																										
Site area	444	<input type="radio"/>																																																										
Number of dwellings	475	<input type="radio"/>																																																										
Housing density	82	<input checked="" type="radio"/>																																																										
Total Bedrooms	91	<input type="radio"/>																																																										
Day of week	No. of surveys	Include																																																										
Monday	11	<input type="checkbox"/>																																																										
Tuesday	15	<input checked="" type="checkbox"/>																																																										
Wednesday	8	<input checked="" type="checkbox"/>																																																										
Thursday	16	<input checked="" type="checkbox"/>																																																										
Friday	4	<input type="checkbox"/>																																																										
Saturday	2	<input type="checkbox"/>																																																										
Sunday	6	<input type="checkbox"/>																																																										
Minimum/maximum range Selection by: Housing density Units: Minimum: 10.00 From: 10.00 Maximum: 100.00 To: 40.00		Location Types to include <table border="1"> <thead> <tr> <th></th> <th>No. of surveys</th> <th>Include</th> </tr> </thead> <tbody> <tr> <td>Town Centre</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Edge of Town Centre</td> <td>2</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Suburban Area</td> <td>19</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Edge of Town</td> <td>16</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Neighbourhood Centre</td> <td>2</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Free Standing</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Not Known</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td colspan="3">Sub-categories</td> </tr> <tr> <td>Industrial Zone</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Commercial Zone</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Development Zone</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Retail Zone</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Residential Zone</td> <td>29</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Built-Up Zone</td> <td>1</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Village</td> <td>1</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Out of Town</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>High Street</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>No Sub Category</td> <td>8</td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table>			No. of surveys	Include	Town Centre		<input checked="" type="checkbox"/>	Edge of Town Centre	2	<input checked="" type="checkbox"/>	Suburban Area	19	<input checked="" type="checkbox"/>	Edge of Town	16	<input checked="" type="checkbox"/>	Neighbourhood Centre	2	<input checked="" type="checkbox"/>	Free Standing		<input checked="" type="checkbox"/>	Not Known		<input checked="" type="checkbox"/>	Sub-categories			Industrial Zone		<input checked="" type="checkbox"/>	Commercial Zone		<input checked="" type="checkbox"/>	Development Zone		<input checked="" type="checkbox"/>	Retail Zone		<input checked="" type="checkbox"/>	Residential Zone	29	<input checked="" type="checkbox"/>	Built-Up Zone	1	<input checked="" type="checkbox"/>	Village	1	<input checked="" type="checkbox"/>	Out of Town		<input checked="" type="checkbox"/>	High Street		<input checked="" type="checkbox"/>	No Sub Category	8	<input checked="" type="checkbox"/>
	No. of surveys	Include																																																										
Town Centre		<input checked="" type="checkbox"/>																																																										
Edge of Town Centre	2	<input checked="" type="checkbox"/>																																																										
Suburban Area	19	<input checked="" type="checkbox"/>																																																										
Edge of Town	16	<input checked="" type="checkbox"/>																																																										
Neighbourhood Centre	2	<input checked="" type="checkbox"/>																																																										
Free Standing		<input checked="" type="checkbox"/>																																																										
Not Known		<input checked="" type="checkbox"/>																																																										
Sub-categories																																																												
Industrial Zone		<input checked="" type="checkbox"/>																																																										
Commercial Zone		<input checked="" type="checkbox"/>																																																										
Development Zone		<input checked="" type="checkbox"/>																																																										
Retail Zone		<input checked="" type="checkbox"/>																																																										
Residential Zone	29	<input checked="" type="checkbox"/>																																																										
Built-Up Zone	1	<input checked="" type="checkbox"/>																																																										
Village	1	<input checked="" type="checkbox"/>																																																										
Out of Town		<input checked="" type="checkbox"/>																																																										
High Street		<input checked="" type="checkbox"/>																																																										
No Sub Category	8	<input checked="" type="checkbox"/>																																																										
Public Transport Provision Selection by: Include all surveys		Date range Minimum: 01/01/02 From: 01/01/00 Maximum: 10/02/10 To: 10/02/10 20th century dates: 01/01/70-31/12/99 21st century dates: 01/01/00-31/12/69																																																										
Survey Types to include <table border="1"> <thead> <tr> <th>Survey type</th> <th>No. of surveys</th> <th>Include</th> </tr> </thead> <tbody> <tr> <td>Manual count</td> <td>39</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Directional ATC Count</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table>		Survey type	No. of surveys	Include	Manual count	39	<input checked="" type="checkbox"/>	Directional ATC Count		<input checked="" type="checkbox"/>	Definitions																																																	
Survey type	No. of surveys	Include																																																										
Manual count	39	<input checked="" type="checkbox"/>																																																										
Directional ATC Count		<input checked="" type="checkbox"/>																																																										
Important note on filtering by Public Transport																																																												

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED										
Rank	Graph	Copy Data	Print	Selection	Cross Test	Help	Previous Screen			
TRAFFIC/ MULTI-MODAL		FILTERING STAGE 1		FILTERING STAGE 2		FILTERING STAGE 3		FILTERING STAGE 4		COUNT TYPE
VEHICLES <input type="checkbox"/> Estimate TRIP rates										
TRIP RATE VALUE PER 1 DWELLS	ARRIVALS Total rate: 2.896 Peak: 17:00-18:00			DEPARTURES Total rate: 2.894 Peak: 08:00-09:00			TOTALS Total rate: 5.790 Peak: 17:00-18:00			
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	
00:00-01:00	0	0	0.000	0	0	0.000	0	0	0.000	
01:00-02:00	0	0	0.000	0	0	0.000	0	0	0.000	
02:00-03:00	0	0	0.000	0	0	0.000	0	0	0.000	
03:00-04:00	0	0	0.000	0	0	0.000	0	0	0.000	
04:00-05:00	0	0	0.000	0	0	0.000	0	0	0.000	
05:00-06:00	0	0	0.000	0	0	0.000	0	0	0.000	
06:00-07:00	1	30	0.133	1	30	0.033	1	30	0.166	
07:00-08:00	36	88	0.082	36	88	0.260	36	88	0.342	
08:00-09:00	36	88	0.191	36	88	0.410	36	88	0.601	
09:00-10:00	36	88	0.193	36	88	0.245	36	88	0.438	
10:00-11:00	36	88	0.159	36	88	0.198	36	88	0.357	
11:00-12:00	36	88	0.204	36	88	0.191	36	88	0.395	
12:00-13:00	36	88	0.214	36	88	0.207	36	88	0.421	
13:00-14:00	36	88	0.208	36	88	0.200	36	88	0.408	
14:00-15:00	36	88	0.215	36	88	0.207	36	88	0.422	
15:00-16:00	36	88	0.293	36	88	0.230	36	88	0.523	
16:00-17:00	36	88	0.322	36	88	0.216	36	88	0.538	
17:00-18:00	36	88	0.380	36	88	0.258	36	88	0.638	
18:00-19:00	36	88	0.302	36	88	0.239	36	88	0.541	
19:00-20:00	0	0	0.000	0	0	0.000	0	0	0.000	
20:00-21:00	0	0	0.000	0	0	0.000	0	0	0.000	
21:00-22:00	0	0	0.000	0	0	0.000	0	0	0.000	
22:00-23:00	0	0	0.000	0	0	0.000	0	0	0.000	
23:00-24:00	0	0	0.000	0	0	0.000	0	0	0.000	

Vehicle Trip Rates

AM Peak: 0.601 vehicle trips/dwelling

PM Peak: 0.638 vehicle trips/dwelling

Daily: 5.790 vehicle trips/dwelling

Trip rates are generally lower than typical average residential dwellings in UK and NZ (8-10 vehicle trips/dwelling). This is likely to be because the low density dwellings are located in less PT accessible locations resulting in more trip linking occurring per vehicle trip.

AM Peak Hour - Rank Ordered Survey sites indicating 85th and 15th% percentile values

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED

Graph
 Geographic Map
 Recalc Rank
 Copy Data
 Print
 Help
 Previous Screen
 Search

VEHICLES

Rank order for: **Number of dwellings**
 Calculated on: **TOTALS** Time range: **08:00-09:00**
 Total: **36** ****85th Percentile = no. 6**
****15th Percentile = no. 31**

Sorted by Trip Rate

Arrivals
 Departures
 Totals

Median Values	
Arrivals	0.188
Departures	0.389
Totals	0.577*

Rank	Site Ref	Description	Area	DWELLS	Day	Date	TRIP RATE			Travel Plan
							Arrivals	Departures	Totals	
1	KK-03-A-04	TERRACED, KILKENNY	KILKENNY	30	Thursday	27/11/08	0.567	0.767	1.334	
2	WO-03-A-01	DETACHED, BROMSGROVE	WORCESTERSHIRE	10	Thursday	23/06/05	0.500	0.600	1.100	
3	HI-03-A-13	HOUSING, INVERNESS	HIGHLAND	9	Thursday	21/05/09	0.556	0.444	1.000	
4	CS-03-A-02	DETACHED, SLIGO	SLIGO	35	Thursday	14/06/07	0.343	0.657	1.000	
5	KK-03-A-03	MIXED HOUSING, KILKENNY	KILKENNY	70	Wednesday	26/11/08	0.314	0.657	0.971	
6 **	BT-03-A-01	SEMI DETACHED, BRENT	BRENT	82	Tuesday	20/11/07	0.415	0.488	0.903	
7	BN-03-A-01	SEMI DETACHED, COCKFOSTERS	BARNET	10	Thursday	20/10/05	0.300	0.600	0.900	
8	BD-03-A-02	SEMI DETACHED, LUTON	BEDFORDSHIRE	82	Tuesday	06/07/04	0.317	0.537	0.854	
9	CH-03-A-05	DETACHED, CREWE	CHESHIRE	17	Tuesday	14/10/08	0.235	0.588	0.823	
10	GA-03-A-01	SEMI DETACHED, GALWAY	GALWAY	123	Wednesday	20/09/06	0.138	0.667	0.805	
11	SH-03-A-04	TERRACED, SHREWSBURY	SHROPSHIRE	108	Thursday	11/06/09	0.287	0.454	0.741	
12	SF-03-A-02	SEMI DET./TERRACED, IPSWICH	SUFFOLK	230	Thursday	24/05/07	0.243	0.491	0.734	
13	EX-03-A-01	SEMI-DET., STANFORD-LE-HOPE	ESSEX	237	Tuesday	13/05/08	0.177	0.523	0.700	
14	CB-03-A-03	SEMI DETACHED, WORKINGTON	CUMBRIA	40	Thursday	20/11/08	0.225	0.450	0.675	
15	LC-03-A-29	DETACHED/SEMI D., BLACKBURN	LANCASHIRE	185	Thursday	10/06/04	0.130	0.524	0.654	
16	LN-03-A-01	MIXED HOUSES, LINCOLN	LINCOLNSHIRE	150	Tuesday	15/05/07	0.187	0.440	0.627	
17	RO-03-A-01	MIXED HOUSES, ROSCOMMON	ROSCOMMON	80	Thursday	07/05/09	0.150	0.475	0.625	
18	EA-03-A-01	DETACHED, KILMARNOCK	EAST AYRSHIRE	39	Thursday	05/06/08	0.231	0.359	0.590	
19	BD-03-A-01	SEMI DETACHED, LUTON	BEDFORDSHIRE	131	Thursday	08/07/04	0.145	0.420	0.565	
20	GA-03-A-03	SEMI DET./TERRACED, GALWAY	GALWAY	24	Wednesday	20/09/06	0.167	0.375	0.542	
21	CA-03-A-02	MIXED HOUSES, PETERBOROUGH	CAMBRIDGESHIRE	363	Thursday	13/05/04	0.201	0.339	0.540	
22	CR-03-A-01	BUNGALOWS, CORK	CORK	48	Thursday	08/12/05	0.208	0.313	0.520	
23	SF-03-A-01	SEMI DETACHED, IPSWICH	SUFFOLK	77	Wednesday	23/05/07	0.104	0.416	0.520	
24	LC-03-A-22	BUNGALOWS, BLACKPOOL	LANCASHIRE	98	Tuesday	18/10/05	0.173	0.337	0.510	
25	KD-03-A-02	TERRACED/SEMI-D., NEWBRIDGE	KILDARE	71	Tuesday	12/05/09	0.197	0.282	0.479	
26	DC-03-A-01	DETACHED, POOLE	DORSET	51	Wednesday	16/07/08	0.098	0.373	0.471	
27	LE-03-A-01	DETACHED, MELTON MOWBRAY	LEICESTERSHIRE	11	Tuesday	03/05/05	0.091	0.364	0.455	
28	WO-03-A-02	SEMI DETACHED, REDDITCH	WORCESTERSHIRE	48	Tuesday	02/05/06	0.104	0.333	0.437	
29	WA-03-A-01	DET./SEMI-DET., WATERFORD	WATERFORD	70	Tuesday	18/11/08	0.143	0.286	0.429	
30	CW-03-A-02	SEMI D./DETACHED, TRURO	CORNWALL	73	Tuesday	18/09/07	0.096	0.329	0.425	
31 **	NT-03-A-03	SEMI DETACHED, KIRKBY-IN-A-SHFD	NOTTINGHAMSHIRE	166	Wednesday	28/06/06	0.108	0.313	0.421	
32	CH-03-A-06	SEMI-DET./BUNGALOWS, CREWE	CHESHIRE	129	Tuesday	14/10/08	0.163	0.240	0.403	
33	NY-03-A-01	MIXED HOUSES, NORTHALLERTON	NORTH YORKSHIRE	52	Tuesday	25/09/07	0.173	0.173	0.346	
34	WM-03-A-02	DETACHED/SEMI D., STRBRIDGE	WEST MIDLANDS	12	Wednesday	26/04/06	0.083	0.250	0.333	
35	DS-03-A-01	SEMI D./TERRACED, DRONFIELD	DERBYSHIRE	20	Thursday	22/06/06	0.200	0.100	0.300	
36	GA-03-A-02	TERRACED, GALWAY	GALWAY	185	Tuesday	19/09/06	0.124	0.157	0.281	

PM Peak Hour - Rank Ordered

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED

Graph
 Geographic Map
 Recalc Rank
 Copy Data
 Print
 Help
 Previous Screen
 Search

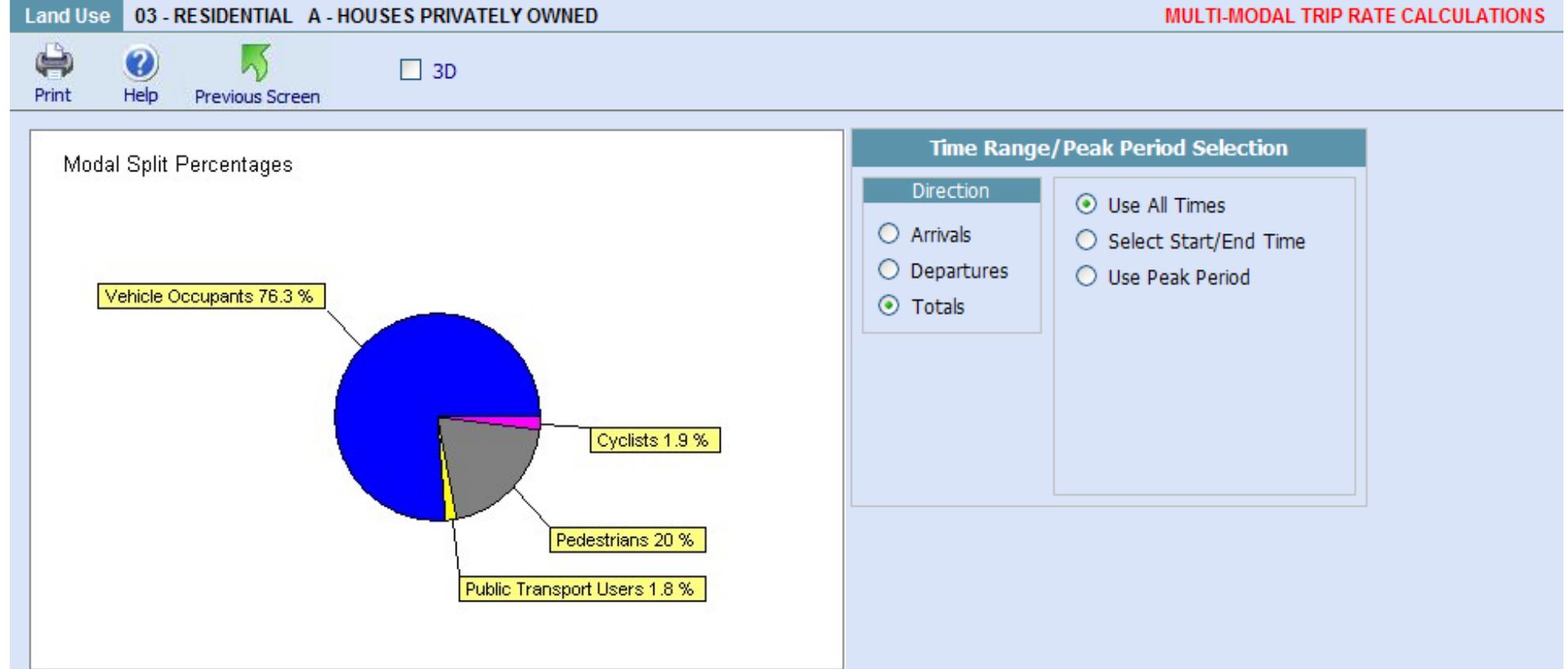
VEHICLES

Rank order for: **Number of dwellings**
 Calculated on: **TOTALS** Time range: **17:00-18:00**
 Total: **36** ****85th Percentile = no. 6**
****15th Percentile = no. 31**

Sorted by Trip Rate		Median Values	
<input type="radio"/>	Arrivals	Arrivals	0.349
<input type="radio"/>	Departures	Departures	0.354
<input checked="" type="radio"/>	Totals	Totals	0.702*

Rank	Site Ref	Description	Area	DWELLS	Day	Date	TRIP RATE			Travel Plan
							Arrivals	Departures	Totals	
1	KK-03-A-04	TERRACED, KILKENNY	KILKENNY	30	Thursday	27/11/08	0.667	0.700	1.367	
2	CS-03-A-02	DETACHED, SLIGO	SLIGO	35	Thursday	14/06/07	0.600	0.514	1.114	
3	WO-03-A-01	DETACHED, BROMSGROVE	WORCESTERSHIRE	10	Thursday	23/06/05	0.500	0.600	1.100	
4	CR-03-A-01	BUNGALOWS, CORK	CORK	48	Thursday	08/12/05	0.563	0.521	1.083	
5	KK-03-A-03	MIXED HOUSING, KILKENNY	KILKENNY	70	Wednesday	26/11/08	0.629	0.357	0.986	
6 **	RO-03-A-01	MIXED HOUSES, ROSCOMMON	ROSCOMMON	80	Thursday	07/05/09	0.600	0.313	0.912	
7	LC-03-A-29	DETACHED/SEMI D., BLACKBURN	LANCASHIRE	185	Thursday	10/06/04	0.551	0.346	0.897	
8	BT-03-A-01	SEMI DETACHED, BRENT	BRENT	82	Tuesday	20/11/07	0.439	0.427	0.866	
9	EA-03-A-01	DETACHED, KILMARNOCK	EAST AYRSHIRE	39	Thursday	05/06/08	0.667	0.179	0.846	
10	DC-03-A-01	DETACHED, POOLE	DORSET	51	Wednesday	16/07/08	0.510	0.333	0.843	
11	CH-03-A-05	DETACHED, CREWE	CHESHIRE	17	Tuesday	14/10/08	0.353	0.412	0.765	
12	SH-03-A-04	TERRACED, SHREWSBURY	SHROPSHIRE	108	Thursday	11/06/09	0.463	0.296	0.759	
13	KD-03-A-02	TERRACED/SEMI-D., NEWBRIDGE	KILDARE	71	Tuesday	12/05/09	0.408	0.338	0.746	
14	SF-03-A-02	SEMI DET./TERRACED, IPSWICH	SUFFOLK	230	Thursday	24/05/07	0.478	0.248	0.726	
15	CB-03-A-03	SEMI DETACHED, WORKINGTON	CUMBRIA	40	Thursday	20/11/08	0.475	0.250	0.725	
16	EX-03-A-01	SEMI-DET., STANFORD-LE-HOPE	ESSEX	237	Tuesday	13/05/08	0.439	0.274	0.713	
17	GA-03-A-03	SEMI DET./TERRACED, GALWAY	GALWAY	24	Wednesday	20/09/06	0.542	0.167	0.709	
18	NT-03-A-03	SEMI DETACHED,KIRKBY-IN-ASHFD	NOTTINGHAMSHIRE	166	Wednesday	28/06/06	0.398	0.307	0.705	
19	BN-03-A-01	SEMI DETACHED, COCKFOSTERS	BARNET	10	Thursday	20/10/05	0.300	0.400	0.700	
20	WO-03-A-02	SEMI DETACHED, REDDITCH	WORCESTERSHIRE	48	Tuesday	02/05/06	0.458	0.229	0.687	
21	HI-03-A-13	HOUSING, INVERNESS	HIGHLAND	9	Thursday	21/05/09	0.333	0.333	0.666	
22	CW-03-A-02	SEMI D./DETACHED, TRURO	CORNWALL	73	Tuesday	18/09/07	0.425	0.219	0.644	
23	GA-03-A-01	SEMI DETACHED, GALWAY	GALWAY	123	Wednesday	20/09/06	0.382	0.260	0.642	
24	LN-03-A-01	MIXED HOUSES, LINCOLN	LINCOLNSHIRE	150	Tuesday	15/05/07	0.413	0.213	0.626	
25	BD-03-A-01	SEMI DETACHED, LUTON	BEDFORDSHIRE	131	Thursday	08/07/04	0.351	0.183	0.534	
26	LC-03-A-22	BUNGALOWS, BLACKPOOL	LANCASHIRE	98	Tuesday	18/10/05	0.347	0.173	0.520	
27	BD-03-A-02	SEMI DETACHED, LUTON	BEDFORDSHIRE	82	Tuesday	06/07/04	0.232	0.268	0.500	
28	GA-03-A-02	TERRACED, GALWAY	GALWAY	185	Tuesday	19/09/06	0.254	0.205	0.459	
29	LE-03-A-01	DETACHED, MELTON MOWBRAY	LEICESTERSHIRE	11	Tuesday	03/05/05	0.273	0.182	0.455	
30	SF-03-A-01	SEMI DETACHED, IPSWICH	SUFFOLK	77	Wednesday	23/05/07	0.247	0.169	0.416	
31 **	WM-03-A-02	DETACHED/SEMI D., STRBRIDGE	WEST MIDLANDS	12	Wednesday	26/04/06	0.083	0.333	0.416	
32	CA-03-A-02	MIXED HOUSES, PETERBOROUGH	CAMBRIDGESHIRE	363	Thursday	13/05/04	0.220	0.190	0.410	
33	NY-03-A-01	MIXED HOUSES,NORTHALLERTON	NORTH YORKSHIRE	52	Tuesday	25/09/07	0.154	0.231	0.385	
34	CH-03-A-06	SEMI-DET./BUNGALOWS,CREWE	CHESHIRE	129	Tuesday	14/10/08	0.132	0.140	0.272	
35	DS-03-A-01	SEMI D./TERRACED, DRONFIELD	DERBYSHIRE	20	Thursday	22/06/06	0.100	0.150	0.250	
36	WA-03-A-01	DET./SEMI-DET., WATERFORD	WATERFORD	70	Tuesday	18/11/08	0.100	0.057	0.157	

Weekday Modal Split



6. Equivalent of Appendix D - Residential - Person Trips

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED										
Rank Graph Copy Data Print MM Selection Modal split Cross Test Help Previous Screen										
TRAFFIC/ MULTI-MODAL		FILTERING STAGE 1		FILTERING STAGE 2		FILTERING STAGE 3		FILTERING STAGE 4		COUNT TYPE
MULTI-MODAL TOTAL PEOPLE <input type="checkbox"/> Estimate TRIP rates										
TRIP RATE VALUE PER 1 DWELLS	ARRIVALS			DEPARTURES			TOTALS			
	Total rate: 4.722 Peak: 15:00-16:00			Total rate: 5.000 Peak: 08:00-09:00			Total rate: 9.722 Peak: 08:00-09:00			
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	
00:00-01:00	0	0	0.000	0	0	0.000	0	0	0.000	
01:00-02:00	0	0	0.000	0	0	0.000	0	0	0.000	
02:00-03:00	0	0	0.000	0	0	0.000	0	0	0.000	
03:00-04:00	0	0	0.000	0	0	0.000	0	0	0.000	
04:00-05:00	0	0	0.000	0	0	0.000	0	0	0.000	
05:00-06:00	0	0	0.000	0	0	0.000	0	0	0.000	
06:00-07:00	0	0	0.000	0	0	0.000	0	0	0.000	
07:00-08:00	34	91	0.127	34	91	0.391	34	91	0.518	
08:00-09:00	34	91	0.309	34	91	0.864	34	91	1.173	
09:00-10:00	34	91	0.305	34	91	0.415	34	91	0.720	
10:00-11:00	34	91	0.241	34	91	0.346	34	91	0.587	
11:00-12:00	34	91	0.327	34	91	0.318	34	91	0.645	
12:00-13:00	34	91	0.350	34	91	0.342	34	91	0.692	
13:00-14:00	34	91	0.336	34	91	0.324	34	91	0.660	
14:00-15:00	34	91	0.350	34	91	0.339	34	91	0.689	
15:00-16:00	34	91	0.636	34	91	0.397	34	91	1.033	
16:00-17:00	34	91	0.593	34	91	0.401	34	91	0.994	
17:00-18:00	34	91	0.629	34	91	0.433	34	91	1.062	
18:00-19:00	34	91	0.519	34	91	0.430	34	91	0.949	
19:00-20:00	0	0	0.000	0	0	0.000	0	0	0.000	
20:00-21:00	0	0	0.000	0	0	0.000	0	0	0.000	
21:00-22:00	0	0	0.000	0	0	0.000	0	0	0.000	
22:00-23:00	0	0	0.000	0	0	0.000	0	0	0.000	
23:00-24:00	0	0	0.000	0	0	0.000	0	0	0.000	

Person Trip Rates:

AM peak : 1.173 trips/dwelling

PM Peak : 1.062 trips/dwelling

Daily : 9.722 trips/dwelling

6. SATURDAY

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED											
       Search <input type="checkbox"/>											Sort By
											Reference
											Order
											Normal
											13 Sites Available
Select	Reference	Description	Area	Location	SITE AREA	DWELLS	DENSITY	TOTBED	Survey Type	Most Recent Survey	Status
<input checked="" type="checkbox"/>	AN-03-A-04	DETACHED/SEMI DET., ANTRIM	ANTRIM	Edge of Town	7.80	164			VEHICLES	03/10/03	One-Off
<input checked="" type="checkbox"/>	AN-03-A-05	DETACHED/SEMI DET., LISBURN	ANTRIM	Edge of Town	15.60	358			VEHICLES	03/10/03	One-Off
<input checked="" type="checkbox"/>	CM-03-A-01	DETAT./BG'LOWS,CARMARTHEN	CARMARTHENSHIRE	Edge of Town	1.30	17	14.91	51	MULTI-MODAL	13/09/08	One-Off
<input checked="" type="checkbox"/>	DE-03-A-01	SEMI.D./DETACHED, MAGHERAFLT	DERRY	Edge of Town	4.50	106			VEHICLES	11/11/02	One-Off
<input checked="" type="checkbox"/>	DE-03-A-02	DETACHED, COLERAINE	DERRY	Neighbourhood Cent	7.90	112			VEHICLES	11/11/02	One-Off
<input checked="" type="checkbox"/>	DO-03-A-01	TERRACED, BANBRIDGE	DOWN	Edge of Town	5.60	161			VEHICLES	20/10/02	One-Off
<input checked="" type="checkbox"/>	DO-03-A-02	BUNGALOWS, NR BALLYNAHINCH	DOWN	Free Standing (PPS6)	11.10	104			VEHICLES	03/10/03	One-Off
<input checked="" type="checkbox"/>	FE-03-A-01	MIXED HOUSES, ENNISKILLEN	FERMANAGH	Edge of Town	7.20	132			VEHICLES	10/11/02	One-Off
<input type="checkbox"/>	HC-03-A-16	MIXED HOUSES/FLATS,WINCHSTR	HAMPSHIRE	Edge of Town	45.00	1040			VEHICLES	10/12/00	Re-Survey
<input checked="" type="checkbox"/>	KK-03-A-02	SEMI-DETACHED, KILKENNY	KILKENNY	Edge of Town Centr	2.51	68	31.63	144	MULTI-MODAL	29/11/08	One-Off
<input checked="" type="checkbox"/>	TY-03-A-01	DETACHED/SEMI DET., OMAGH	TYRONE	Edge of Town	2.20	44			VEHICLES	03/10/03	One-Off
<input checked="" type="checkbox"/>	WO-03-A-04	MIXED HOUSES, WORCESTER	WORCESTERSHIRE	Edge of Town	39.50	792			VEHICLES	26/05/02	One-Off
<input type="checkbox"/>	WS-03-A-03	SEMI D./TERRACED, NR CH'CHSTR	WEST SUSSEX	Neighbourhood Cent	2.00	90		270	VEHICLES	26/11/00	Re-Survey

Saturday site densities adjusted for public space allowance

SATURDAY

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED										
Rank	Graph	Copy Data	Print	Selection	Cross Test	Help	Previous Screen			
TRAFFIC/ MULTI-MODAL		FILTERING STAGE 1		FILTERING STAGE 2		FILTERING STAGE 3		FILTERING STAGE 4		COUNT TYPE
VEHICLES <input type="checkbox"/> Estimate TRIP rates										
TRIP RATE VALUE PER 1 DWELLS	ARRIVALS			DEPARTURES			TOTALS			
	Total rate: 4.127 Peak: 17:00-18:00			Total rate: 4.112 Peak: 13:00-14:00			Total rate: 8.239 Peak: 17:00-18:00			
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	
00:00-01:00	7	146	0.067	7	146	0.042	7	146	0.109	
01:00-02:00	7	146	0.050	7	146	0.031	7	146	0.081	
02:00-03:00	7	146	0.030	7	146	0.017	7	146	0.047	
03:00-04:00	7	146	0.016	7	146	0.013	7	146	0.029	
04:00-05:00	7	146	0.005	7	146	0.011	7	146	0.016	
05:00-06:00	7	146	0.013	7	146	0.028	7	146	0.041	
06:00-07:00	7	146	0.022	7	146	0.064	7	146	0.086	
07:00-08:00	11	187	0.045	11	187	0.113	11	187	0.158	
08:00-09:00	11	187	0.111	11	187	0.215	11	187	0.326	
09:00-10:00	11	187	0.166	11	187	0.270	11	187	0.436	
10:00-11:00	11	187	0.216	11	187	0.263	11	187	0.479	
11:00-12:00	11	187	0.276	11	187	0.300	11	187	0.576	
12:00-13:00	11	187	0.315	11	187	0.290	11	187	0.605	
13:00-14:00	11	187	0.300	11	187	0.318	11	187	0.618	
14:00-15:00	11	187	0.277	11	187	0.287	11	187	0.564	
15:00-16:00	11	187	0.272	11	187	0.259	11	187	0.531	
16:00-17:00	11	187	0.327	11	187	0.240	11	187	0.567	
17:00-18:00	11	187	0.350	11	187	0.282	11	187	0.632	
18:00-19:00	11	187	0.323	11	187	0.280	11	187	0.603	
19:00-20:00	7	146	0.307	7	146	0.282	7	146	0.589	
20:00-21:00	7	146	0.274	7	146	0.183	7	146	0.457	
21:00-22:00	7	146	0.178	7	146	0.152	7	146	0.330	
22:00-23:00	7	146	0.108	7	146	0.097	7	146	0.205	
23:00-24:00	7	146	0.079	7	146	0.075	7	146	0.154	

Vehicle Trips Rates:

Saturday Peak occurs between 17.00-18.00hrs : 0.632 trips/dwelling

Daily : 8.239 trips/dwelling

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED

Next Stage Reset Stage 2 Selections Help Previous Screen

TRAFFIC/MULTI-MODAL FILTERING STAGE 1 FILTERING STAGE 2 FILTERING STAGE 3 FILTERING STAGE 4 COUNT TYPE RESULTS

Main selection

Description	No. of surveys	Include
Site area	444	<input type="radio"/>
Number of dwellings	475	<input checked="" type="radio"/>
Housing density	82	<input type="radio"/>
Total Bedrooms	91	<input type="radio"/>

[Definitions](#)

Minimum/maximum range

Selection by: Number of dwellings

Units:

Minimum: 5 **From:**

Maximum: 4334 **To:**

Public Transport Provision

Selection by:

[Important note on filtering by Public Transport](#)

Date range

Minimum: 05/05/87 **From:**

Maximum: 10/02/10 **To:**

20th century dates: 01/01/70-31/12/99
21st century dates: 01/01/00-31/12/69

The default lower date has been set to 01/01/00 in order to exclude old data from the calculation. If this is accepted, 305 days will be excluded. The minimum date may be manually set to any date down to the lowest date shown which will have the effect of including some or all of these days. The default cut-off is set in Settings from the Main Menu (note for

Survey Types to include

Survey type	No. of surveys	Include
Manual count	4	<input checked="" type="checkbox"/>
Directional ATC Count	12	<input checked="" type="checkbox"/>

Week days to include

Day of week	No. of surveys	Include
Monday	24	<input type="checkbox"/>
Tuesday	26	<input type="checkbox"/>
Wednesday	16	<input type="checkbox"/>
Thursday	40	<input type="checkbox"/>
Friday	25	<input type="checkbox"/>
Saturday	16	<input checked="" type="checkbox"/>
Sunday	23	<input type="checkbox"/>

Location Types to include

	No. of surveys	Include
Town Centre		<input checked="" type="checkbox"/>
Edge of Town Centre	1	<input checked="" type="checkbox"/>
Suburban Area		<input checked="" type="checkbox"/>
Edge of Town	12	<input checked="" type="checkbox"/>
Neighbourhood Centre	2	<input checked="" type="checkbox"/>
Free Standing	1	<input checked="" type="checkbox"/>
Not Known		<input checked="" type="checkbox"/>
Sub-categories		
Industrial Zone	1	<input checked="" type="checkbox"/>
Commercial Zone		<input checked="" type="checkbox"/>
Development Zone		<input checked="" type="checkbox"/>
Retail Zone		<input checked="" type="checkbox"/>
Residential Zone	10	<input checked="" type="checkbox"/>
Built-Up Zone		<input checked="" type="checkbox"/>
Village	1	<input checked="" type="checkbox"/>
Out of Town	1	<input checked="" type="checkbox"/>
High Street		<input checked="" type="checkbox"/>
No Sub Category	3	<input checked="" type="checkbox"/>

*Note that only 11 sites out of 16 were used in the analysis for Saturday. Out of the 5 that were not included: 3 were sites that were recounted, 1 contained flats, and 1 had a high density.

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED

Graph
 Geographic Map
 Recalc Rank
 Copy Data
 Print
 Help
 Previous Screen
 Search

VEHICLES

Rank order for: **Number of dwellings**
 Calculated on: **TOTALS** Time range: **17:00-18:00**
 Total: **11** ****85th Percentile = no. 3**
****15th Percentile = no. 9**

Note
WARNING: Using 85th and 15th percentile highlighted trip rates in data sets of under 20 surveys is not recommended by TRICS, and may be misleading.

Sorted by Trip Rate		Median Values	
<input type="radio"/> Arrivals		Arrivals	0.368
<input type="radio"/> Departures		Departures	0.330
<input checked="" type="radio"/> Totals		Totals	0.698*

Rank	Site Ref	Description	Area	DWELLS	Day	Date	TRIP RATE			Travel Plan
							Arrivals	Departures	Totals	
1	TY-03-A-01	DETACHED/SEMI DET., OMAGH	TYRONE	44	Saturday	27/09/03	0.614	0.500	1.114	
2	AN-03-A-04	DETACHED/SEMI DET., ANTRIM	ANTRIM	164	Saturday	27/09/03	0.622	0.384	1.006	
3 **	DE-03-A-02	DETACHED, COLERAINE	DERRY	112	Saturday	09/11/02	0.429	0.420	0.849	
4	AN-03-A-05	DETACHED/SEMI DET., LISBURN	ANTRIM	358	Saturday	27/09/03	0.419	0.358	0.777	
5	DO-03-A-02	BUNGALOWS, NR BALLYNAHINCH	DOWN	104	Saturday	27/09/03	0.452	0.308	0.760	
6	DE-03-A-01	SEMI.D./DETACHED, MAGHERAFLT	DERRY	106	Saturday	09/11/02	0.368	0.330	0.698	
7	KK-03-A-02	SEMI-DETACHED, KILKENNY	KILKENNY	68	Saturday	29/11/08	0.382	0.294	0.676	
8	DO-03-A-01	TERRACED, BANBRIDGE	DOWN	161	Saturday	19/10/02	0.304	0.255	0.559	
9 **	FE-03-A-01	MIXED HOUSES, ENNISKILLEN	FERMANAGH	132	Saturday	09/11/02	0.265	0.258	0.523	
10	WO-03-A-04	MIXED HOUSES, WORCESTER	WORCESTERSHIRE	792	Saturday	25/05/02	0.244	0.196	0.440	
11	CM-03-A-01	DETAT./BG'LOWS,CARMARTHEN	CARMARTHENSHIRE	17	Saturday	13/09/08	0.235	0.176	0.411	

Equivalent of Appendix D - Residential - Person Trips (Saturday)

Land Use 03 - RESIDENTIAL A - HOUSES PRIVATELY OWNED										
Rank	Graph	Copy Data	Print	MM Selection	Modal split	Cross Test	Help	Previous Screen		
TRAFFIC/ MULTI-MODAL		FILTERING STAGE 1		FILTERING STAGE 2		FILTERING STAGE 3		FILTERING STAGE 4		COUNT TYPE
MULTI-MODAL TOTAL PEOPLE <input type="checkbox"/> Estimate TRIP rates										
TRIP RATE VALUE PER 1 DWELLS	ARRIVALS			DEPARTURES			TOTALS			
	Total rate: 6.189 Peak: 14:00-15:00			Total rate: 6.164 Peak: 11:00-12:00			Total rate: 12.353 Peak: 11:00-12:00			
	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	
00:00-01:00	0	0	0.000	0	0	0.000	0	0	0.000	
01:00-02:00	0	0	0.000	0	0	0.000	0	0	0.000	
02:00-03:00	0	0	0.000	0	0	0.000	0	0	0.000	
03:00-04:00	0	0	0.000	0	0	0.000	0	0	0.000	
04:00-05:00	0	0	0.000	0	0	0.000	0	0	0.000	
05:00-06:00	0	0	0.000	0	0	0.000	0	0	0.000	
06:00-07:00	0	0	0.000	0	0	0.000	0	0	0.000	
07:00-08:00	2	43	0.071	2	43	0.106	2	43	0.177	
08:00-09:00	2	43	0.106	2	43	0.353	2	43	0.459	
09:00-10:00	2	43	0.259	2	43	0.529	2	43	0.788	
10:00-11:00	2	43	0.306	2	43	0.365	2	43	0.671	
11:00-12:00	2	43	0.706	2	43	0.765	2	43	1.471	
12:00-13:00	2	43	0.400	2	43	0.588	2	43	0.988	
13:00-14:00	2	43	0.624	2	43	0.635	2	43	1.259	
14:00-15:00	2	43	0.929	2	43	0.447	2	43	1.376	
15:00-16:00	2	43	0.541	2	43	0.753	2	43	1.294	
16:00-17:00	2	43	0.741	2	43	0.576	2	43	1.317	
17:00-18:00	2	43	0.694	2	43	0.506	2	43	1.200	
18:00-19:00	2	43	0.812	2	43	0.541	2	43	1.353	
19:00-20:00	0	0	0.000	0	0	0.000	0	0	0.000	
20:00-21:00	0	0	0.000	0	0	0.000	0	0	0.000	
21:00-22:00	0	0	0.000	0	0	0.000	0	0	0.000	
22:00-23:00	0	0	0.000	0	0	0.000	0	0	0.000	
23:00-24:00	0	0	0.000	0	0	0.000	0	0	0.000	

* Note. based on only 2 multi-modal surveyed sites

Person Trip Rates:

Peak hour (11.00-12.00hrs): 1.471 people trips/dwelling

Daily : 12.353 person trips/dwelling

Saturday Modal Split

