1. INTRODUCTION

This technical note explains the model development changes to the Waikato Regional Transport Model which have been carried out in early 2010 to take the three step (vehicle driver only) model from version 3V1001 which was reported in the original set of WRTM technical notes 1 through 20, through to versions 3V1003.

Whilst the model has briefly been applied as 3V1002 for one operational project the changes that correspond to 3V1002 and 3V1003 occurred in quick succession. Whilst this technical note reports on both sets of changes, the model validation performance is only presented for 3V1003 as this becomes the active model for subsequent operational work.

The original model was strategically validated across a range of regional and urban screenlines, and was updated to 3V1002 following local area validation to prepare for an assessment of the Wairere Drive extension from Crosby Street to Cobham Drive. It became evident once local area data was analysed that traffic volumes were light in some parts of East Hamilton, especially in the vicinity of Waikato University.

Two key changes were introduced into the model in 3V1002. Firstly, attractions to Waikato University were isolated from those of other tertiary education institutions. This is a variation from the reporting included in technical note 10 and the revised attraction model is documented in section 2 of this technical note 21. The second change is the introduction of a bimodal distribution function for private trip purposes. This treats urban and rural trips as having separately calibrated trip lengths with the intention of improving the fit of travel patterns in the model. This is a variation from technical note 11 and is reported here in section 3 of this technical note 21.

Whilst the operational project work towards the assessment of the Wairere Drive extension continued, the model was prepared for an assessment of the proposed Northern River Crossing (NRC). Local area validation checks found that whilst the Eastern Hamilton model changes associated with 3V1002 provided an appropriate fit to the south of the NRC, there was too much traffic interaction between Ngaruawahia/Taupiri and Hamilton. As such the model has evolved from 3V1002 to 3V1003.

The principle change involved in this upgrade is to modify the attraction model for private home-based trip attractions to allow internal jobs to compete with jobs in Auckland, which are filled by Waikato residents.

The subsequent sections of this Technical Note document these changes and an overview of traffic validation results are also presented.

2. ATTRACTION MODEL CHANGES TO INCLUDE UNIVERSITY

In the local area validation work associated with the Wairere Drive extension corridor it was evident that the University was under-generating trips. Subsequently the University was isolated from other Tertiary Education institutions and the attraction equations were re-calibrated as presented below. In all cases R-squared statistics have improved from those published in Technical Note 10.

Morning Peak Vehicle Trip Attractions			R^2	Mean Cell
HBE	=	$0.095SCH + 0.199TER + 0.372UNI$ T=8.160 T=11.924 T=20.616	0.788	65
HBO	=	$0.142COM + 0.064HH + 0.287SCH + 0.076UNI$ T=4.026 T=3.049 T=9.709 T=2.590	0.698	186
Interpeak Vehicle Trip Attractions			R^2	Mean Cell
HBE	=	$0.095SCH + 0.199TER + 0.372UNI$ T=8.160 T=11.924 T=20.616	0.788	65
HBO	=	$0.136HH + 0.266RET + 0.308SCH + 0.134UNI$ T=4.434 T=3.653 T=6.928 T=3.105	0.654	246
Evening Peak Vehicle Trip Attractions			R^2	Mean Cell
HBE	=	$0.095SCH + 0.199TER + 0.372UNI$ T=8.160 T=11.924 T=20.616	0.788	65
HBO	=	$0.170COM + 0.196RET + 0.072SCH + 0.040UNI$ T=5.386 T=4.377 T=4.702 T=1.950	0.570	84

As with the original analysis presented in Technical Note 10, there are a few instances where landuse variables are included in some periods but not others. This often occurs because the nature of trip-making across the course of the day changes, depending on the hours of operation of various industry sectors and the business functions they serve at different times of day. Such results have been noted in other similar studies including the North Shore model calibration (from 1991 Auckland HIS) and model calibrations from Sydney's Transport Data Centre.

Where:

HH = Households (source Statistics New Zealand 2006 census)

SCH = School Roll (source 2008 Ministry of Education July roll data)

UNI = Tertiary Equivalent Full Time Students for Waikato University (source 2008 Ministry of Education EFTS by campus by provider)

TER = Tertiary Equivalent Full Time Students for other Institutions (source 2008 Ministry of Education EFTS by campus by provider)

COM = Community Jobs (Health Care and Social Assistance; Arts and Recreation Services; and Other Services ANZSIC06 industry categories aggregated from Statistics New Zealand 2006 census)

OFF = Office Jobs (Information Media and Telecommunications; Financial and Insurance Services; Rental, Hiring and Real Estate Services; Professional, Scientific and Technical Services; Administrative and Support Services; and Public Administration and Safety ANZSIC06 industry categories aggregated from Statistics New Zealand 2006 census)

RET = Retail Trade Jobs (ANZSIC06 category from Statistics New Zealand 2006 census)

WHO = Wholesale Trade Jobs (ANZSIC06 category from Statistics New Zealand 2006 census)

TOT = Total Jobs (all 19 ANZSIC06 categories from (source Statistics New Zealand 2006 census)

Following this update to the model, it was evident that there was still a level of under-generation of trips in the vicinity of the University as traffic volumes in the model on Knighton and Hillcrest Roads, especially during the interpeak period. Given that there is only one University campus in one zone of the study area, any under-reporting or over-reporting of trip ends at Waikato University from the HIS is not moderated by having a number of Universities with surveyed trip ends feeding into the attraction model.

In order to balance the generation with surveyed traffic volumes, the coefficients in the above analysis were doubled for Home Based Other trips and a similar coefficient was added during the interpeak period to allow for some Non Home Based trips to interact with University. The resultant finalised attraction models applied (with R-squared values) within the trip generation stage of the model are:

Morning Peak Vehicle Trip Attractions

HBE = 0.095SCH + 0.199TER + 0.372UNI
Revised R-Squared = 0.770

HBO = 0.142COM + 0.064HH + 0.287SCH + 0.152UNI
Revised R-Squared = 0.523

Interpeak Vehicle Trip Attractions

HBE = 0.095SCH + 0.199TER + 0.372UNI
Revised R-Squared = 0.770

HBO = 0.136HH + 0.308SCH + 0.266RET + 0.268UNI
Revised R-Squared = 0.466

NHB = 0.872HH + 0.485SCH + 12.333RET + 0.268UNI
Revised R-Squared = 0.815

Evening Peak Vehicle Trip Attractions

HBE = 0.095SCH + 0.199TER + 0.372UNI
Revised R-Squared = 0.770

HBO = 0.170COM + 0.196RET + 0.072SCH + 0.080UNI
Revised R-Squared = 0.461

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3. BIMODAL DISTRIBUTION MODEL

A bimodal distribution has been extracted whereby trips to/from the main urban area in the WRTM (defined as Region 2 in **Figure 1**) had a distribution model which was calibrated independently from those trips which had both trip ends outside of the main urban area (defined as Region 1 in **Figure 1**).

The distribution model coefficients for each region were calibrated by trip purpose in the same manner as the distribution model, which has been reported in WRTM Technical Note 11. In short the trips corresponding to the region were extracted from the HIS and assigned to the WRTM road network and compared against the model. The model coefficients were then carefully tuned to match the average trip lengths for Region 1 trips, and the process was repeated independently for Region 2 trips. Note that the Region 2 assessment included those trips between Region 1 and Region 2. The Region 1 assessment only included trips, which originated and terminated inside the Region 2 boundary.

The resultant distribution model coefficients are presented for each purpose and time period in **Table 1** (for Region 1 or rural trips) and **Table 2** (for Region 2 or urban and urban/rural trips).

The mean and standard deviation of trip lengths for HIS and model results are presented for each purpose and time period in **Table 3** (for Region 1 or rural trips) and **Table 4** (for Region 2 or urban and urban/rural trips).
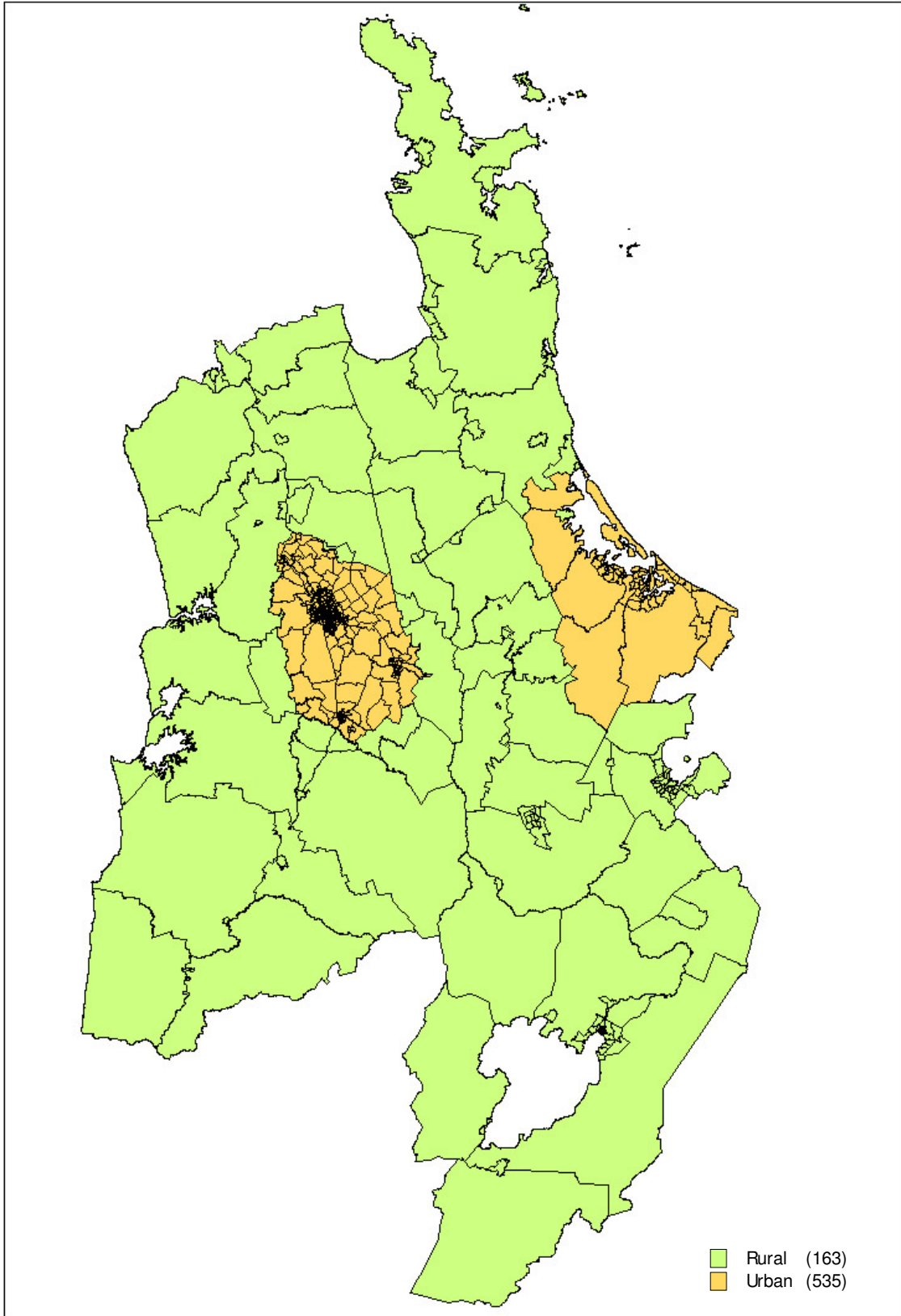
Urban and Rural Regions in Waikato

Rural (163)
Urban (535)

Waikato Regional Transportation Model	**Urban and Rural Regions in Waikato**	**Figure 1**
Gabites Porter		

Validated Distribution Model Coefficients – Region 1			Table 1
	Morning Peak	**Inter Peak**	**Evening Peak**
Home To Work	0.145	0.134	0.145
Home To Ed	0.200	0.800	0.200
Home To Business	0.950	0.900	0.950
Home To Shop	0.950	0.320	0.950
Home To soc/rec	0.350	0.105	0.350
Home To Other	0.430	0.285	0.430
Non Home Based	0.130	0.096	0.130
Work To Home	0.110	0.110	0.110
Ed To Home	0.200	0.800	0.200
Business To Home	0.220	0.800	0.220
Shop To Home	0.320	0.330	0.320
Soc/rec To Home	0.130	0.157	0.130
Other To Home	0.280	0.220	0.280

Validated Distribution Model Coefficients – Region 2			Table 2
	Morning Peak	**Inter Peak**	**Evening Peak**
Home To Work	0.130	0.155	0.130
Home To Ed	0.950	0.800	0.950
Home To Business	0.900	0.900	0.900
Home To Shop	0.530	0.290	0.530
Home To soc/rec	0.420	0.105	0.420
Home To Other	0.380	0.200	0.380
Non Home Based	0.110	0.115	0.110
Work To Home	0.120	0.175	0.120
Ed To Home	0.950	0.800	0.950
Business To Home	0.500	0.900	0.500
Shop To Home	0.380	0.360	0.380
Soc/rec To Home	0.092	0.157	0.092
Other To Home	0.450	0.135	0.450

Comparison of HIS and Modelled Trip Lengths – Region 1								Table 3
		Trip Time				Trip Distance			
Period	Purpose	HIS		Model		HIS		Model	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Morning Peak	Home to Work	10.44	13.76	10.05	12.37	11.31	16.58	11.20	15.92
	Home to Education	13.96	11.49	13.28	18.37	14.71	13.62	15.40	22.77
	Home to Business	10.28	11.11	11.39	16.86	11.53	13.57	12.66	20.52
	Home to Shop	9.07	12.46	9.21	13.95	9.91	16.74	9.85	17.32
	Home to Social/Rec	3.95	4.57	3.97	6.15	3.27	4.97	3.44	7.08
	Home to Other	6.90	8.87	6.39	9.55	6.48	9.98	6.49	11.58
	Non Home Based	9.98	16.01	9.72	13.03	10.90	19.91	11.00	17.01
	Other to Home	5.42	7.22	5.39	8.41	4.88	8.49	5.26	10.03
	Work to Home	1.99	1.18	10.11	12.44	1.31	1.18	11.32	16.10
	Education to Home	12.30	.00	11.92	16.16	15.98	.00	13.99	20.64
	Business to Home	7.69	8.52	7.79	10.40	8.07	10.04	8.26	13.18
	Shop to Home	6.95	11.19	8.58	13.72	6.08	11.06	9.46	17.60
	Soc/Rec to Home	2.94	2.22	2.98	4.58	2.00	1.69	2.31	5.16
Interpeak	Home to Work	10.61	18.67	10.80	14.38	12.38	25.77	12.11	18.08
	Home to Education	1.41	.00	11.35	19.13	.71	.00	12.95	23.01
	Home to Business	10.74	16.73	10.23	18.03	10.38	17.51	11.12	21.00
	Home to Shop	9.75	11.88	9.38	14.20	10.44	14.34	10.15	17.82
	Home to Social/Rec	12.14	16.17	11.71	15.25	13.35	18.09	13.28	19.29
	Home to Other	5.06	6.08	5.06	7.80	4.99	7.64	4.94	9.84
	Non Home Based	9.31	18.30	9.23	12.71	10.39	22.78	10.35	16.52
	Other to Home	5.29	4.96	5.15	7.68	4.83	5.52	4.97	9.37
	Work to Home	10.95	17.46	10.85	13.34	12.32	23.37	12.29	17.29
	Education to Home	1.57	.63	11.79	19.81	.93	.50	13.45	23.69
	Business to Home	8.88	10.34	9.20	14.57	8.62	11.22	10.32	18.19
	Shop to Home	10.22	14.02	10.55	15.57	11.26	16.90	11.73	19.90
	Soc/Rec to Home	7.70	11.21	7.70	10.74	8.18	15.49	8.22	13.68
Evening Peak	Home to Work	9.28	10.44	8.97	12.36	9.28	13.61	9.60	15.16
	Home to Education	18.60	9.88	14.53	19.80	23.13	13.07	16.97	25.43
	Home to Business	2.47	1.86	4.81	8.22	1.76	2.18	4.54	9.59
	Home to Shop	5.73	6.28	7.63	12.41	5.21	7.67	8.21	16.10
	Home to Social/Rec	7.41	9.94	9.16	13.70	7.47	12.02	9.78	16.72
	Home to Other	6.97	9.23	6.99	11.02	6.71	13.49	7.16	13.25
	Non Home Based	5.93	13.24	5.68	8.43	5.72	15.13	5.75	10.74
	Other to Home	9.08	11.16	8.75	12.91	9.13	13.82	9.27	15.98
	Work to Home	11.26	13.71	11.50	14.29	12.22	17.16	12.94	18.19
	Education to Home	15.79	3.28	12.43	15.77	18.58	6.36	14.19	19.96
	Business to Home	11.10	8.92	12.59	17.79	12.21	11.84	14.15	21.94
	Shop to Home	11.59	12.65	11.69	17.14	11.92	14.87	12.93	21.93
	Soc/Rec to Home	8.41	10.64	7.87	10.54	8.21	11.87	8.27	13.22

Comparison of HIS and Modelled Trip Lengths – Region 2									Table 4
		Trip Time				**Trip Distance**			
Period	**Purpose**	**HIS**		**Model**		**HIS**		**Model**	
		Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Morning Peak	Home to Work	15.12	13.09	14.96	10.97	13.51	16.56	13.58	14.24
	Home to Education	11.66	8.79	12.84	11.73	9.40	10.71	12.78	15.19
	Home to Business	12.14	7.67	14.73	13.45	9.68	8.65	14.41	17.59
	Home to Shop	10.77	7.64	11.19	11.66	8.58	9.08	9.93	15.21
	Home to Social/Rec	16.34	20.99	18.77	16.04	16.40	28.67	18.99	21.44
	Home to Other	10.15	9.09	10.04	8.00	8.17	10.17	8.37	9.80
	Non Home Based	10.96	11.01	10.83	8.27	8.90	13.11	8.90	10.01
	Other to Home	10.11	8.22	9.96	8.59	8.25	8.77	8.47	10.76
	Work to Home	13.88	12.63	14.33	10.42	12.84	16.16	12.99	13.53
	Education to Home	9.30	5.36	11.91	11.01	5.15	2.86	11.86	14.47
	Business to Home	27.33	39.31	24.77	22.69	29.55	49.87	26.34	29.96
	Shop to Home	5.96	3.67	8.91	10.20	4.20	3.35	8.12	13.50
	Soc/Rec to Home	11.52	6.31	11.41	10.43	10.10	7.10	10.12	13.57
Interpeak	Home to Work	13.74	8.98	13.25	10.16	11.85	10.76	12.16	13.12
	Home to Education	15.99	11.06	19.46	22.11	13.30	10.93	21.88	28.58
	Home to Business	17.77	30.58	22.42	22.47	17.09	36.63	25.22	29.55
	Home to Shop	11.33	10.88	11.29	11.25	9.64	13.89	10.16	14.76
	Home to Social/Rec	15.89	14.39	15.95	12.55	15.28	18.91	15.53	16.53
	Home to Other	10.14	9.38	10.42	11.12	8.74	11.62	8.95	14.11
	Non Home Based	11.76	13.08	11.98	9.70	10.35	16.22	10.54	12.19
	Other to Home	12.56	9.02	13.04	10.78	11.89	12.95	11.91	13.87
	Work to Home	11.34	7.87	10.97	7.42	9.19	9.49	9.16	9.07
	Education to Home	13.88	6.57	19.86	22.19	10.82	7.72	22.36	28.79
	Business to Home	11.41	7.72	17.14	16.68	10.05	9.14	18.30	22.01
	Shop to Home	11.86	10.05	11.41	11.06	10.03	12.04	10.45	14.64
	Soc/Rec to Home	12.58	11.20	12.18	9.27	11.12	14.87	10.92	11.82
Evening Peak	Home to Work	13.93	11.85	13.68	9.85	12.81	16.82	11.91	12.53
	Home to Education	8.68	5.42	8.02	6.70	4.82	4.25	6.37	8.05
	Home to Business	15.04	7.70	12.04	13.00	11.08	8.92	11.16	16.83
	Home to Shop	8.76	7.08	8.31	10.19	6.55	7.21	6.56	13.08
	Home to Social/Rec	12.21	13.92	11.37	10.36	10.18	17.59	9.98	13.36
	Home to Other	11.50	7.68	10.94	10.79	8.93	8.38	9.84	13.93
	Non Home Based	12.90	13.72	12.43	10.40	10.63	16.83	10.53	12.91
	Other to Home	9.52	6.73	9.57	8.21	7.18	7.10	8.00	10.02
	Work to Home	15.88	11.12	15.39	11.35	13.98	14.18	13.62	14.54
	Education to Home	11.91	7.16	10.83	9.81	8.25	7.44	10.05	12.59
	Business to Home	14.96	10.39	13.42	11.35	12.71	12.49	11.84	14.10
	Shop to Home	10.40	9.32	10.39	8.95	8.42	11.23	8.38	11.17
	Soc/Rec to Home	17.92	21.84	17.56	13.30	16.87	28.30	16.62	17.49

4.   EXTERNAL ATTRACTION MODEL FOR AUCKLAND JOBS

External traffic is a mix of through traffic for the entire Waikato Model study area, Waikato residents with trip ends in Auckland, and Auckland residents with trip ends in the Waikato Region. The quantity of through traffic is already accurately reflected in the model based on Road Side Interview analysis, however it is evident that there is value in making a distinction for non–through traffic between that which is generated by Waikato residents and those generated externally.

The key concern here is that whilst the trip generation model only generated those trips, which are internal to the Study Area, those zones which are close to the study area boundary will have a lower than average proportion of trips which are internal due to the degree of proximity and level of interaction with neighbouring external zones.

For this reason it is likely that there is some 'doubling' up of trips near the externals. Analysis of the traffic volumes indicated that this is only a significant issue at the two northern externals located just to the north of the Auckland Region/Waikato Region boundary in the vicinity of Pokeno and Tuakau. These two external stations carry a combined total of approximately 40,000 vpd.

In order to model this interaction, the trip rates need to be recalculated from the Household Interview Survey data such that they include all internal and external trips that the Waikato households generate. This corresponds to a slight increase in trip rates and replaces those published in Appendices 5 through 8 of Technical Note 7. The revised trip rates are included as Appendices 1 through 4 of this Technical Note 21 and are as follows:

- Appendix 1 - Morning Peak Car Driver Trip Rates by Purpose -(0700 to 0900)

- Appendix 2 - Inter Peak Car Driver Trip Rates by Purpose -(0900 to 1600)

- Appendix 3 - Inter Peak Car Driver Trip Rates by Purpose -(1100 to 1300)

- Appendix 4 – Evening Peak Car Driver Trip Rates by Purpose -(1600 to 1800)

With the application of these trip rates the additional resultant traffic generation then has been apportioned to a combination of internal and external attractions by modifying the modelled trip attraction equations from Technical Note 10 (and subsequent modifications as in section 3 of this Technical Note 21).

An additional landuse variable has been added to the model as a mechanism to attract trips to the northern externals. It is an estimate of the number of jobs to the north which are held by residents within the Study Area, based on census Journey to Work data and peak hour traffic flows. A total of 3300 jobs have been apportioned to the northern externals, 75% of which are on State Highway One (external 891 and are synonymous with jobs in South Auckland and further afield) and the remainder on the old State Highway 22 (external 890 which are jobs in Tuakau, Pukekohe and western Franklin District).

Coefficients have been calculated for this additional landuse variable such that the external and internal jobs compete with each other. The coefficients have been calculated based on the HIS data which recorded the number of trips by purpose which headed out the external stations.

The resultant attraction equations, which replace those published in Technical Note 10 and subsequent amendments in section 2 of this Technical Note 21, are as follows:

Morning Peak Vehicle Trip Attractions

HBW	=	0.302TOT + 0.600EXT
HBE	=	0.095SCH + 0.199TER + 0.372UNI + 0.160 EXT
HBB	=	0.104OFF + 0.050EXT
HBSh	=	0.211RET + 0.20EXT
HBSR	=	0.650RET + 0.215HH
HBO	=	0.142COM + 0.064HH + 0.287SCH + 0.152UNI + 0.050EXT
NHB	=	0.225WHOLE + 0.411 RET + 0.032HH + 0.077 SCH

Interpeak Vehicle Trip Attractions

HBW	=	0.347TOT + 0.092HH + 0.430EXT
HBE	=	0.095SCH + 0.199TER + 0.372UNI + 0.08EXT
HBB	=	0.247OFF + 0.452COM + 0.260EXT
HBSh	=	3.046 RET + 0.500EXT
HBSR	=	0.589RET + 0.221HH + 370EXT
HBO	=	0.136HH + 0.308SCH + 0.266TER + 0.268UNI + 0.260EXT
NHB	=	12.333RET + 0.872HH + 0.485SCH + 0.286UNI

Evening Peak Vehicle Trip Attractions

HBW	=	0.294TOT + 0.530EXT
HBE	=	0.095SCH + 0.199TER + 0.372UNI + 0.350EXT
HBB	=	0.054OFF + 0.120COM + 0.30EXT
HBSh	=	1.018 RET + 0.040EXT
HBSR	=	0.166RET + 0.098COM + 0.010EXT
HBO	=	0.170COM+ 0.196RET + 0.072SCH + 0.080UNI + 0.50EXT
NHB	=	1.518RET + 0.207COM + 0.187HH

Where EXT are Jobs for Waikato Residents External to the Study Area and other variables are as before.

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5. SUMMARY OF TRAFFIC FLOW VALIDATION

An overview of the traffic flow validation has been prepared to show the level of improvement in key locations of the model study area. One of the key drivers behind these changes has been that there were a number of areas where screenline counts were not included in the original (3V001) validation yet significant differences between model and actual were evident.

For this reason the 3V1001 and 3V1003 modelled volumes are presented alongside each other to show the relative improvement and also to provide confidence that model performance in other locations are not compromised.

The overview provided here focuses on AADT volumes but covers a broad range of locations. Almost invariably there is an improvement in model performance and any deterioration in performance from 3V001 to 3V003 is negligible. The plots are included as Appendix Five, and cover the Study Area as follows:

- north half of Hamilton City

- south half of Hamilton City

- north half of the Waikato Region

- south half of the Waikato Region

Some key statistics for each of these four areas are included in **Table 5**. These indicate a significant improvement in the fit between survey AADT volumes and modelled AADT volumes in the north of Waikato, as well as throughout Hamilton City. The southern half of the Waikato Region has not changed significantly, as no local area validation work has been undertaken in the vicinity when updating from 3V1001 to 3V1003.

Level of Correlation Between Surveyed AADT and Modelled AADT					Table 5
	Model as %age of Survey		Correl Coeff		R-Squared	
Region	3V1001	3V1003	3V1001	3V1003	3V1001	3V1003
North Hamilton	86.5%	97.9%	0.917	0.980	0.841	0.960
South Hamilton	89.0%	99.7%	0.927	0.978	0.860	0.956
North Waikato	110.0%	94.2%	0.977	0.987	0.954	0.973
South Waikato	99.5%	99.8%	0.921	0.921	0.848	0.849

6.   HIS SECTOR-TO-SECTOR VALIDATION

In order to check that the modelled mean trip patterns match the observed HIS trip patterns an analysis of sector to sector trips was undertaken in Technical Note 12. This has been revisited here to ensure that the model changes implemented in moving from 3V001 to 3V003 have not resulted in a deterioration in the fit between inter-sectoral movements.

The sector analysis has been repeated at TLA level and represents the trips for each modelled period between the nine TLA's in the modelled area. The correlation between HIS and modelled inter-sectoral movements has been plotted and the R^2 correlation coefficient has been calculated for each period. Plots showing this correlation are shown in **Figure 2,** with R^2 values compared against those from the 3V001 model.

In all three periods, the fit against HIS data has improved, particularly in the Interpeak and PM Peak models.

AM Model Versus HIS Sectored Trips

R-Squared = 0.995 (with HCC internal) was 0.994

R-Squared = 0.965 (without HCC internal) was 0.962

Interpeak Model Versus HIS Sectored Trips

R-Squared = 0.992 (with HCC internal) was 0.981

R-Squared = 0.957 (without HCC internal) was 0.921

PM Model Versus HIS Sectored Trips

R-Squared = 0.994 (with HCC internal) was 0.987

R-Squared = 0.961 (without HCC internal) was 0.938
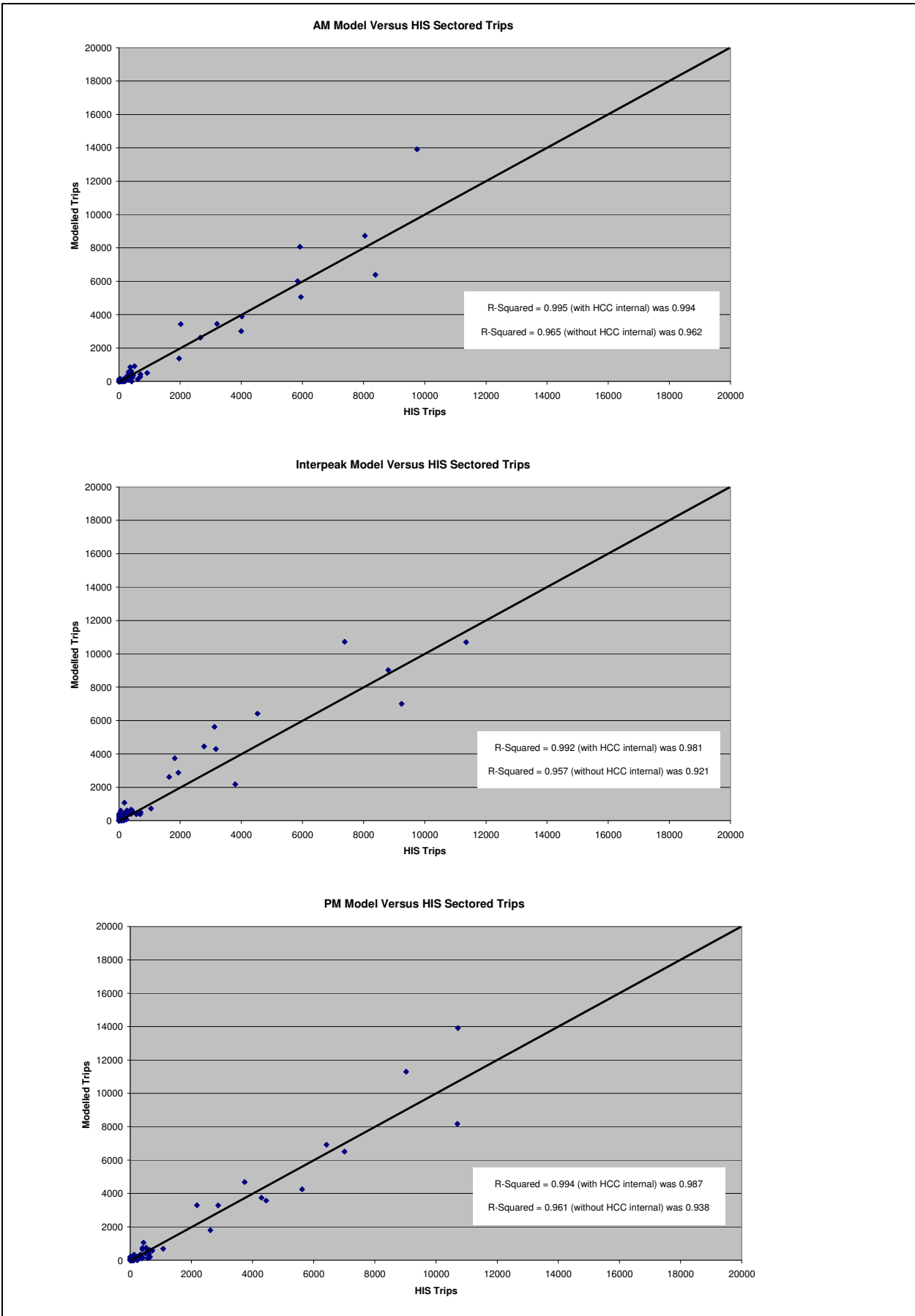
Waikato Regional Transportation Model	**HIS Sector to Sector Trip Validation**	**Figure 2**
Gabites Porter Traffic Design Group		

7. TRAVEL TIME VALIDATION

A comparison of the 3V1001 and 3V1003 modelled travel times for all urban and regional routes are presented in Table 6 and Table 7 respectively. There is a marginal deterioration in validation quality overall in general and an improvement in PM peak Regional Route validation.

Urban Route Travel Time Validation Comparison — Table 6

AM PEAK — ACCUMULATED TIME (In Seconds)

	Journey	Minimum	Average	Max	Std Dev	Time	Abs Diff	% Diff	Time	Abs Diff	% Diff
		OBSERVED				**MODELLED (3V1003)**			**MODELLED (3V1001)**		
HAMILTON ROUTES	H1NB	1203	1379	1581	170	1408	29	2.06%	1443	64	4.56%
	H1SB	1113	1225	1399	135	1306	81	6.18%	1272	47	3.61%
	H2EB	1342	1838	2170	267	1663	175	10.53%	1713	125	7.49%
	H2WB	1520	1913	2440	344	1706	207	12.14%	1775	138	8.09%
	H3EB	545	609	693	60	627	18	2.85%	617	8	1.23%
	H3WB	642	747	1060	199	669	77	11.56%	662	85	12.67%
	H4EB	734	975	1422	273	945	29	3.10%	938	37	3.89%
	H4WB	723	824	971	100	968	144	14.87%	933	109	11.25%
	H5NB	501	612	715	84	663	51	7.70%	664	52	7.84%
	H5SB	570	631	702	55	659	29	4.33%	649	18	2.78%
	H6aEB	345	469	609	95	447	22	4.92%	442	27	5.95%
	H6aWB	281	518	755	209	545	28	5.05%	565	47	8.69%
	H6bNB	142	205	288	53	200	5	2.52%	201	4	1.85%
	H6bSB	200	212	224	19	219	8	3.53%	215	3	1.52%
	H6cEB	23	167	311	93	146	21	14.25%	146	21	14.07%
	H6cWB	100	250	310	59	248	2	0.80%	258	8	3.18%
						Mean Absolute Difference	58			49	

INTER PEAK

	Journey	Minimum	Average	Max	Std Dev	Time	Abs Diff	% Diff	Time	Abs Diff	% Diff
		OBSERVED				**MODELLED (3V1003)**			**MODELLED (3V1001)**		
HAMILTON ROUTES	H1NB	1087	1219	1325	99	1344	125	9.32%	1302	83	6.20%
	H1SB	1232	1264	1306	29	1292	28	2.20%	1239	25	1.93%
	H2EB	1601	1651	1715	47	1534	117	7.62%	1627	24	1.56%
	H2WB	1607	1797	2149	223	1638	160	9.74%	1644	153	9.36%
	H3EB	590	627	666	38	619	8	1.29%	582	45	7.25%
	H3WB	612	706	792	70	659	47	7.09%	627	79	11.92%
	H4EB	782	874	1074	120	938	65	6.89%	892	18	1.96%
	H4WB	721	772	815	36	894	122	13.67%	877	105	11.79%
	H5NB	549	663	737	79	649	14	2.18%	636	27	4.16%
	H5SB	587	650	733	63	647	4	0.56%	629	21	3.28%
	H6aEB	404	431	468	20	464	33	7.20%	430	1	0.22%
	H6aWB	379	383	387	7	452	69	15.21%	421	38	8.44%
	H6bNB	167	206	269	36	195	10	5.20%	211	6	2.82%
	H6bSB	232	257	282	38	264	7	2.70%	250	7	2.76%
	H6cEB	47	187	327	93	158	29	18.55%	153	34	21.45%
	H6cWB	144	216	324	44	199	17	8.32%	198	18	8.89%
						Mean Absolute Difference	53			43	

PM PEAK

	Journey	Minimum	Average	Max	Std Dev	Time	Abs Diff	% Diff	Time	Abs Diff	% Diff
		OBSERVED				**MODELLED (3V1003)**			**MODELLED (3V1001)**		
HAMILTON ROUTES	H1NB	1278	1550	1876	237	1353	197	14.54%	1467	83	6.13%
	H1SB	1362	1504	1708	158	1527	23	1.48%	1581	77	5.02%
	H2EB	1866	1926	1982	42	1671	255	15.29%	1837	89	5.34%
	H2WB	1941	2265	2649	307	1777	488	27.46%	1865	400	22.50%
	H3EB	655	767	929	112	763	4	0.52%	725	42	5.48%
	H3WB	703	787	871	71	709	78	11.02%	671	116	16.35%
	H4EB	1122	1346	1756	313	1133	213	18.84%	1175	171	15.12%
	H4WB	818	987	1074	112	970	17	1.79%	1002	15	1.55%
	H5NB	617	703	769	63	715	12	1.73%	714	11	1.59%
	H5SB	626	714	802	65	672	42	6.29%	695	19	2.86%
	H6aEB	379	529	663	107	594	65	10.95%	656	127	21.46%
	H6aWB	615	686	783	90	491	195	39.70%	499	187	38.02%
	H6bNB	149	243	351	105	196	47	24.08%	196	47	24.12%
	H6bSB	205	242	295	52	261	19	7.45%	280	38	14.53%
	H6cEB	220	257	320	59	210	48	22.86%	237	20	9.74%
	H6cWB	161	224	303	43	205	19	9.28%	214	10	4.93%
						Mean Absolute Difference	108			91	

Regional Route Travel Time Validation Comparison — Table 7

24 HR Regional — ACCUMULATED TIME (In Seconds)

		OBSERVED 24 HOUR				AM PEAK						INTER PEAK						PM PEAK					
						MODELLED (3V1003)			MODELLED (3V1001)			MODELLED (3V1003)			MODELLED (3V1001)			MODELLED (3V1003)			MODELLED (3V1001)		
	Journey	Minimum	Average	Max	Std Dev	TIME	ABS DIFF	% DIFF	TIME	ABS DIFF	% DIFF	TIME	ABS DIFF	% DIFF	TIME	ABS DIFF	% DIFF	TIME	ABS DIFF	% DIFF	TIME	ABS DIFF	% DIFF
REGIONAL ROUTES	R1EB SH2	6545	6904	7151	299	6903	1	0.01%	7007	103	1.49%	6919	14	0.21%	6926	22	0.32%	7102	198	2.87%	7081	177	2.56%
	R1WB SH2	6845	6869	6893	31	7065	197	2.86%	7035	166	2.42%	6901	32	0.47%	6926	57	0.84%	7183	315	4.58%	7342	473	6.89%
	R2aNB SH1	2842	2909	2964	61	2811	98	3.36%	2810	99	3.40%	2821	88	3.02%	2836	73	2.51%	2861	48	1.65%	2916	7	0.24%
	R2aSB SH1	2807	2903	2999	126	2799	104	3.58%	2816	87	3.01%	2801	102	3.53%	2811	92	3.18%	2816	87	3.00%	2824	79	2.73%
	R2cNB SH1	688	735	768	29	717	18	2.46%	712	23	3.12%	696	39	5.28%	696	39	5.30%	701	34	4.56%	704	31	4.21%
	R2cSB SH1	692	729	786	38	685	44	6.03%	692	37	5.02%	693	36	4.94%	689	40	5.44%	725	4	0.53%	738	9	1.29%
	R2dNB SH1	1225	1483	2045	201	1423	60	4.06%	1456	27	1.82%	1407	76	5.12%	1445	38	2.56%	1420	63	4.26%	1472	11	0.74%
	R2dSB SH1	1197	1465	1769	158	1394	71	4.83%	1441	24	1.63%	1396	69	4.68%	1437	28	1.90%	1410	54	3.72%	1452	13	0.87%
	R3aNB SH1B	1197	1264	1379	104	1340	76	5.98%	1340	76	6.01%	1340	76	5.99%	1341	77	6.09%	1348	84	6.68%	1352	88	6.96%
	R3aSB SH1B	1149	1253	1405	132	1346	93	7.40%	1351	98	7.82%	1343	90	7.22%	1346	93	7.42%	1348	95	7.60%	1349	96	7.66%
	R3bNB SH1B	769	816	862	56	795	21	2.55%	796	20	2.47%	793	23	2.86%	795	21	2.59%	802	14	1.71%	801	15	1.86%
	R4EB SH29	2583	2600	2617	24	2556	44	1.68%	2570	30	1.14%	2551	49	1.87%	2553	47	1.79%	2566	33	1.28%	2569	31	1.17%
	R4WB SH29	2430	2553	2772	184	2530	23	0.91%	2529	24	0.95%	2523	30	1.17%	2529	24	0.95%	2547	6	0.23%	2567	14	0.54%
	R5NB SH1	1308	1395	1538	105	1354	42	2.98%	1351	44	3.17%	1352	44	3.12%	1351	44	3.17%	1353	42	2.99%	1357	38	2.74%
	R5SB SH1	1268	1355	1510	91	1344	11	0.83%	1346	9	0.69%	1347	9	0.64%	1345	10	0.77%	1351	4	0.30%	1351	4	0.32%
	R6NB SH32	4682	5039	5358	338	5129	89	1.77%	5132	93	1.84%	5128	89	1.76%	5133	94	1.86%	5135	96	1.90%	5137	98	1.94%
	R6SB SH32	5020	5138	5256	165	5128	10	0.19%	5133	5	0.10%	5131	7	0.14%	5134	4	0.08%	5133	6	0.11%	5137	1	0.02%
	R7NB SH1	2665	2668	2671	2	2667	1	0.04%	2668	0	0.01%	2684	16	0.60%	2681	13	0.47%	2783	115	4.29%	2818	150	5.61%
	R7SB SH1	2508	2710	2863	95	2674	36	1.31%	2680	30	1.11%	2676	34	1.25%	2673	37	1.36%	2708	2	0.08%	2713	3	0.11%
	R8NB SH1	2076	2076	2076	0	2070	6	0.31%	2073	3	0.14%	2075	1	0.06%	2081	5	0.24%	2079	3	0.14%	2092	16	0.77%
	R9NB SH5	4865	5111	5357	336	5147	35	0.69%	5143	32	0.62%	5166	54	1.06%	5154	43	0.83%	5292	181	3.54%	5373	262	5.12%
	R9SB SH5	5052	5161	5332	142	5176	15	0.30%	5210	49	0.95%	5146	15	0.29%	5137	24	0.47%	5168	7	0.14%	5179	18	0.34%
	R10aNB SH27	1640	1731	1838	100	1704	27	1.53%	1702	29	1.66%	1704	27	1.55%	1706	25	1.43%	1708	23	1.32%	1715	16	0.91%
	R10aSB SH27	1663	1740	1869	113	1700	40	2.28%	1706	34	1.95%	1699	41	2.38%	1702	38	2.18%	1701	39	2.25%	1703	37	2.13%
	R10bNB SH27	1992	2079	2166	113	2084	5	0.23%	2081	2	0.10%	2080	2	0.07%	2080	1	0.05%	2089	10	0.48%	2101	22	1.06%
	R10bSB SH27	2030	2139	2284	118	2082	57	2.67%	2089	50	2.36%	2082	58	2.70%	2081	58	2.73%	2087	52	2.44%	2091	48	2.26%
	R11aNB SH3	2308	2415	2522	146	2386	29	1.20%	2396	19	0.78%	2365	50	2.07%	2374	41	1.69%	2375	40	1.64%	2389	26	1.07%
	R11aSB SH3	2319	2372	2423	52	2356	16	0.67%	2369	3	0.13%	2369	3	0.13%	2376	4	0.17%	2398	26	1.09%	2415	43	1.81%
	R11bNB SH39	2828	2876	2942	59	2884	8	0.29%	2880	4	0.14%	2878	2	0.06%	2881	5	0.18%	2882	6	0.21%	2883	7	0.25%
	R11bSB SH39	2903	2906	2909	4	2891	15	0.52%	2894	12	0.41%	2895	11	0.37%	2898	8	0.27%	2911	5	0.17%	2907	1	0.04%
	Mean Absolute Difference					43			41			40			37			56			61		

Appendix One - Morning Peak Car Driver Trip Rates by Purpose

Home to work					Work to home				
1	0	0.437	0	0	1	0.151	0.011	0	0
2	0	0	0	0	2	0	0	0	0
3	0.605	0.221	0.699	0	3	0	0	0.02	0
4	0	0	0.037	0	4	0	0	0	0
5	0	0.22	0.331	0	5	0	0	0.015	0
6	0	0	0.822	1.051	6	0	0	0	0.037
7	0	0.177	0.149	0	7	0	0.017	0	0
8	0	0.081	0.539	0.811	8	0	0.015	0	0.023
9	0	0.19	0.472	0.483	9	0	0.015	0.011	0.1
10	0	0.252	0.333	0.385	10	0	0	0.03	0.046

Home to education					Education to home				
1	0	0	0	0	1	0	0	0	0
2	0	0.012	0	0	2	0	0	0	0
3	0	0.015	0	0	3	0	0	0	0
4	0	0.007	0	0	4	0	0	0	0
5	0	0	0.019	0	5	0	0	0	0
6	0	0	0	0.056	6	0	0	0	0
7	0	0	0.08	0	7	0	0	0	0
8	0	0.013	0.055	0.203	8	0	0.013	0	0
9	0	0	0.017	0.199	9	0	0	0	0
10	0	0.049	0.033	0.16	10	0	0	0.023	0

Home to business					Business to home				
1	0	0.017	0	0	1	0	0.005	0	0
2	0	0.034	0	0	2	0	0	0	0
3	0	0.016	0.068	0	3	0	0	0.004	0
4	0	0.008	0.099	0	4	0	0.007	0.014	0
5	0	0.02	0.05	0	5	0	0	0.014	0
6	0	0.062	0.044	0.033	6	0	0	0	0
7	0	0.018	0.078	0	7	0	0.018	0	0
8	0	0	0.017	0	8	0	0.026	0	0
9	0	0	0.026	0.037	9	0	0	0	0.016
10	0	0	0	0.073	10	0	0	0	0.046

Home to shop					Shopping to home				
1	0	0.03	0	0	1	0	0	0	0
2	0	0.015	0	0	2	0	0.015	0	0
3	0	0.036	0.032	0	3	0	0.052	0.004	0
4	0	0.019	0.029	0	4	0	0.008	0.01	0
5	0	0.039	0.028	0	5	0	0.018	0.014	0
6	0	0	0.028	0.053	6	0	0	0.028	0
7	0	0.041	0.109	0	7	0	0	0	0
8	0	0	0.044	0.054	8	0	0	0.008	0
9	0	0	0.033	0.017	9	0	0.015	0	0
10	0	0.075	0.04	0.043	10	0	0	0.034	0

Home to soc/rec

1	0	0.005	0	0
2	0	0.035	0	0
3	0	0	0.024	0
4	0	0.054	0.095	0
5	0	0.017	0.052	0
6	0	0	0.028	0.021
7	0	0.037	0.113	0
8	0	0.014	0.026	0
9	0	0.015	0.029	0.015
10	0	0.047	0.007	0.051

Soc/rec to home

1	0	0.019	0	0
2	0	0	0	0
3	0	0	0.011	0
4	0	0.007	0.039	0
5	0	0	0.008	0
6	0	0	0	0.011
7	0	0	0	0
8	0	0.013	0	0.026
9	0	0.028	0.018	0
10	0	0	0	0.032

Home to other

1	0	0.005	0	0
2	0	0.011	0	0
3	0	0.089	0.031	0
4	0	0.031	0.039	0
5	0	0.099	0.027	0
6	0	0	0.045	0.011
7	0	0.363	0	0
8	0	0.355	0.413	0.306
9	0	0.383	0.598	0.459
10	0	0.301	0.594	0.529

Other to home

1	0	0.005	0	0
2	0	0.006	0	0
3	0	0	0.003	0
4	0	0	0.008	0
5	0	0.066	0	0
6	0	0	0.045	0
7	0	0.151	0.07	0
8	0	0.149	0.052	0.072
9	0	0.146	0.104	0.167
10	0	0.215	0.261	0.163

Non home based

1	0	0.099	0	0
2	0	0.033	0	0
3	0	0.145	0.249	0
4	0	0.008	0.124	0
5	0	0.168	0.168	0
6	0	0.187	0.143	0.291
7	0	0.311	0.219	0
8	0	0.262	0.569	0.387
9	0	0.272	0.621	0.615
10	0	0.217	0.409	0.893

Appendix Two - Inter Peak Car Driver Trip Rates by Purpose (0900 to 1600)

#	Home to work				Work to home			
1	0.347	0.207	0	0	0.173	0.24	0	0
2	0	0	0	0	0	0	0	0
3	0.737	0.166	0.302	0	0.737	0.16	0.412	0
4	0	0.014	0	0	0	0	0	0
5	0	0.116	0.264	0	0	0.147	0.323	0
6	0	0.268	0.054	0.349	0	0.194	0.191	0.354
7	0	0.163	0.22	0	0	0.063	0	0
8	0	0.154	0.317	0.46	0	0.162	0.387	0.643
9	0	0.179	0.194	0.381	0	0.229	0.346	0.515
10	0	0.159	0.287	0.32	0	0.154	0.307	0.395

#	Home to education				Education to home			
1	0	0	0	0	0	0	0	0
2	0	0.007	0	0	0	0.007	0	0
3	0	0	0	0	0	0.019	0.005	0
4	0	0	0.019	0	0	0.01	0.01	0
5	0	0	0.015	0	0	0	0.02	0
6	0	0.067	0.033	0.121	0	0.067	0.033	0
7	0	0.019	0	0	0	0	0	0
8	0	0.066	0	0	0	0.016	0.01	0
9	0	0.03	0.013	0.069	0	0.03	0.047	0
10	0	0	0.03	0	0	0.058	0.039	0

#	Home to business				Business to home			
1	0	0.043	0	0	0	0.02	0	0
2	0	0.213	0	0	0	0.145	0	0
3	0	0.097	0.147	0	0	0.086	0.105	0
4	0	0.24	0.312	0	0	0.214	0.268	0
5	0	0.097	0.324	0	0	0.079	0.207	0
6	0	0.081	0.086	0.128	0	0.229	0.087	0
7	0	0.067	0	0	0	0.067	0	0
8	0	0.145	0.085	0.077	0	0.099	0.085	0
9	0	0.095	0.076	0.201	0	0.049	0.059	0
10	0	0.136	0.032	0.191	0	0.229	0.087	0

#	Home to shop				Shopping to home			
1	0	0.108	0	0	0	0.112	0	0
2	0	0.305	0	0	0	0.334	0	0
3	0	0.108	0.162	0	0	0.119	0.228	0
4	0	0.269	0.474	0	0	0.331	0.635	0
5	0	0.111	0.292	0	0	0.108	0.329	0
6	0	0.156	0.217	0.267	0	0.163	0.248	0.387
7	0	0.084	0.287	0	0	0.176	0.287	0
8	0	0.256	0.211	0.372	0	0.302	0.247	0.382
9	0	0.126	0.206	0.34	0	0.122	0.29	0.53
10	0	0.453	0.282	0.382	0	0.489	0.414	0.487

Home to soc/rec

1	0	0.045	0	0
2	0	0.205	0	0
3	0	0.033	0.096	0
4	0	0.248	0.434	0
5	0	0	0.212	0
6	0	0.362	0.185	0.258
7	0	0.022	0.485	0
8	0	0.161	0.101	0.035
9	0	0.135	0.107	0.165
10	0	0.165	0.195	0.204

Soc/rec to home

1	0	0.033	0	0
2	0	0.2	0	0
3	0	0.075	0.09	0
4	0	0.172	0.326	0
5	0	0.074	0.184	0
6	0	0.149	0.1	0.221
7	0	0.041	0.481	0
8	0	0.099	0.099	0.096
9	0	0.13	0.169	0.117
10	0	0.051	0.196	0.089

Home to other

1	0	0.011	0	0
2	0	0.013	0	0
3	0	0.033	0.03	0
4	0	0.066	0.061	0
5	0	0.125	0.055	0
6	0	0.137	0.163	0.061
7	0	0.168	0	0
8	0	0.238	0.161	0.226
9	0	0.345	0.455	0.446
10	0	0.2	0.56	0.666

Other to home

1	0	0.027	0	0
2	0	0.033	0	0
3	0	0.052	0.047	0
4	0	0.065	0.052	0
5	0	0.086	0.084	0
6	0	0.074	0.064	0.017
7	0	0.232	0	0
8	0	0.322	0.205	0.167
9	0	0.345	0.458	0.349
10	0	0.263	0.536	0.658

Non home based

1	0	0.837	0	0
2	0	0.706	0	0
3	0	1.245	1.898	0
4	0	0.819	1.342	0
5	0	0.837	1.912	0
6	0	0.909	1.373	2.11
7	0	1.044	0.718	0
8	0	1.052	2.37	2.377
9	0	1.189	2.34	2.667
10	0	1.985	2.188	3.7

Appendix Three - Inter Peak Car Driver Trip Rates by Purpose (1100 to 1300)

Home to work

1	0	0.03	0	0
2	0	0	0	0
3	0.737	0.017	0.059	0
4	0	0.014	0	0
5	0	0.055	0.107	0
6	0	0	0	0.069
7	0	0.02	0	0
8	0	0.015	0.075	0.06
9	0	0.033	0.067	0.048
10	0	0	0.087	0.098

Work to home

1	0.173	0.079	0	0
2	0	0	0	0
3	0.737	0.047	0.134	0
4	0	0	0	0
5	0	0.067	0.137	0
6	0	0.067	0.091	0.148
7	0	0.043	0	0
8	0	0.098	0.203	0.169
9	0	0.045	0.071	0.223
10	0	0.052	0.135	0.166

Home to education

1	0	0	0	0
2	0	0.007	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0.03
7	0	0	0	0
8	0	0.032	0	0
9	0	0	0.007	0.028
10	0	0	0	0

Education to home

1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0.01	0
5	0	0	0.011	0
6	0	0	0	0.043
7	0	0	0	0
8	0	0	0	0
9	0	0.018	0	0.046
10	0	0	0.01	0

Home to business

1	0	0.009	0	0
2	0	0.065	0	0
3	0	0.058	0.03	0
4	0	0.055	0.073	0
5	0	0.035	0.063	0
6	0	0	0	0
7	0	0.024	0	0
8	0	0.016	0.011	0.055
9	0	0.036	0.007	0.07
10	0	0	0.009	0.061

Business to home

1	0	0.015	0	0
2	0	0.052	0	0
3	0	0.043	0.022	0
4	0	0.058	0.072	0
5	0	0.039	0.101	0
6	0	0.074	0	0.031
7	0	0.024	0	0
8	0	0.018	0.01	0
9	0	0.018	0.015	0.016
10	0	0.183	0.016	0.094

Home to shop

1	0	0.031	0	0
2	0	0.086	0	0
3	0	0.028	0.057	0
4	0	0.04	0.088	0
5	0	0.018	0.075	0
6	0	0	0.027	0.072
7	0	0.025	0	0
8	0	0.103	0.053	0.083
9	0	0.092	0.039	0.153
10	0	0	0.091	0.052

Shopping to home

1	0	0.037	0	0
2	0	0.145	0	0
3	0	0.015	0.087	0
4	0	0.109	0.298	0
5	0	0.039	0.136	0
6	0	0.082	0.152	0.176
7	0	0	0.134	0
8	0	0.121	0.106	0.116
9	0	0.028	0.058	0.176
10	0	0.052	0.134	0.108

Home to soc/rec

1	0	0.009	0	0
2	0	0.037	0	0
3	0	0	0.041	0
4	0	0.094	0.072	0
5	0	0	0.057	0
6	0	0.13	0.067	0.031
7	0	0	0.212	0
8	0	0.033	0.011	0
9	0	0.029	0.04	0.018
10	0	0.051	0.042	0.02

Soc/rec to home

1	0	0.01	0	0
2	0	0.033	0	0
3	0	0.014	0.046	0
4	0	0.052	0.104	0
5	0	0	0.043	0
6	0	0.082	0.033	0.111
7	0	0	0	0
8	0	0.049	0.041	0.035
9	0	0.082	0.052	0
10	0	0	0.028	0.049

Home to other

1	0	0.006	0	0
2	0	0	0	0
3	0	0	0.008	0
4	0	0.009	0.019	0
5	0	0.022	0.017	0
6	0	0	0.03	0.025
7	0	0	0	0
8	0	0.042	0.03	0
9	0	0.033	0.061	0.04
10	0	0.046	0.053	0.073

Other to home

1	0	0.011	0	0
2	0	0	0	0
3	0	0	0.004	0
4	0	0.014	0	0
5	0	0.022	0.034	0
6	0	0	0.03	0
7	0	0	0	0
8	0	0.059	0.052	0
9	0	0.078	0.081	0.04
10	0	0	0.054	0.086

Non home based

1	0	0.291	0	0
2	0	0.174	0	0
3	0	0.416	0.643	0
4	0	0.304	0.464	0
5	0	0.451	0.623	0
6	0	0.406	0.215	0.615
7	0	0.315	0	0
8	0	0.302	0.672	0.816
9	0	0.162	0.641	0.982
10	0	0.181	0.578	1.035

Appendix Four - Peak Car Driver Trip Rates by Purpose

Home to work

1	0	0.013	0	0
2	0	0	0	0
3	0	0.014	0.043	0
4	0	0	0	0
5	0	0.018	0	0
6	0	0	0	0.053
7	0	0.022	0	0
8	0	0	0.016	0
9	0	0.033	0.038	0.075
10	0	0	0.033	0.05

Work to home

1	0.166	0.394	0	0
2	0	0	0	0
3	0.679	0.334	0.704	0
4	0	0.014	0.024	0
5	0	0.201	0.434	0
6	0	0.067	0.647	0.856
7	0.199	0.159	0.311	0
8	0	0.119	0.612	0.834
9	0	0.351	0.537	0.535
10	0	0.231	0.44	0.489

Home to education

1	0	0	0	0
2	0	0	0	0
3	0	0.018	0.004	0
4	0	0	0	0
5	0	0	0.033	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0.014	0.007	0.016
10	0	0	0	0

Education to home

1	0	0	0	0
2	0	0.012	0	0
3	0	0	0.008	0
4	0	0	0.009	0
5	0	0	0	0
6	0	0	0.031	0.041
7	0	0	0.074	0
8	0	0	0.055	0.025
9	0	0	0.007	0.069
10	0	0	0.009	0.073

Home to business

1	0	0.004	0	0
2	0	0.011	0	0
3	0	0.034	0.02	0
4	0	0.034	0.026	0
5	0	0	0.023	0
6	0	0	0	0.013
7	0	0.021	0.129	0
8	0	0	0	0.028
9	0	0	0.014	0.066
10	0	0	0.011	0.034

Business to home

1	0	0.022	0	0
2	0	0.011	0	0
3	0	0.034	0.033	0
4	0	0.03	0.047	0
5	0	0	0.052	0
6	0	0	0	0.028
7	0	0.041	0.087	0
8	0	0.033	0.034	0.032
9	0	0.024	0.021	0.057
10	0	0	0.018	0.019

Home to shop

1	0	0.02	0	0
2	0	0.016	0	0
3	0	0.085	0.018	0
4	0	0.017	0.026	0
5	0	0.06	0.04	0
6	0	0	0.076	0.088
7	0	0.038	0.153	0
8	0	0.082	0.044	0.056
9	0	0.059	0.046	0.053
10	0	0.105	0.032	0.089

Shopping to home

1	0	0.08	0	0
2	0	0.029	0	0
3	0	0.054	0.127	0
4	0	0.046	0.146	0
5	0	0.132	0.176	0
6	0	0.126	0.256	0.28
7	0	0.127	0.282	0
8	0	0.11	0.121	0.221
9	0	0.064	0.161	0.223
10	0	0.202	0.091	0.196

Home to soc/rec

1	0	0.075	0	0
2	0	0.047	0	0
3	0	0.084	0.037	0
4	0	0.016	0.096	0
5	0	0.02	0.051	0
6	0	0	0.06	0.096
7	0	0.039	0.123	0
8	0	0.074	0.066	0.029
9	0	0.083	0.046	0.118
10	0	0.129	0.064	0.111

Soc/rec to home

1	0	0.051	0	0
2	0	0.075	0	0
3	0	0.026	0.053	0
4	0	0.059	0.139	0
5	0	0.018	0.079	0
6	0	0.077	0.031	0.181
7	0	0.038	0.376	0
8	0	0.043	0.107	0.063
9	0	0.076	0.072	0.125
10	0	0.096	0.079	0.145

Home to other

1	0	0.008	0	0
2	0	0	0	0
3	0	0.03	0.005	0
4	0	0.007	0	0
5	0	0.016	0	0
6	0	0	0	0.016
7	0	0.075	0.072	0
8	0	0.043	0.11	0.032
9	0	0.049	0.071	0.038
10	0	0.047	0.144	0.187

Other to home

1	0	0.004	0	0
2	0	0	0	0
3	0	0.095	0.015	0
4	0	0.007	0.01	0
5	0	0.115	0.02	0
6	0	0	0.09	0.045
7	0	0.112	0.072	0
8	0	0.183	0.23	0.085
9	0	0.094	0.169	0.088
10	0	0.047	0.204	0.325

Non home based

1	0	0.16	0	0
2	0	0.083	0	0
3	0	0.19	0.268	0
4	0	0.069	0.179	0
5	0	0.405	0.234	0
6	0	0.068	0.614	0.529
7	0	0.304	0.505	0
8	0	0.38	0.556	0.62
9	0	0.364	0.544	0.463
10	0	0	0.224	1.116
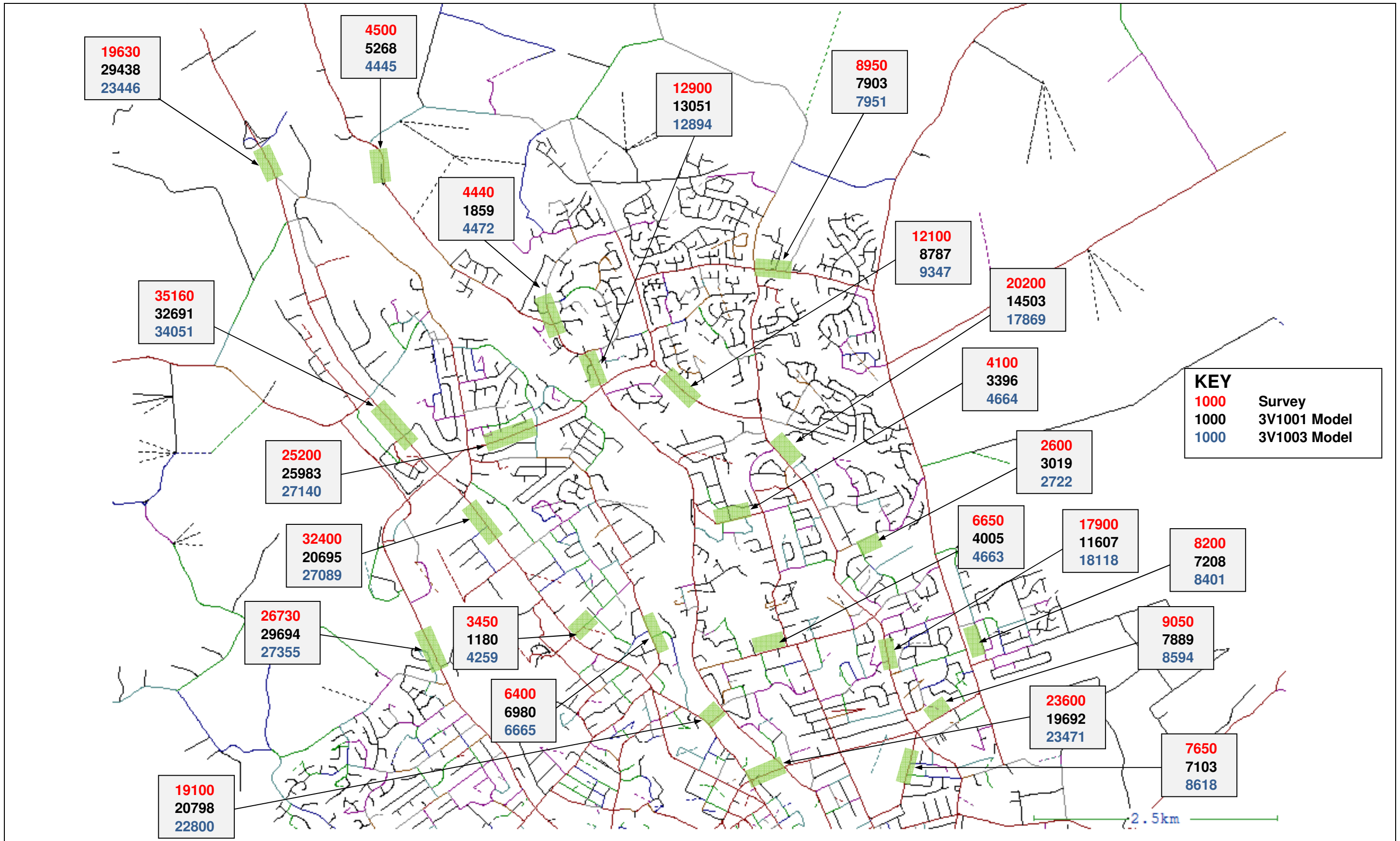
AADT Validation Summary
Hamilton North View

Appendix Five

Figure 1

KEY

1000	Survey
1000	3V1001 Model
1000	3V1003 Model

2.5km

Tech Note 21 Three Step Model Upgrade from V3001 to V3003
Final.doc

GABITES PORTER

TRAFFIC DESIGN GROUP

KEY

1000	**Survey**
1000	**3V1001 Model**
1000	**3V1003 Model**

Labels on map:

- **10500** / 10622 / 12114
- **20170** / 19327 / 18956
- **12510** / 11333 / 12215
- **23600** / 19692 / 23471
- **12000** / 12657 / 15821
- **27700** / 25776 / 28342
- **22830** / 22981 / 21965
- **20800** / 21368 / 21980
- **26720** / 28516 / 28539
- **16000** / 7320 / 11703
- **28410** / 28351 / 27281
- **5150** / 6806 / 6165
- **17200** / 15458 / 17139
- **5350** / 2440 / 3756
- **6050** / 7650 / 7053
- **28690** / 31427 / 29051

2.5km

AADT Validation Summary
Hamilton South View

Appendix Five
Figure 2
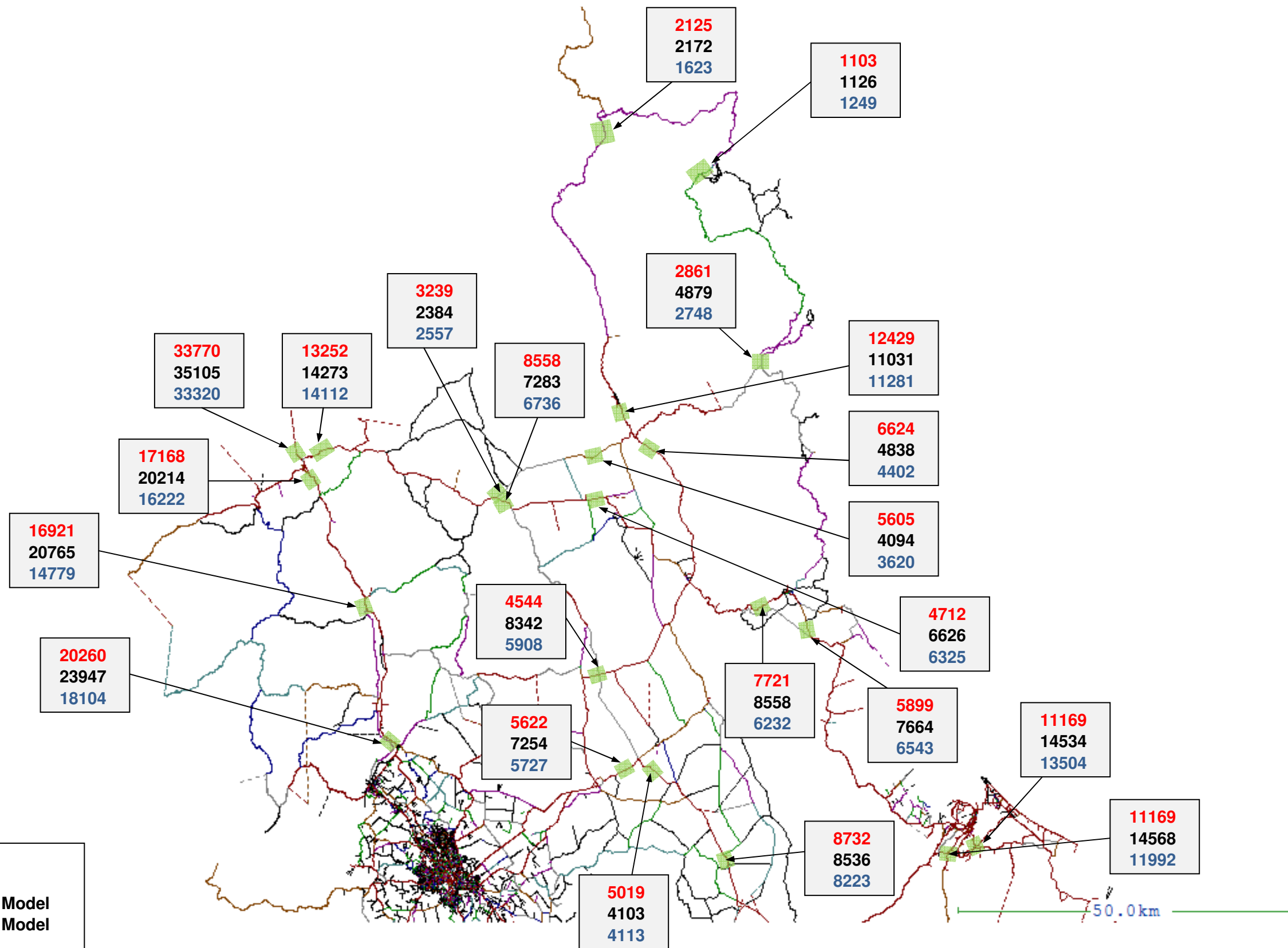
AADT Validation Summary
North Waikato View

Appendix Five
Figure 3

KEY

1000	Survey
1000	3V1001 Model
1000	3V1003 Model

GABITES PORTER

TRAFFIC DESIGN GROUP

KEY
1000 Survey
1000 3V1001 Model
1000 3V1003 Model

4036	4332	4381
4085	4712	3890
7895	7065	7590
6220	6632	6613
5376	6049	6522
10506	8070	7984
8439	7844	7698
6335	6736	6796
7389	7874	7501
8220	5593	5740
1993	2756	3268
737	843	857
5331	3857	3923
941	2981	2778
2127	3739	3783
730	837	746
5662	5268	5429
3755	4115	4110

25.0km
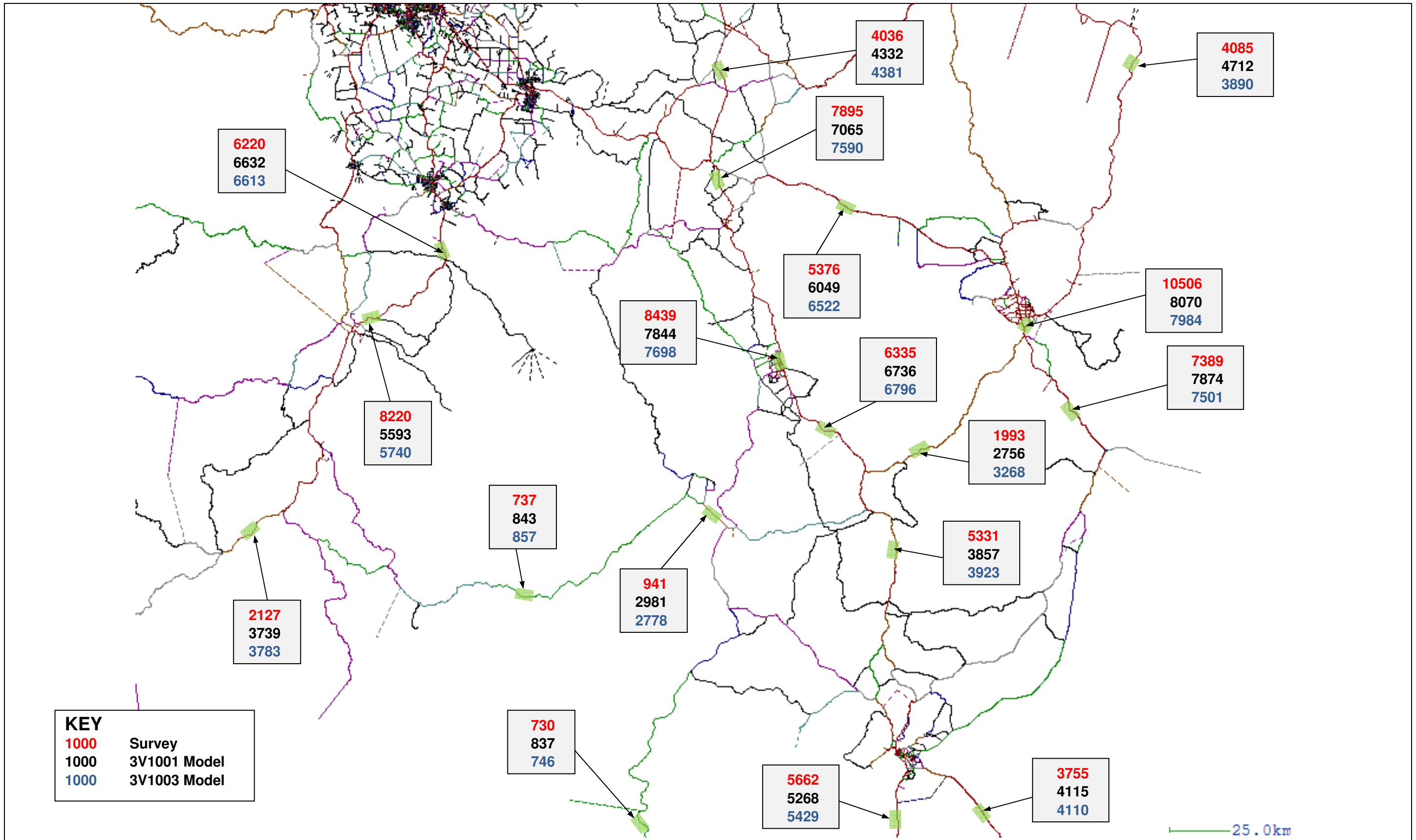
**AADT Validation Summary
South Waikato View**

**Appendix Five
Figure 4**