

APPENDIX B

LOCAL MODEL VALIDATION REPORT

TECHNICAL NOTE

MARKET HARBOROUGH TRANSPORT STUDY

LOCAL MODEL VALIDATION REPORT

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1. INTRODUCTION

1.1 Background

- 1.1.1 SYSTRA has been commissioned by Leicestershire County Council (LCC) to use the Leicester and Leicestershire Integrated Transport Model (LLITM) to develop an understanding of current and future transport issues in Market Harborough.
- 1.1.2 Stage 1, Part 1 of the study involved an assessment of the LLITM highway model validation within the identified Area of Interest (AOI) in and around Market Harborough.
- 1.1.3 Part 2 of the study comprises of the revalidation of the LLITM highway model within the AOI to ensure that the modelled flows reflect the observed flow data. Both count and journey time validation has been undertaken as requested by LCC.
- 1.1.4 This Technical Note details the results from the revalidation exercise and summarises the calibration and validation statistics for the updated LLITM highway model in the AOI of Market Harborough.

1.2 Structure of the Note

- 1.2.1 The structure of the rest of the note is given below:

- Chapter 2 describes the process of highway model calibration and provides the calibration and validation statistics within the AOI;
- Chapter 3 discusses the impact of Matrix Estimation on matrix totals, trip ends and trip length distributions;
- Chapter 4 discussed the journey time validation; and,
- Chapter 5 concludes the findings of the study.

2. LOCAL AREA HIGHWAY MODEL VALIDATION

2.1 General Overview

- 2.1.1 In order to ensure a robust assessment, LLITM has been re-validated for the area within the Market Harborough AOI using traffic flow data provided by LCC.

2.2 Calibration Approach

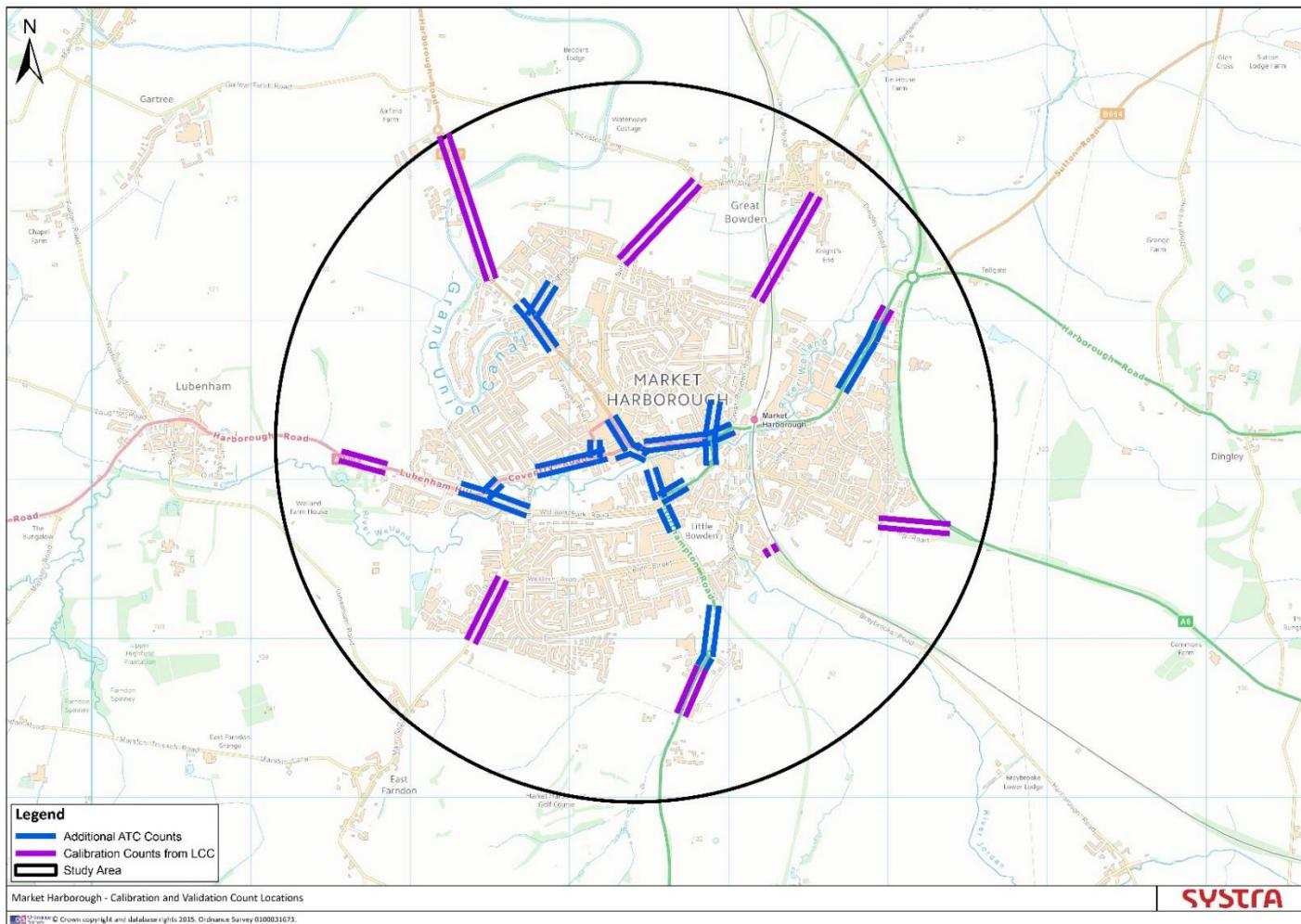
- 2.2.1 The DfT guidelines for the calibration and validation of highway models are based on those laid out in the Design Manual for Roads and Bridges (DMRB) Volume 12, Section 2, Part 1, Chapter 4. In respect of the count comparisons presented in this section, there are two separate sets of criteria against which the counts and modelled flow comparisons should be measured. In both cases the criteria are expected to be met in 85% of cases. The two sets of criteria are:
- GEH Statistic
 - Links should have a GEH value of less than 5.
 - DMRB Vehicle Flow Comparison (DMRB criteria 1-3):
 - Where observed flow is less than 700 vehicles per hour, the modelled flow should be within 100 vehicles of the observed flow;
 - Where the observed flow is between 700 and 2,700 vehicles per hour, the modelled flow should be within 15% of the observed flow; and
 - Where observed flow is greater than 2,700 vehicles per hour, the modelled flow should be within 400 vehicles of the observed flow.

- 2.2.2 As per WebTAG Unit M3.1, these two criteria are broadly consistent and modelled flows that meet either criterion should be regarded as satisfactory. This allows links where only one of the two criteria has been met to be acceptable for overall flow validation/calibration purposes. As a result we have identified a combined statistic where either of the criteria is achieved.

2.3 Leicester and Leicestershire Integrated Transport Model (LLITM)

- 2.3.1 A 2008 base LLITM SATURN network has been provided to SYSTRA by LCC.
- 2.3.2 In order to complete the local area validation, count data has been provided by LCC. The additional count data has been factored to represent 2008 conditions using LLITM5 Temporal Factors, this takes into account season and monthly ATC trends as well as local factors, such as rural or urban location and road type. Link counts have been used throughout the validation process. This approach has been agreed with LCC.
- 2.3.3 Figure 1 identifies the locations of all observed counts, provided by LCC, within the AOI.

Figure 1. Calibration and validation count locations.



2.4 Network Enhancements

- 2.4.1 Necessary network checks were undertaken within the AOI to ensure it reflected the current network situation. Three amendments were made, they included;
- Modifying the signal timings in the AM peak at the junctions of Welland Park Road/Northampton Road, Northampton Road/Springfield Street, Springfield Street/Sainsbury's access and the Clarence Street/A4304 crossroads,
 - Modifying the signal timings in the PM peak at the junction of Northampton Road/Springfield Street, Springfield Street/Sainsbury's access and the Clarence Street/A4304 crossroads, and;
 - The coding of an additional right turn filter lane at the junction of Springfield Street junction and Sainsbury's access for both the AM and PM peak periods.

- 2.4.2 No amendments to speeds, link capacities, or other network attributes within the AOI were made, as generally they reflected the current network conditions.

2.5 Matrix Estimation (Calibration)

- 2.5.1 A full cycle of matrix estimation (commencing with the original 'prior' matrix) was undertaken. Each stage of matrix estimation concentrated on one specific vehicle classification as detailed in the traffic surveys, the three vehicle classifications being:
- Car;
 - LGV;
 - HGV.
- 2.5.2 Matrix estimation makes use of traffic flow information to enable the model to adjust demand between zone pairs to replicate these flows. The modelled flows along these links are then measured against a series of independent validation counts.
- 2.5.3 It was agreed with LCC that Calibration counts would be only used within the AOI, therefore a total of **44 counts** were used in both the AM and PM peak periods.
- 2.5.4 As no turning counts were available, the calibration process has been undertaken and reported for link flows only.

Calibration Statistics

- 2.5.5 Table 1 provides the calibration statistics within the AOI for the AM and PM peaks. The full calibration spreadsheets can be found in *Figure 101 – AM Calibration* and *Figure 102 – PM Calibration*.
- 2.5.6 For both the AM and PM peak period models a 98% calibration has been achieved. Both peaks are in excess of the standards required by the DfT guidelines and show that the model replicates observed flows to an excellent degree.

Table 1. Calibration Statistics within the Market Harborough AOI.

AM				PM			
Vehicle type	GEH<5	DMRB 1-3 ²	Combined Statistic	Vehicle type	GEH<5	DMRB 1-3 ²	Combined Statistic
Car	98%	95%	98%	Car	98%	98%	98%
LGV	100%	100%	100%	LGV	100%	100%	100%
OGV	100%	100%	100%	OGV	100%	100%	100%
Total	98%	98%	98%	Total	98%	98%	98%

2.1 Validation Results

- 2.1.1 A separate set of independent counts were omitted from the matrix estimation process with the intention of being used for validation.
- 2.1.2 This independent comparison provides confidence that the model replicates the flows across the network. It also instils confidence that the trips within the matrix have not been altered in a manner which unrealistically skews their attributes, such as distributions, in order to produce the required flows along the calibration links used in matrix estimation.
- 2.1.3 The guidance set out in the DMRB (Volume 12, Section 1, Part 1, Chapter 11.4.22) suggests that a reasonable sample of modelled flows along links should be validated. The guidance suggests that a minimum of 10 counts should be used, with preferably around 20 counts for large models with this increasing as the model scale increases.
- 2.1.4 For this study, SYSTRA have used **24 link counts** in the AM Peak and **23 link counts** in the PM Peak. Overall three validation link counts were removed, one from the AM and two from the PM peaks, this was due to inconsistencies between calibration and validation counts on the adjacent links.

Validation Statistics

- 2.1.5 Table 2 provides a summary of flow validation statistics within the AOI, after the matrix estimation was undertaken.
- 2.1.6 In the AM peak, 79% of link counts meet the combined validation statistics with 78% in the PM Peak. Although it falls slightly short of meeting DfT criteria, this level of validation is usually considered acceptable by Local Authorities and Highways England for the purposes of strategic modelling.
- 2.1.7 The full validation spreadsheets can be found in *Figure 103 – AM Validation* and *Figure 104 – PM Validation*.

Table 2. Model Validation of independent counts within the Market Harborough AOI.

AM				PM			
Vehicle type	GEH<5	DMRB 1-3 ²	Combined Statistic	Vehicle type	GEH<5	DMRB 1-3 ²	Combined Statistic
Car	75%	75%	88%	Car	74%	74%	78%
LGV	96%	100%	100%	LGV	83%	100%	100%
OGV	100%	100%	100%	OGV	100%	100%	100%
Total	75%	75%	79%	Total	74%	78%	78%

Trunk Road Validation Statistics

- 2.1.8 Table 4 provides the trunk road validation statistics for the AM and PM peaks within LLITM. In the AM peak 93% of the links meet the combined GEH and DMRB criteria, in the PM peak this is 95%.
- 2.1.9 The full validation spreadsheets can be found in *Figure 113 – AM and PM Trunk Road Validation*.

Table 4. Trunk Road Link Validation Statistics.

AM				PM			
Vehicle type	GEH<5	DMRB 1-3 ²	Combined Statistic	Vehicle type	GEH<5	DMRB 1-3 ²	Combined Statistic
Car	95%	93%	95%	Car	93%	93%	93%
LGV	93%	98%	98%	LGV	93%	98%	98%
OGV	78%	85%	85%	OGV	90%	93%	95%
Total	90%	93%	93%	Total	88%	95%	95%

2.2 Calibration and Validation Profiles

- 2.2.1 Figures 2 and 3 illustrate the calibration and validation link counts within the AOI for both the AM and PM peaks respectively. The links that validate are shown in green, links that are modelled low are identified in blue, with links that are modelled high in red.
- 2.2.2 The illustration demonstrates that the calibration and validation of the model for both the AM and PM peak periods is generally good within the AOI.

Figure 2. GEH and/or DMRB criteria for calibration and validation counts – AM Peak.

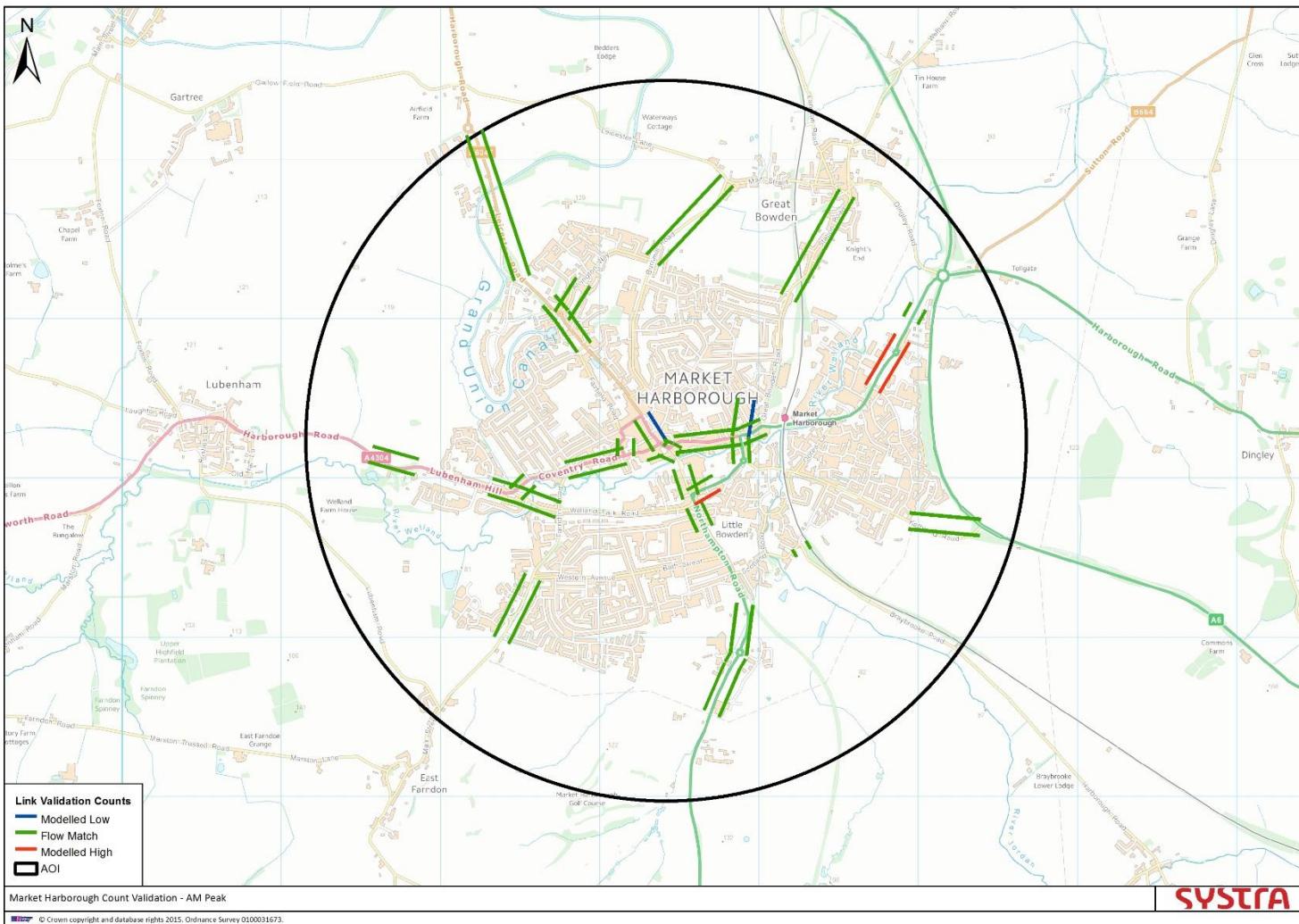
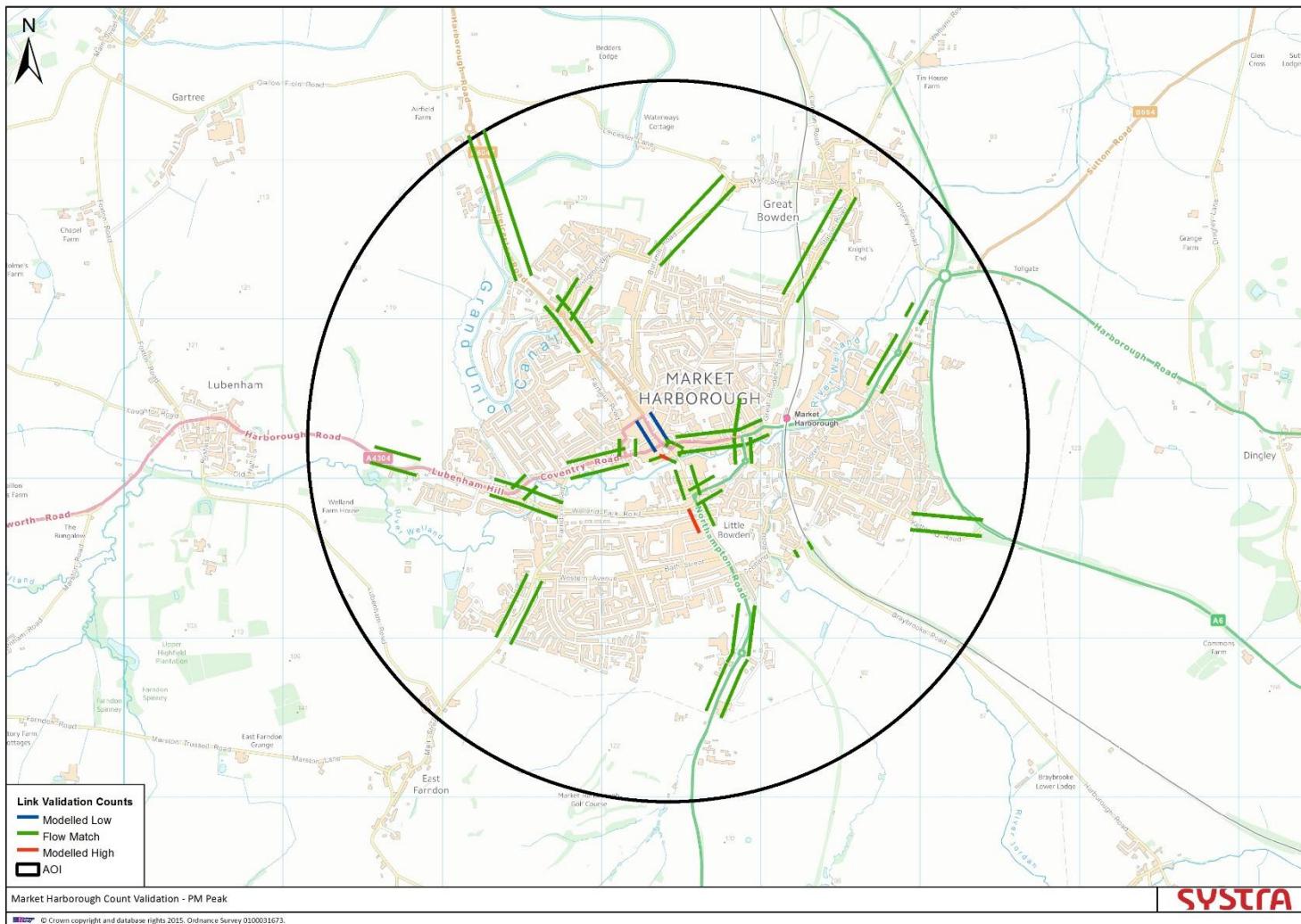


Figure 3. GEH and/or DMRB criteria for calibration and validation counts – PM Peak.



3. IMPACT OF MATRIX ESTIMATION

3.1 Impact on Matrix Totals

- 3.1.1 Tables 3 and 4 provide the highway matrix totals for pre and post matrix estimation for the AM and PM peaks respectively.
- 3.1.2 The overall trip levels have changed by 0.01% in the AM peak and by 0.01% in the PM peak. This shows that the matrix estimation has had a minimal impact upon both AM and PM peak trip levels.
- 3.1.3 WebTAG Unit M3.1 states that the matrix size should not change by more than 5% as a result of matrix estimation. Both the AM peak and the PM peak matrix changes are well within this limit.

Table 5. Impact on AM peak matrix totals (vehicles).

	BEFORE MATRIX ESTIMATION	AFTER MATRIX ESTIMATION	PERCENTAGE DIFFERENCE
Cars	5,652,513	5,653,502	0.02%
LGV	436,058	435,994	-0.01%
OGV	163,537	163,520	-0.01%
Total	6,252,108	6,253,017	0.01%

Table 6. Impact on PM peak matrix totals (vehicles).

	BEFORE MATRIX ESTIMATION	AFTER MATRIX ESTIMATION	PERCENTAGE DIFFERENCE
Cars	6,583,424	6,584,089	0.01%
LGV	353,221	353,222	0.00%
OGV	83,777	83,791	0.02%
Total	7,020,422	7,021,102	0.01%

3.1 Trip Length Distributions

- 3.1.1 The distributions of trip lengths within the model are shown in Figures 4 and 5 for all vehicles combined, by time period. The variation in trip length distribution for the separate vehicle classes (Cars, LGVs and OGVs) are provided in Figure 105. The blue bars represent trips for the prior matrix, whilst the purple bars represent the post matrix estimation trips.

Figure 4. AM peak total vehicles change in trip length distribution.

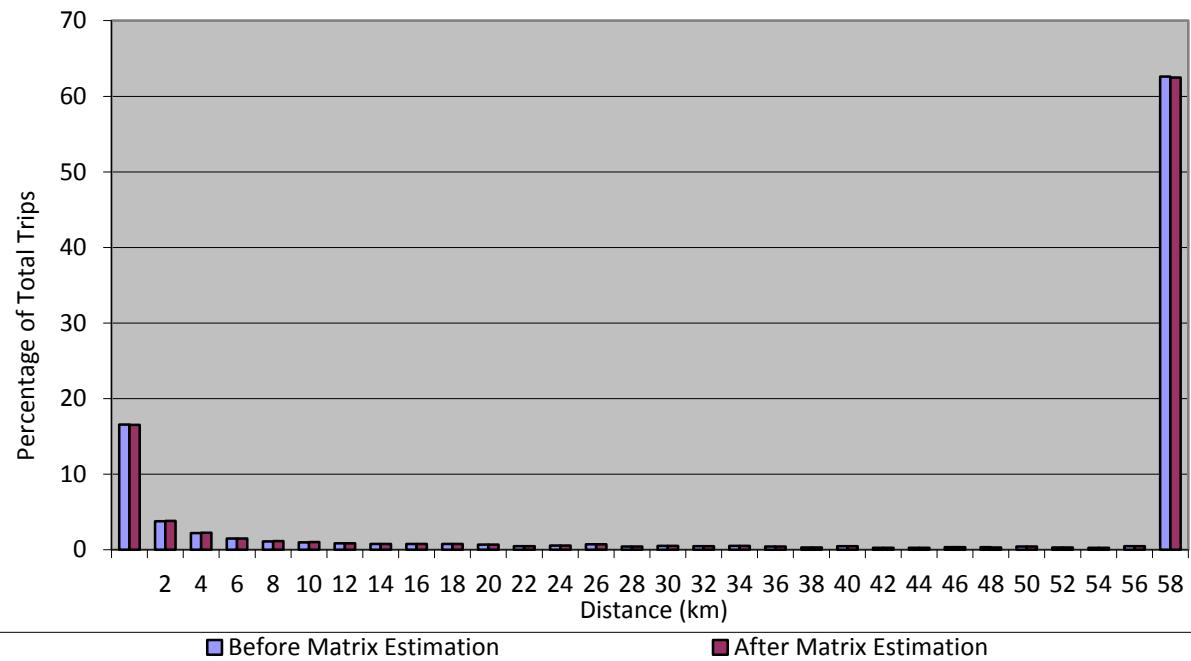
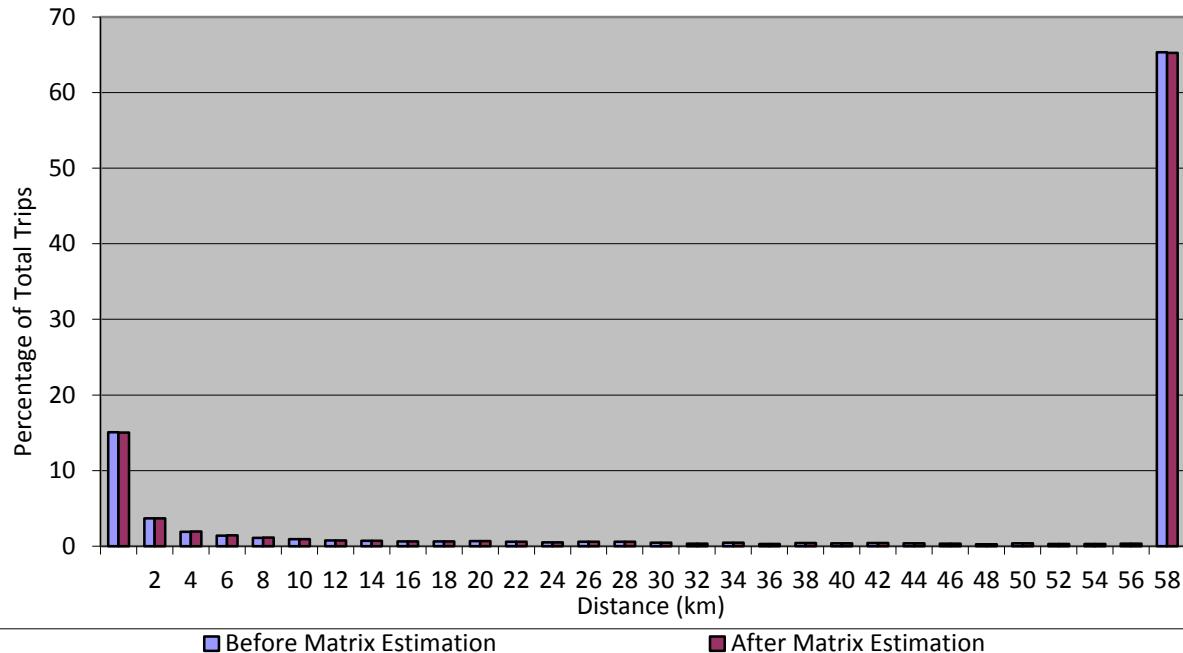


Figure 5. PM peak total vehicles change in trip length distribution.



- 3.1.2 Table 5 shows the change in mean car trip lengths for the prior and post matrix estimation matrices for the AM and PM peaks. This includes all trips within the network, including exogenous trips that travel through the study area.
- 3.1.3 These show that matrix estimation changes the mean total trip lengths by -0.13% in the AM and -0.08% in the PM peak. WebTAG Unit M3.1 advises that changes to mean trip length by matrix estimation should be no more than 5% and therefore the model successfully complies with the WebTAG guidance.

Table 7. Model wide trip length distribution summary.

	BEFORE ME	AFTER ME	% DIFFERENCE
AM	41.11	41.05	-0.13%
PM	42.50	42.46	-0.08%

3.1 LLTM Trip End Analysis

- 3.1.1 A regression analysis has been conducted to ascertain the degree of fit between the prior trip ends and those following the ME process. Figures 6 and 7 graphically represent this data for the AM and PM peak periods. The degree of fit for trip ends for the separate vehicle classes (Cars, LGVs and OGVs) are provided in Figure 106.
- 3.1.2 Table 6 conveys the correlation between prior and post matrix estimation trip ends at Origin and Destination levels. The correlation coefficient R provides indication of the 'goodness of fit' whilst the slope of the best fit regression line through the origin indicates the range by which the modelled values are under or over estimated.
- 3.1.3 WebTAG Unit M3.1 advises that acceptable values are deemed to be in excess of 0.98 for R^2 and a slope of between 0.99 and 1.01 with a value of 1.00 for each being a perfect fit. Where trip numbers are large it may be difficult to obtain a perfect slope and values of R^2 .

Figure 6. AM peak total vehicles change in trip ends.

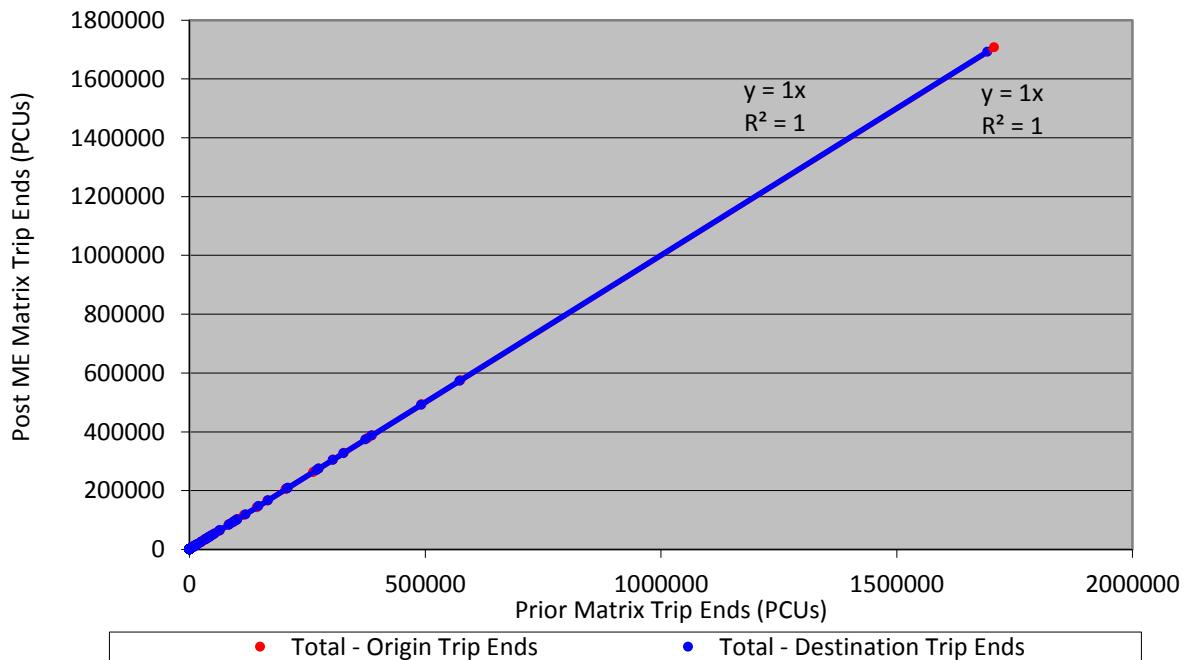


Figure 7. PM peak total vehicles change in trip ends.

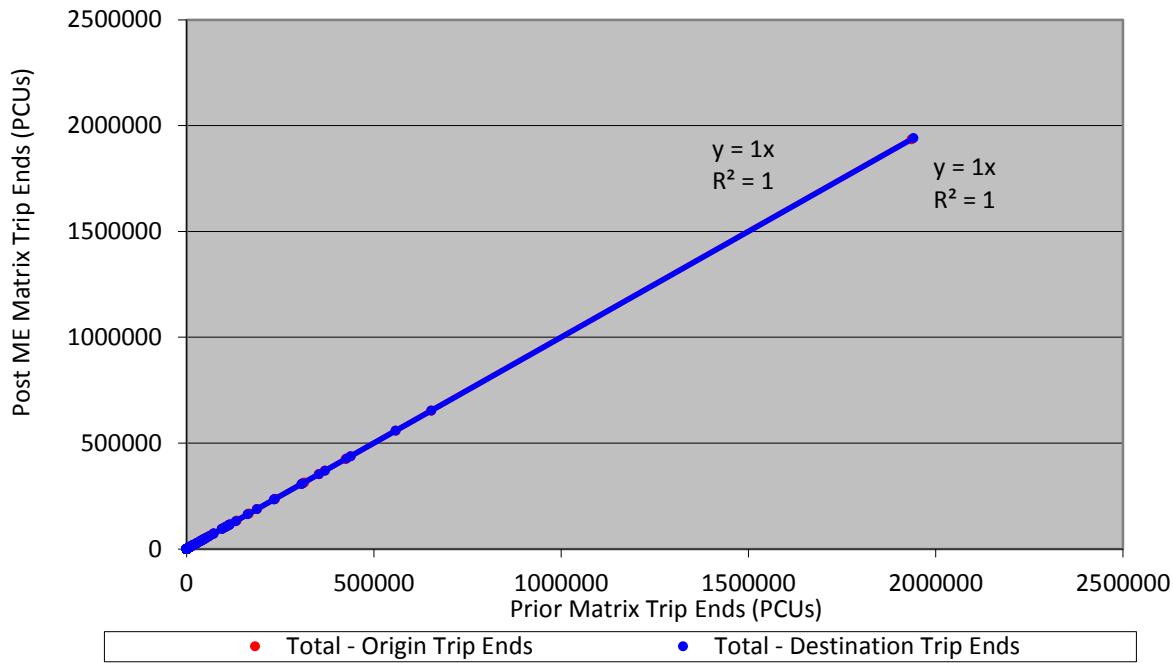


Table 8. Model wide trip end total analysis summary.

Period	ORIGIN TRIP ENDS		DESTINATION TRIP ENDS	
	R ²	slope	R ²	slope
AM Peak	1	1	1	1
PM Peak	1	1	1	1

- 3.1.4 The correlation between the trip ends before and after matrix estimation is a perfect fit. For both the AM and PM peak periods, the R² value, an indicator of 'goodness of fit' between the two datasets, and is in excess of 0.98 and therefore meets the required DfT criteria.
- 3.1.5 The slope for both the AM and PM peak periods also meet the required DfT criteria.

3.2 AOI Trip End Analysis

- 3.2.1 Table 7 shows the differences in trip ends within the AOI before and after matrix estimation. Overall it shows a total change of 36% in the AM peak period for the Origin Trip End and 34% for the Destination Trip Ends. For the PM peak period this is 24% and 25% respectively.
- 3.2.2 The full AOI trip end analysis can be found in *Figure 107 – AM Trip End Analysis* and *Figure 108 – PM Trip End Analysis*. Whilst *Figure 109 – AM Trip End Differences* and *Figure 110 – PM Trip End Differences* illustrate this information for combined user classes.

Table 9. AOI trip end total analysis summary.

	ORIGIN TRIP ENDS			DESTINATION TRIP ENDS			
	AM	Prior	Post	% Difference	Prior	Post	% Difference
Car	2,803	3,944		41%	3,024	4,188	39%
LGV	243	209		-14%	270	224	-17%
HGV	63	68		9%	39	40	4%
Total	3,109	4,222		36%	3,333	4,452	34%
PM	Prior	Post	% Difference	Prior	Post	% Difference	
Car	3,282	4,114		25%	3,104	3,919	26%
LGV	181	182		0%	200	201	0%
HGV	41	46		13%	16	23	46%
Total	3,504	4,341		24%	3,320	4,143	25%

4. JOURNEY TIME VALIDATION

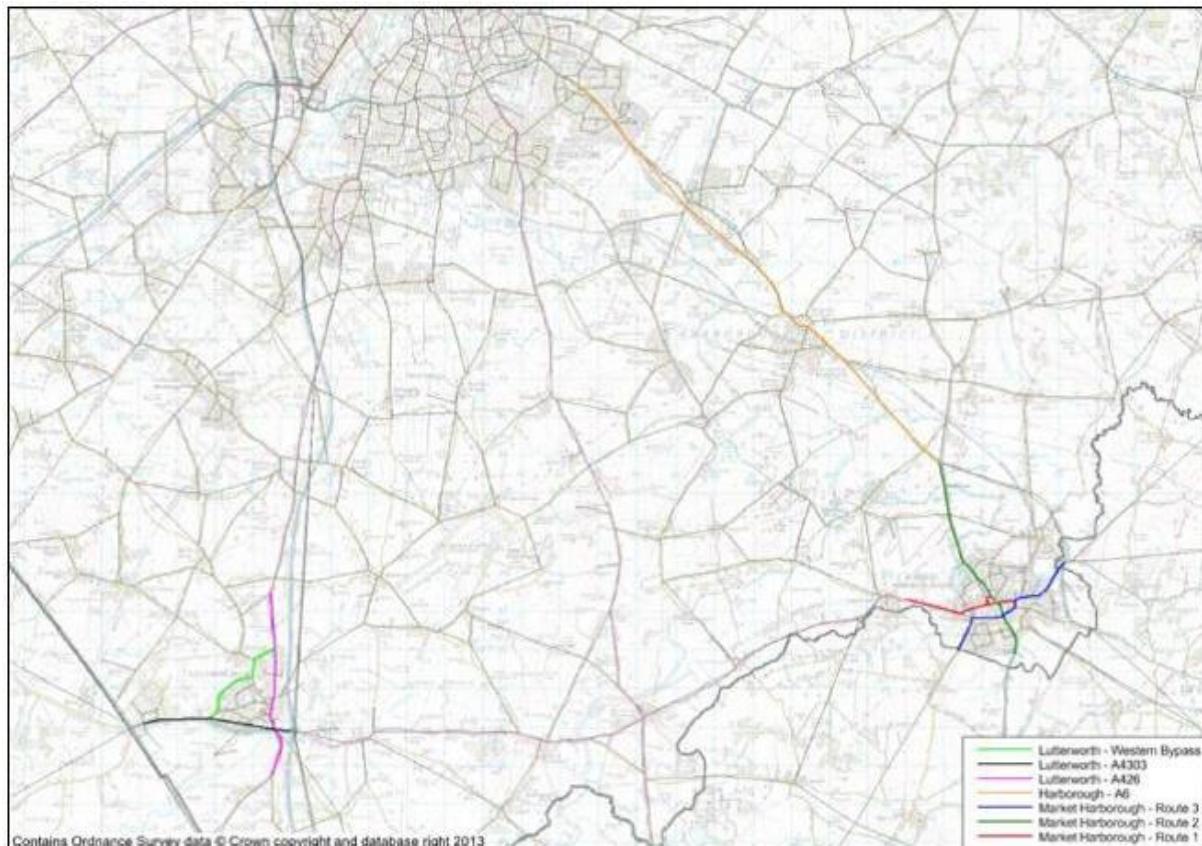
4.1 Overview

- 4.1.1 Observed journey time information has been provided by LCC for the AM and PM peaks. The information was provided for routes within Market Harborough.
- 4.1.2 The WebTAG guidance suggests that the total end to end modelled journey times should be either within 15% or 60 seconds of the equivalent observed journey time.

4.2 Journey Time Validation Results

- 4.2.1 Table 8 shows the results of the journey time validation for each the identified routes provided by LCC, as seen in figure 8 for both the AM and PM peaks respectively.
- 4.2.2 The distance/time diagrams for all journey time routes can be found in *Figure 111 – AM distance/time diagrams* and *Figure 112 – PM distance/time diagrams*.

Figure 8. South and southeast Leicestershire journey time route plan.



4.2.3 Overall 100% of routes for both the AM and PM peak periods meet the journey time criteria.

Table 10. Journey time validation statistics.

Location	Route	AM PEAK					PM PEAK				
		Obs.	Mod.	Abs. (Sec)	% Diff.	DMRB	Obs.	Mod.	Abs. (Sec)	% Diff.	DMRB
Market Harborough	Route 1 A4304 (EB)	9.26	9.19	-7	-1%	Y	8.04	9.19	75	15%	Y
Market Harborough	Route 1 A4304 (WB)	8.34	8.54	20	4%	Y	7.58	8.20	22	5%	Y
Market Harborough	Route 2 Northampton Rd-B6047 (NB)	8.57	9.12	15	3%	Y	8.38	8.17	-21	-4%	Y
Market Harborough	Route 2 Northampton Rd-B6047 (SB)	9.21	9.43	22	4%	Y	8.15	8.33	18	4%	Y
Market Harborough	Route 3 Farndon Rd-A4304 (EB)	7.45	8.49	64	14%	Y	7.22	8.45	57	13%	Y
Market Harborough	Route 3 Farndon Rd-A4304 (WB)	7.44	8.54	70	15%	Y	7.06	8.02	56	13%	Y
Percentage of overall journey time criteria met:							100%				

5. CONCLUSIONS

- 5.1.1 SYSTRA has been commissioned by Leicestershire County Council (LCC) to use the Leicester and Leicestershire Integrated Transport Model (LLITM) to develop an understanding of current and future transport issues in Market Harborough.
- 5.1.2 Stage 1, Part 1 of the study involved an assessment of the LLITM highway model validation within the identified Area of Interest (AOI) in and around Market Harborough.
- 5.1.3 Part 2 of the study comprised of the re-validation of the LLITM highway model within the AOI to ensure that the modelled flows reflect the observed flow data. Both count and journey time validation has been undertaken as requested by LCC.
- 5.1.4 The findings from model re-validation are as follows:
- An overall calibration of 98% for both the AM and PM peak hour for all vehicle types in total.
 - An overall validation of 79% in the AM peak hour and 78% in the PM peak hour for all vehicle types in total.
 - An overall change of 0.01% for both the AM and PM peak hour for matrix estimation for all vehicle types in total.
 - An overall change of -0.13% in the AM peak hour and -0.08% in the PM peak hour for the mean total trip lengths for all vehicle types.
 - An overall change of 33% for origin and destination trip ends in the AM peak hour and a 24% change for origin and a 25% change for destination trip ends in the PM peak hour for total vehicles within the AOI.
 - An overall pass of 100% for both the AM and PM peak hour for journey time validation of the three routes identified.
- 5.1.5 Overall, the level of validation within Market Harborough AOI model is considered to be sufficiently high, enabling the robust assessment of Market Harborough AOI.

Figure 101 – AM Calibration

Location	linkID	Car Modelled	Car Observed	GEH	DMRB	LGV Modelled	LGV Observed	GEH	DMRB	HGV Modelled	HGV Observed	GEH	DMRB	Total Modelled	Total Observed	GEH	DMRB
Market Harborough Calibration Cordon	7226_20557	370	384	0.7	Y	40	49	1.3	Y	4	17	4.1	Y	414	450	1.7	Y
Market Harborough Calibration Cordon	20133_29516	131	131	0.0	Y	10	12	0.5	Y	3	3	0.0	Y	144	146	0.1	Y
Market Harborough Calibration Cordon	20132_29501	19	19	0.0	Y	2	2	0.0	Y	1	1	0.2	Y	22	22	0.0	Y
Market Harborough Calibration Cordon	20776_20235	474	472	0.1	Y	47	46	0.0	Y	12	12	0.0	Y	533	530	0.1	Y
Market Harborough Calibration Cordon	20425_20220	267	237	1.9	Y	24	24	0.0	Y	7	7	0.0	Y	298	268	1.8	Y
Market Harborough Calibration Cordon	20515_29512	105	131	2.4	Y	12	12	0.0	Y	4	3	0.3	Y	120	146	2.2	Y
Market Harborough Calibration Cordon	20328_20236	226	229	0.2	Y	19	30	2.1	Y	5	7	0.7	Y	250	265	0.9	Y
Market Harborough Calibration Cordon	20123_20821	131	131	0.0	Y	12	12	0.0	Y	3	3	0.0	Y	146	146	0.0	Y
Market Harborough Calibration Cordon	20237_20070	342	335	0.4	Y	24	41	2.9	Y	10	32	4.9	Y	376	408	1.6	Y
Market Harborough Calibration Cordon	20557_7226	343	339	0.2	Y	33	52	2.8	Y	16	24	1.9	Y	392	415	1.1	Y
Market Harborough Calibration Cordon	29516_20133	111	108	0.3	Y	10	10	0.0	Y	3	3	0.0	Y	124	121	0.3	Y
Market Harborough Calibration Cordon	29501_20132	33	30	0.5	Y	3	3	0.0	Y	1	1	0.0	Y	37	34	0.4	Y
Market Harborough Calibration Cordon	20235_20776	380	367	0.7	Y	41	41	0.0	Y	29	29	0.0	Y	450	437	0.6	Y
Market Harborough Calibration Cordon	20220_20425	175	179	0.3	Y	18	18	0.0	Y	5	5	0.0	Y	198	202	0.3	Y
Market Harborough Calibration Cordon	25512_20515	132	131	0.1	Y	12	12	0.0	Y	3	3	0.0	Y	147	146	0.1	Y
Market Harborough Calibration Cordon	20236_20328	207	208	0.1	Y	23	23	0.1	Y	8	16	2.4	Y	238	248	0.6	Y
Market Harborough Calibration Cordon	20821_20123	132	131	0.1	Y	12	12	0.0	Y	3	3	0.0	Y	147	146	0.1	Y
Market Harborough Calibration Cordon	20070_20237	320	316	0.2	Y	25	35	2.0	Y	11	25	3.4	Y	355	376	1.1	Y
High Street EB - Att to Sign Post/bus stop	20207_20012	396	334	3.2	Y	17	8	2.5	Y	7	3	1.8	Y	419	345	3.8	Y
St Mary's Road	20207_29996	198	195	0.2	Y	7	6	0.1	Y	6	9	0.9	Y	211	210	0.1	Y
St Mary's Road	20178_20134	345	315	1.6	Y	5	5	0.0	Y	13	13	0.0	Y	363	333	1.6	Y
Kettering Road - Att to Sign Post	20199_20178	247	206	2.7	Y	4	4	0.3	Y	10	14	1.2	Y	261	224	2.4	Y
Northampton Road NB	20181_25527	253	272	1.1	Y	11	12	0.4	Y	3	3	0.3	Y	267	287	1.2	Y
Springfield Road - Lamp Column	20181_25508	422	381	2.0	Y	9	9	0.1	Y	6	5	0.1	Y	437	395	2.0	Y
Northampton Road	20246_20069	468	471	0.1	Y	17	15	0.5	Y	4	2	0.8	Y	488	488	0.0	Y
Coventry Road - Att to Tree	20658_20189	389	308	4.3	Y	10	9	0.3	Y	2	2	0.1	Y	401	320	4.3	Y
Fairfield Road - Att to sign post	20189_29518	389	413	1.2	Y	10	10	0.1	Y	2	1	0.6	Y	401	425	1.1	Y
Welland Park Road - Att to sign	20217_20124	266	250	1.0	Y	14	10	1.2	Y	6	3	1.6	Y	286	262	1.4	Y
Coventry Road - Att to lamp column end of bus stop	20217_29510	204	212	0.6	Y	8	8	0.2	Y	3	1	1.2	Y	215	221	0.4	Y
Alvington Way - Att to lamp column	20196_29993	114	111	0.3	Y	13	2	4.1	Y	1	0	0.3	Y	128	113	1.3	Y
Leicester Road - att to sign post	20635_20196	618	736	4.5	N	23	23	0.0	Y	14	4	3.5	Y	655	763	4.0	Y
High Street WB - Att to Tree or Bus Stop (ONE WAY)	20012_20207	400	442	2.0	Y	19	16	0.8	Y	7	3	1.9	Y	426	460	1.6	Y
St Mary's Road	29996_20020	199	243	2.9	Y	6	7	0.5	Y	4	2	1.4	Y	210	252	2.8	Y
St Mary's Road	20134_20178	321	377	3.0	Y	5	6	0.4	Y	5	12	2.3	Y	331	395	3.4	Y
Kettering Road - Att to Sign Post	20178_20199	378	342	1.9	Y	11	11	0.0	Y	3	2	0.1	Y	391	355	1.8	Y
Northampton Road SB	25527_20181	259	299	2.4	Y	13	15	0.5	Y	1	1	0.4	Y	273	315	2.5	Y
Springfield Road - Lamp Column	25508_20181	559	404	7.1	N	7	9	0.6	Y	2	4	0.8	Y	569	417	6.8	N
Northampton Road	20069_20246	346	345	0.0	Y	21	9	3.3	Y	6	4	1.0	Y	373	358	0.8	Y
Coventry Road - Att to Tree	20189_20658	449	454	0.2	Y	11	13	0.4	Y	5	1	2.1	Y	466	468	0.1	Y
Fairfield Road - Att to sign post	29518_20189	196	192	0.3	Y	6	5	0.1	Y	2	2	0.1	Y	203	199	0.3	Y
Welland Park Road - Att to sign	20124_20217	192	188	0.3	Y	21	8	3.3	Y	5	0	2.8	Y	218	196	1.5	Y
Coventry Road - Att to lamp column end of bus stop	29510_20217	232	231	0.0	Y	5	7	0.7	Y	6	5	0.0	Y	242	243	0.1	Y
Alvington Way - Att to lamp column	29993_20196	105	104	0.1	Y	7	3	1.5	Y	2	0	1.7	Y	114	108	0.6	Y
Leicester Road - att to sign post	20196_20635	653	676	0.9	Y	27	20	1.3	Y	4	4	0.1	Y	684	700	0.6	Y

Figure 102 – PM Calibration

Description	linkID	Car Modelled	Car Observed	GEH	DMRB	LGV Modelled	LGV Observed	GEH	DMRB	HGV Modelled	HGV Observed	GEH	DMRB	Total Modelled	Total Observed	GEH	DMRB
Market Harborough Calibration Cordon	7226_20557	341	343	0.1	Y	31	31	0.0	Y	5	9	1.3	Y	377	383	0.3	Y
Market Harborough Calibration Cordon	20133_29516	108	108	0.0	Y	8	8	0.0	Y	1	1	0.0	Y	117	117	0.0	Y
Market Harborough Calibration Cordon	20132_29501	31	31	0.0	Y	2	2	0.0	Y	0	0	0.6	Y	33	33	0.0	Y
Market Harborough Calibration Cordon	20776_20235	382	382	0.0	Y	52	52	0.0	Y	4	4	0.0	Y	438	438	0.0	Y
Market Harborough Calibration Cordon	20425_20220	238	238	0.0	Y	19	19	0.1	Y	3	3	0.0	Y	260	260	0.0	Y
Market Harborough Calibration Cordon	20515_25512	108	108	0.0	Y	8	8	0.0	Y	1	1	0.0	Y	117	117	0.0	Y
Market Harborough Calibration Cordon	20328_20236	229	229	0.0	Y	32	32	0.0	Y	3	3	0.0	Y	264	264	0.0	Y
Market Harborough Calibration Cordon	20123_20821	108	108	0.0	Y	8	8	0.0	Y	1	1	0.0	Y	117	117	0.0	Y
Market Harborough Calibration Cordon	20237_20070	385	387	0.1	Y	25	29	0.8	Y	5	5	0.1	Y	415	421	0.3	Y
Market Harborough Calibration Cordon	20557_7226	406	406	0.0	Y	28	28	0.0	Y	7	7	0.0	Y	440	441	0.0	Y
Market Harborough Calibration Cordon	29516_20133	78	78	0.0	Y	6	6	0.0	Y	1	1	0.0	Y	85	85	0.0	Y
Market Harborough Calibration Cordon	29501_20132	23	23	0.0	Y	2	2	0.0	Y	0	0	0.5	Y	25	25	0.0	Y
Market Harborough Calibration Cordon	20235_20776	572	573	0.0	Y	50	50	0.0	Y	20	20	0.1	Y	642	643	0.1	Y
Market Harborough Calibration Cordon	20220_20425	224	226	0.2	Y	18	18	0.1	Y	3	3	0.0	Y	244	247	0.2	Y
Market Harborough Calibration Cordon	25512_20515	108	108	0.0	Y	8	8	0.0	Y	1	1	0.0	Y	117	117	0.0	Y
Market Harborough Calibration Cordon	20236_20328	223	224	0.0	Y	19	19	0.1	Y	8	8	0.0	Y	250	251	0.1	Y
Market Harborough Calibration Cordon	20821_20123	108	108	0.0	Y	8	8	0.0	Y	1	1	0.0	Y	117	117	0.0	Y
Market Harborough Calibration Cordon	20070_20237	318	319	0.1	Y	28	28	0.0	Y	7	11	1.2	Y	353	358	0.2	Y
High Street EB - Att to Sign Post/bus stop	20207_20012	525	334	9.2	N	16	8	2.3	Y	4	3	0.7	Y	545	345	9.5	N
St Mary's Road	20207_29996	196	195	0.1	Y	6	6	0.1	Y	3	9	2.5	Y	205	210	0.4	Y
St Mary's Road	20178_20134	312	315	0.2	Y	5	5	0.1	Y	12	13	0.2	Y	329	333	0.2	Y
Kettering Road - Att to Sign Post	20199_20178	205	206	0.0	Y	4	4	0.2	Y	13	14	0.4	Y	222	224	0.1	Y
Northampton Road NB	20181_25527	272	272	0.0	Y	10	12	0.8	Y	2	3	0.4	Y	284	287	0.2	Y
Springfield Road - Lamp Column	20181_25508	380	381	0.1	Y	9	9	0.1	Y	5	5	0.0	Y	394	395	0.0	Y
Northampton Road	20246_20069	471	471	0.0	Y	15	15	0.1	Y	3	2	0.1	Y	488	488	0.0	Y
Coventry Road - Att to Tree	20658_20189	342	308	1.9	Y	10	10	0.3	Y	2	2	0.4	Y	353	320	1.8	Y
Fairfield Road - Att to sign post	20189_29518	342	413	3.7	Y	10	10	0.1	Y	2	1	0.2	Y	353	425	3.6	Y
Welland Park Road - Att to sign	20217_20124	250	250	0.0	Y	13	10	1.0	Y	3	3	0.0	Y	266	262	0.2	Y
Coventry Road - Att to lamp column end of bus stop	20217_29510	212	212	0.0	Y	8	8	0.2	Y	2	1	0.1	Y	222	221	0.0	Y
Alvington Way - Att to lamp column	20196_29993	111	111	0.0	Y	2	2	0.0	Y	1	0	0.3	Y	113	113	0.0	Y
Leicester Road - att to sign post	20635_20196	735	736	0.1	Y	23	23	0.0	Y	5	4	0.7	Y	763	763	0.0	Y
High Street WB - Att to Tree Bus Stop (ONE WAY)	20012_20207	485	442	2.0	Y	16	16	0.1	Y	3	3	0.0	Y	504	460	2.0	Y
St Mary's Road	29996_20207	253	243	0.6	Y	6	7	0.2	Y	2	2	0.2	Y	262	252	0.6	Y
St Mary's Road	20134_20178	376	377	0.0	Y	6	6	0.0	Y	5	12	2.3	Y	387	395	0.4	Y
Kettering Road - Att to Sign Post	20178_20199	321	342	1.2	Y	10	11	0.1	Y	2	2	0.1	Y	333	355	1.2	Y
Northampton Road SB	25527_20181	289	299	0.6	Y	10	15	1.4	Y	0	1	0.4	Y	299	315	0.9	Y
Springfield Road - Lamp Column	25508_20181	389	404	0.8	Y	9	9	0.2	Y	4	4	0.0	Y	401	417	0.8	Y
Northampton Road	20069_20246	344	345	0.1	Y	9	9	0.3	Y	3	4	0.1	Y	357	358	0.1	Y
Coventry Road - Att to Tree	20189_20658	465	454	0.5	Y	13	13	0.1	Y	2	1	0.7	Y	481	468	0.6	Y
Fairfield Road - Att to sign post	29518_20189	192	192	0.0	Y	1	5	2.3	Y	2	2	0.1	Y	195	199	0.3	Y
Welland Park Road - Att to sign	20124_20217	187	188	0.1	Y	10	8	0.5	Y	2	0	1.3	Y	198	196	0.1	Y
Coventry Road - Att to lamp column end of bus stop	29510_20217	231	231	0.0	Y	7	7	0.0	Y	6	5	0.0	Y	243	243	0.0	Y
Alvington Way - Att to lamp column	29993_20196	103	104	0.1	Y	3	3	0.1	Y	1	0	1.4	Y	108	108	0.0	Y
Leicester Road - att to sign post	20196_20635	676	676	0.0	Y	20	20	0.1	Y	5	4	0.3	Y	700	700	0.0	Y

Figure 103 – AM Validation

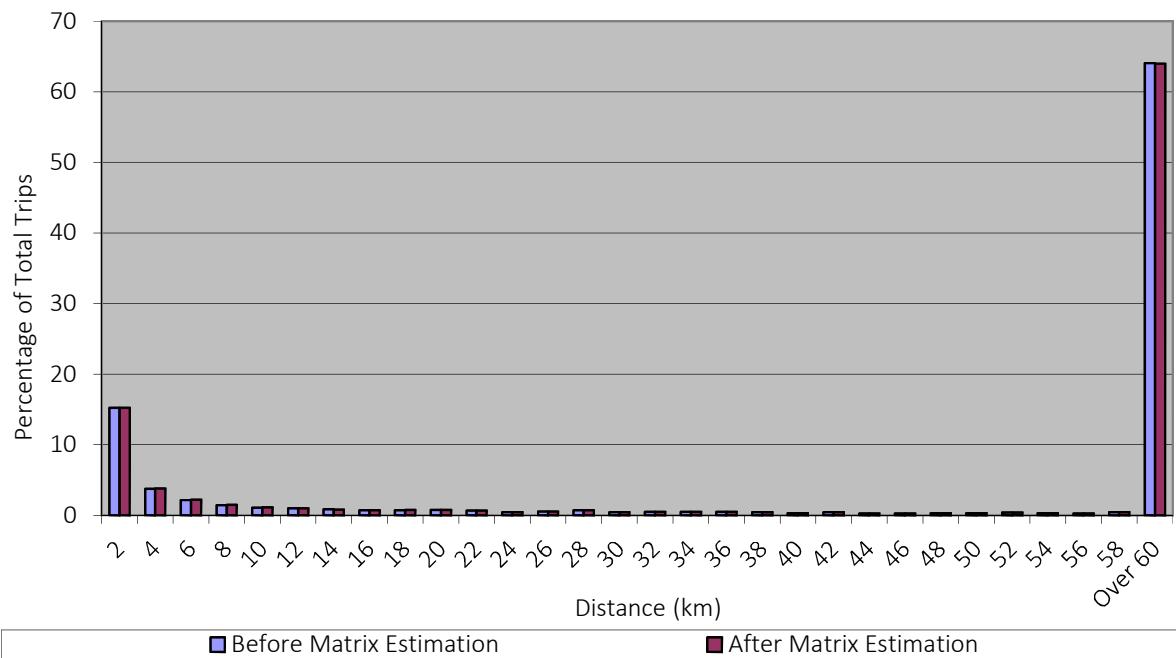
Location	linkID	Car Modelled	Car Observed	GEH	DMRB	LGV Modelled	LGV Observed	GEH	DMRB	HGV Modelled	HGV Observed	GEH	DMRB	Total Modelled	Total Observed	GEH	DMRB
High Street - Att to Tree	20012_20009	258	215	2.8	Y	12	14	0.6	Y	3	3	0.0	Y	273	232	2.6	Y
Northampton Road - Att to Sign Post	20207_20010	259	305	2.8	Y	13	9	1.1	Y	1	11	4.0	Y	273	325	3.1	Y
St Mary's Road	29996_20178	198	197	0.1	Y	7	5	0.7	Y	6	4	0.8	Y	211	206	0.4	Y
Clarence Street	84716_20178	201	57	12.7	N	8	2	2.9	Y	1	1	0.4	Y	211	60	12.9	N
Rockingham Road - South of Euro Business park R/bout	25517_29960	418	589	7.6	N	37	12	5.1	Y	25	7	4.4	Y	480	608	5.5	N
Northampton Road - South of Springfield Street NB	25509_29504	391	496	5.0	N	19	8	2.9	Y	4	10	2.3	Y	414	515	4.7	N
Compass Point Business Park	84733_20246	15	28	2.6	Y	0	0	0.3	Y	0	2	1.5	Y	16	29	2.8	Y
Northampton Road - South of Roundabout	20236_20246	226	295	4.3	Y	19	12	1.8	Y	5	3	0.9	Y	250	310	3.6	Y
Northampton Road - East of Roundabout	84725_20246	238	140	7.1	Y	6	1	2.4	Y	3	1	1.0	Y	247	143	7.4	N
Lubenham Hill - Att to sign	7216_20217	470	404	3.2	Y	22	16	1.4	Y	10	5	1.7	Y	501	425	3.6	Y
Leicester Road - Att to 30mph sign	20196_20100	512	593	3.5	Y	29	22	1.5	Y	16	9	1.9	Y	556	624	2.8	Y
High Street - Att to Tree	20009_20012	545	437	4.9	N	22	10	3.0	Y	8	6	1.0	Y	576	453	5.4	N
Coventry Road - Att to 40MPH/One way Sign (ONE WAY)	20012_20120	284	331	2.7	Y	7	15	2.3	Y	5	1	1.9	Y	296	347	2.9	Y
Northampton Road - Att to Sign Post	20010_20207	253	244	0.6	Y	11	4	2.7	Y	3	2	0.6	Y	267	249	1.1	Y
St Mary's Road	20178_29996	199	252	3.5	Y	6	6	0.0	Y	4	1	1.9	Y	210	259	3.2	Y
Clarence Street	20178_84716	45	87	5.1	Y	2	2	0.2	Y	4	1	1.4	Y	50	90	4.7	Y
Rockingham Road - Att to Sign Post	20235_29960	395	500	5.0	N	32	11	4.4	Y	12	5	2.5	Y	438	516	3.5	Y
Rockingham Road - South of Euro Business park R/bout	29960_25517	395	535	6.5	N	32	17	3.0	Y	12	4	2.9	Y	438	556	5.3	N
Northampton Road - South of Springfield Street SB	29504_25509	349	432	4.2	Y	18	7	3.3	Y	3	6	1.2	Y	370	445	3.7	Y
Compass Point Business Park	20246_84733	4	91	12.7	Y	0	1	1.1	Y	0	0	0.7	Y	4	92	12.7	Y
Northampton Road - South of Roundabout	20246_20236	207	224	1.1	Y	23	7	4.2	Y	8	2	2.9	Y	238	232	0.4	Y
Northampton Road - East of Roundabout	20246_84725	147	117	2.6	Y	7	0	3.8	Y	2	3	0.8	Y	155	120	3.0	Y
Lubenham Hill - Att to sign	20217_7216	424	378	2.3	Y	26	14	2.6	Y	10	3	2.7	Y	460	395	3.1	Y
Leicester Road - Att to 30mph sign	20100_20196	555	650	3.8	Y	40	22	3.2	Y	4	3	0.8	Y	599	674	3.0	Y

Figure 104 – PM Validation

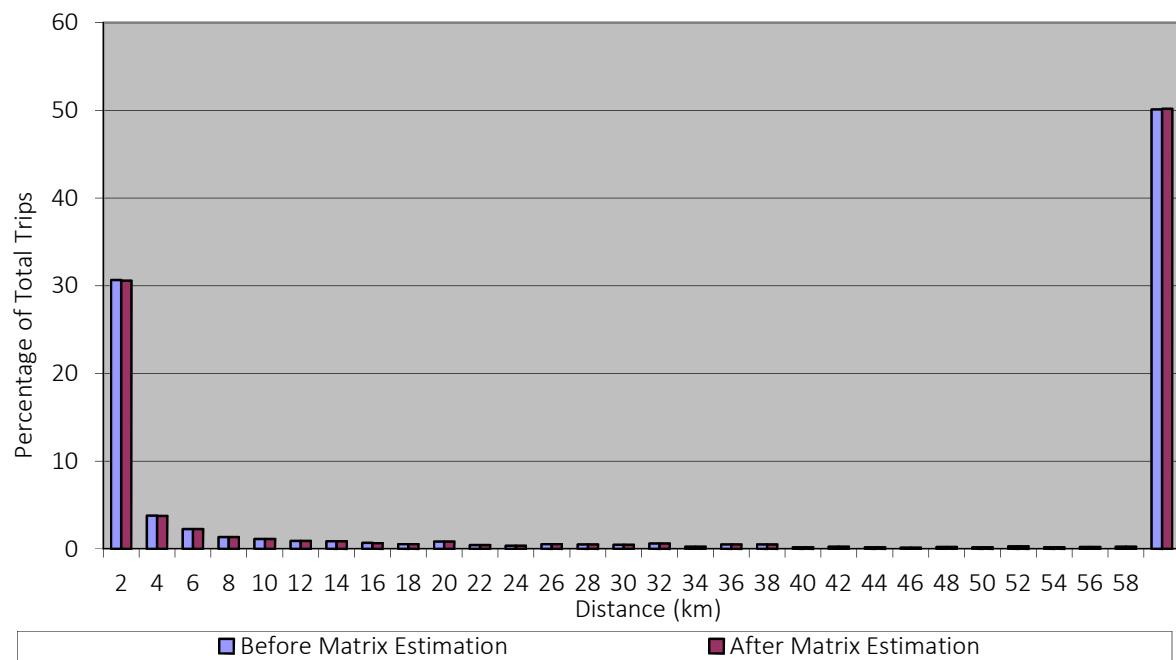
Location	linkID	Car Modelled	Car Observed	GEH	DMRB	LGV Modelled	LGV Observed	GEH	DMRB	HGV Modelled	HGV Observed	GEH	DMRB	Total Modelled	Total Observed	GEH	DMRB
High Street - Att to Tree	20012_20009	344	215	7.7	N	11	14	1.1	Y	4	3	0.5	Y	358	232	7.3	N
Northampton Road - Att to Sign Post	20207_20010	288	305	1.0	Y	10	9	0.2	Y	0	11	4.5	Y	299	325	1.5	Y
St Mary's Road	29996_20178	196	197	0.0	Y	6	5	0.6	Y	3	4	1.0	Y	205	206	0.1	Y
Rockingham Road - Att to Sign Post	29960_20235	482	697	8.9	N	41	15	4.8	Y	18	5	3.7	Y	541	718	7.1	N
Rockingham Road - South of Euro Business park R/bout	25517_29960	482	589	4.6	N	41	12	5.7	Y	18	7	3.0	Y	541	608	2.8	Y
Northampton Road - South of Springfield Street NB	25509_29504	378	496	5.7	N	17	8	2.6	Y	2	10	3.3	Y	398	515	5.5	N
Compass Point Business Park	84733_20246	9	28	4.4	Y	1	0	0.6	Y	0	2	1.7	Y	9	29	4.5	Y
Northampton Road - South of Roundabout	20236_20246	229	295	4.1	Y	32	12	4.2	Y	3	3	0.1	Y	264	310	2.7	Y
Northampton Road - East of Roundabout	84725_20246	247	140	7.7	N	10	1	3.5	Y	5	1	2.0	Y	261	143	8.3	N
Lubenham Hill - Att to sign	7216_20217	462	404	2.8	Y	21	16	1.2	Y	5	5	0.2	Y	488	425	2.9	Y
Leicester Road - Att to 30mph sign	20196_20100	627	593	1.4	Y	26	22	0.9	Y	7	9	0.8	Y	660	624	1.4	Y
High Street - Att to Tree	20009_20012	636	437	8.6	N	24	10	3.4	Y	4	6	0.9	Y	663	453	8.9	N
Coventry Road - Att to 40MPH/One way Sign (ONE WAY)	20012_20120	332	331	0.1	Y	14	15	0.4	Y	1	1	0.2	Y	347	347	0.0	Y
Northampton Road - Att to Sign Post	20010_20207	272	244	1.8	Y	10	4	2.2	Y	2	2	0.4	Y	284	249	2.1	Y
St Mary's Road	20178_29996	253	252	0.1	Y	6	6	0.2	Y	2	1	0.7	Y	262	259	0.2	Y
Clarence Street	20178_84716	35	87	6.7	Y	2	2	0.0	Y	4	1	1.5	Y	40	90	6.2	Y
Rockingham Road - Att to Sign Post	20235_29960	444	500	2.6	Y	46	11	6.5	Y	4	5	0.3	Y	493	516	1.0	Y
Rockingham Road - South of Euro Business park R/bout	29960_25517	444	535	4.1	Y	46	17	5.1	Y	4	4	0.2	Y	493	556	2.7	Y
Northampton Road - South of Springfield Street SB	29504_25509	411	432	1.0	Y	11	7	1.5	Y	2	6	1.6	Y	425	445	1.0	Y
Northampton Road - South of Roundabout	20246_20236	223	224	0.0	Y	19	7	3.4	Y	8	2	2.9	Y	250	232	1.1	Y
Northampton Road - East of Roundabout	20246_84725	128	117	1.0	Y	16	0	5.6	Y	1	3	1.8	Y	144	120	2.1	Y
Lubenham Hill - Att to sign	20217_7216	417	378	2.0	Y	17	14	0.6	Y	7	3	1.7	Y	441	395	2.2	Y
Leicester Road - Att to 30mph sign	20100_20196	576	650	3.0	Y	22	22	0.1	Y	5	3	1.2	Y	603	674	2.8	Y

Figure 105 – Trip Length Distributions

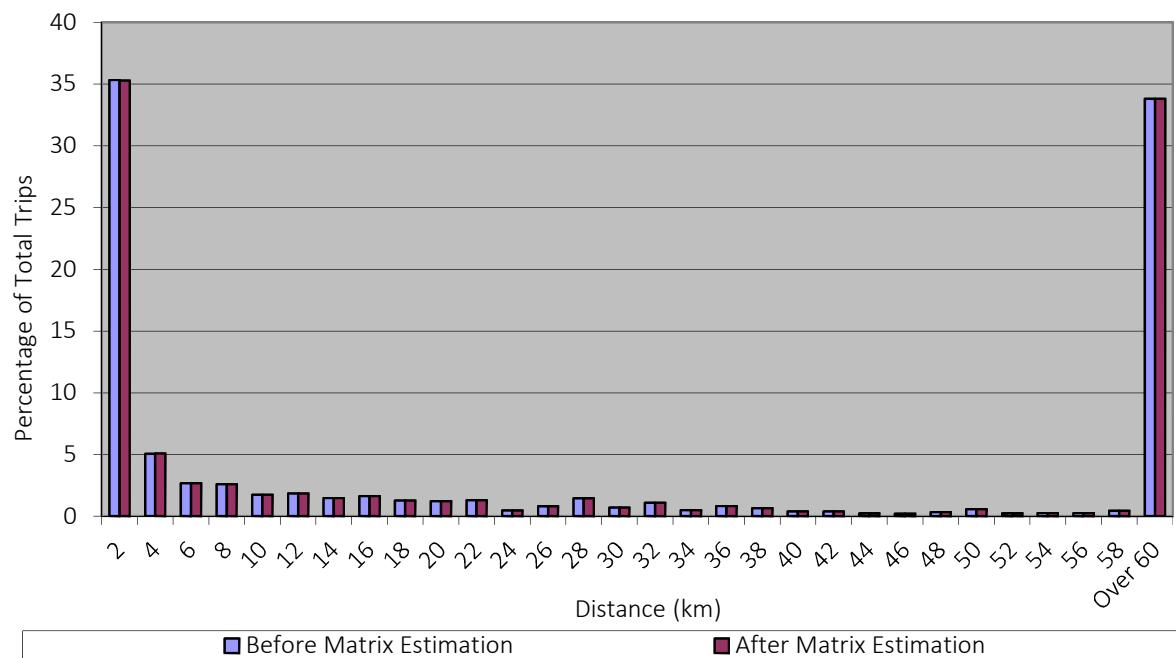
AM Peak Car - Change in Trip Length Distribution



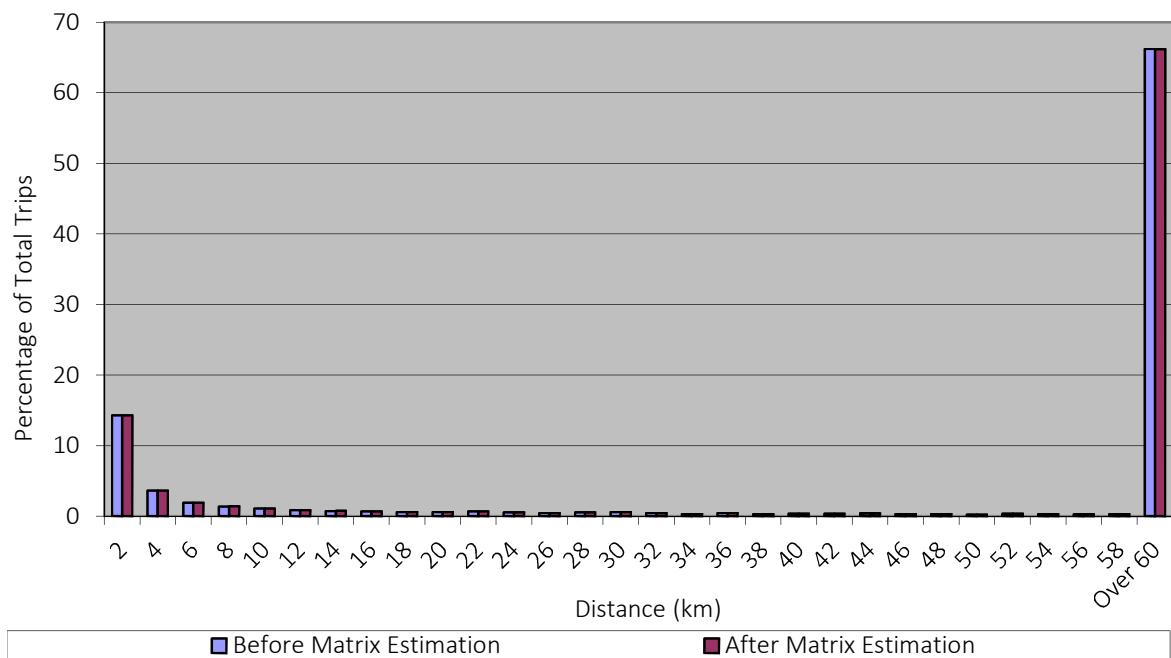
AM Peak LGV - Change in Trip Length Distribution



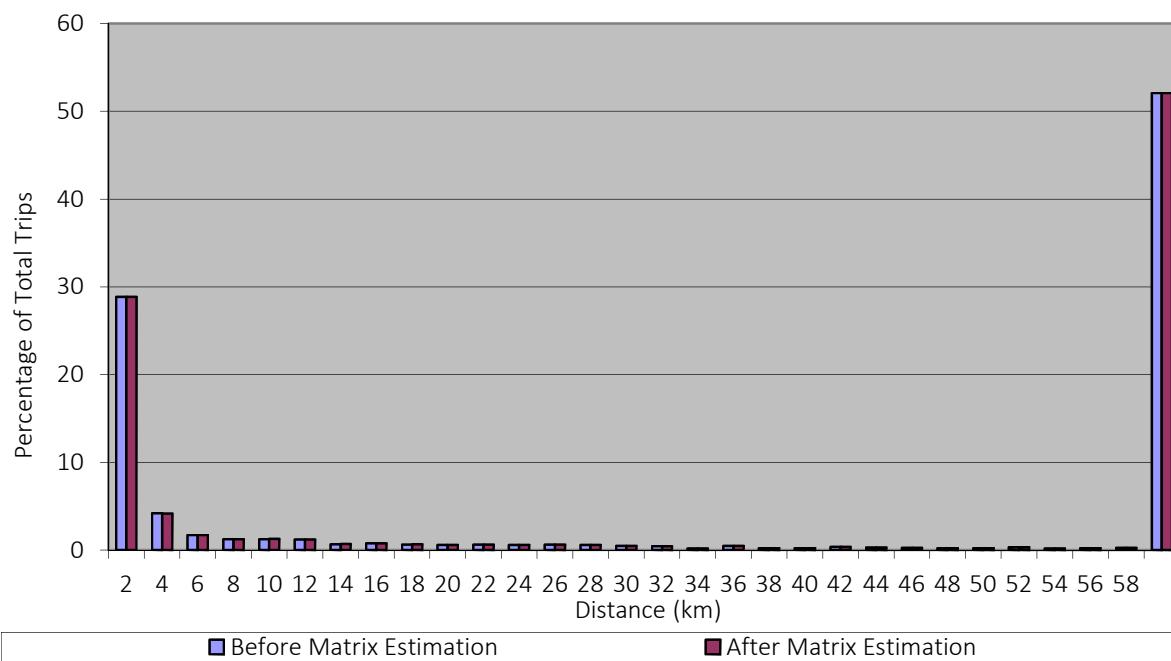
AM Peak HGV - Change in Trip Length Distribution



PM Peak Car - Change in Trip Length Distribution



PM peak LGV - Change in Trip Length Distribution



PM Peak HGV - Change in Trip Length Distribution

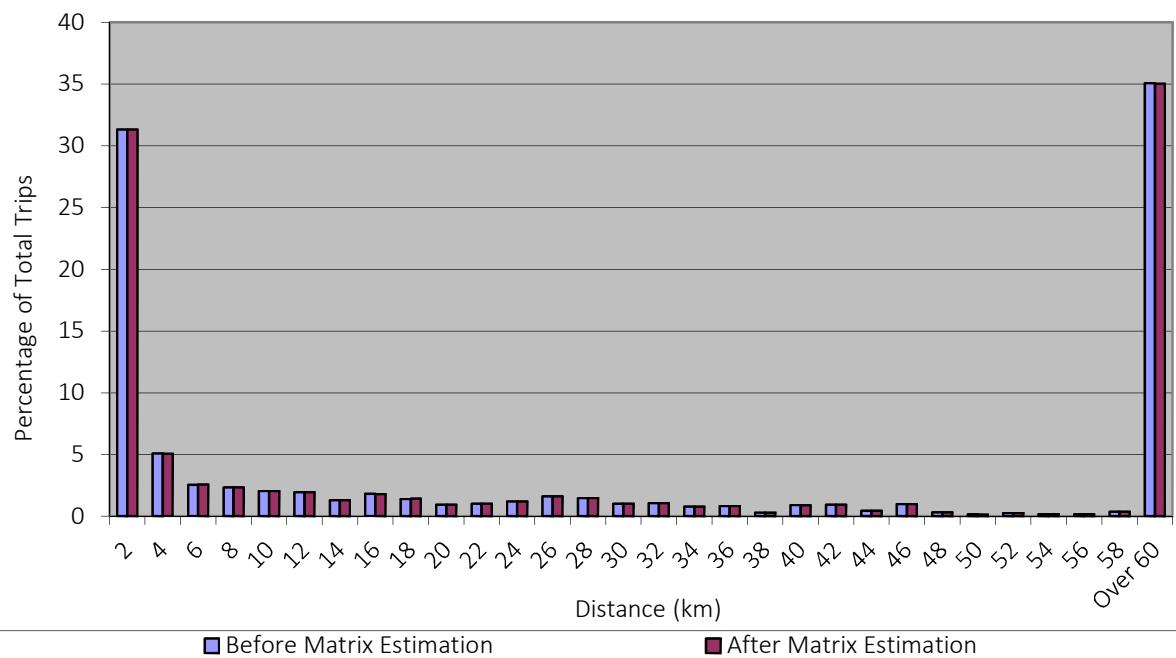
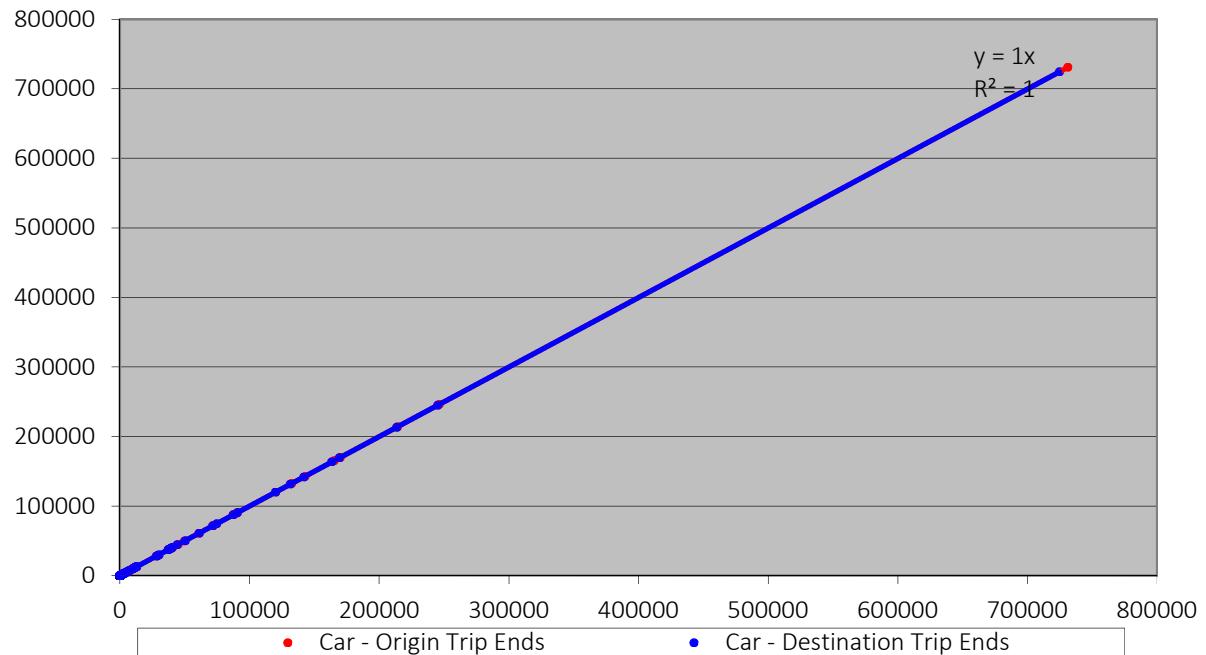
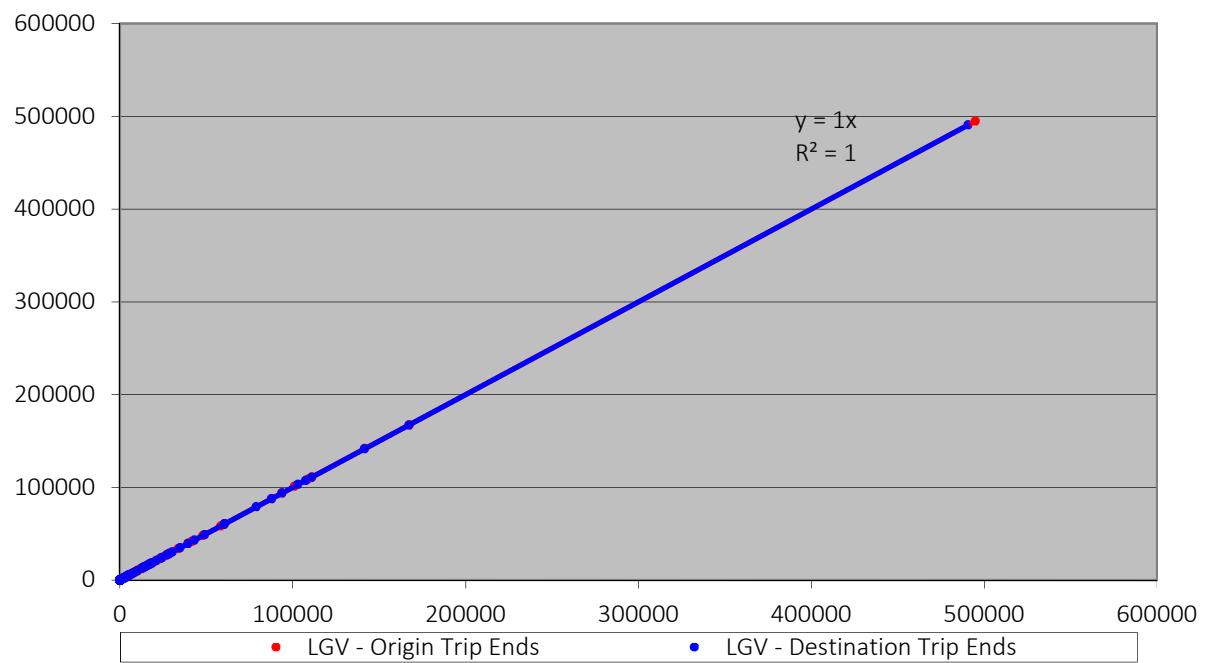


Figure 106 – Trip Ends

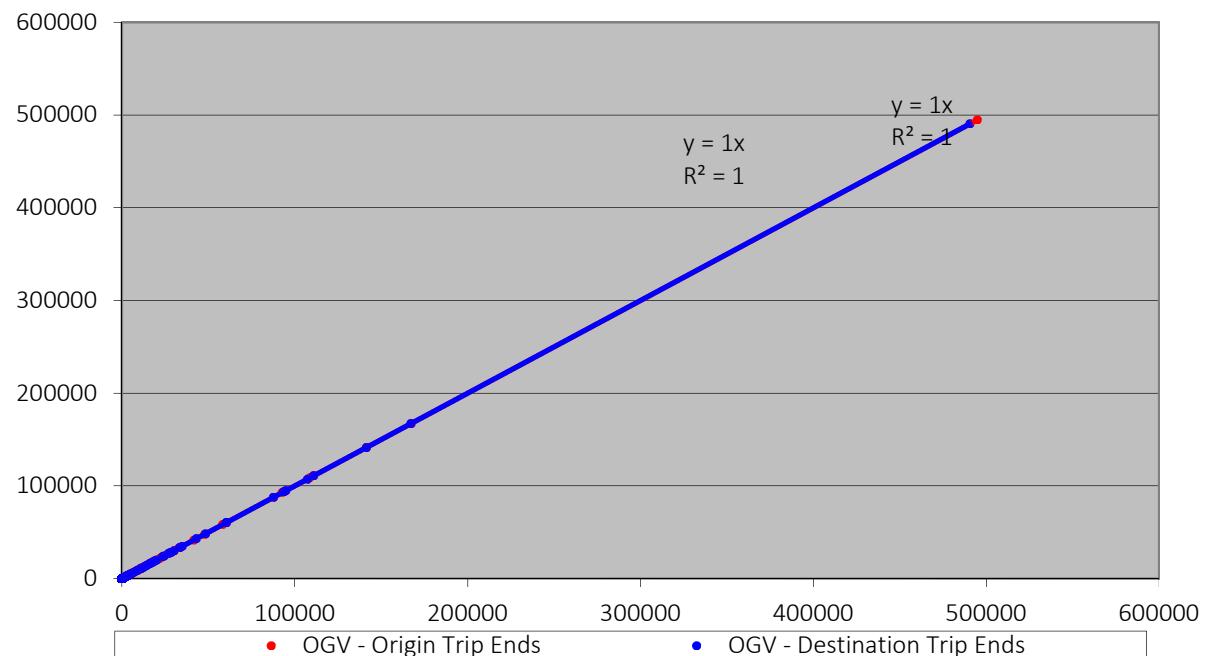
Car- AM Trip End Summary



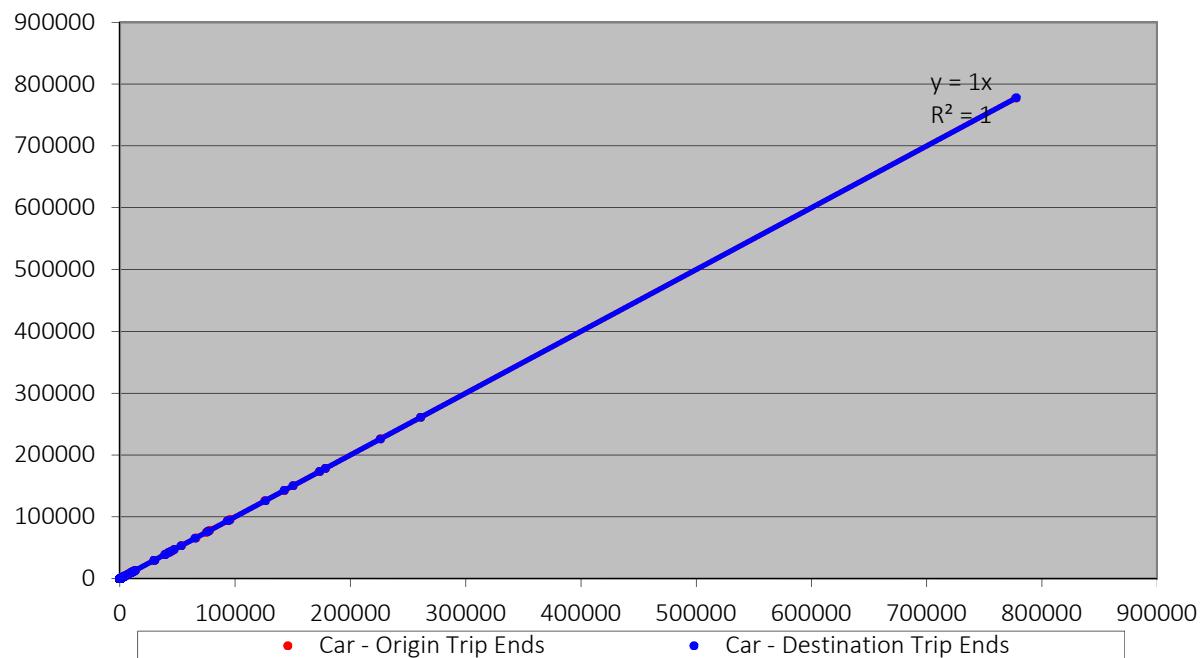
LGV - AM Trip End Summary



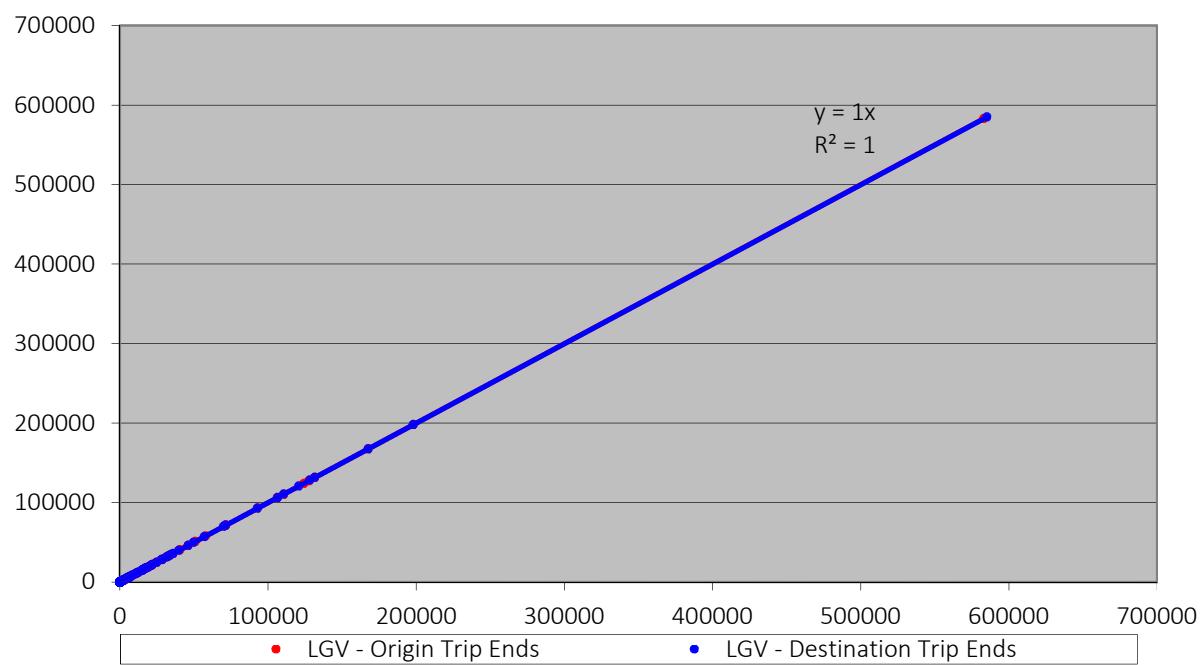
HGV - AM Trip End Summary



Car- PM Trip End Summary



LGV - PM Trip End Summary



OGV - PM Trip End Summary

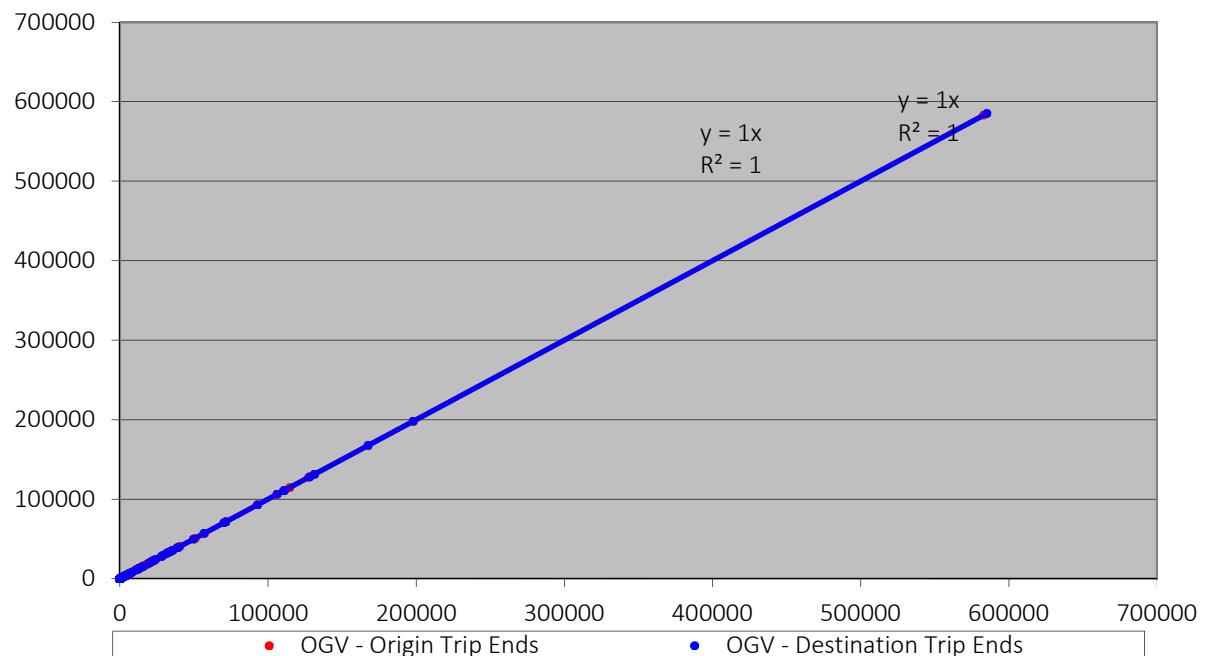


Figure 107 – AOI Trip Ends – AM Analysis

ORIGIN	AM															
	Prior				Post				Difference				Difference %			
	Zone_No	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
5701	96	10	5	111	131	6	4	142	35	-4	0	31	37%	-40%	-3%	28%
5702	21	2	0	22	160	4	0	164	139	3	0	142	680%	177%	135%	643%
5703	149	12	1	162	166	10	1	176	16	-2	0	15	11%	-15%	36%	9%
5704	121	11	12	143	143	8	11	162	22	-3	-1	18	18%	-24%	-8%	13%
5705	93	3	1	96	138	2	1	140	45	-2	0	44	49%	-50%	-28%	45%
5706	50	2	1	54	55	2	2	59	5	0	1	5	9%	-4%	86%	10%
5708	97	5	0	102	200	4	0	204	103	-1	0	102	106%	-23%	-12%	100%
5709	148	3	0	151	171	3	0	174	23	0	0	23	15%	-5%	126%	15%
5710	53	8	0	61	46	7	1	55	-7	-1	1	-7	-13%	-7%	163%	-11%
5711	90	2	0	92	92	2	0	94	2	0	0	2	2%	8%	163%	3%
5712	161	19	19	199	182	16	18	216	21	-3	-1	17	13%	-17%	-6%	8%
5713	17	4	1	21	33	2	1	36	16	-2	0	15	97%	-43%	-4%	70%
5714	9	1	0	10	9	1	0	10	0	0	0	0	0%	-2%	-19%	-1%
5715	5	0	0	5	27	0	0	27	22	0	0	22	456%	-12%	142%	415%
5716	51	6	2	59	202	8	1	211	150	2	0	151	292%	27%	-24%	255%
5717	40	3	0	44	47	3	0	50	7	-1	0	6	18%	-20%	0%	15%
5718	118	17	5	140	151	14	4	170	33	-3	0	29	28%	-17%	-10%	21%
5719	45	4	0	49	51	2	0	53	6	-1	0	4	12%	-37%	14%	8%
5720	289	5	0	294	331	4	0	334	41	-1	0	40	14%	-26%	7%	14%
5721	26	5	1	32	33	3	1	36	6	-2	0	4	24%	-42%	-13%	13%
5722	46	3	0	49	50	2	0	52	4	-1	0	3	9%	-40%	-5%	6%
5723	42	4	1	47	71	3	2	75	29	-2	1	28	69%	-40%	78%	59%
5724	117	40	1	158	111	34	1	146	-6	-6	0	-12	-5%	-15%	8%	-7%
5725	61	10	2	73	239	6	3	247	177	-4	0	174	290%	-41%	25%	237%
5726	52	5	1	58	80	3	2	86	28	-2	1	27	55%	-40%	74%	47%
5727	221	12	1	233	280	15	1	296	59	3	0	63	27%	26%	31%	27%
5728	13	6	1	20	7	4	0	12	-6	-1	0	-8	-48%	-22%	-58%	-41%
5729	143	9	0	152	146	12	0	158	3	3	0	6	2%	28%	19%	4%
5730	97	5	0	102	86	3	0	89	-11	-2	0	-12	-11%	-33%	2%	-12%
5731	124	7	2	132	288	5	6	299	164	-1	4	167	132%	-22%	259%	126%
5732	22	2	0	24	28	2	0	31	6	0	0	7	29%	3%	12%	27%
5733	7	0	0	7	15	0	0	16	9	0	0	9	133%	50%	147%	131%
5734	85	10	4	99	86	10	5	100	0	0	1	2	0%	4%	19%	2%
5769	96	9	1	106	92	9	1	102	-4	0	0	-4	-4%	-1%	-28%	-4%
Total	2803	243	63	3109	3944	209	68	4222	1141	-33	6	1113	41%	-14%	9%	36%

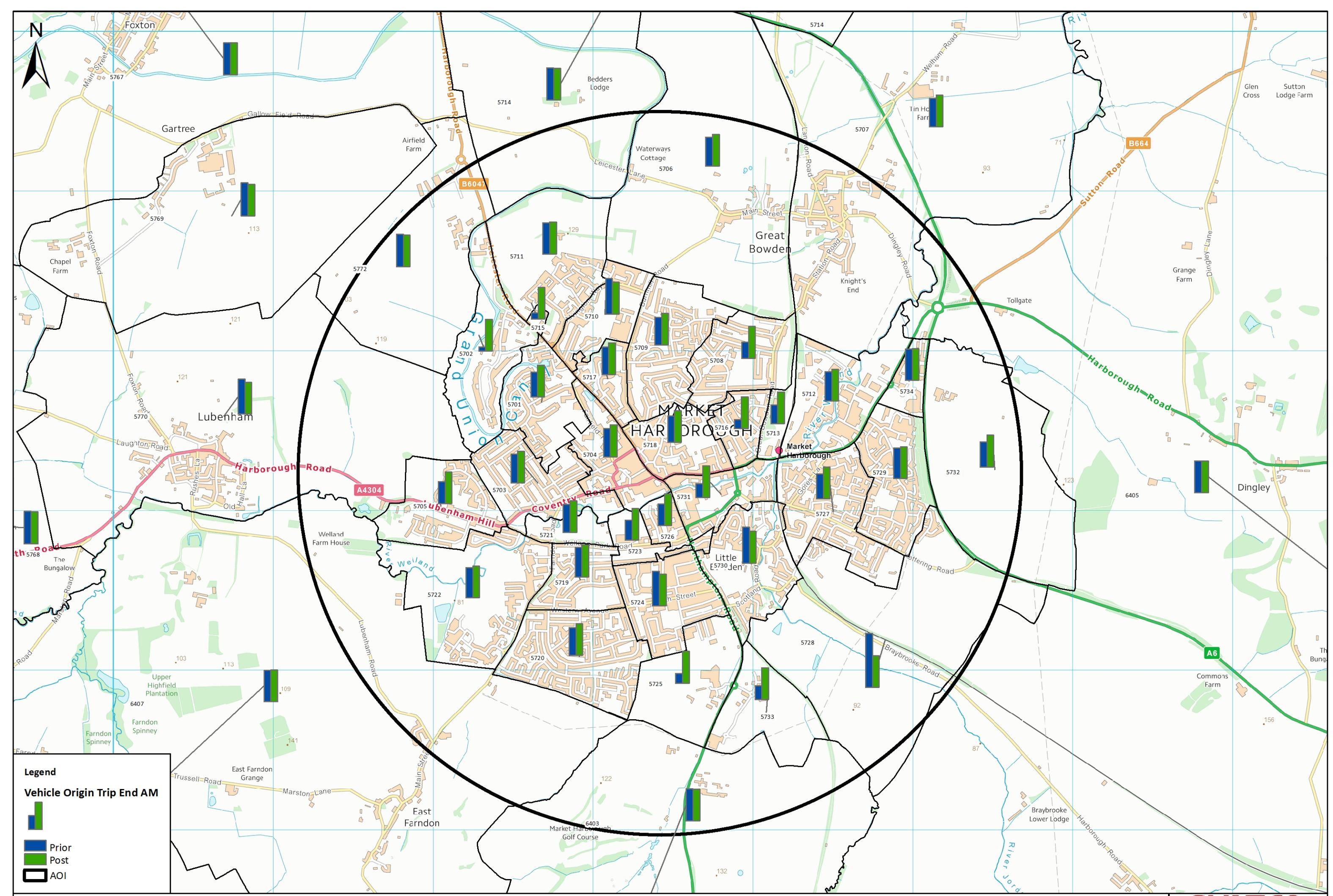
DESTINATION	AM															
	Prior				Post				Difference				Difference %			
	Zone_No	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV
5701	64	7	2	73	72	3	1	77	8	-4	0	4	12%	-53%	-6%	6%
5702	21	1	0	22	117	1	0	117	95	0	0	95	452%	-26%	-30%	431%
5703	121	9	1	131	145	8	1	153	24	-1	0	22	20%	-15%	-15%	17%
5704	199	18	6	223	176	11	2	190	-23	-7	-4	-33	-12%	-37%	-61%	-15%
5705	39	6	0	44	114	5	0	120	76	0	0	75	196%	-6%	133%	170%
5706	40	3	1	43	39	2	0	42	0	0	0	-1	-1%	-14%	-11%	-2%
5708	57	3	0	60	86	2	0	88	29	-1	0	29	52%	-29%	188%	48%
5709	111	8	0	119	73	8	0	81	-38	0	0	-38	-34%	-5%	12%	-32%
5710	72	11	1	84	76	11	1	87	4	0	0	4	5%	-2%	44%	4%
5711	51	1	0	52	85	1	0	86	34	0	0	34	67%	-12%	63%	66%
5712	349	36	7	392	426	37	10	473	77	1	3	81	22%	3%	46%	21%
5713	37	4	1	42	58	2	2	62	21	-2	1	20	56%	-49%	210%	49%
5714	16	1	3	20	20	1	3	24	5	0	0	4	29%	-9%	-3%	22%
5715	14	1	0	14	53	0	0	54	40	0	0	40	291%	-29%	-29%	276%
5716	98	9	2	108	45	2	4	51	-53	-7	2	-57	-54%	-78%	92%	-53%
5717	29	3	0	32	28	2	0	30	-1	-1	0	-2	-3%	-23%	-53%	-5%
5718	224	27	3	254	217	15	2	234	-7	-11	-2	-20	-3%	-42%	-47%	-8%
5719	32	1	0	34	51	1	0	53	19	0	0	19	60%	3%	-11%	57%
5720	127	4	0	131	173	4	0	177	46	0	0	46	36%	-1%	-14%	35%
5721	71	7	1	79	106	6	1	113	35	-1	0	33	48%	-17%	-16%	42%
5722	64	4	0	68	102	3	0	105	38	-1	0	37	60%	-15%	-16%	55%
5723	69	6	1	75	196	6	1	203	128	0	0	128	186%	2%	21%	170%
5724	143	13	1	157	206	13	1	219	63	0	0	63	44%	1%	-14%	40%
5725	107	12	2	121	147	7	2	156	40	-5	0	35	37%	-42%	9%	29%
5726	92	7	1	99	219	7	1	227	128	0	0	128	139%	-3%	23%	128%
5727	106	6	0	112	169	6	0	175	62	0	0	62	59%	-3%	36%	55%
5728	27	5	1	33	27	6	1	34	0	1	0	1	1%	17%	-15%	3%
5729	57	6	0	63	80	7	0	87	23	1	0	25	41%	19%	45%	39%
5730	86	5	0	92	146	6	0	152	60	1	0	61	69%	19%	38%	67%
5731	183	16	2	201	414	9	2	425	231	-7	0	224	126%	-44%	11%	111%
5732	30	2	1	33	29	2	1	33	0	0	0	0	-1%	-1%	31%	0%
5733	4	0	0	5	4	0	0	4	-1	0	0	-1	-15%	38%	0%	-12%
5734	197	19	1	218	203	21	1	225	6	2	0	7	3%	9%	-3%	3%
5769	86	11	1	98	84	7	1	92	-2	-4	0	-6	-3%	-34%	-1%	-6%
Total	3024	270	39	3333	4188	224	40	4452	1164	-47	2	1119	39%	-17%	4%	34%

Figure 108 – AOI Trip Ends – PM Analysis

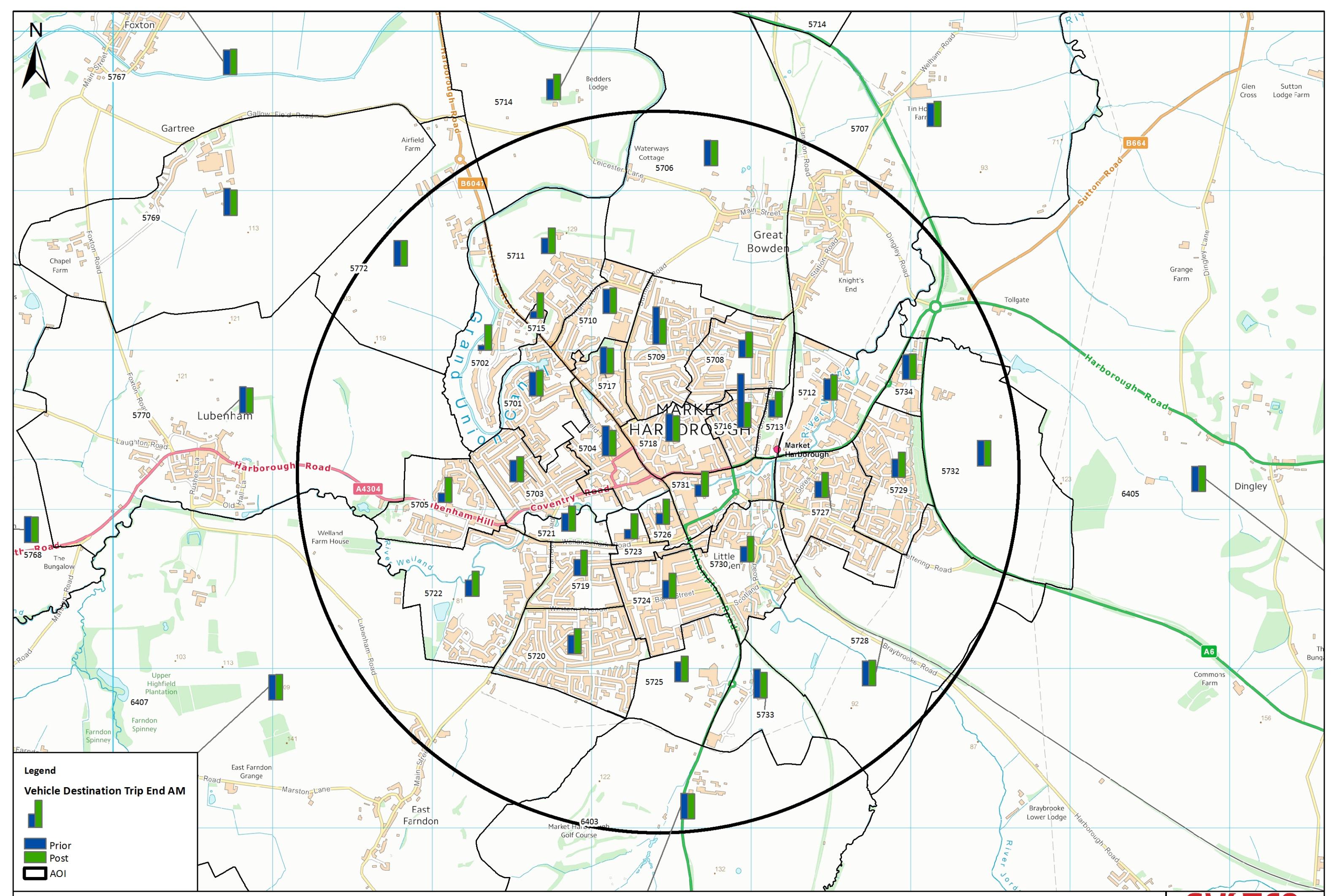
PM																	
Origin		Prior				Post				Difference				Difference %			
Zone_No	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	
5701	68	5	1	74	86	4	3	94	18	0	2	20	27%	-10%	136%	27%	
5702	18	0	0	19	163	1	0	164	145	1	0	146	790%	141%	162%	772%	
5703	145	5	1	151	157	4	1	162	11	-1	0	10	8%	-24%	50%	7%	
5704	220	8	11	239	365	7	4	376	145	-1	-7	137	66%	-13%	-65%	57%	
5705	44	3	0	47	89	12	0	101	44	9	0	53	100%	309%	531%	113%	
5706	46	2	0	48	45	1	0	46	-1	0	0	-1	-3%	-4%	26%	-3%	
5708	59	2	0	61	130	2	0	133	72	0	0	72	123%	-6%	313%	118%	
5709	103	2	0	105	84	2	0	86	-18	0	0	-19	-18%	-22%	289%	-18%	
5710	61	5	0	66	66	4	1	71	5	-1	1	5	8%	-17%	163%	7%	
5711	43	1	0	43	59	0	0	60	17	0	0	16	39%	-28%	44%	38%	
5712	391	33	12	436	437	36	11	484	46	4	-2	48	12%	12%	-14%	11%	
5713	42	3	0	45	89	2	1	92	47	0	1	47	111%	-10%	293%	105%	
5714	14	0	0	15	14	0	0	15	0	0	0	0	-1%	-3%	-6%	-1%	
5715	9	0	0	9	73	1	0	74	65	0	0	65	740%	133%	133%	715%	
5716	99	5	2	106	217	9	1	227	117	4	-1	120	118%	85%	-63%	114%	
5717	22	2	0	24	22	3	0	25	0	0	0	0	0%	23%	-63%	2%	
5718	217	14	4	235	218	13	2	232	1	-1	-2	-3	0%	-10%	-54%	-1%	
5719	33	1	0	34	38	1	0	39	5	0	0	5	16%	-10%	53%	16%	
5720	171	2	0	174	202	2	0	204	30	0	0	30	18%	-10%	60%	17%	
5721	71	4	0	75	84	3	0	87	13	-1	0	12	19%	-30%	-26%	16%	
5722	68	2	0	71	83	2	1	85	14	-1	0	14	21%	-25%	230%	20%	
5723	68	3	0	72	71	2	1	74	3	-1	1	3	4%	-33%	275%	4%	
5724	142	21	0	164	124	18	1	142	-18	-4	0	-22	-13%	-17%	40%	-13%	
5725	117	7	1	125	248	10	5	262	131	3	4	137	112%	38%	362%	110%	
5726	98	4	0	102	101	2	2	106	4	-1	1	4	4%	-37%	311%	3%	
5727	152	4	0	157	134	4	0	139	-18	0	0	-18	-12%	-7%	6%	-12%	
5728	32	3	0	35	29	3	0	32	-3	0	0	-3	-11%	8%	76%	-8%	
5729	86	6	0	92	88	5	0	94	2	-1	0	1	2%	-9%	-11%	2%	
5730	93	3	0	97	83	2	0	86	-10	-1	0	-11	-11%	-19%	9%	-11%	
5731	191	8	2	201	163	3	8	174	-28	-5	6	-28	-15%	-67%	248%	-14%	
5732	40	2	0	42	40	2	0	42	1	0	0	0	2%	-12%	4%	1%	
5733	5	0	0	6	9	1	0	9	3	0	0	4	64%	225%	467%	69%	
5734	244	10	3	256	238	12	2	253	-6	3	0	-4	-3%	26%	-7%	-1%	
5769	68	9	0	78	67	7	0	74	-2	-2	0	-4	-2%	-25%	-9%	-5%	
Total	3282	181	41	3504	4114	182	46	4341	832	0	5	838	25%	0%	13%	24%	

Destination																	
Origin		Prior				Post				Difference				Difference %			
Zone_No	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	
5701	120	5	0	126	138	3	0	141	17	-2	0	15	14%	-40%	-16%	12%	
5702	25	1	0	26	187	9	0	196	162	7	0	170	656%	589%	1120%	653%	
5703	182	12	0	194	192	10	0	201	10	-2	0	8	5%	-17%	-20%	4%	
5704	156	9	4	169	153	5	4	162	-3	-4	0	-7	-2%	-44%	-8%	-4%	
5705	98	3	0	102	113	4	0	117	15	1	0	16	15%	36%	39%	16%	
5706	47	2	0	49	46	2	0	48	-1	0	0	-1	-2%	-4%	-20%	-2%	
5708	92	4	0	96	105	2	0	107	13	-2	0	11	14%	-50%	233%	12%	
5709	164	2	0	166	122	1	0	124	-42	-1	0	-42	-26%	-36%	181%	-26%	
5710	59	4	0	63	44	3	0	48	-14	-1	0	-16	-25%	-33%	181%	-25%	
5711	99	2	0	101	121	2	0	123	22	0	0	22	22%	-5%	163%	21%	
5712	134	23	2	158	143	20	3	165	9	-3	1	7	7%	-12%	50%	4%	
5713	23	3	0	26	24	1	0	26	1	-1	0	0	6%	-48%	177%	1%	
5714	9	1	1	11	9	1	1	10	0	0	0	0	-1%	-4%	-6%	-1%	
5715	5	0	0	5	38	1	0	39	33	0	0	34	690%	109%	975%	654%	
5716	59	7	0	66	35	2	4	41	-23	-5	3	-25	-40%	-70%	788%	-38%	
5717	40	3	0	44	35	2	0	37	-5	-2	0	-7	-12%	-49%	0%	-15%	
5718	186	16	1	203	178	11	1	191	-8	-4	0	-12	-4%	-27%	-1%	-6%	
5719	44	3	0	46	62	3	0	65	18	0	0	18	41%	9%	70%	40%	
5720	305	3	0	309	416	3	0	420	111	0	0	111	36%	2%	60%	36%	
5721	38	4	0	43	41	3	0	45	3	-1	0	2	7%	-24%	48%	5%	
5722	61	2	0	63	68	2	0	70	7	0	0	7	12%	-21%	45%	11%	
5723	53	4	0	58	86	3	1	90	33	-1	0	33	61%	-15%	226%	57%	
5724	133	16	0	150	201	17	0	218	68	0	0	68	51%	3%	53%	46%	
5725	75	8	1	83	130	16	1	147	56	8	0	63	75%	91%	-5%	76%	
5726	68	4	0	72	111	4	1	115	43	-1	1	43	64%	-15%	227%	60%	
5727	246	13	0	259	327	18	0	345	81	5	0	86	33%	39%	57%	33%	
5728	18	4	0	22	20	4	0	25	2	1	0	3	13%	15%	95%	14%	
5729	168	12	0	181	200	16	0	217	32	4	0	36	19%	35%	67%	20%	
5730	112	4	0	116	170	5	0	175	59	1	0	60	52%	25%	88%	52%	
5731	116	5	0	122	231	7	1	239	115	2	0	118	99%	38%	99%	96%	
5732	28	2	0	30	28	2	0	31	0	0	0	1	2%	1%	31%	2%	
5733	6	0	0	6	7	2	0	9	1	1	0	3	24%	535%	750%	48%	
5734	88	10	0	99	87	10	1	97	-1	0	0	-1	-1%	-4%	44%	-1%	
5769	48	7	2	58	50	7	1	59	2	0	0	1	3%	0%	-25%	2%	
Total	3104	200	16	3320	3919	201	23	4143	815	1	7	823	26%	0%	46%	25%	

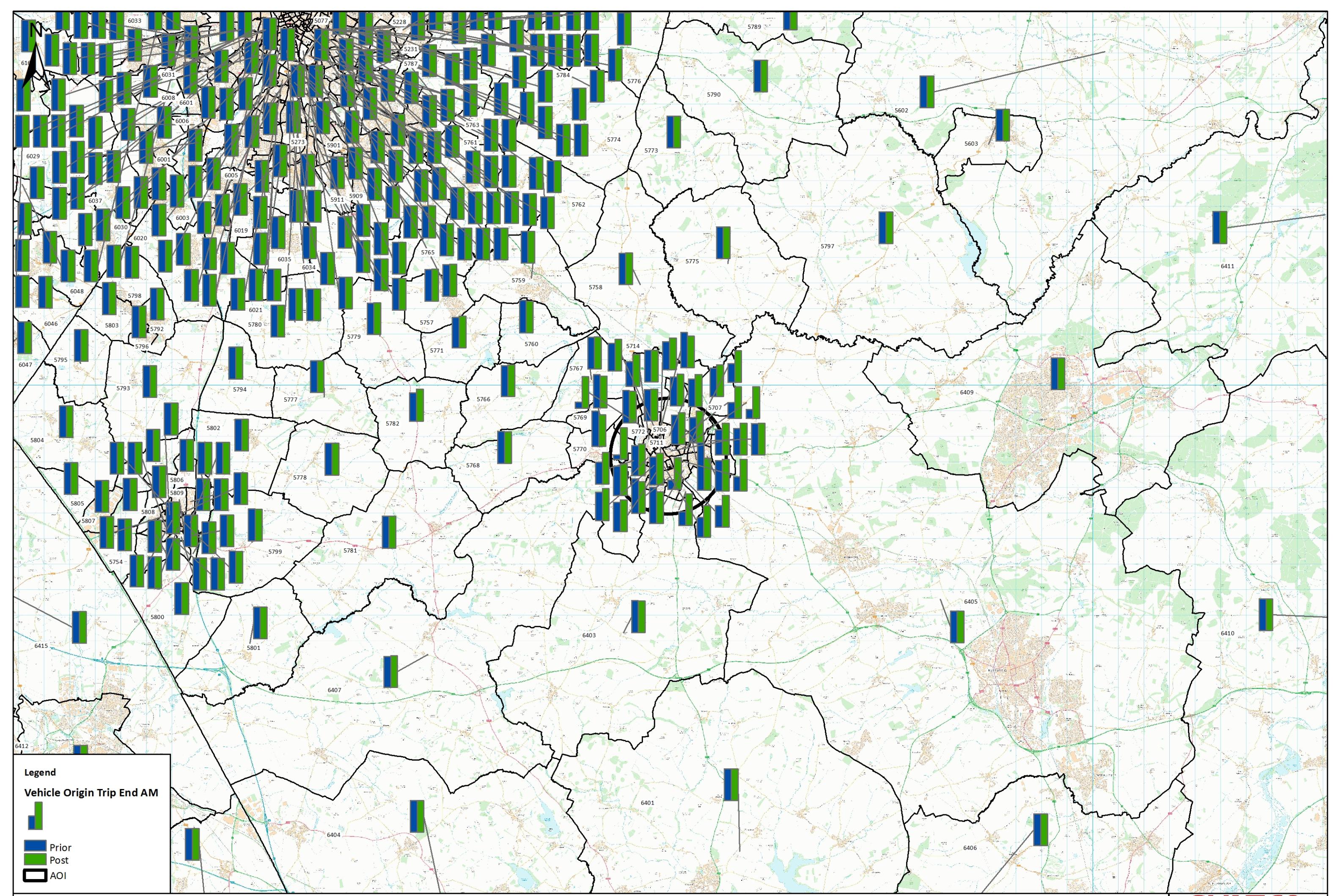
Figure 109 – Origin/Destination Trip End – AM



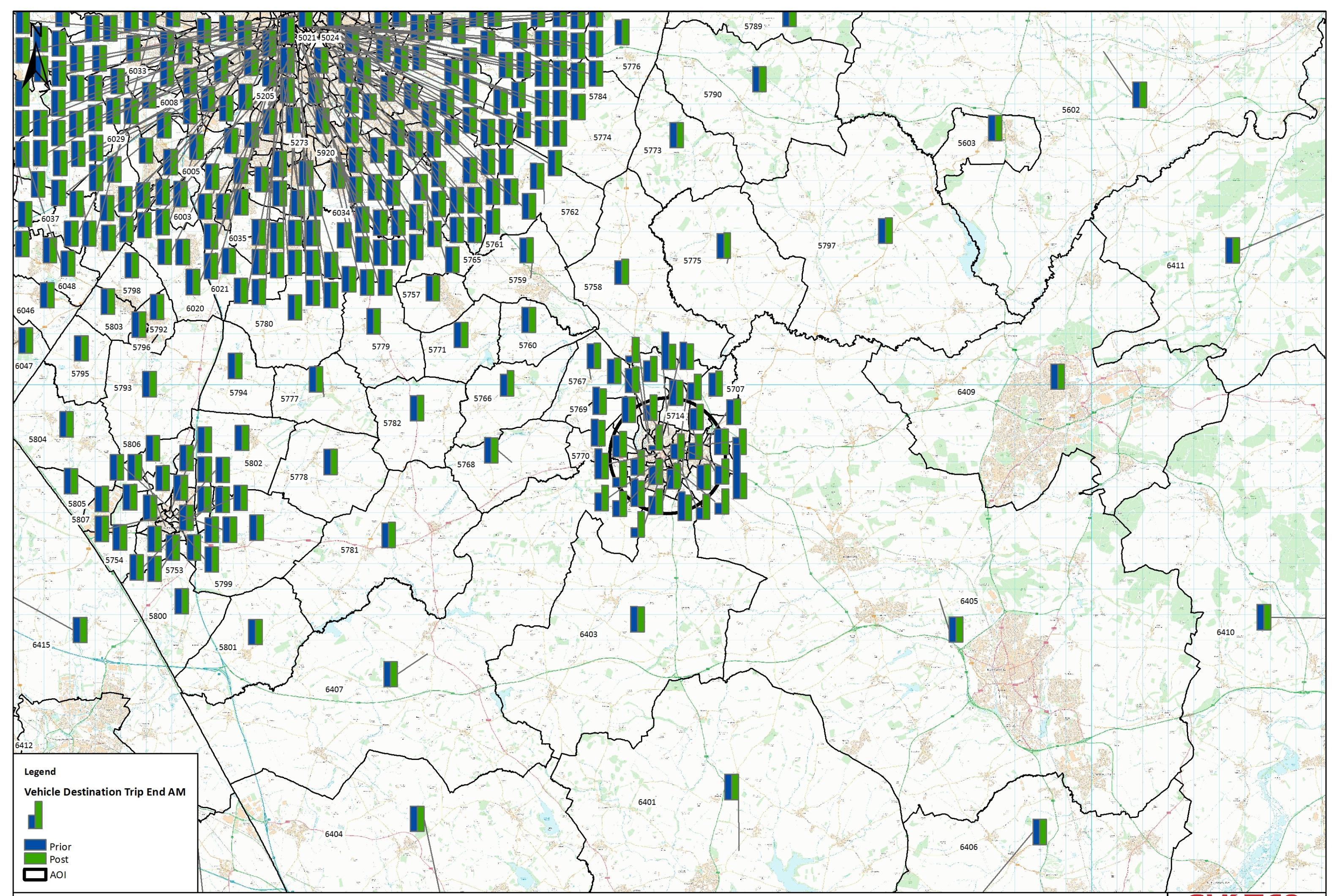
SYSTRA



SYSTRA

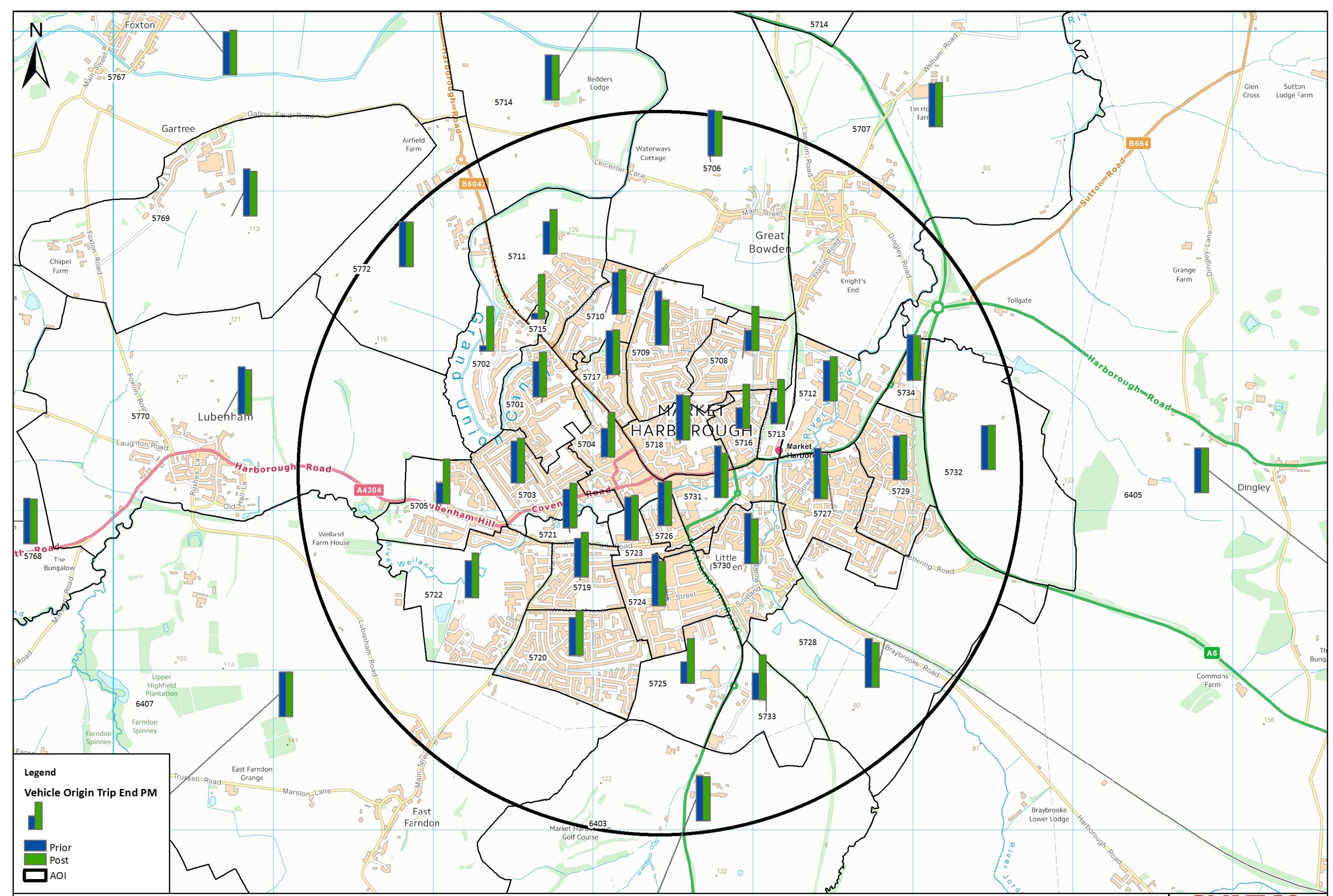


SYSTRA

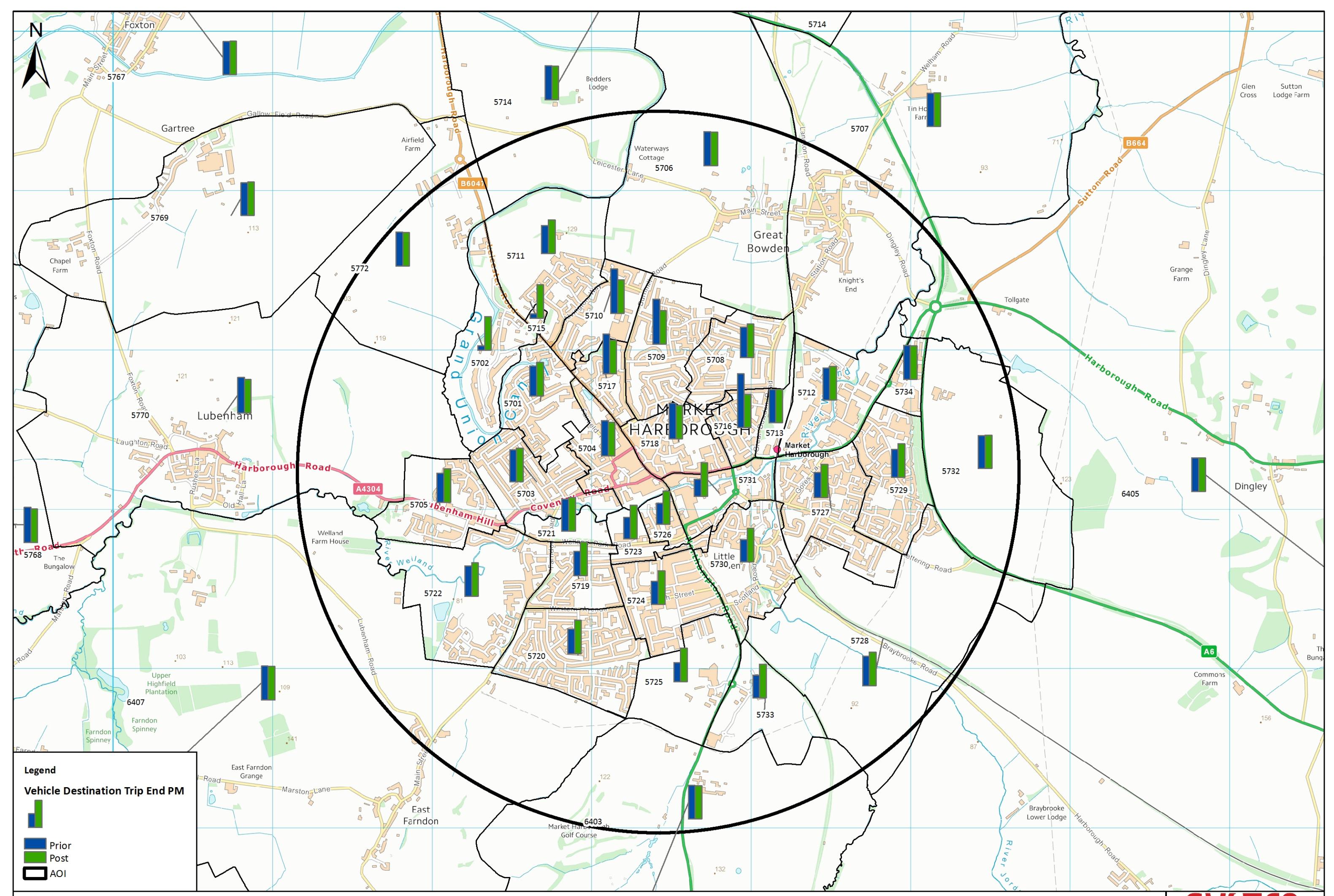


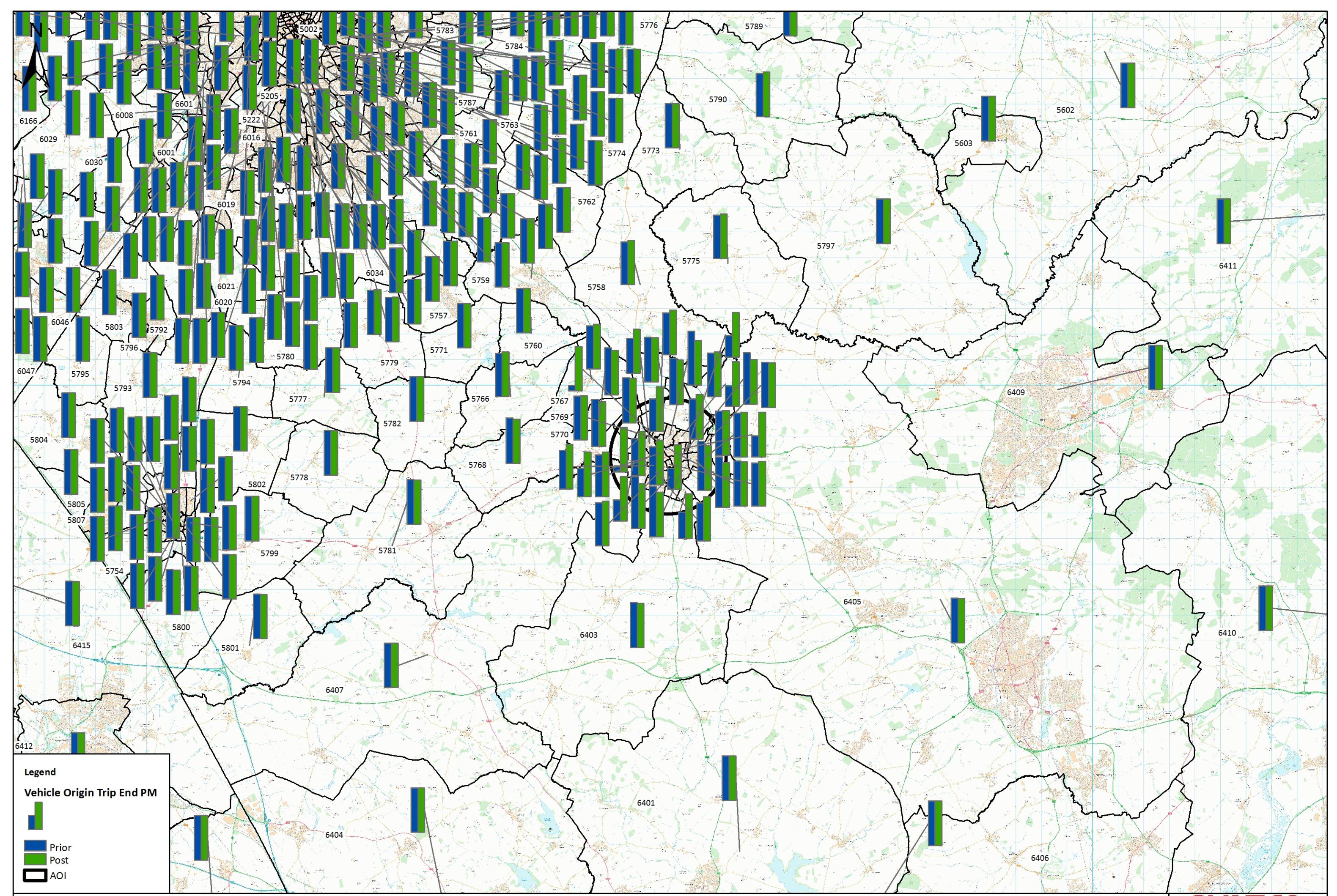
SYSTRA

Figure 110 – Origin/Destination Trip End – PM

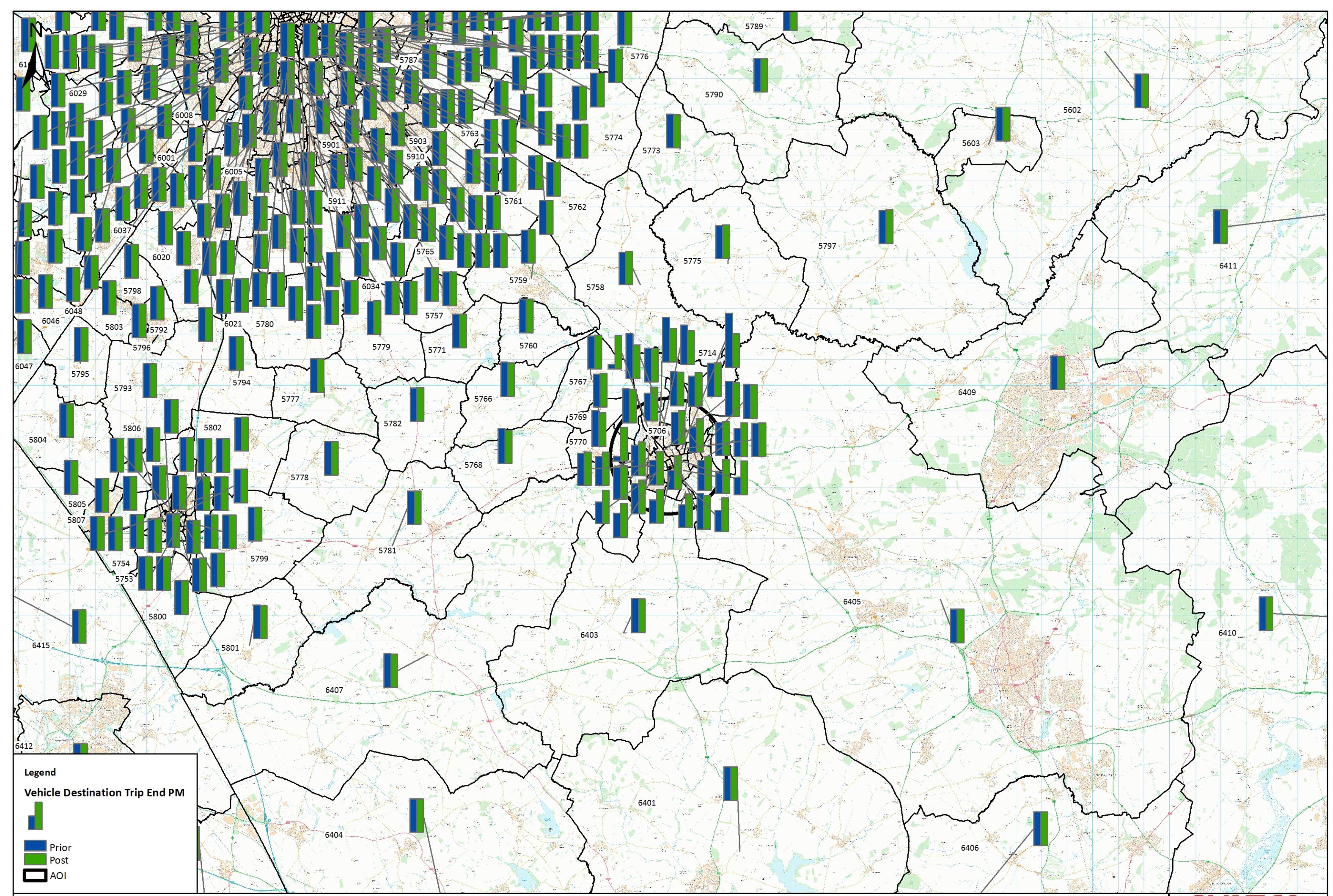


SYSTRA





SYSTRA



SYSTRA

Figure 111 – AM Distance/Time Diagrams

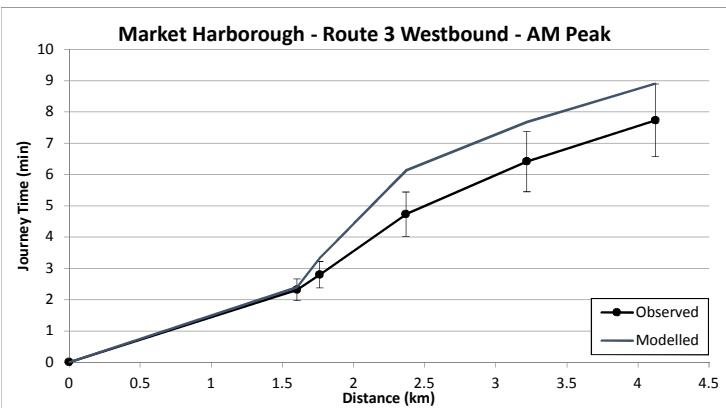
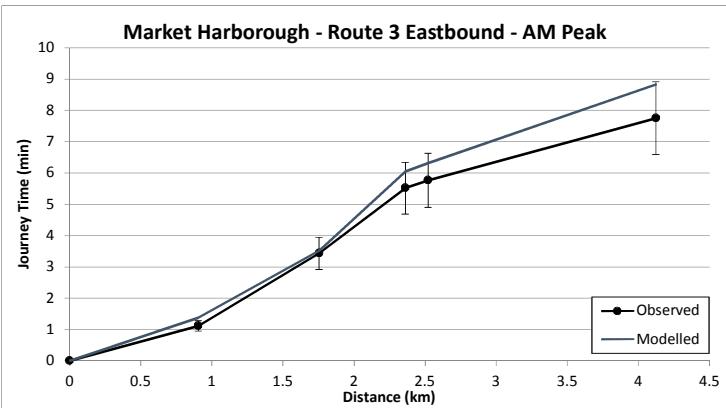
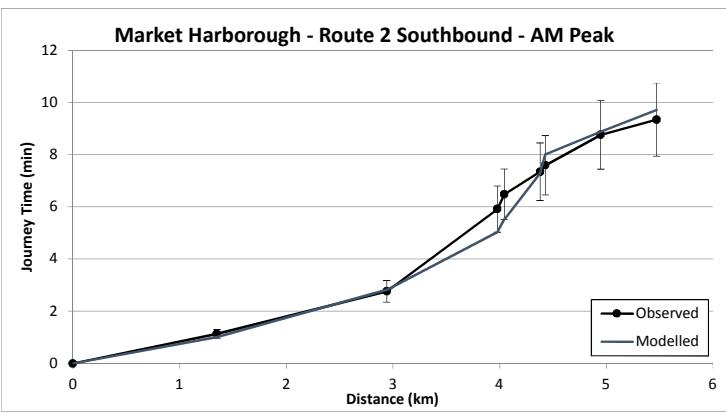
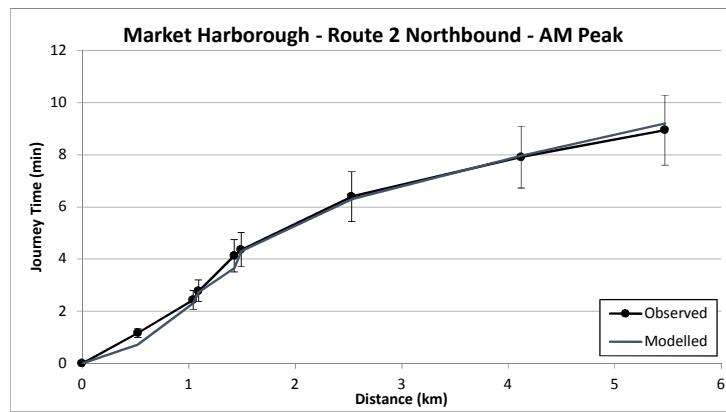
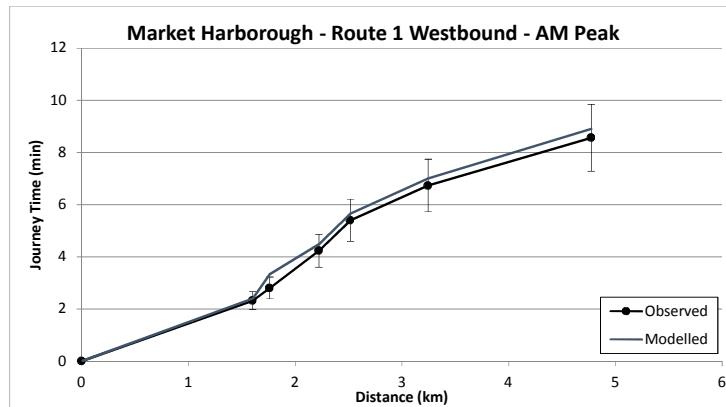
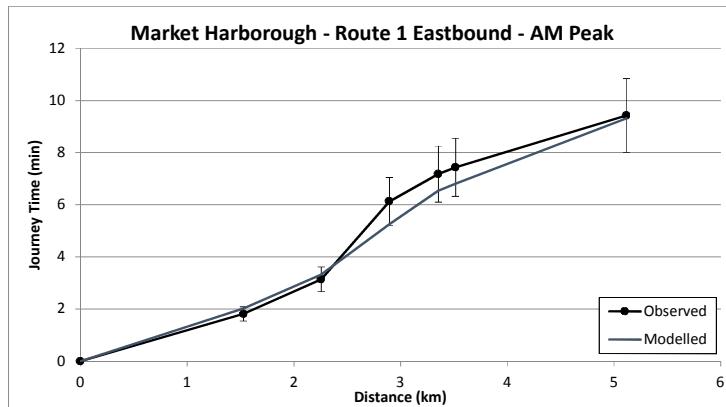


Figure 112 – PM Distance/Time Diagrams

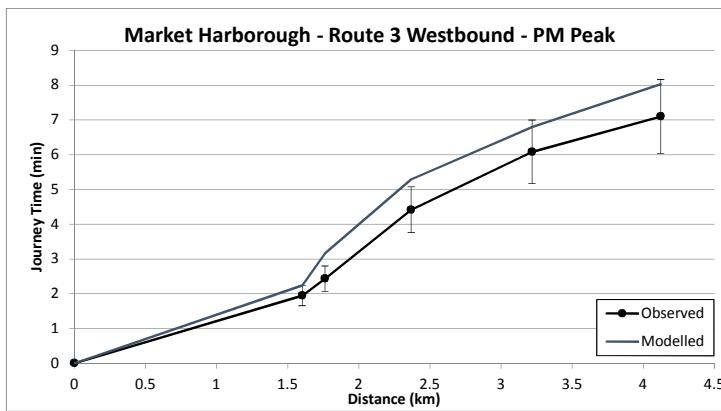
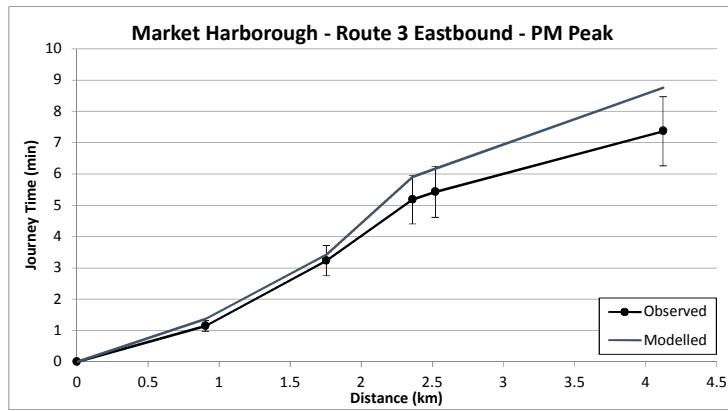
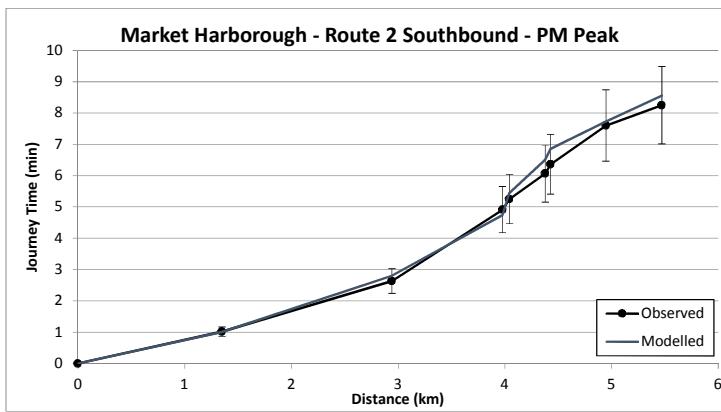
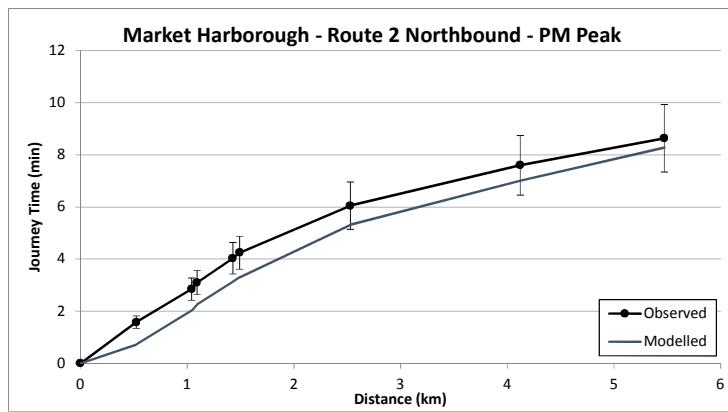
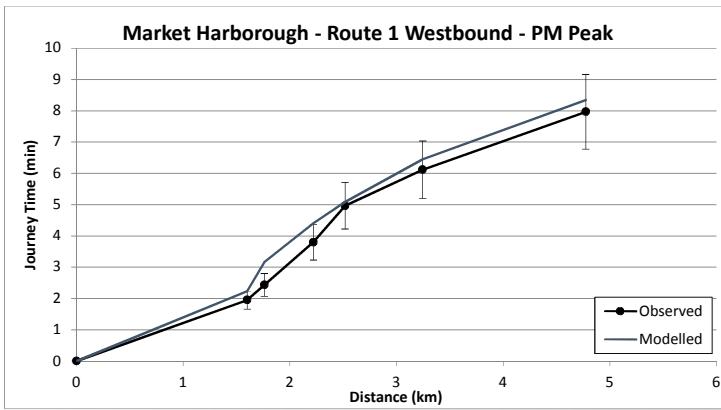
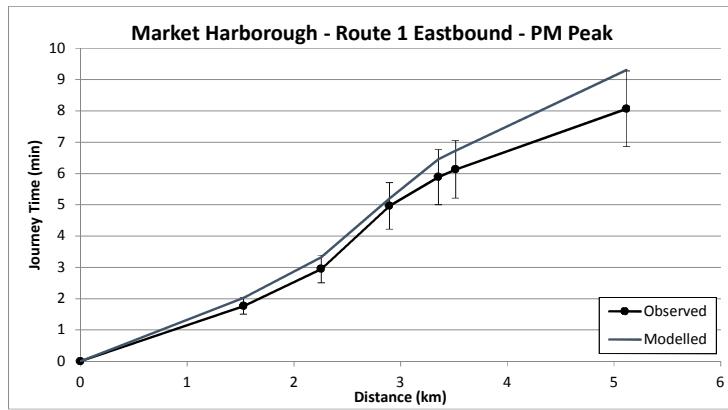


Figure 113 –
AM and PM Trunk Road Validation

AM																	
Description	linkID	Car Modelled	Car Observed	GEH	DMRB	LGV Modelled	LGV Observed	GEH	DMRB	HGV Modelled	HGV Observed	GEH	DMRB	Total Modelled	Total Observed	GEH	DMRB
A46 Calibration	69971_2175	1826	1757	1.6	Y	351	346	0.3	Y	267	335	3.9	Y	2444	2438	0.1	Y
A46 Calibration	2173_2226	1165	1200	1.0	Y	230	236	0.4	Y	187	229	2.9	Y	1583	1665	2.0	Y
A46 Validation	60252_69976	727	873	5.2	N	157	172	1.2	Y	120	166	3.8	Y	1004	1211	6.2	N
A46 Validation	69976_60252	1109	1260	4.4	Y	242	248	0.4	Y	218	240	1.5	Y	1569	1748	4.4	Y
A5 Calibration	20780_29976	411	379	1.6	Y	103	95	0.8	Y	91	103	1.3	Y	605	578	1.1	Y
A5 Calibration	29976_20780	506	461	2.0	Y	114	116	0.2	Y	104	125	2.0	Y	723	702	0.8	Y
A5 Calibration	79737_79738	1616	1453	4.2	Y	196	368	10.3	N	140	406	16.1	N	1952	2227	6.0	Y
A5 Calibration	79738_79735	1250	1220	0.9	Y	221	309	5.5	Y	206	341	8.2	N	1677	1871	4.6	Y
A5 Calibration	49957_40169	995	928	2.2	Y	231	234	0.2	Y	170	253	5.7	Y	1396	1415	0.5	Y
A5 Calibration	40169_49957	1112	928	5.8	N	261	233	1.7	Y	174	253	5.4	Y	1547	1414	3.5	Y
A5 Calibration	79623_79201	406	363	2.2	Y	84	73	1.3	Y	57	58	0.1	Y	548	494	2.3	Y
A5 Calibration	79201_79623	432	407	1.2	Y	81	82	0.1	Y	64	65	0.2	Y	577	554	1.0	Y
A5 Validation	20387_26014	329	352	1.2	Y	89	87	0.2	Y	86	109	2.2	Y	504	547	1.9	Y
A5 Validation	26014_20387	646	546	4.1	N	115	135	1.7	Y	124	169	3.7	Y	886	849	1.2	Y
A5 Validation	49955_40189	725	713	0.4	Y	143	179	2.9	Y	139	194	4.3	Y	1006	1086	2.5	Y
A5 Validation	40189_49955	624	616	0.3	Y	99	155	5.0	Y	134	168	2.7	Y	857	938	2.7	Y
A50 Calibration	79878_79875	1466	1471	0.1	Y	235	282	2.9	Y	85	358	18.4	N	1786	2112	7.4	N
A50 Calibration	79875_79878	1879	1901	0.5	Y	318	364	2.5	Y	54	463	25.4	N	2250	2729	9.6	N
A50 Calibration	79876_79889	1050	1112	1.9	Y	209	213	0.3	Y	240	271	1.9	Y	1500	1595	2.4	Y
A50 Calibration	79889_79876	752	781	1.0	Y	120	149	2.5	Y	97	190	7.8	Y	969	1120	4.7	Y
M1 Calibration	9378_9442	3916	3898	0.3	Y	677	674	0.1	Y	960	999	1.2	Y	5553	5571	0.2	Y
M1 Calibration	5050_9379	3854	3825	0.5	Y	695	662	1.3	Y	970	980	0.3	Y	5520	5466	0.7	Y
M1 Calibration	9255_40464	2506	2535	0.6	Y	437	438	0.1	Y	665	649	0.6	Y	3607	3622	0.2	Y
M1 Calibration	49999_9262	2242	2324	1.7	Y	383	402	1.0	Y	586	595	0.4	Y	3210	3321	1.9	Y
M1 Calibration	50562_50626	3269	3193	1.3	Y	699	683	0.6	Y	819	850	1.1	Y	4788	4726	0.9	Y
M1 Calibration	50626_50563	3571	3537	0.6	Y	772	757	0.5	Y	926	942	0.5	Y	5269	5235	0.5	Y
M1 Calibration	79608_20828	2575	2591	0.3	Y	458	473	0.7	Y	682	716	1.3	Y	3715	3780	1.1	Y
M1 Calibration	20827_79607	2542	2534	0.2	Y	461	463	0.1	Y	694	700	0.2	Y	3697	3696	0.0	Y
M42 / A42 Calibration	78298_79748	2148	1958	4.2	Y	275	310	2.0	Y	401	400	0.0	Y	2824	2669	3.0	Y
M42 / A42 Calibration	79747_78290	2274	2287	0.3	Y	362	363	0.0	Y	362	468	5.2	N	2998	3118	2.2	Y
M42 / A42 Calibration	59997_50595	1594	1588	0.2	Y	281	282	0.1	Y	380	447	3.3	Y	2255	2317	1.3	Y
M42 / A42 Calibration	59996_59998	1472	1494	0.6	Y	265	266	0.0	Y	364	421	2.9	Y	2101	2181	1.7	Y
M42 / A42 Validation	59988_50519	1352	1427	2.0	Y	282	254	1.7	Y	357	402	2.3	Y	1991	2083	2.0	Y
M42 / A42 Validation	50553_50565	1284	1286	0.1	Y	234	229	0.3	Y	338	362	1.3	Y	1856	1877	0.5	Y
M42 / A42 Validation	59993_50571	1788	1759	0.7	Y	300	313	0.7	Y	389	496	5.1	N	2477	2567	1.8	Y
M42 / A42 Validation	59992_50576	1629	1543	2.2	Y	283	274	0.5	Y	381	435	2.7	Y	2293	2252	0.9	Y
M69 Calibration	30327_9344	2061	2021	0.9	Y	378	372	0.3	Y	279	335	3.2	Y	2717	2728	0.2	Y
M69 Calibration	30325_30500	1908	1859	1.1	Y	344	342	0.1	Y	297	308	0.7	Y	2549	2510	0.8	Y
M69 Validation	49996_30328	1582	1547	0.9	Y	303	285	1.0	Y	241	257	1.0	Y	2126	2088	0.8	Y
M69 Validation	39995_40510	1755	1748	0.2	Y	324	322	0.1	Y	285	290	0.3	Y	2363	2360	0.1	Y

PM																	
Description	linkID	Car Modelled	Car Observed	GEH	DMRB	LGV Modelled	LGV Observed	GEH	DMRB	HGV Modelled	HGV Observed	GEH	DMRB	Total Modelled	Total Observed	GEH	DMRB
A46 Calibration	69971_2175	1316	1315	0.0	Y	121	120	0.1	Y	73	76	0.4	Y	1509	1511	0.1	Y
A46 Calibration	2173_2226	2266	2241	0.5	N	191	204	0.9	Y	107	130	2.1	Y	2565	2575	0.2	Y
A46 Validation	60252_69976	1268	1513	6.6	N	160	138	1.8	Y	89	88	0.1	Y	1517	1739	5.5	Y
A46 Validation	69976_60252	945	1023	2.5	Y	74	93	2.1	Y	54	59	0.7	Y	1073	1176	3.1	Y
A5 Calibration	20780_29976	564	555	0.4	Y	55	53	0.3	Y	45	49	0.5	Y	664	658	0.3	Y
A5 Calibration	29976_20780	442	443	0.0	Y	47	43	0.6	Y	38	39	0.1	Y	527	525	0.1	Y
A5 Calibration	79737_79738	2196	1834	8.1	N	102	198	7.9	Y	95	153	5.2	Y	2392	2184	4.3	Y
A5 Calibration	79738_79735	1432	2069	15.2	N	118	223	8.1	N	91	172	7.1	Y	1640	2464	18.2	N
A5 Calibration	49957_40169	1193	1200	0.2	Y	123	115	0.7	Y	75	106	3.3	Y	1391	1422	0.8	Y
A5 Calibration	40169_49957	1302	1229	2.0	Y	120	118	0.2	Y	66	108	4.6	Y	1488	1455	0.8	Y
A5 Calibration	79623_79201	536	536	0.0	Y	45	42	0.4	Y	31	32	0.1	Y	613	610	0.1	Y
A5 Calibration	79201_79623	442	439	0.1	Y	39	35	0.7	Y	26	26	0.0	Y	507	500	0.3	Y
A5 Validation	20387_26014	763	722	1.5	Y	56	65	1.1	Y	52	66	1.8	Y	872	853	0.6	Y
A5 Validation	26014_20387	466	422	2.1	Y	42	38	0.6	Y	43	38	0.8	Y	551	498	2.3	Y
A5 Validation	49955_40189	653	737	3.2	Y	12	71	9.2	Y	55	65	1.2	Y	720	873	5.4	N
A5 Validation	40189_49955	925	879	1.5	Y	51	85	4.1	Y	56	78	2.6	Y	1032	1041	0.3	Y
A50 Calibration	79878_79875	2252	2273	0.4	Y	178	225	3.4	Y	29	249	18.6	N	2459	2748	5.7	Y
A50 Calibration	79875_79878	1894	1854	0.9	Y	151	184	2.5	Y	19	203	17.4	N	2064	2241	3.8	Y
A50 Calibration	79876_79889	1259	1331	2.0	Y	125	132	0.6	Y	111	146	3.1	Y	1496	1608	2.9	Y
A50 Calibration	79889_79876	1065	1209	4.3	Y	112	120	0.7	Y	98	132	3.2	Y	1275	1461	5.0	Y
M1 Calibration	9378_9442	4588	4559	0.4	Y	457	441	0.7	Y	463	572	4.8	N	5508	5572	0.8	Y
M1 Calibration	5050_9379	5619	5252	5.0	Y	522	508	0.6	Y	560	659	4.0	Y	6701	6419	3.5	Y
M1 Calibration	9255_40464	3178	3174	0.1	Y	307	307	0.0	Y	395	398	0.1	Y	3880	3879	0.0	Y
M1 Calibration	49999_9262	3021	3011	0.2	Y	310	291	1.1	Y	345	377	1.7	Y	3676	3679	0.1	Y
M1 Calibration	50562_50626	4042	4072	0.5	Y	488	476	0.5	Y	516	535	0.8	Y	5046	5083	0.5	Y
M1 Calibration	50626_50563	3920	3794	2.0	Y	442	444	0.1	Y	458	498	1.8	Y	4819	4736	1.2	Y
M1 Calibration	79608_20828	3289	3284	0.1	Y	344	347	0.2	Y	548	548	0.0	Y	4181	4179	0.0	Y
M1 Calibration	20827_79607	3159	3165	0.1	Y	323	335	0.7	Y	490	528	1.7	Y	3972	4027	0.9	Y
M42 / A42 Calibration	78298_79748	3130	3164	0.6	Y	199	271	4.7	Y	249	306	3.4	Y	3578	3741	2.7	Y
M42 / A42 Calibration	79747_78290	2249	2216	0.7	Y	162	190	2.1	Y	208	215	0.5	Y	2619	2621	0.0	Y
M42 / A42 Calibration	59997_50595	1830	1840	0.2	Y	191	191	0.1	Y	208	242	2.3	Y	2229	2272	0.9	Y
M42 / A42 Calibration	59996_59998	1796	1829	0.8	Y	187	189	0.2	Y	212	240	1.8	Y	2195	2258	1.3	Y
M42 / A42 Validation	59988_50519	1411	1515	2.7	Y	156	157	0.1	Y	182	199	1.2	Y	1749	1871	2.9	Y
M42 / A42 Validation	50553_50565	1551	1580	0.7	Y	158	164	0.4	Y	188	207	1.4	Y	1897	1951	1.2	Y
M42 / A42 Validation	59993_50571	1916	1891	0.6	Y	195	196	0.0	Y	205	248	2.9	Y	2317	2335	0.4	Y
M42 / A42 Validation	59992_50576	1962	1955	0.2	Y	208	202	0.4	Y	217	257	2.6	Y	2386	2414	0.6	Y
M69 Calibration	30327_9344	2458	2460	0.1	Y	203	201	0.1	Y	126	137	0.9	Y	2787	2798	0.2	Y
M69 Calibration	30325_30500	2238	2282	0.9	Y	185	186	0.1	Y	133	127	0.5	Y	2555	2596	0.8	Y
M69 Validation	49996_30328	2233	2180	1.1	Y	180	178	0.2	Y	122	122	0.0	Y	2535	2480	1.1	Y
M69 Validation	39995_40510	1823	1866	1.0	Y	152	152	0.0	Y	124	104	1.8	Y	2099	2123	0.5	Y

