LLITM 2014 Base

Local Melton Borough Highway Model LMVR

Quality Information

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Revision History

Revision	Revision date	Details	Authorised	Name	Position
v1.0	May 2017	Initial draft for comment	MJD	Mark Dazeley	Regional Director
v1.1	June 2017	Responding to comments	MJD	Mark Dazeley	Regional Director
v1.2	July 2017	Responding to minor comments	MJD	Mark Dazeley	Regional Director
v1.3	December 2017	Minor edits following DfT comments	MJD	Mark Dazeley	Regional Director
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Section 1 – Introduction

1.1 Context

1.1.1 This report forms an addendum to the LLITM 2014 Base highway model Local Model Validation Report (LMVR), and provides additional detail on the performance of the highway model in and around Melton Mowbray.

1.1.2 This local review of the model performance is part of the modelling work for the Outline Business Base (OBC) for the proposed Melton Mowbray Distributor Road, and includes analysis in response to comments from the DfT at a meeting to discuss the OBC for the scheme in March 2017.

1.1.3 This local LMVR does not seek to reproduce the information contained within the main LMVR for the highway model, and as such this report should be read in conjunction with the main LMVR. This report builds on the information provided for the highway model development and performance, and provides the results of additional analysis on the model performance in and around Melton Mowbray in the context of comments raised by DfT specifically.

1.1.4 This additional analysis includes:

- a detailed review of the highway network coding;
- a review of the base year highway matrices (which have made use of travel demand data from mobile phone data),and checked against independent sources of data on travel demand; and
- the comparison of the modelled flows against additional count data collected in Melton Mowbray since the development of the base year highway model.

1.1.5 The performance of the highway model as reported within the LMVR across the county in terms of screenlines, individual link counts and journey times is given in Table 1.1 to Table 1.3 below. This demonstrates that across the county the model performs well against WebTAG criteria, with:

- the percentage of screenlines meeting WebTAG criteria being in excess of 90% in all three time periods;
- the percentage of individual link counts meeting WebTAG criteria is at or above 85% in all three time periods; and
- the percentage of journey time routes meeting WebTAG criteria is above 85% in all three time periods.

1.1.6 The North-East Leicestershire reporting area in Table 1.1 to Table 1.3 closely aligns with Melton Borough, and for this area the model performs well against WebTAG criteria for flows and journey times.

Table 1.1: Leicestershire Screenline Performance (Total Vehicle Flows)

	AM Peak Hour		Interpeak Hour		PM Peak Hour	
	Total %	ScnLine Passes	Total %	ScnLine Passes	Total %	ScnLine Passes
Leicester City	0.2%	94%	0.4%	100%	0.7%	100%
North Leicestershire	-0.1%	94%	0.7%	88%	1.1%	88%
North-East Leicestershire	0.1%	86%	0.9%	93%	0.4%	93%
South Leicestershire	-0.6%	85%	0.3%	96%	0.3%	88%
South-West Leicestershire	0.7%	100%	0.1%	100%	1.0%	88%
North-West Leicestershire	-0.5%	88%	-0.5%	100%	-0.2%	94%
County-wide	1.1%	100%	0.5%	100%	0.7%	100%
SRN (Int)	1.7%	100%	1.4%	100%	1.0%	95%
Leicestershire	***0.5%***	***93%***	***0.6%***	***97%***	***0.7%***	***93%***

Table 1.2: Leicestershire Link Flow Performance (Total Vehicle Flows)

	AM Peak Hour		Interpeak Hour		PM Peak Hour	
	%Links	%Links (ex dupl.)	%Links	%Links (ex dupl.)	%Links	%Links (ex dupl.)
Leicester City	79%	78%	88%	88%	80%	79%
North Leicestershire	82%	81%	91%	90%	80%	78%
North-East Leicestershire	93%	93%	96%	95%	91%	90%
South Leicestershire	90%	89%	94%	94%	89%	89%
South-West Leicestershire	88%	88%	98%	98%	89%	89%
North-West Leicestershire	94%	93%	95%	95%	93%	92%
County-wide	89%	86%	97%	96%	87%	84%
SRN (Int)	97%	97%	100%	100%	96%	96%
Leicestershire	***87%***	***86%***	***94%***	***93%***	***86%***	***85%***

Table 1.3: Journey Time Validation

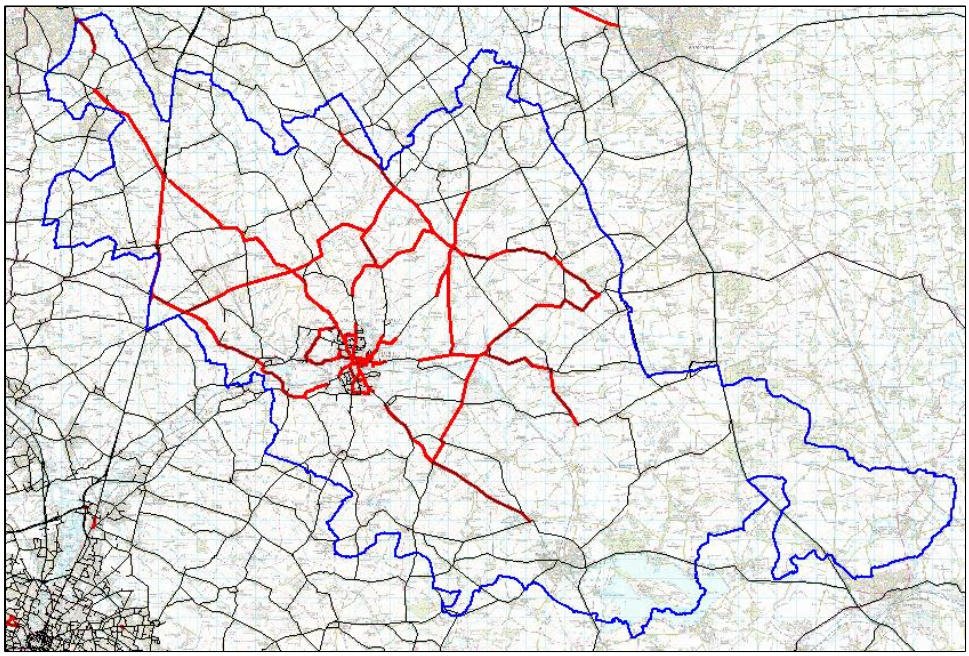
	No. of Routes	AM %Pass	IP %Pass	PM %Pass
Leicester City	32	91%	84%	84%
North Leicestershire	18	89%	94%	89%
North-East Leicestershire	12	100%	92%	92%
South Leicestershire	18	94%	100%	83%
South-West Leicestershire	24	92%	92%	92%
North-West Leicestershire	24	92%	100%	92%
SRN (Int)	10	90%	100%	100%
Leicestershire	**138**	**92%**	**93%**	**89%**
SRN (Ext)	12	83%	100%	100%

1.1.7 An initial area of interest has been defined by running a LLITM 2014 Base forecast with and without the proposed scheme and identifying those links where the flows change by more than 5%. To remove links with low flows where a small absolute change in flow results in a large percentage change, the absolute flow change for those identified links must also be over 30 PCUs[1].

1.1.8 Any model zone with at least one link which has changed by more than 5% and 30 PCUs has been included within the initial area of interest. The identified links (blue) and the defined area of interest (red) are shown in Figure 1.1. This analysis is likely to include an element of convergence 'noise' within the model forecasts; therefore as the majority of links highlighted fall within Melton Borough, the borough itself has been used to define the focus of this local LMVR.

[1] Passenger car unit, where cars and LGVs have a weight of 1 and HGVs have a weight of 2

Figure 1.1: Initial Area of Interest



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1.2 Report Structure

1.2.1 This addendum to the LLITM 2014 Base highway LMVR contains the following sections:

- **Section 2 – Calibration and Validation Data**: this section details the calibration and validation count data included within the development of the base year model, the additional count data collated since the development of the model within Melton Mowbray, and the observed journey times routes used in the validation of the highway model.
- **Section 3 – Local Highway Network Review**: this section discusses the checks undertaken as part of the review of the base year network coding, and details the recommended updates which are applied to the base year highway network coding.
- **Section 4 – Highway Matrix Review**: this section details the analysis undertaken to compare the base year highway demand matrices against independent data sources on travel demand, including the 2014 roadside interview surveys undertaken around Melton Mowbray.
- **Section 5 – Assignment Calibration and Validation**: this section details the performance of the base year highway model against observed count and journey time data, focussing on the performance within Melton Borough.
- **Section 6 – Conclusions**: this section provides a summary of the local LMVR and its findings.

Section 2 – Calibration and Validation Data

2.1 Introduction

2.1.1 This section details the observed data collated to calibrate and validate the base year traffic volumes within Melton Borough, to validate the modelled journey times within Melton Borough, and the additional recent count data provided to supplement the existing count dataset within Melton Mowbray for the purposes of this local Melton Mowbray LMVR.

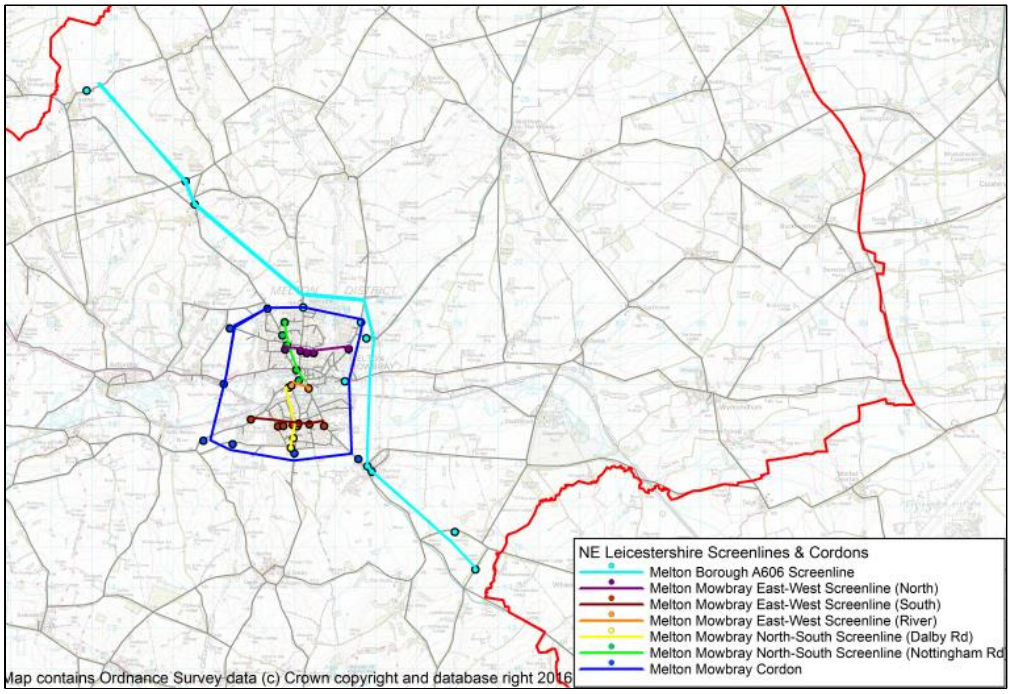
2.1.2 The processing of the count data and journey time data used within the calibration and validation of the base year highway model is detailed within the LLITM 2014 Base LMVR, and is not reproduced here.

2.2 Existing Calibration and Validation Count Data

2.2.1 Within the existing count dataset collated for the development of the base year model, a total of seven screenlines and cordons were defined within Melton Borough. These are shown in Figure 2.1, and consist of:

- a cordon of the Melton Mowbray urban area;
- five screenlines within Melton Mowbray, which are:
  - a river screenline in Melton Mowbray town centre;
  - a north-south screenline running parallel to the A606 Nottingham Road in the northern half of Melton Mowbray;
  - an east-west screenline within the northern half of Melton Mowbray;
  - a north-south screenline running parallel to Dalby Road in the southern half of Melton Mowbray; and
  - an east-west screenline within the southern half of Melton Mowbray.
- a screenline running broadly parallel to the A606 through Melton Borough, and following the Melton Mowbray Cordon around the eastern side of the urban area.

Figure 2.1: Melton Borough Screenlines and Cordons



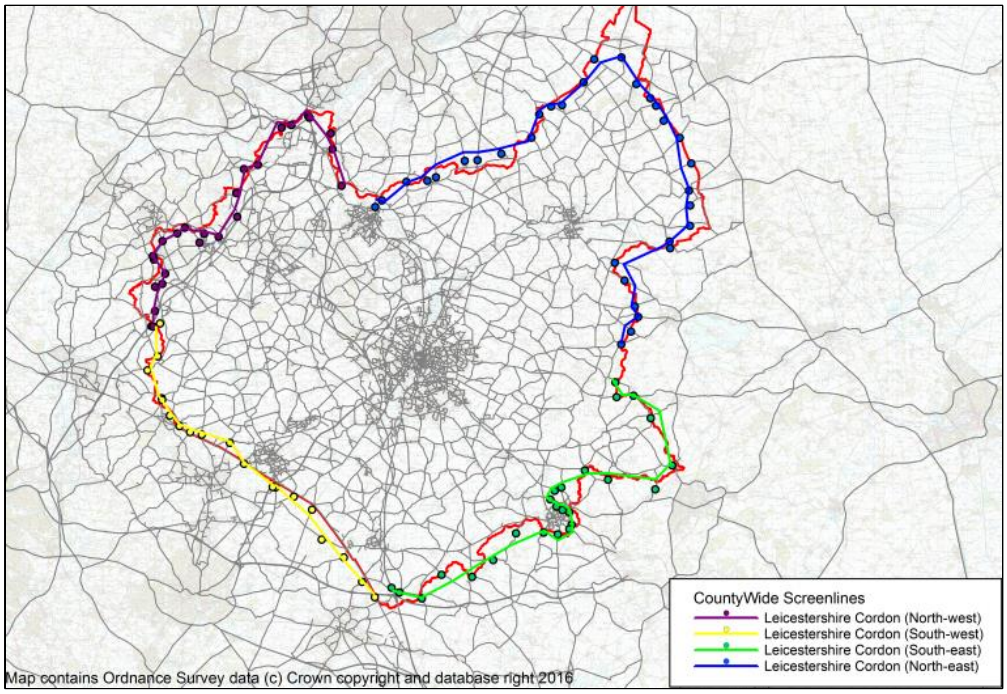
2.2.2 These screenlines provide coverage of traffic entering and leaving the urban area, and also for travel within Melton Mowbray. In total these screenlines and cordon consist of around 40 individual count locations within Melton Borough, with count data in both directions of travel (except in cases where the surveyed location is a one-way street).

2.2.3 All of these screenlines and cordons have been used as calibration data within the development of the highway model with the exception of the Melton Mowbray River Screenline, the Melton Mowbray Nottingham Road Screenline and the East-West Melton Mowbray Screenline within the southern half of the town.

2.2.4 These three screenlines have been used as independent validation data as part of the development of the model.

2.2.5 In addition to these screenlines, a cordon following the Leicestershire County boundary was also included in the count dataset for the base year model. This Leicestershire County cordon is shown in Figure 2.2, and this cordon has been split into four sections. The north-east section of the Leicestershire Cordon covers the Melton Borough boundary with neighbouring counties, and also includes some counts within Charnwood and Harborough. This cordon of the county has been used as calibration data within the matrix estimation of the base year model.

Figure 2.2: Leicestershire County Screenline



2.3 Observed Journey Time Routes

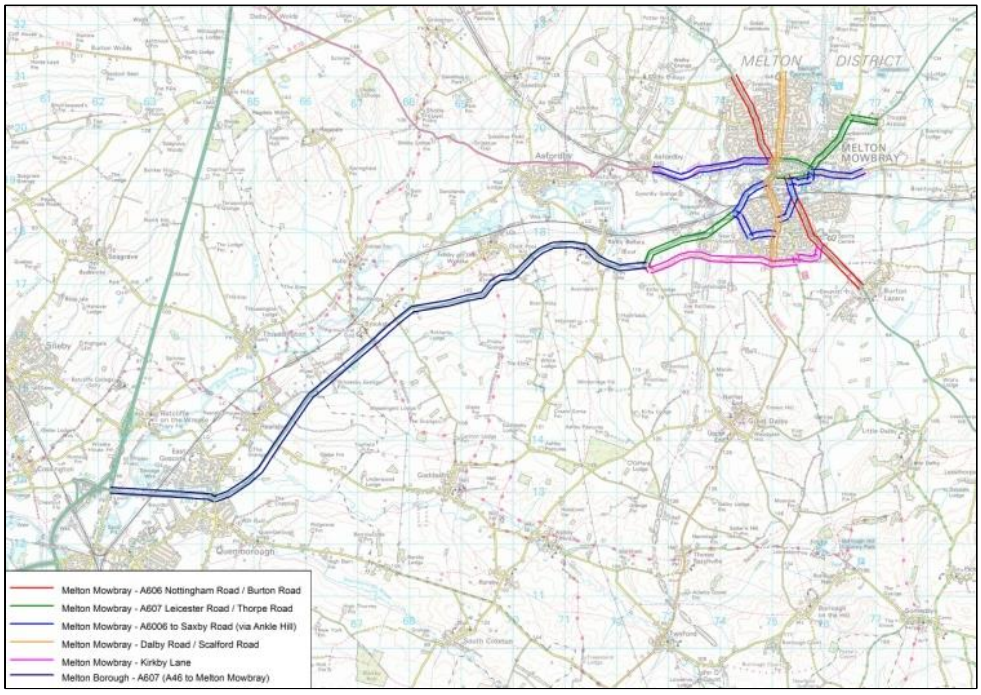
2.3.1 In addition to the count data within Melton Borough detailed in Section 2.2, a number of journey time routes have been defined to validate the modelled journey times in the base year. Detail on the use and processing of Trafficmaster data to derive these observed journey times is detailed within the LLITM 2014 Base highway LMVR.

2.3.2 Within Melton Borough a total of six, two-way journey time routes have been defined, which focus on the Melton Mowbray urban area. These are shown in Figure 2.3, and consist of journey time routes along:

- the A606 Nottingham Road and Burton Road;
- the A607 Leicester Road and Thorpe Road;
- the A6006 to Saxby Road via Ankle Hill;

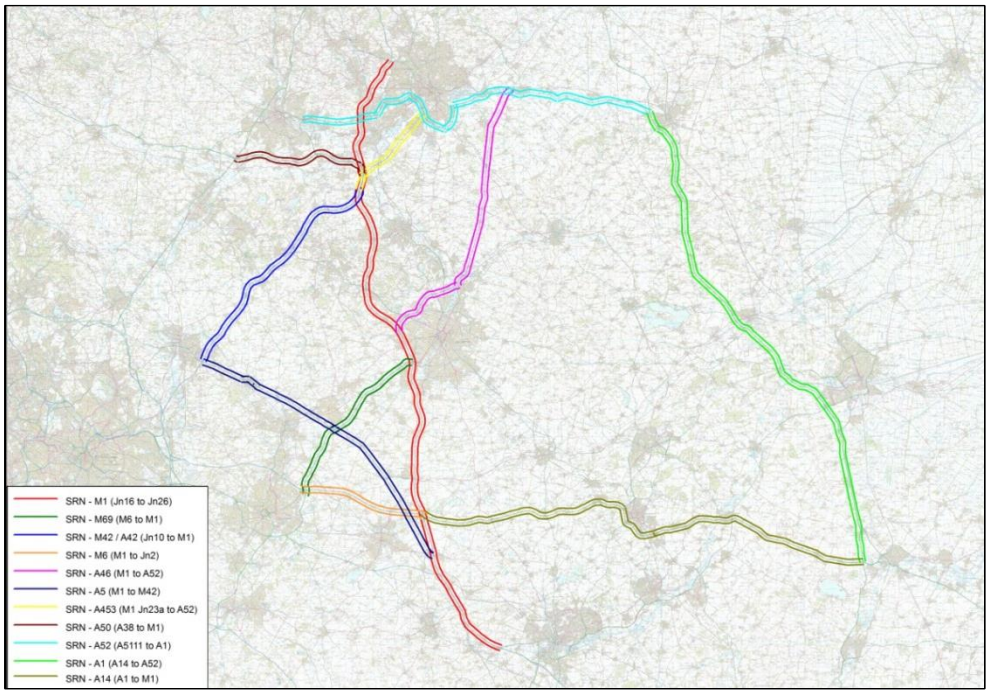
- Dalby Road and Scalford Road;
- Kirby Lane; and
- the A607 between the A46 and the junction with Kirby Road.

Figure 2.3: Melton Borough Journey Time Routes



2.3.3 In addition to these journey time routes derived within Melton Borough, observed journey time routes have also been defined to cover all the Strategic Road Network within Leicestershire. These journey time routes are shown in Figure 2.4, and include a journey time route along the A46, some of which runs along the western boundary of Melton Borough.

Figure 2.4: Strategic Road Network Journey Time Routes



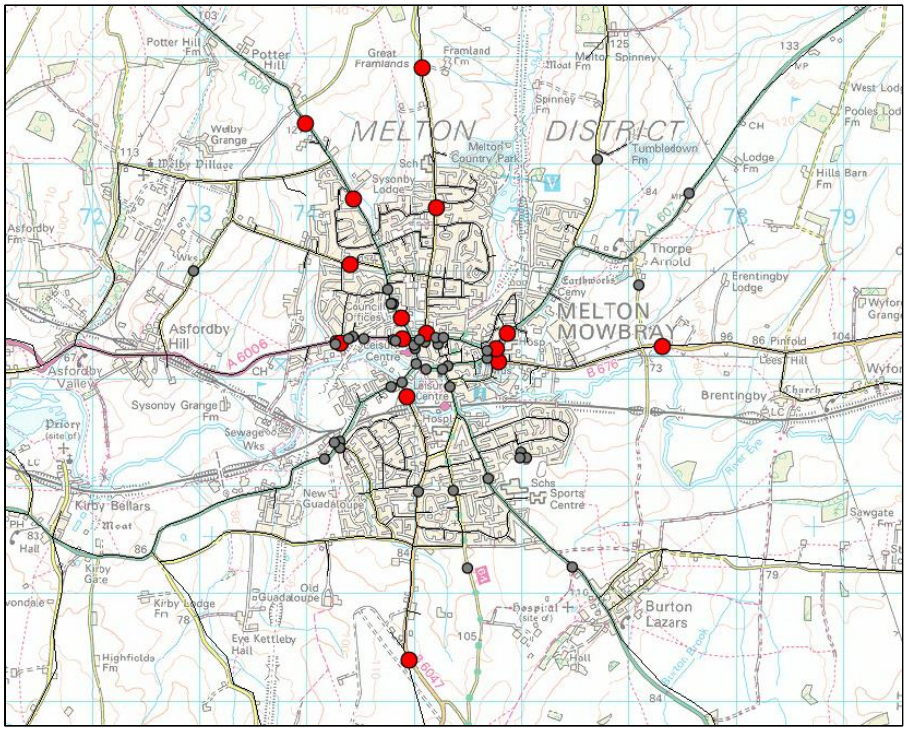
2.4 Additional Local Count Data

2.4.1 Since the count data were collected as part of the original model development, additional counts have been undertaken within Melton Mowbray. In total, an additional 57 Automatic Traffic Counts (ATCs) have been undertaken during October and November 2016.

2.4.2 Some of these count locations are on roads which are not represented within the base year highway model, and others are duplicates of counts locations already included within the dataset or are in close proximity to existing count locations. Removing these locations results in a total of 15 new counts to compare the modelled base year flows against.

2.4.3 The additional count locations are shown in Figure 2.5 with those which have been identified for use within this local LMVR highlighted.

Figure 2.5: Locations of Additional Melton Mowbray Counts (Red=used | Grey=not used)



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2.4.4 With the 15 additional ATC locations identified, these data were cleaned through a process of analysing the raw data for outliers within the dataset. Any outliers which were identified within the dataset were removed from the dataset. The count data were then summarised for an average day between Monday and Thursday for the three modelled hours: AM Peak hour (08:00 to 09:00); interpeak hour (average between 10:00 and 16:00); and PM Peak hour (17:00 to 18:00).

2.4.5 Given that the count data were collected during October and November 2016, they have then been adjusted to represent the base year / month of the highway model, which is April, May and June 2014. To make this adjustment, long-term ATC data across Leicestershire have been processed to estimate factors to both adjust between 2016 and 2014, but also to take account of the seasonality of traffic volumes between months of the year.

2.4.6 This processing of the long-term ATC data is discussed in '*PR205 - LLITM 2014 Base Data Collection Report*', with the outturn calculated adjustment factors as follows:

Table 2.4: Temporal Factors Derived from Long-Term C2 Count Data

	Year	2010	2011	2012	2013	2014	2015	2016
Month		1.052	1.050	1.054	1.045	1.000	0.992	**0.986**
1	1.137	1.196	1.194	1.199	1.189	1.137	1.128	1.122
2	1.074	1.130	1.128	1.133	1.123	1.074	1.066	1.060
3	1.035	1.089	1.087	1.091	1.082	1.035	1.027	1.021
4	1.015	1.068	1.066	1.070	1.061	1.015	1.007	1.001
5	1.024	1.077	1.075	1.080	1.070	1.024	1.016	1.010
6	0.979	1.030	1.028	1.032	1.023	0.979	0.971	0.966
7	0.989	1.041	1.039	1.043	1.034	0.989	0.982	0.976
8	0.997	1.048	1.047	1.051	1.042	0.997	0.989	0.983
9	0.972	1.022	1.021	1.025	1.016	0.972	0.965	0.959
10	**1.002**	1.054	1.052	1.056	1.047	1.002	0.994	**0.988**
11	**1.018**	1.071	1.070	1.074	1.064	1.018	1.011	**1.005**
12	1.092	1.149	1.147	1.151	1.141	1.092	1.084	1.077

2.4.7 These are summarised as follows:

- 2016 to 2014 adjustment of 0.986 (i.e. an average 1.4% increase in traffic between 2014 and 2016)
- October to April/May/June adjustment of 1.002, and between November and April/May/June of 1.018
- Combined, this results in an adjustment factor of 0.988 for counts undertaken in October 2016, and 1.005 for counts undertaken in November 2016.

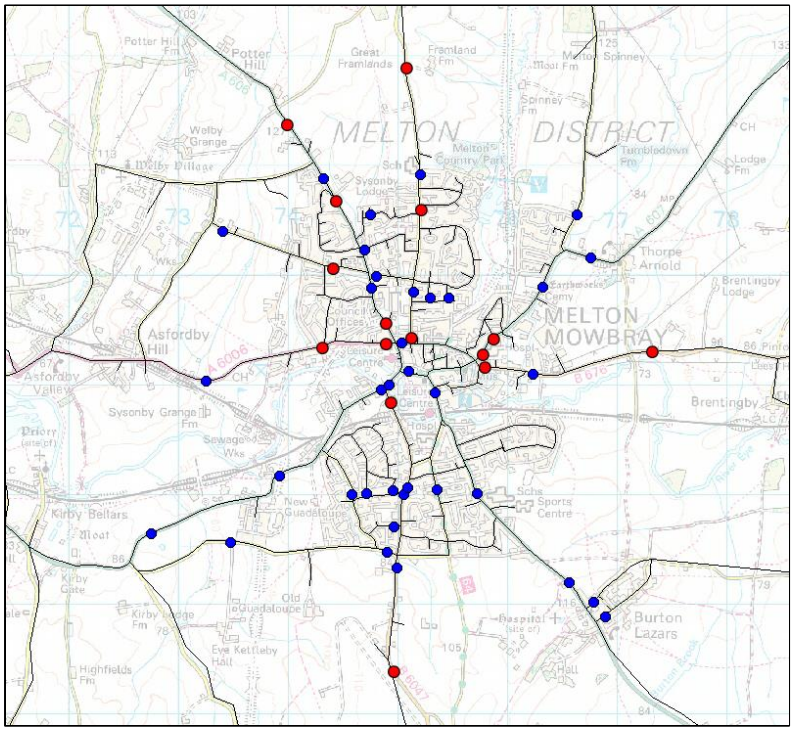
2.4.8 The ATC data processed give observed total volumes, but do not provide an accurate classification of these volumes by vehicle type. Unlike the counts collated for the calibration and validation of the base year highway model, where the majority of ATCs had a corresponding manual classified count from which vehicle splits could be calculated, associated manual counts were not available for the additional 15 count locations.

2.4.9 Therefore, vehicle splits between car, LGV and HGV traffic have been calculated from the existing count dataset. Vehicle splits from a nearby count location or locations have been used to provide the proportion of car, LGV and HGV traffic at the additional count locations.

2.4.10 The location of these additional counts in relation to the existing counts used in the development of LLITM 2014 Base is shown in Figure 2.6. This demonstrates that there are existing counts, from which the vehicle split has been sourced, within a reasonable distance to most of the additional counts available within Melton Mowbray. There are some additional counts where the distance between these locations and existing counts is larger, and these locations are on the edge of the urban area. In these locations there are no significant junctions or developments between the count locations.

2.4.11 Based on this, it is thought that use of the existing counts provides a reasonable estimate of the vehicle splits for the additional count data provided for this review.

Figure 2.6: Locations of Additional Melton Mowbray Counts (Red) and Existing Count Locations (Blue)



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2.4.12 With the additional counts processed, these have been checked for internal consistency and for consistency with the existing counts used in the calibration and validation of the highway model. Based on this review, two of the fifteen additional counts have been removed from the analysis.

- Two additional counts have been provided on Thorpe Road to the north of Norman Way, which are within ~200m of one another. This section is represented by a single link within the highway model, and so only one count can be applied to this link. Upon review of the consistency of these counts with counts elsewhere on Thorpe Road, the more northerly count on this section has been retained.
- An additional count has been provided on Dalby Road to the south of Melton Mowbray. This has been compared with the calibration count on Dalby Road to the south of Kirby Lane, just outside the urban area of Melton Mowbray. There is little land-use between these two counts, so the expectation is that the counts should be similar; however significant differences between the two counts were found. Therefore, the additional count on this road has been removed from the additional count dataset.

Section 3 – Local Highway Network Review

3.1 Introduction

3.1.1 The first stage of the model review was to undertake a detailed review of the highway network coding within Melton Borough, which broadly aligns with the anticipated area of influence of the proposed scheme options.

3.1.2 This review has considered the coverage of the simulation network within Melton Borough and also the coding of this network against the standards set out in the agreed LLITM 2014 Base coding manual (*'TN206 - LLITM 2014 Base SATURN Coding Manual'*).

3.1.3 The main LMVR for the highway model includes route analysis at a county-level as part of the validation of the model. To supplement this analysis, additional route analysis has been undertaken for routes within and passing through Melton Mowbray.

3.2 Local Network and Zone Coverage

3.2.1 Figure 3.1 shows the zone system adopted within LLITM 2014 Base for Melton Borough and for Melton Mowbray itself. Within the borough there are a total of 95 model zones, with around 60 of these covering the urban area of Melton Mowbray. The derivation of the model zones is detailed within the LLITM 2014 Base highway model LMVR; however the zone boundaries shown in Figure 3.1 are based on 2011 Census geographies.

3.2.2 Figure 4.5 within the highway model LMVR shows the maximum trip-ends across time periods and origins / destinations within Leicestershire, and highlights those zones with more than the suggested 300 PCU threshold contained within WebTAG. This figure shows that there are very few zones within Melton Borough with trip-ends of more than 300 PCUs.

3.2.3 Figure 3.2 shows the coded highway network within the base year model for Melton Borough and for Melton Mowbray. Within the figure for Melton Borough the extent of the simulation network (shown in black) is shown, with buffer network links shown in red. This figure shows that all major routes, the majority of rural routes, all known local rat-runs, and a significant proportion of the residential routes within Melton Mowbray have been coded into the base year model.

3.2.4 The simulation network extends to the north-west of the borough towards Nottingham, with limited buffer network to the east of Melton Borough, outside Leicestershire. Based on the analysis shown in Figure 1.1, all locations where significant flow changes due to the proposed scheme are expected are within the coded simulation network.

Figure 3.1: LLITM 2014 Base Zone System (Melton Borough and Melton Mowbray)

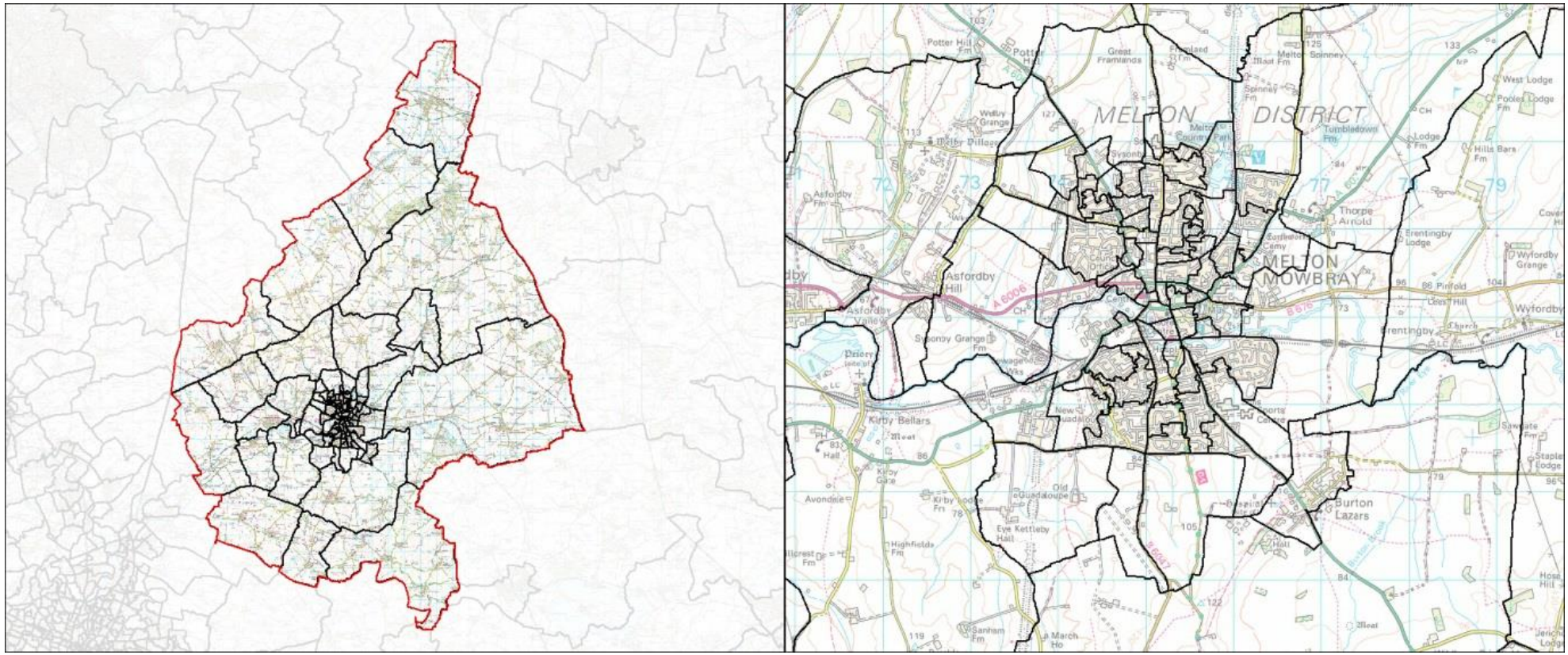

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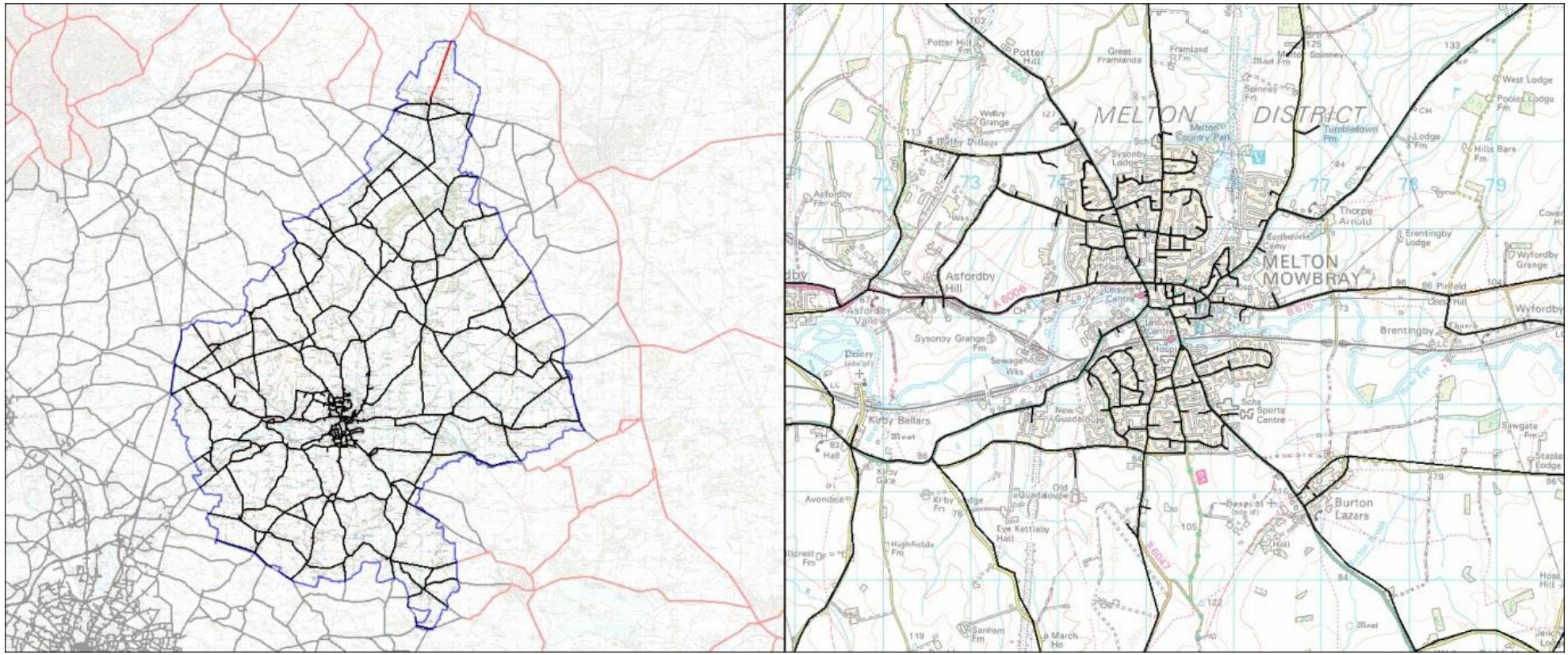
Figure 3.2: LLITM 2014 Base Network (Melton Borough and Melton Mowbray)



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3.3 Local Highway Network Coding Review

3.3.1 As part of the highway network coding review, the following four attributes of the coded network have been reviewed:

- the coded link distances within Melton Borough (aligned with the initial Area of Influence);
- the coded number of lanes and the applied speed-flow curve for links within Melton Borough;
- the coded junction type and the applied saturation flows for all junctions within Melton Mowbray; and
- the location of centroid connectors for zones within Melton Mowbray.

3.3.2 The focus of the review of junction coding and centroid connectors has been focussed on the Melton Mowbray urban area, and does not cover Melton Borough as a whole. The rationale for this is that it is the junctions within the urban area which are likely to generate delay due to congestion, and the junctions within the rural areas of Melton Borough are likely to be significantly below capacity. Within the rural areas the key driver to routeing will be the coded distances and speed-flow curves, which is why these areas have been included in the review of these network attributes.

Coded Link Distances

3.3.3 For the coded link distance review, the node coordinates for the nodes at either end of a link have been used to calculate the "crow-fly" distance for each link. This "crow-fly" distance forms a lower bound on the coded distance, and we would also not expect the coded distances to be significantly longer than the "crow-fly" distance. This analysis relies on the accuracy of the coded node coordinates, and any errors in the node coordinates will impact on the outcomes of this review.

3.3.4 Based on this analysis, any link which is more than 10% shorter than the "crow-fly" distance, and where the absolute difference between the coded and "crow-fly" distance is greater than 30m have been investigated. There are 44 links within the area of interest which meet this criterion. For links which are longer than the "crow-fly" distance, this criterion has been adapted such links are highlighted where the coded distance is more than 30% longer than the "crow-fly" distance and the absolute difference is at least 30m. There are 59 links which meet this criterion.

3.3.5 With these links reviewed, the majority of links identified have been coded correctly, but errors in the coded node coordinates leads to the given links being highlighted as part of this analysis. Two adjacent links were identified with an error in the coded distance: the section of the A606 Nottingham Road between St Bartholomew's Way and Brampton Road; and the section of St Bartholomew's Way approaching the A606 Nottingham Road.

3.3.6 These sections of the A606 Nottingham Road and St Batholomew's Way have been recoded from 435m to 320m and 149m from 115m respectively. Speed flow curves in this area were reassessed and small changes were made on St Bartholomew's Way to ensure consistency with the surrounding area of the model and maintain the flow performance against counts on Welby Road.

Coded Link Lanes and Speed-Flow Curves

3.3.7 The coded number of lanes and the speed-flow curves has been extracted from the base year highway model. Figure 3.3 and Figure 3.4 show the coded number of lanes within the area of interest and within Melton Mowbray respectively. Figure 3.3 shows that within the area of interest the majority of links, with the exception of the A46, are coded with a single lane. Analysis of this figure has highlighted has however highlighted some coding errors at the junction between the A46 and the A606.

3.3.8 The A46 / A606 junction was thoroughly reviewed and a number of changes made. This review included the number of coded lanes and associated speed-flow curves, and also the connectivity of the routes accessing the A46 / A606 junction. An amendment to the location of the junction between the gyratory and Kinoulton Lane was made as part of this review.

Figure 3.3: Coded Number of Lanes (Area of Interest)

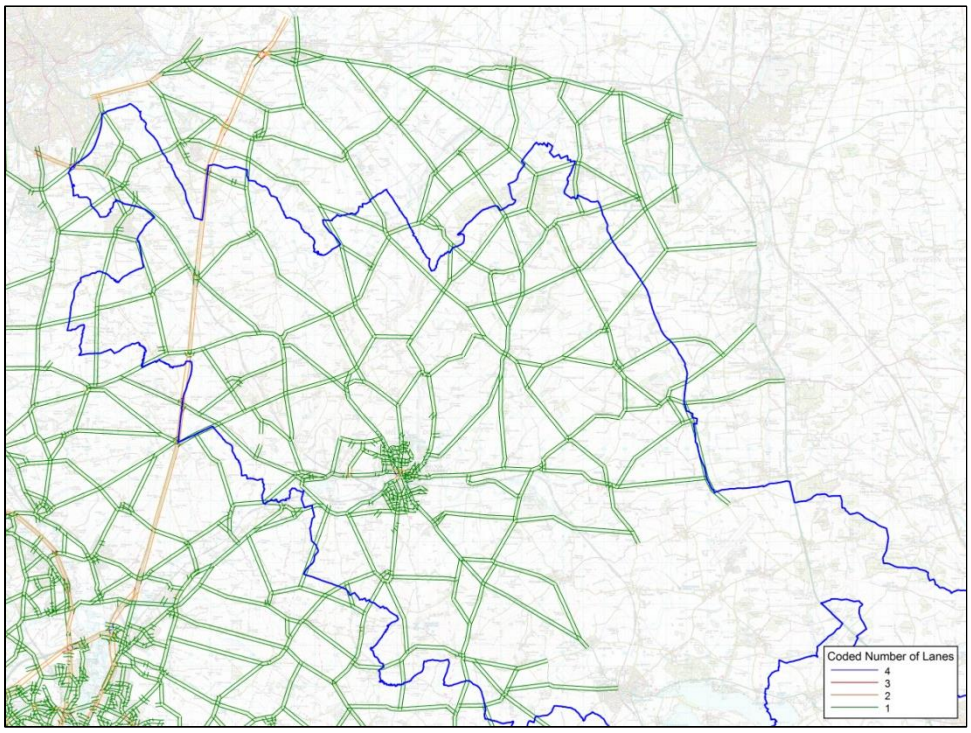

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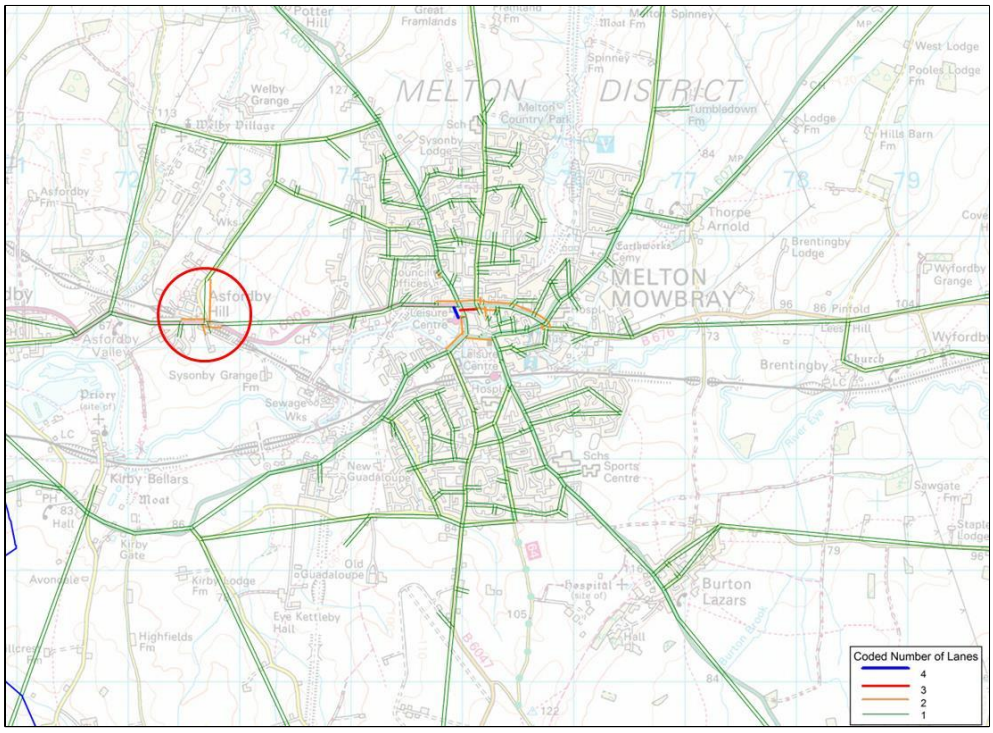
Figure 3.4: Coded Number of Lanes (Melton Mowbray)



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3.3.9 Considering Figure 3.4 which shows the coded number of lanes within Melton Mowbray, these have been reviewed based on imagery from Google Maps. The only inconsistency highlighted as part of this review relates to the coding of links approaching the junction between the A6006 Asfordby Road and Welby Road (highlighted). This has, incorrectly, been coded as a two-lane approach with a flare,

whereas these links should be coded as a single-lane approach with a flare. This has been corrected within the base year highway networks.

3.3.10 In addition to the coded number of lanes, the speed-flow curve applied to the links has been reviewed. The focus of this review has been on the coded free-flow speeds and their consistency with the posted speed limits, and Figure 3.5 and Figure 3.6 show the coded free-flow speeds within the area of interest and within Melton Mowbray respectively.

Figure 3.5: Coded Free-Flow Speed (kph) (Area of Interest)

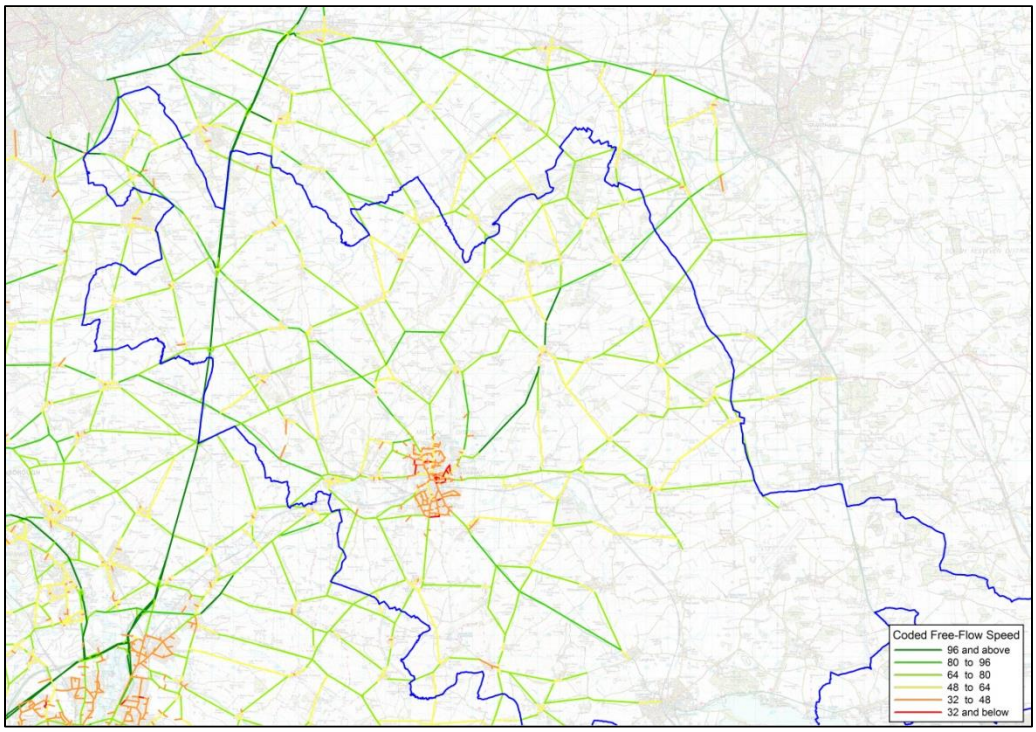

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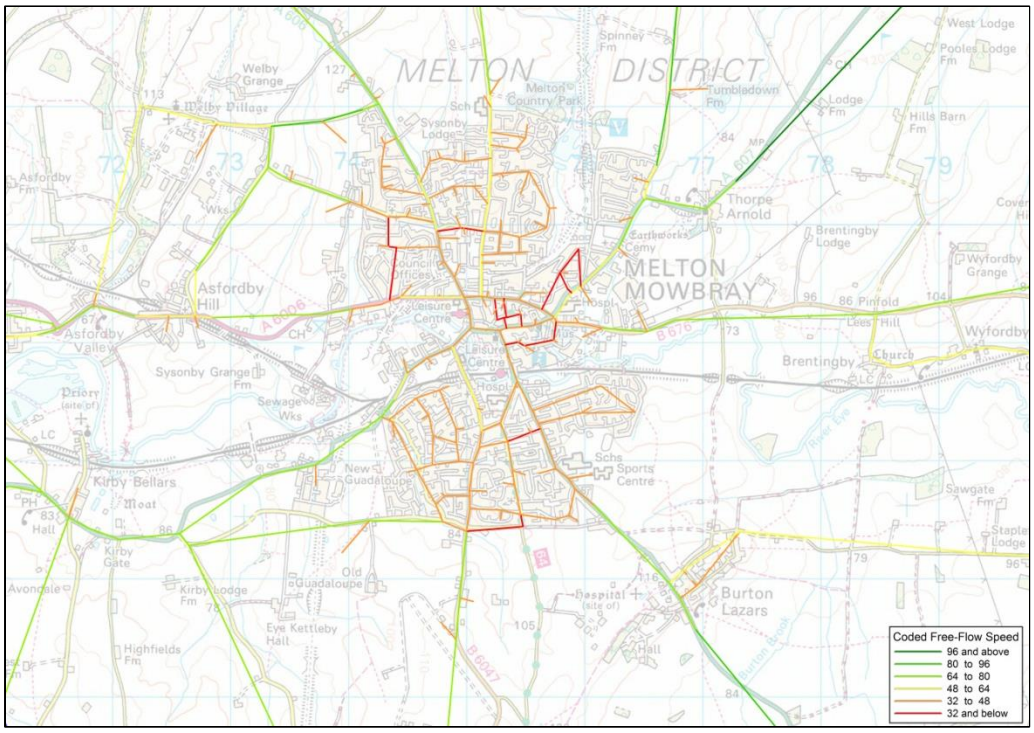
Figure 3.6: Coded Free-Flow Speed (kph) (Melton Mowbray)



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3.3.11 It is also possible to use this analysis to cross-check the coded number of lanes with the applied speed-flow curve. The only inconsistency between the coded number of links and speed-flow curve is on the approaches to the A6006 Asfordby Road junction with Welby Road. As previously discussed, at this location the coded number of lanes is incorrect; however a single-lane speed-flow curve has been applied to these links. On this basis it is not expected that correcting this error will result in significant flow changes within the base year models.

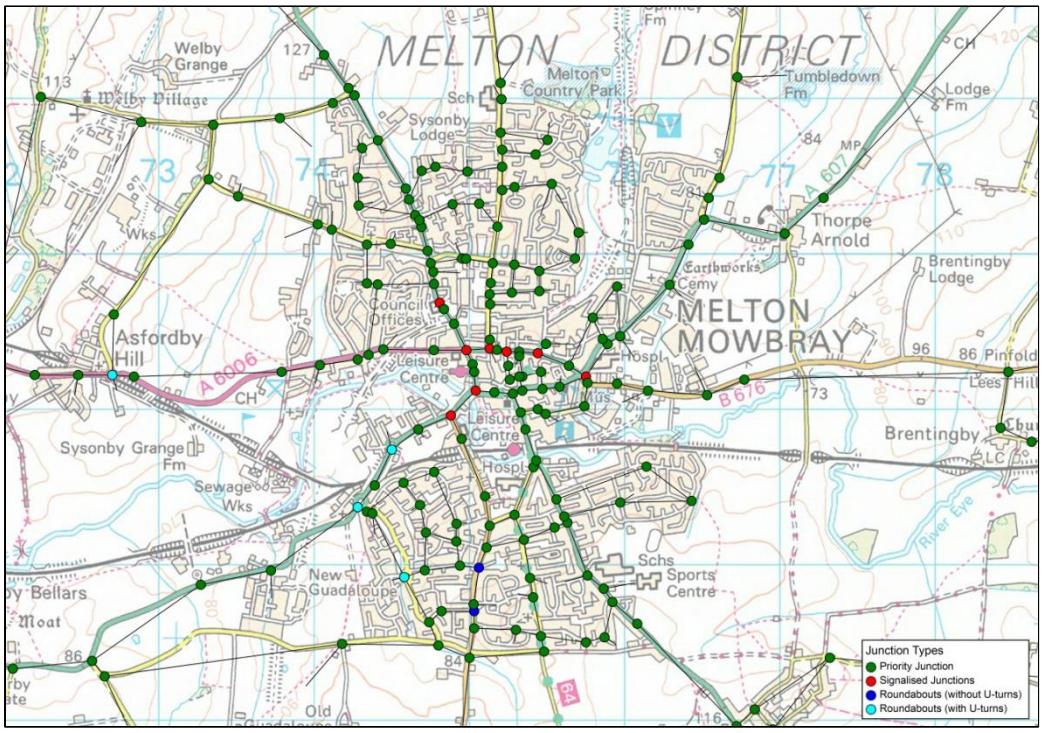
3.3.12 Taking into account that the coded free-flow speeds, especially within Melton Mowbray where fixed speed links have predominately been coded, will have been calibrated to improve the model routeing and journey time validation, no errors in the coded speed-flow curves have been identified as part of this review.

Coded Junction Types and Saturation Flows

3.3.13 The coded junction types have been extracted from the base year networks for Melton Mowbray, and have been compared against Google Maps. The classification of coded junctions into priority junctions, signalised junctions and roundabouts for Melton Mowbray is shown in Figure 3.7.

3.3.14 The outcome of this review was that no instance of an incorrectly coded junction type has been found within Melton Mowbray.

Figure 3.7: Coded Junction Type (Melton Mowbray)



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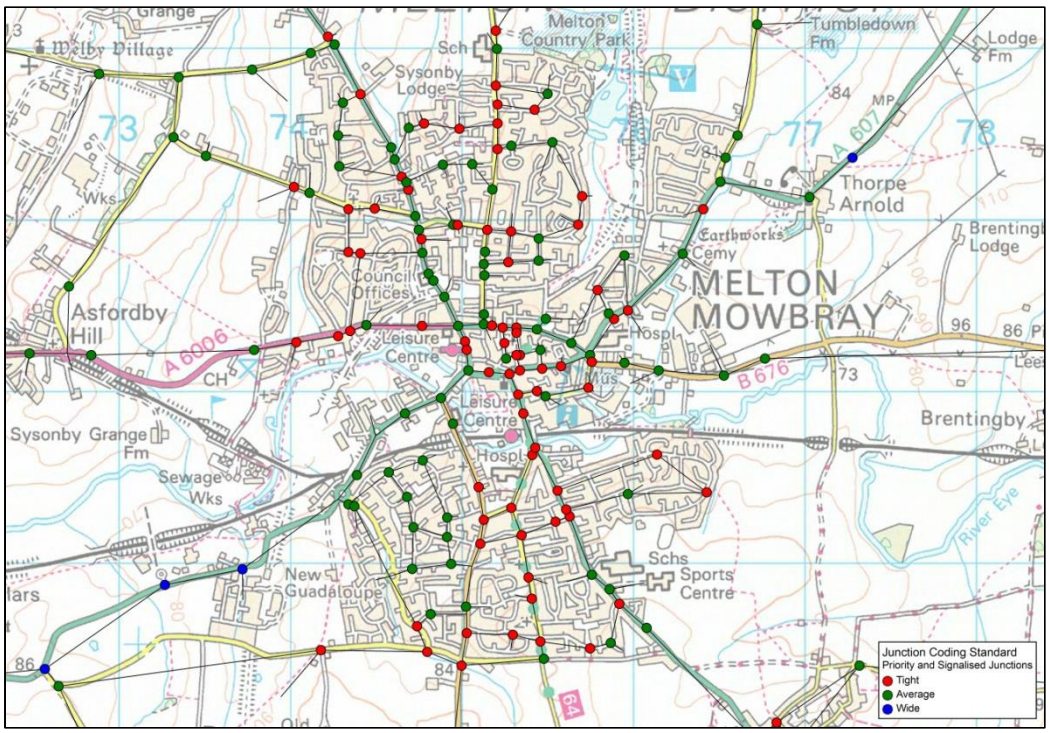
3.3.15 In addition to the coded junction type, the 'standard' of the coded junction has also been reviewed. Within the coding manual for LLITM 2014 Base, three standards of junction have been defined for priority and signalised junctions. Figure 3.8 shows the standard adopted within the base year model for all priority and signalised junctions within Melton Mowbray.

Figure 3.8: Coded 'Standard' of Priority and Signalised Junctions (Melton Mowbray)



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3.3.16 It is recognised that, as with the coded fixed speeds within the urban area, these assumptions on the standard of priority and signalised junctions may have been calibrated as part of the base year model validation. With this in mind, the review of the coded junction standards has not resulted in any junctions being identified where we judge there to be an error in the application of the coding standards.

3.3.17 This review of coded saturation flows against the agreed assumptions detailed within the highway coding manual has also considered the application of the standard saturation flows to the individual turns at the junctions within Melton Mowbray. This review has highlighted a small number of junctions where the saturation flows defined within the coding manual have been incorrectly applied based on the given turn at the junction. These have been corrected within the base year highway networks.

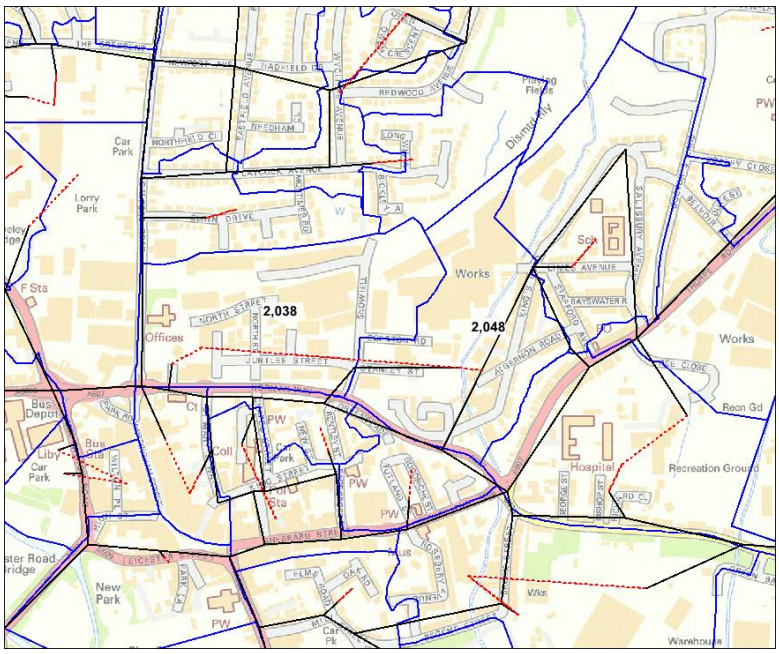
Coding of Centroid Connectors

3.3.18 The final stage of the network review was to undertake a review of the location of the centroid connectors coded to connect the model zones to the network. As with the coding of the junctions, this review has focussed on the Melton Mowbray urban area.

3.3.19 WebTAG advises that each zone be connected to the network at one location, representing the "average" location for demand to access the network to / from the given zone. There are some zones within the model whereby there are more than one zone loading point, and these multiple locations have been represented, although these instances have been kept to a minimum.

3.3.20 This review of centroid connectors has highlighted two areas where adjustments to the zone loading points have been investigated. The first of these are zones 2038 and 2048 to the north of the town centre. The zone loading for these two zones is shown in Figure 3.9.

Figure 3.9: Zone Loading Points for Zone 2038 and 2048



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3.3.21 The most westerly of these two zones (zone 2038) loads onto the network at two locations: firstly onto the A607 Norman Way via Soho Street; and secondly also onto Norman Way, but via Snow Hill. Considering the land-use within this zone, it was felt that the majority of the demand to / from this zone is loaded onto the network via the connector representing Snow Hill only, and that the connector to Soho Street should be removed.

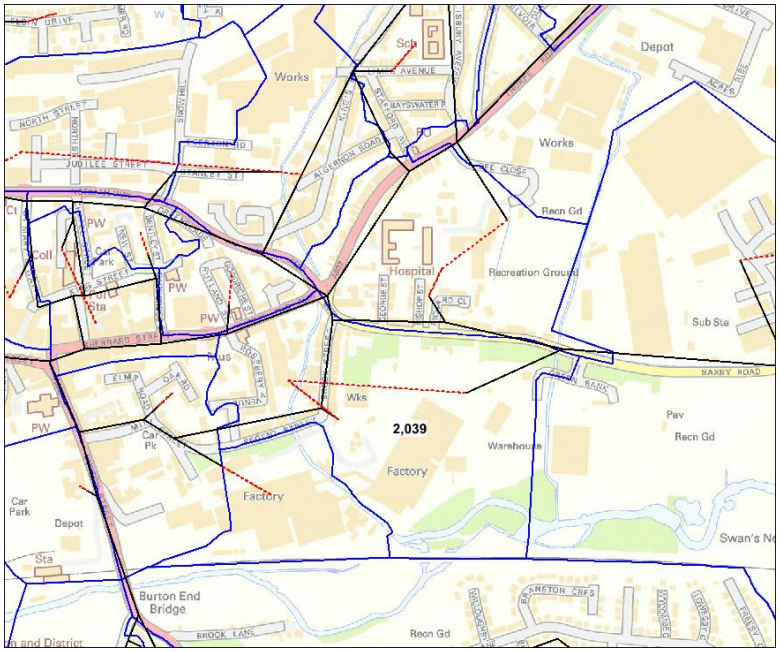
3.3.22 For this zone, the approach of connecting the zone only via Snow Hill was tested and found to generate significant inbound rat-running between Nottingham Road and Scalford Road, significantly affecting the flows at the count locations closest to Norman Way. The connection via Soho Street was

therefore retained, to represent the loading of the western part of the zone and minimise the impact on the model flow validation.

3.3.23 For the second of these two zones (zone 2048), the majority of the land-use contained within this zone is residential development along King's Road. Currently this zone also uses the connector representing Snow Hill, and the loading for this zone has been updated such that this zone loads onto the network in the vicinity of King's Road.

3.3.24 The second area highlighted within this review is zone 2039 to the south-east of the town centre. This zone contains both the Mars factory, which accesses the network on the B676 Saxby Road, and also the residential area between Brook Street and Rosebery Avenue, which accesses the network via both Brook Street and also onto the A606 Sherrard Street view Rosebery Avenue. Currently this zone is coded with loading points for the Mars access on the B676 and also onto Brook Street.

Figure 3.10: Zone Loading Points for Zone 2039



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3.3.25 The existing loading point onto Brook Street is a now disused exit from the Mars factory and testing has been undertaken with this connection removed, with and without a loading point via Rosebury Avenue onto the A606 Sherrard Street. Without the connection onto the A606, a large proportion of westbound trips rerouted via the exit onto the B676 and back into central Melton Mowbray on the B676. This approach created larger than observed flows on the westbound B676 and suggests that other loading points further east are required. With no other suitable loading point on the eastern part of Brook Street, the original loading point was retained and the additional loading point onto Sherrard Street via Rosebury Avenue was also added.

3.3.26 Given the location of this zone, it is judged that the adopted loading of demand to / from this zone would not have a material impact on the assessment of the proposed scheme, and is therefore appropriate for this application of the model.

3.4 Local Highway Network Routeing Review

3.4.1 In addition to reviewing the highway network coding, the routeing of traffic through Melton Mowbray has been reviewed. This review is in addition to the route analysis contained within the LLITM 2014 Base highway LMVR, and considered four zones within Melton Mowbray (north-east, north-west, south-east and south-west) and seven zones within the rural areas surrounding Melton Mowbray (to the north, north-east, north-west, south, south-east, south-west and east). Modelled routeing, by time period and vehicle type, has been reviewed for movements between these locations.

3.4.2 Due to the number of plots which have been produced as part of this review it is not possible to include all figures within this report; however Figure 3.12 provides a selection of model routes by vehicle type for a subset of the zone pairs and time periods assessed.

3.4.3 There is no independent information available on the routeing of traffic through Melton Mowbray, and therefore this review of the modelled routeing has been based on online route planners and knowledge of local congestion hot-stops which may influence traffic to favour minor roads. Our judgement on the modelled routeing based on the assessed zone pairs is that the routeing is plausible given the network topography and the congestion within the base year model.

3.4.4 It is worth noting that the routeing of HGV traffic is heavily influenced by the presence of HGV bans within the coded base year network. These bans allow traffic to access / exit zones, but do not allow through trips to use identified links. For example, within the Melton Rural North or Melton Rural South in the PM Peak routeing contained within Figure 3.12, the routeing of HGV demand is as a result of the HGV bans coded within the network.

3.4.5 Figure 3.11 shows the location of these coded HGV bans within the base year network, with the highlighted links being those where an HGV ban has been applied.

Figure 3.11: Coded HGV Bans within Base Year Network

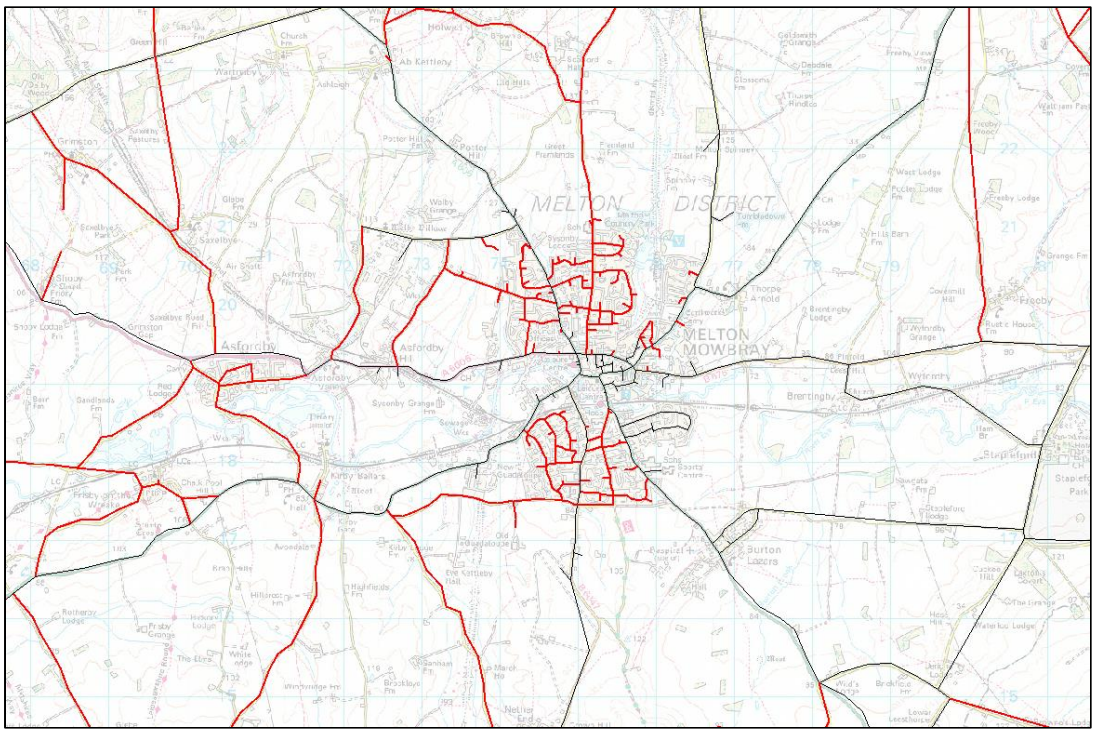

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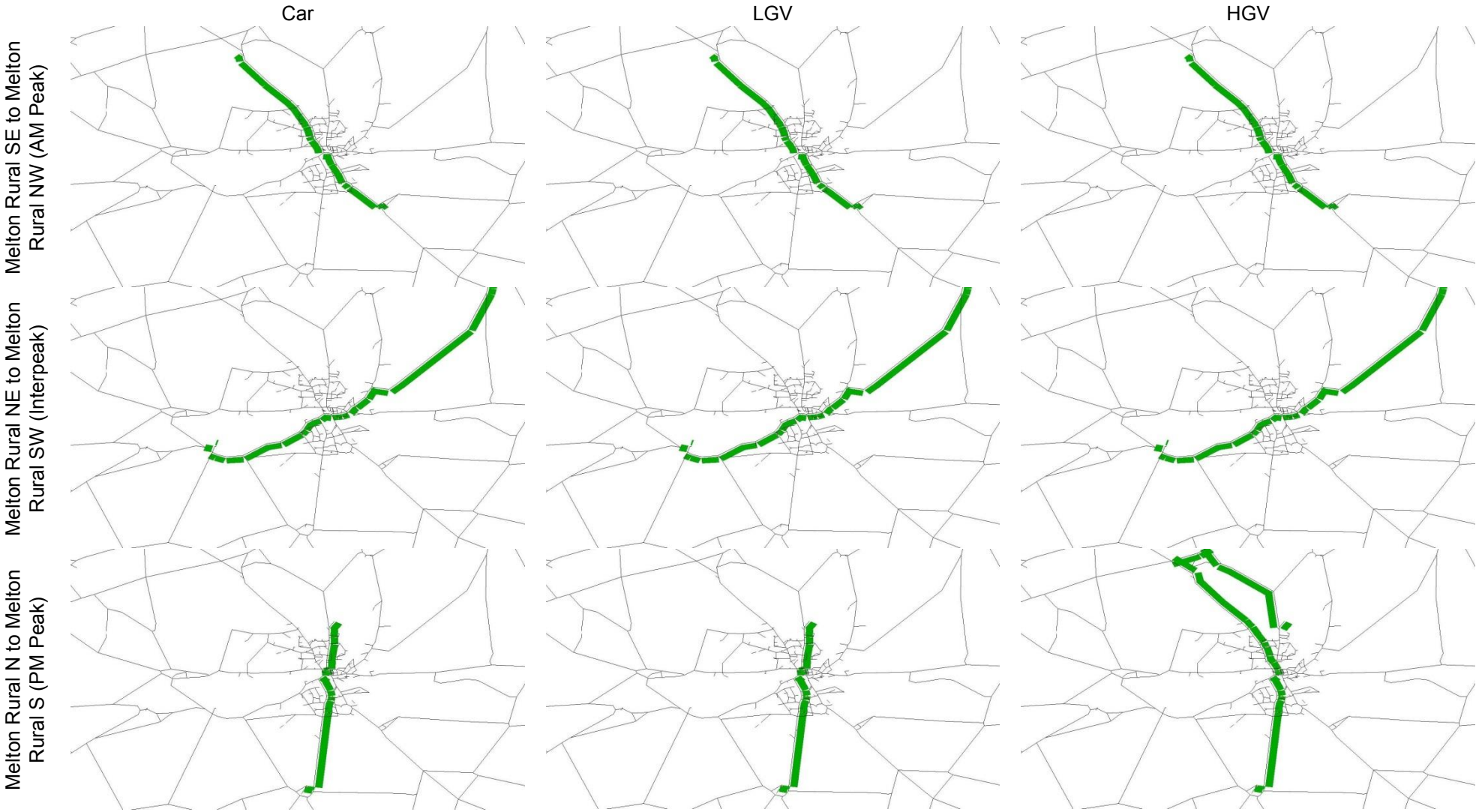
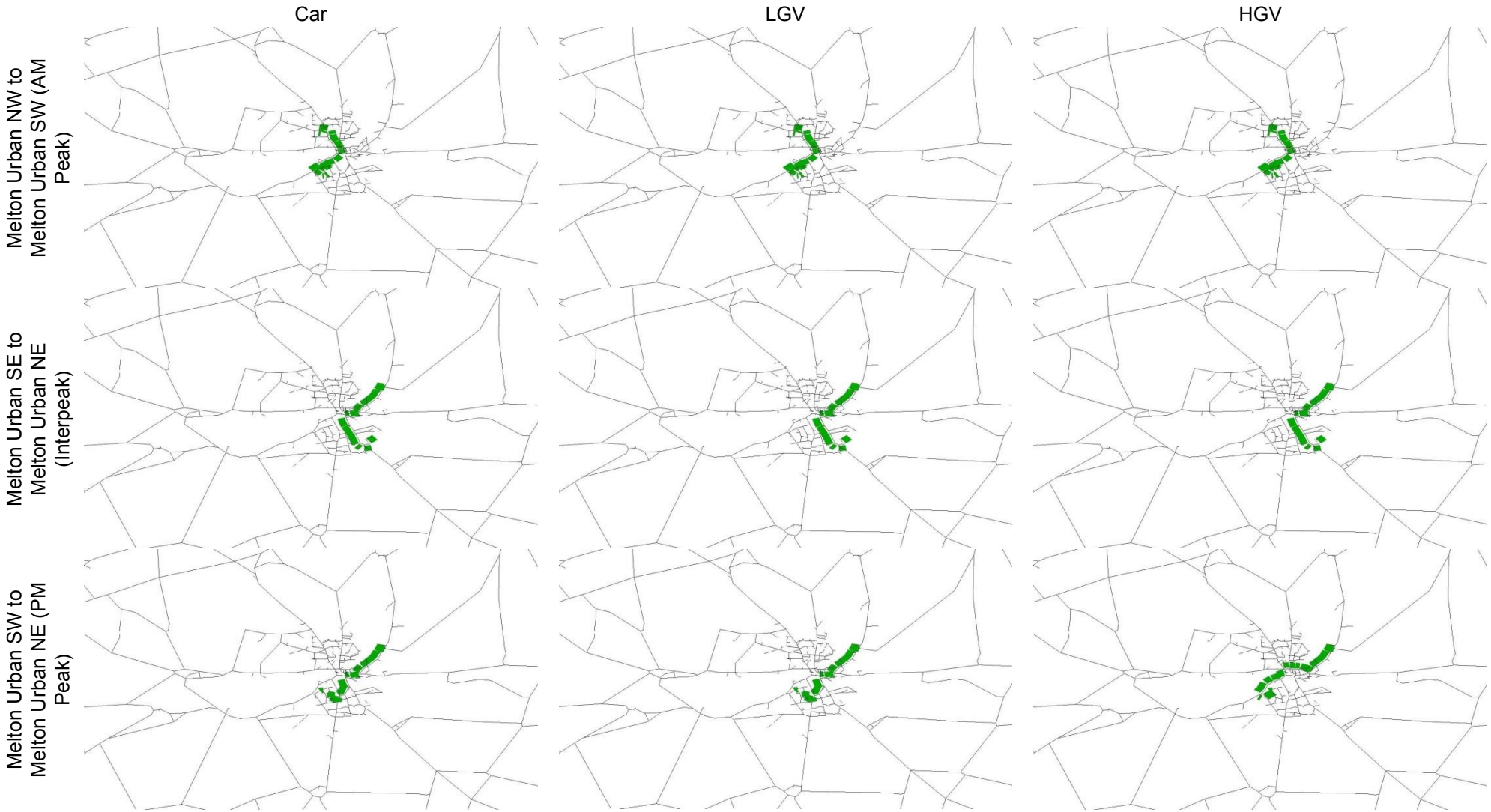
Figure 3.12: Selected Model Route Analysis Results




Car
LGV
HGV
Melton Urban NW to Melton Urban SW (AM Peak)
Melton Urban SE to Melton Urban NE (Interpeak)
Melton Urban SW to Melton Urban NE (PM Peak)

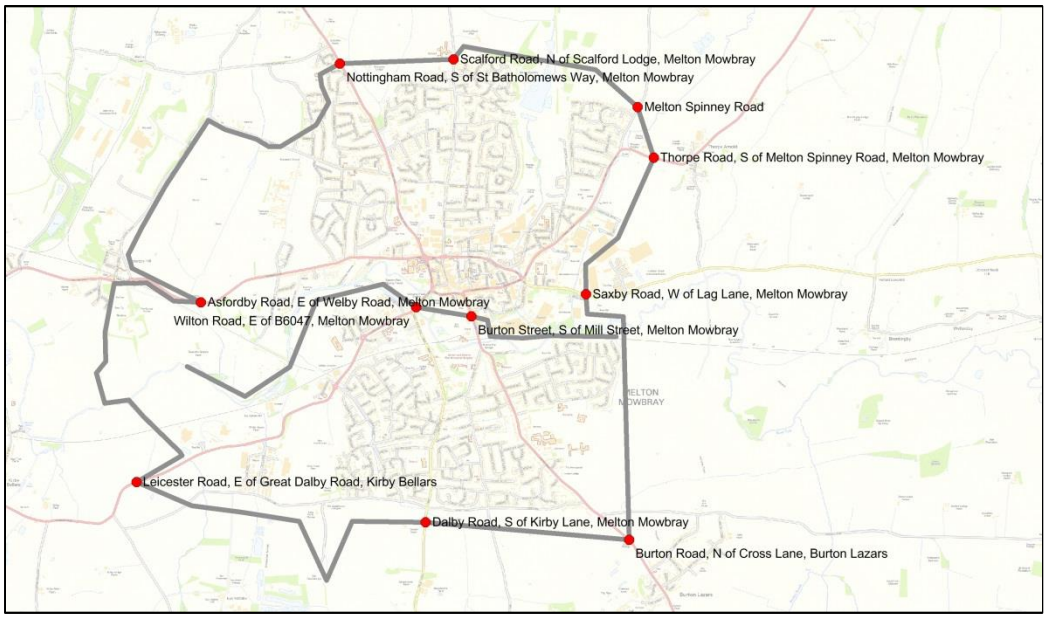
Section 4 – Highway Matrix Review

4.1 Introduction

4.1.1 In addition to reviewing the coded highway network, the base year highway matrices have been reviewed against other available data sources.

4.1.2 As part of the development of the LLITM 2014 Base highway model, a programme of roadside interview (RSI) surveys were undertaken across Leicestershire. This programme of RSI surveys included a cordon of Melton Mowbray urban area and RSI surveys at the two bridges across the River Eye within Melton Mowbray. These RSI locations are shown in Figure 4.1.

Figure 4.1: Melton Mowbray RSI Surveys



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4.1.3 When analysing data from the RSI surveys, RSI records from within the peak periods have been used in the comparison with the AM Peak and PM Peak modelled hours. This approach has been adopted to increase the sample size used within the RSI data, and is based on the assumption that the pattern of trips within the peak periods and individual peak hours are consistent[2]. Note that there is no distinction in time period definition within the interpeak between the RSI data and the model as both represent an average hour within the period.

4.1.4 To illustrate the broad travel patterns for trips intercepted by the Melton Mowbray RSI cordon surveys, 12-hour desire lines are shown in Figure 4.2, provided separately by car, LGV and HGV.

[2] A comparison of the pattern of trips observed within the modelled hour and the period within the morning and evening peak has been undertaken to confirm this assumption. When limiting the RSI records to the individual peak hour, the pattern of observed trips was not significantly different from that observed within the peak period.

Figure 4.2: 12 Hour Demand Desire Lines (Melton Mowbray RSI Cordon): Car

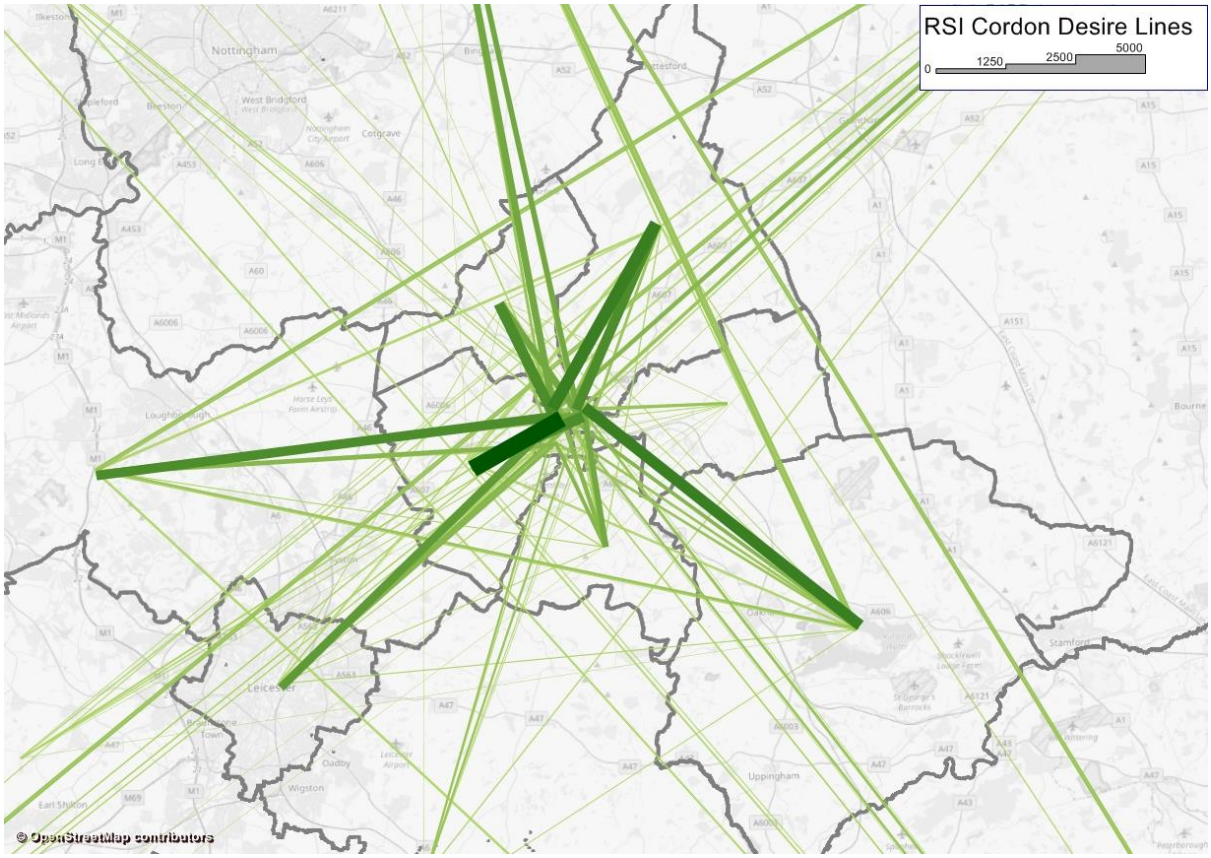


Figure 4.3: 12 Hour Demand Desire Lines (Melton Mowbray RSI Cordon): LGV

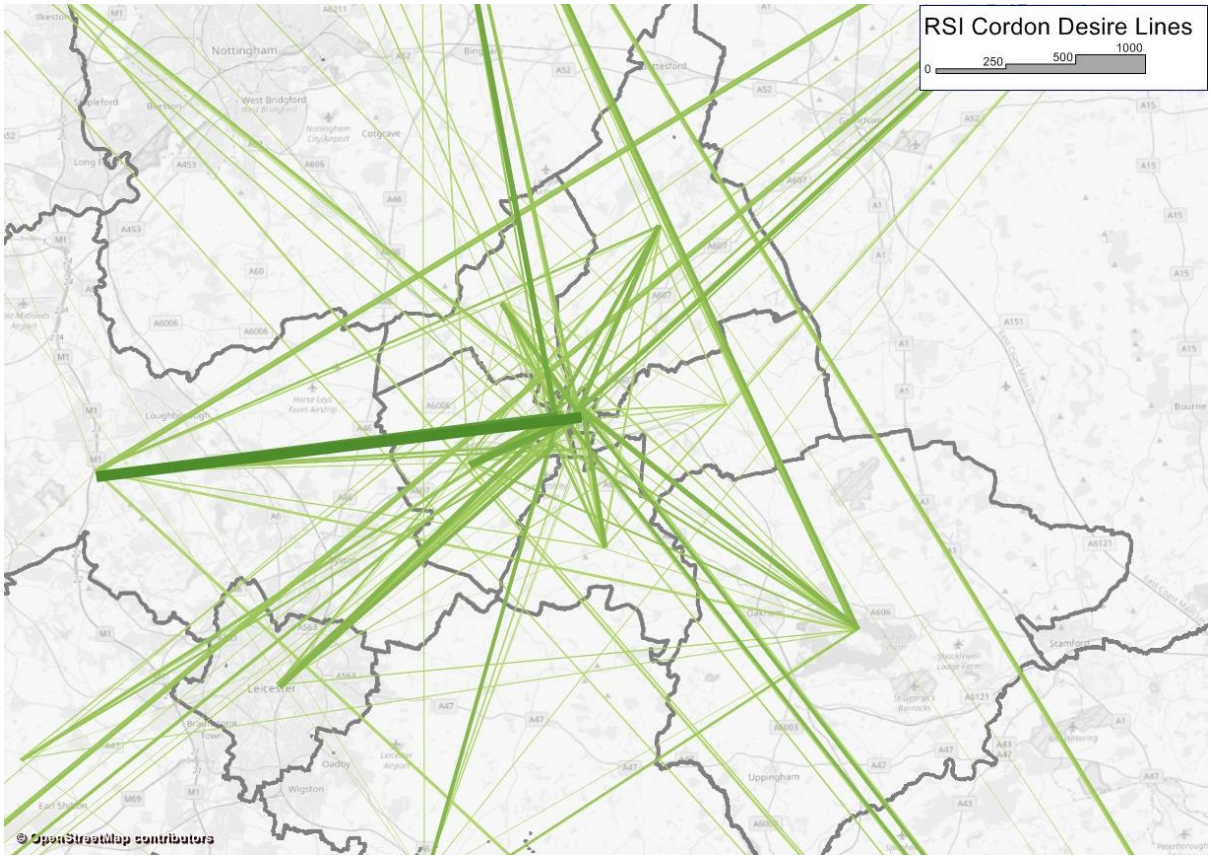
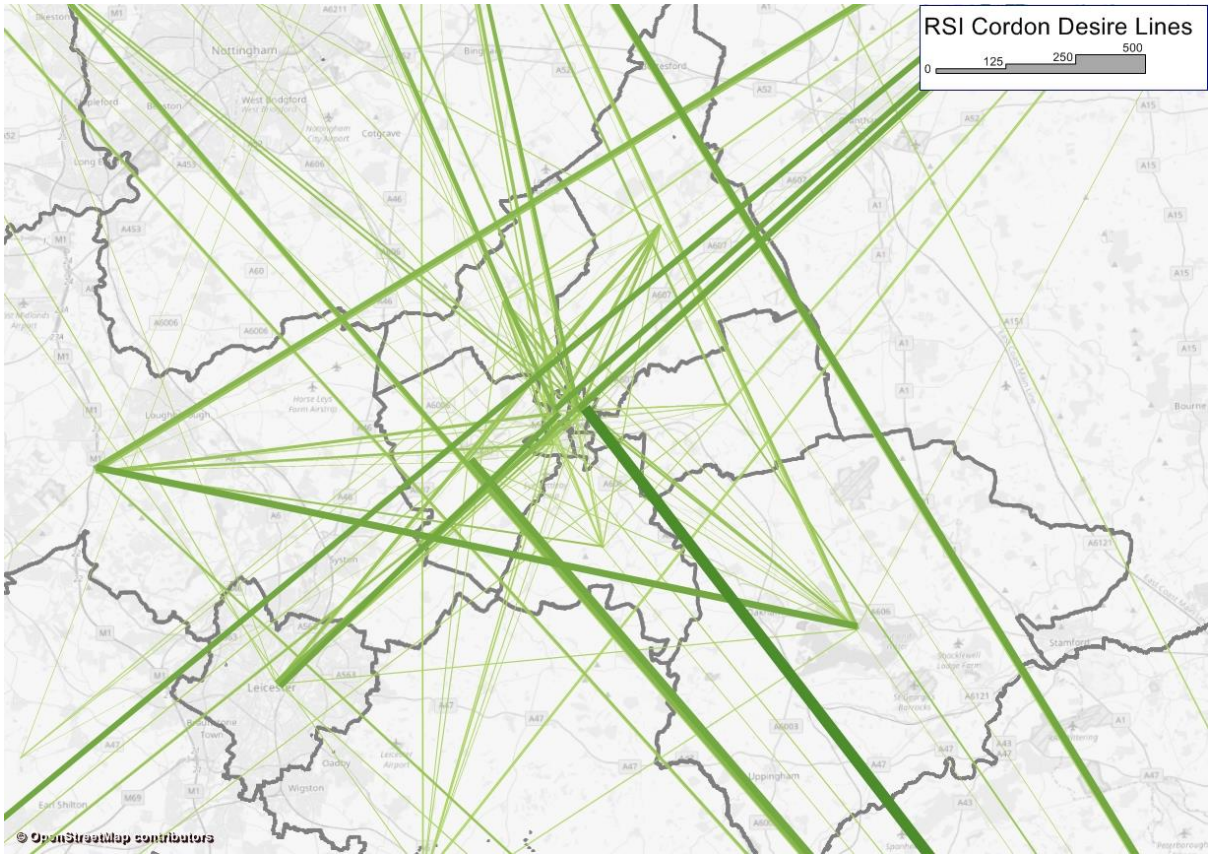


Figure 4.4: 12 Hour Demand Desire Lines (Melton Mowbray RSI Cordon): HGV



4.1.5 In addition to the 2014 RSI surveys undertaken around Melton Mowbray, the 2011 Census Journey to Work data also provides an independent data source for commuting demand, and has been used as part of this matrix review. It should be recognised that the 2011 Census Journey to Work matrix is not directly comparable with the commuting demand matrix due to differences in definition between the two datasets, and there are three years between the 2011 Census and the 2014 base year of the model.

4.1.6 For car travel demand, the primary source of data used in the highway matrix development is mobile phone data. Details on the verification of this data and the processing of this data for use within LLITM 2014 Base are given in the main LMVR for the highway model. One weakness of demand data from mobile phone data is the identification of short distance trips, and therefore shorter distance trips (less than 2.5kms) within the highway model have been infilled with synthetic demand. This means that, for car demand, the majority of trips within the Melton Mowbray urban area will be derived from the synthetic matrices, and are not observed within mobile phone data.

4.1.7 Freight demand within the base year model is purely synthetic as freight trips could not be accurately identified within the mobile phone data. This synthetic matrix build used trip-ends derived from the base year planning data and TRICS trip rates, and observed trip-lengths profiles from the National Travel Survey for LGV and the collated RSI data for HGV. The HGV demand was also controlled to the DfT's Base Year Freight Matrices.

4.1.8 The process by which freight trips have been removed from the mobile phone data provided is discussed within Section 7.6 of the highway LMVR under "Segmentation". This process used synthetic demand by vehicle type and purpose to disaggregate the provided mobile phone data.

4.2 Melton Mowbray Cordon Comparison

4.2.1 The Melton Mowbray Cordon captures highway demand entering and leaving the Melton Mowbray urban area. This cordon consists of 9 RSI surveys and includes two 'holes' within the cordon on Kirby Lane and Welby Lane. For these two locations, where an RSI survey has not been undertaken, an estimation of proxy RSI data have been made to provide a complete picture of travel demand to and

from the urban area. The 'hole' at Kirby Lane has used RSI records from the A607 Leicester Road adjacent to Kirby Lane, and proxy RSI records for Welby Lane have been estimated from a select link process on the previous 2008 base year version of LLITM. At both these locations, the proxy RSI records have been expanded to a count at the cordon 'hole'.

4.2.2 In order to compare the modelled demand against these RSI surveys, a series of select links within the prior matrix assignment and the matrix estimated assignment has been undertaken at the RSI survey locations. Any routeing errors in the assignments will impact on this analysis, but given that the base year model has been calibrated and validated, and given the topography of the road network in and around Melton Mowbray, it is thought that there are unlikely to be any significant routeing issues within the network.

4.2.3 Using the RSI surveys and the select links from the model, three comparisons of the demand have been undertaken. These are a comparison of average trip-lengths, a comparison of trip-length profiles, and a comparison of the proportion of through traffic between the RSI surveys and the modelled demand.

4.2.4 Table 4.1 shows the average trip-lengths for all cordon crossing points combined in both the inbound and outbound direction by time period for the prior matrix assignment, the post-matrix estimation assignment, and the average trip-lengths based on the RSI surveys. This table shows that there is a good fit between the modelled and observed average trip-lengths for car and LGV trips. There is more variation between the modelled and RSI average trip-lengths for HGV traffic, although it should be noted that the sample size for HGV traffic at the Melton Mowbray Cordon within the RSI data is small.

4.2.5 In the AM Peak the HGV average trip-length observed at the Melton Mowbray Cordon is based on around 100 observations, with around 230 observations in the interpeak period and around 50 observations in the PM Peak. This low sample size increases the uncertainty in the observed data for HGV traffic at the cordon.

Table 4.1: Average Trip-Lengths (km) for Melton Mowbray Cordon

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
HGV	131	149	129	131	117	120	74	63	93
LGV	66	71	61	51	50	49	57	50	54
Car	41	42	41	39	40	42	41	42	41
Overall	**54**	**63**	**49**	**48**	**48**	**46**	**45**	**45**	**44**

4.2.6 Whilst the sample size for LGV traffic is higher than that for HGV traffic, it is not sufficient to consider the average trip-lengths for either freight vehicle class at a more disaggregate level. For car traffic, the average trip-lengths have been calculated for inbound (the observed direction for the RSI surveys) and outbound direction, and for A-roads and non-A-roads separately. The results of this analysis is shown in Table 4.2, which demonstrates that there is a good fit between the modelled and observed average trip-lengths for car traffic at the Melton Mowbray Cordon.

Table 4.2: Average Trip-Lengths (km) for Melton Mowbray Cordon (Car)

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Overall	41	42	41	39	40	42	41	42	41
Inbound	39	41	42	37	39	42	39	43	42
Outbound	43	42	40	41	41	42	43	42	41
A-roads	42	44	41	41	42	44	42	45	43
Other	40	38	40	35	34	40	38	36	37

4.2.7 In addition to calculating the average trip-lengths, Figure 4.6 shows a comparison of the trip-length profiles for car traffic at the Melton Mowbray Cordon. This analysis shows the trip-length profiles by time period for all sites combined and in both directions, for inbound and outbound travel separately, and also separately for A-road and non-A-road traffic.

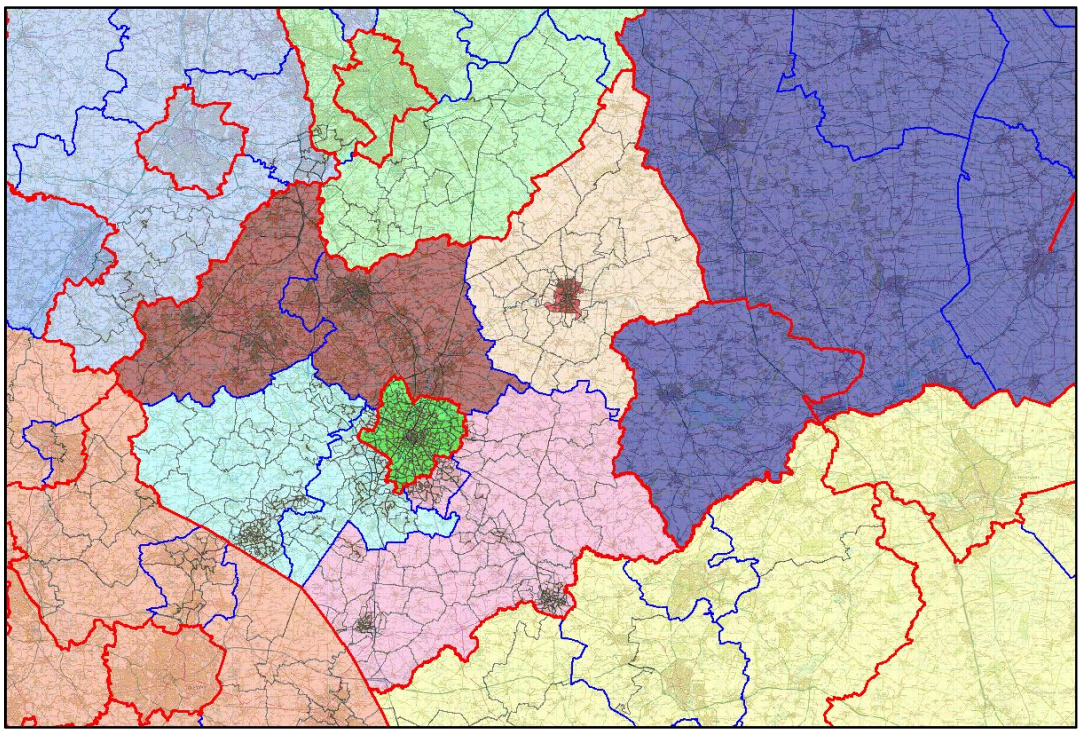
4.2.8 Figure 4.6 shows that for car traffic there is a good correlation between the modelled and observed trip-length profiles within the interpeak model; however the comparison in the AM Peak and PM Peak models shows a similar discrepancy between the modelled and observed data.

4.2.9 In the interpeak trip-length profiles, there are two distinct peaks within the profile at around 15 and 30kms, with the first of these two peaks containing a higher proportion of traffic. This pattern is reproduced within the RSI survey data in the two peak hours, but it is not reproduced within the modelled data for these two periods. Within the modelled data for the AM Peak and PM Peak, the second peak at around 30kms is the stronger peak within the profile, with a weaker peak in the trip-length profile at around 10 to 15kms.

4.2.10 Considering the inbound AM Peak car trips to the Melton Mowbray Cordon, Table 4.3 shows the top five sector-to-sector movements within the assignment of the prior matrices and the RSI survey data. The sector system has been defined based on districts within Leicestershire, and counties outside Leicestershire. The urban area of Melton Mowbray has been separated from the Melton Borough sector within this analysis. This sector system is shown in Figure 4.5.

4.2.11 This shows that whilst the top sector movement is the same in each dataset (Rest of Melton Borough to Melton Mowbray), the proportion of inbound traffic at the cordon making this movement is around 30% in the RSI data compared with around 20% in the prior matrix. Table 4.3 also shows that for some of the longer distance movements (such as Lincolnshire and Rutland to Melton Mowbray, Leicester City to Melton Mowbray, and Nottinghamshire to Melton Mowbray) there is a higher proportion of demand within the model compared with the RSI survey data.

Figure 4.5: Matrix Analysis Sector System



Map contains Ordnance Survey data © Crown copyright and database right 2017

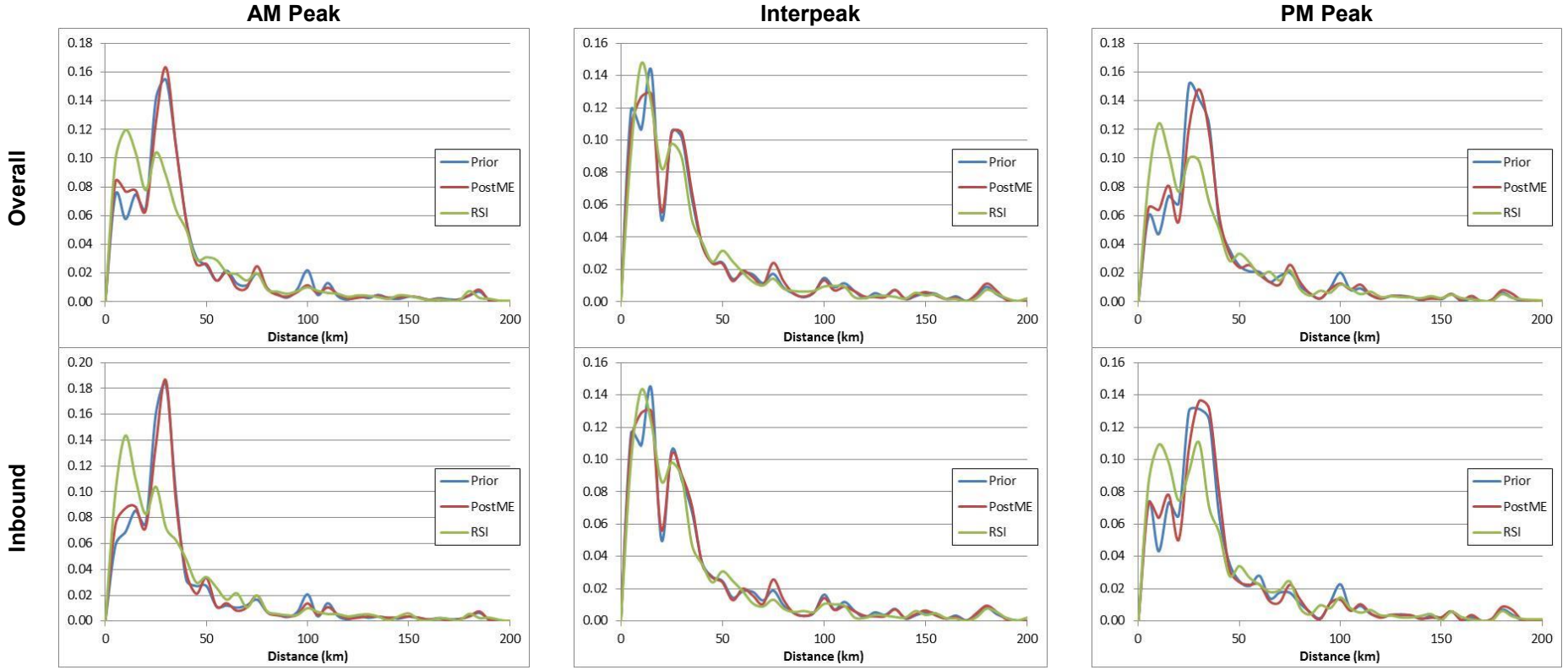
Table 4.3: Top Sector Movements for AM Peak Inbound Car Demand

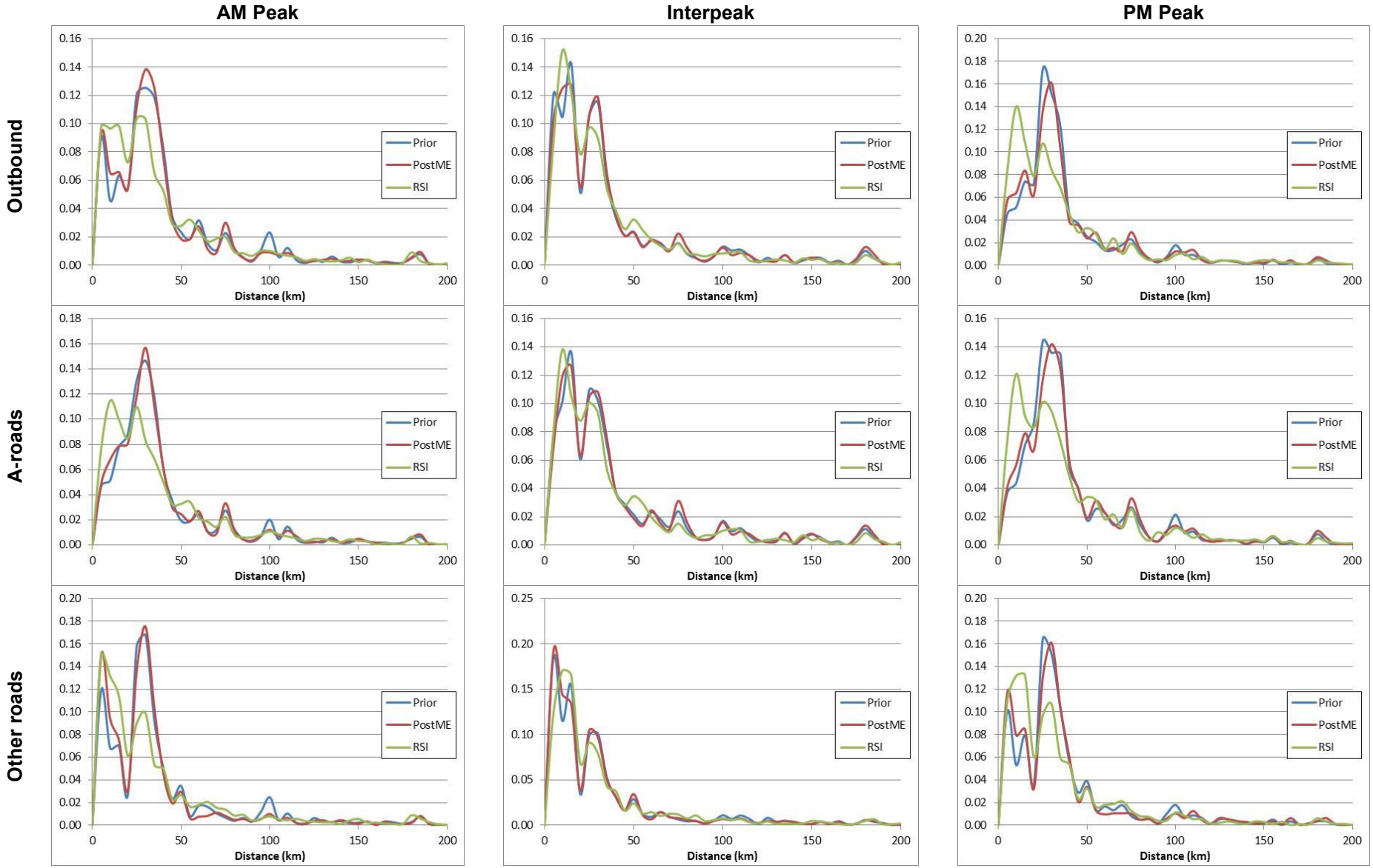
	Prior Matrix		RSI Data	
1	Rest of Melton Borough - Melton Mowbray	19%	Rest of Melton Borough - Melton Mowbray	31%
2	Lincolnshire and Rutland - Melton Mowbray	14%	Lincolnshire and Rutland - Melton Mowbray	9%
3	Leicester City - Melton Mowbray	12%	Charnwood and NW Leics - Melton Mowbray	7%
4	Nottinghamshire - Melton Mowbray	9%	Rest of Melton Borough - Rest of Melton Borough	5%
5	Charnwood and NW Leics - Melton Mowbray	8%	Nottinghamshire - Melton Mowbray	5%

4.2.12 The analysis contained within Table 4.3 suggests that, compared with the RSI survey data, the model understates the proportion of travel to / from Melton Mowbray and the rest of the borough, and overstates the proportion of demand to / from Melton Mowbray and Leicester City, Nottinghamshire and Lincolnshire and Rutland. This is consistent with the trip-length profile analysis, which also suggests that the model has an overstatement of movements around 30kms in length when compared with the RSI survey data.

4.2.13 Based on the sample size, the 95% confidence intervals around these proportions within the RSI data are expected to be around ±5 percentage points. This means that, given the uncertainty in the observed RSI data, the difference between the prior matrix and RSI proportions for all sector-sector movements except the 'Rest of Melton Borough to Melton Mowbray' movement are likely to be within the 95% confidence interval of the RSI data.

Figure 4.6: Melton Mowbray Cordon Trip-Length Profile Comparison (Car)




AM Peak
Interpeak
PM Peak
Outbound
A-roads
Other roads
Prior
PostME
RSI
Distance (km)

4.2.14 Considering inbound car traffic to the Melton Mowbray Cordon only, Table 4.4 provides a high-level summary of the key movements for car traffic inbound to the Melton Mowbray Cordon. This shows that the external-external movement (i.e. the Melton Mowbray through trips) is around 25% and 30% of traffic within the model, compared with between 30% and 35% for the RSI data.

4.2.15 The proportion for trips with an origin external to the RSI cordon and a destination within Melton North is comparable between the modelled data and the RSI data across all time periods. Compared with the RSI data, the overstatement of external-external trips within the model is largely countered by a corresponding understatement in the proportion of trips with an origin external to the RSI cordon and a destination within Melton South.

Table 4.4: High-Level Summary of Inbound Trips at Melton Mowbray Cordon (Car)

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
External-External	26%	28%	25%	26%	27%	26%	35%	31%	34%
External-Melton North	42%	45%	46%	47%	50%	48%	48%	53%	46%
External-Melton South	31%	27%	29%	27%	23%	26%	16%	15%	19%

Note that figures may not sum to 100% due to a small amount of traffic with an origin within Melton Mowbray which is also inbound to the cordon

4.2.16 Finally, using the RSI data and modelled data for the Melton Mowbray Cordon, the proportion of traffic which is through traffic (i.e. has both trip-ends outside the Melton Mowbray Cordon) has been calculated. This analysis is shown in Table 4.5 which gives the proportion of through traffic by time period and for overall traffic, and for inbound and outbound traffic.

4.2.17 Considering the inbound (i.e. observed) direction in more detail, the modelled proportion of through trips does not change significantly as a result of applying matrix estimation. The modelled proportions of through trips are however consistently lower than those observed within the RSI data by around 10 percentage points in the AM Peak and PM Peak hours, and around 4 percentage points in the interpeak hour.

4.2.18 In terms of the number of trips that this relates to, the inbound car cordon flows are around 2,500 vehicles in the two peak hours and around 1,650 vehicles in the interpeak hour. Applying the percentages detailed in Table 4.5 to these flows suggests that the model underrepresents car through trips by around 200 vehicles in the AM Peak and PM Peak, and by around 50 vehicles in the interpeak hour.

4.2.19 It is important when reviewing this analysis to consider confidence intervals around the observed data. All the RSI surveys were undertaken in the inbound direction, and for these locations the 95% confidence internal around the RSI through trip proportion is around ±7 percentage points in the AM Peak and PM Peak time periods, and around ±5 percentage points in the interpeak model at individual sites. There is additional uncertainty for the outbound direction where the observed RSI records have been reversed to estimate travel patterns, and this additional uncertainty has not been quantified.

Table 4.5: Proportion Through Trips at Melton Mowbray Cordon (Car)

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Overall	**26%**	**27%**	**26%**	**27%**	**27%**	**27%**	**35%**	**31%**	**34%**
Inbound	26%	28%	25%	26%	27%	26%	35%	31%	34%
Outbound	27%	26%	27%	28%	26%	29%	35%	31%	34%

4.3 Melton Mowbray River Screenline Comparison

4.3.1 In the context of the scheme a specific comparison has been undertaken using the two RSI surveys which form the Melton Mowbray River Screenline and select links on the prior matrix and post-matrix estimation matrix assignments.

4.3.2 At these two locations, the sample size for freight demand is small, especially for HGV traffic. This leads to significant uncertainty around the data for HGV traffic even for calculating average trip-lengths. The sample size for LGV traffic is higher, with around 60 records in the AM Peak, 90 in the interpeak and 35 in the PM Peak, but caution should be exercised when reviewing the results of the RSI surveys for LGV traffic.

4.3.3 Based on the observed data at the Melton Mowbray River Screenline, Table 4.6 presents the average trip-lengths by time period and vehicle class from the prior matrices, the post-matrix estimation matrices and the RSI surveys. The results for HGV traffic are included, but the sample size is too small to place any confidence on the RSI data for this vehicle class.

4.3.4 For LGV traffic the average trip-lengths from the RSI surveys are similar to those contained within the model; however for car traffic the modelled average trip-lengths are generally shorter than those observed at the RSI surveys. The difference varies by time of day, but the modelled average trip-lengths (after the application of matrix estimation) are between 20% and 30% lower than observed at the RSI surveys.

Table 4.6: Average Trip-Lengths (km) for Melton Mowbray River Screenline

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
HGV	135	155	134	143	126	134	38	23	75
LGV	43	47	36	39	39	36	43	49	29
Car	18	19	21	19	21	20	25	29	28
Overall	**30**	**39**	**28**	**29**	**29**	**25**	**27**	**32**	**28**

4.3.5 Considering the car trip-lengths in more detail, Table 4.7 provides a breakdown of the average trip-lengths for car demand by direction of travel across the screenline. Northbound at the Melton Mowbray River Screenline is the observed direction, with the observed RSI records having been reversed to estimate the southbound demand at the screenline. Table 4.7 shows that for car traffic at the Melton Mowbray River Screenline there is little variation in average trip-lengths by direction in either the modelled or observed data.

Table 4.7: Average Trip-Lengths (km) for Melton Mowbray Cordon (Car)

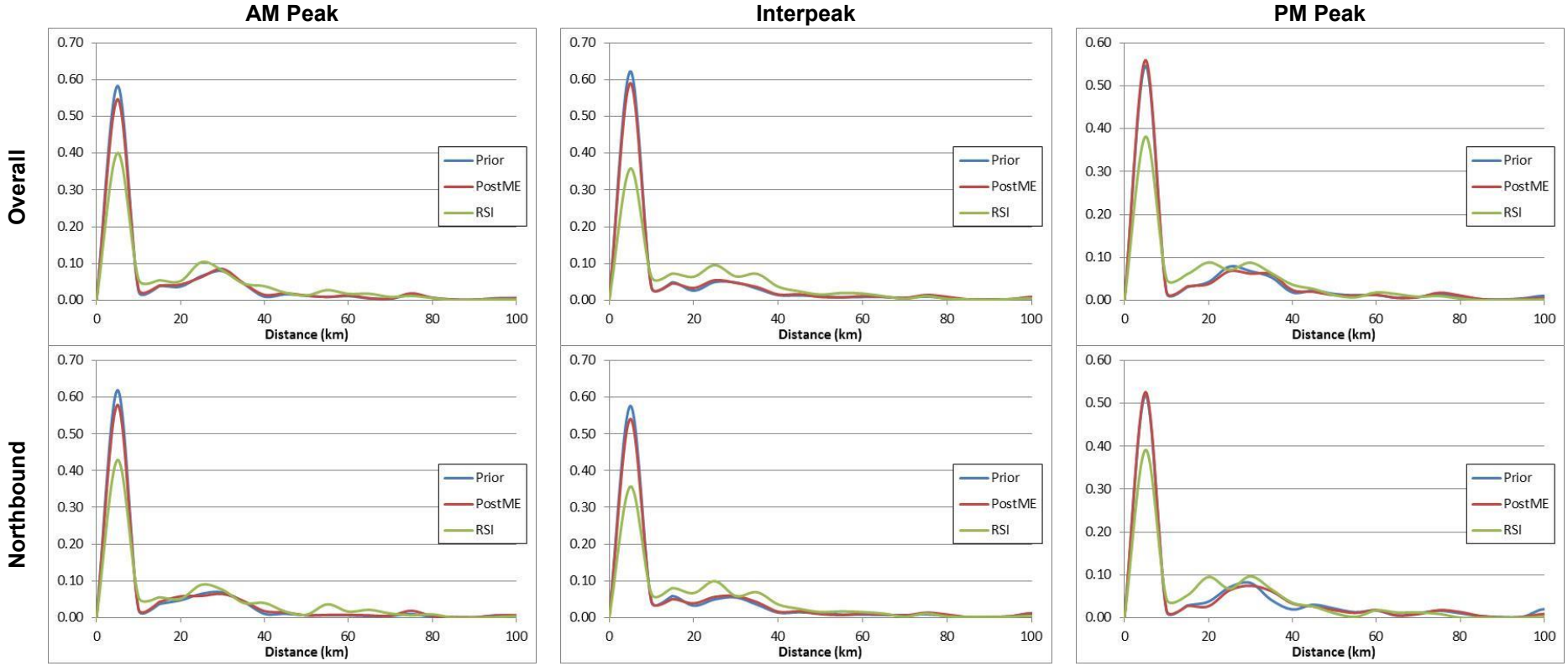
	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**	**AM**	**IP**	**PM**
Overall	18	19	21	19	21	20	25	29	28
Northbound	16	20	24	18	22	23	24	29	28
Southbound	21	18	17	22	19	17	26	29	28

4.3.6 Figure 4.7 shows the trip-length profiles from the assignments of the prior demand and matrix estimated demand, and also that derived from the RSI surveys for car travel across the Melton Mowbray River Screenline by time period and for both directions combined, and for each direction of travel separately.

4.3.7 The analysis contained within Figure 4.7 shows that the peak within the trip-length profile is at the same point within both the modelled data and the observed data, at trips of length around 5km, but that this peak is stronger in the modelled data than compared with the RSI survey data. This is consistent across modelled time periods and direction of travel. This means that a greater proportion

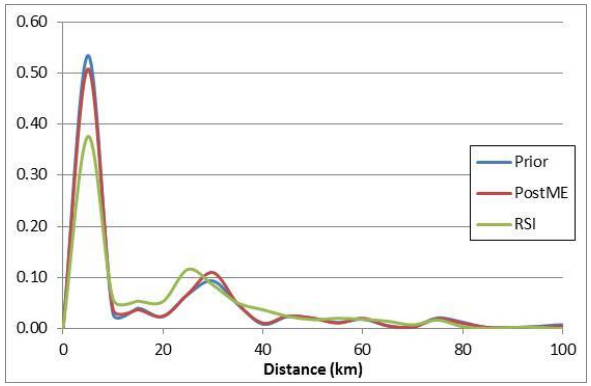
of demand has these shorter trip-lengths within the model than compared with the RSI surveys, and this is consistent with the analysis of average trip-lengths.

Figure 4.7: Melton Mowbray River Screenline Trip-Length Profile Comparison (Car)

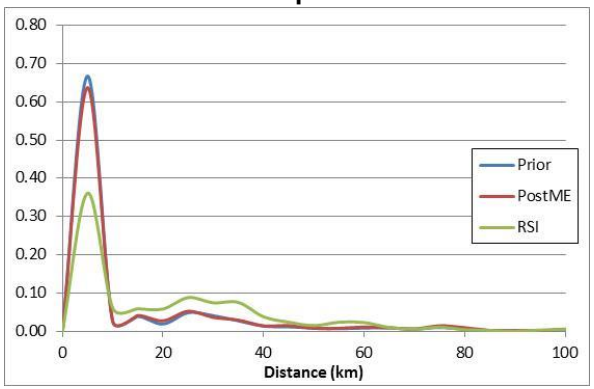


Southbound

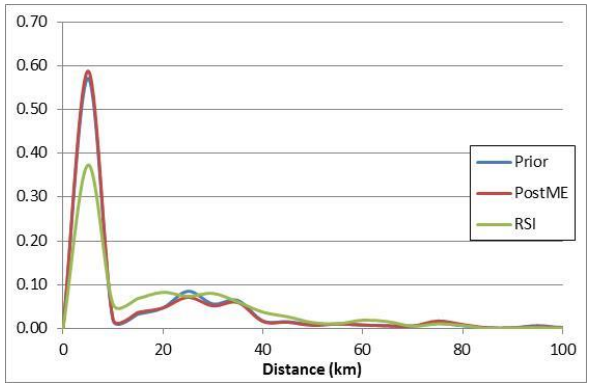
AM Peak



Interpeak



PM Peak



4.3.8 Table 4.8 provides a high-level summary of the proportion of trips within key movements for northbound car trips at the Melton Mowbray River Screenline. Some of the minor movements which contain a small proportion of demand have been excluded from Table 4.8.

4.3.9 Melton South to Melton North trips (i.e. internal cross-river) are a higher proportion of demand within the model than within the RSI data. Within the model this movement is broadly between 50% and 60% of northbound car traffic at this screenline, compared with around 25% to 30% of traffic observed within the RSI surveys. This overstatement in internal cross-river traffic is countered by an understatement compared with the RSI data of trips with at least one trip-end external to the urban area. That is trips external to external (i.e. through trips), external to Melton North and Melton South to external.

Table 4.8: High-Level Summary of Northbound Trips at Melton Mowbray River Screenline (Car)

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
External-Melton North	24%	22%	28%	23%	22%	28%	31%	25%	36%
Melton South-Melton North	59%	51%	49%	55%	49%	49%	29%	27%	27%
External-External	9%	11%	11%	10%	12%	10%	12%	18%	14%
Melton South-External	7%	15%	11%	10%	16%	12%	17%	22%	13%

Note that figures may not sum to 100% due to minor movements being omitted from this table

4.3.10 Table 4.9 provides additional analysis on the pattern of traffic within the model crossing the Melton Mowbray River Screenline which is internal to the urban area, i.e. trips within the urban area from north of the screenline to south of the screenline and vice-versa. This analysis has been undertaken for both directions combined, by direction at the screenline, and for the individual sites along the screenline.

4.3.11 As with the through trip analysis of the Melton Mowbray Cordon, based on the sample size for each RSI, it has been calculated that the 95% confidence internals for the northbound (i.e. interview) direction at each RSI site are around ±6 percentage points in the AM Peak and PM Peak models, and around ±4 percentage points in the interpeak model. As with the Melton Mowbray Cordon, there is additional uncertainty in the non-interview direction where the RSI records have been revered, and this additional uncertainty has not been quantified.

Table 4.9: Proportion Internal Cross-River Trips at Melton Mowbray River Screenline (Car)

	Prior Matrix			Post-ME Matrix			RSI Matrix		
	AM	IP	PM	AM	IP	PM	AM	IP	PM
Overall	55%	56%	51%	51%	54%	53%	27%	26%	27%
Northbound	59%	51%	49%	55%	49%	49%	29%	27%	27%
Southbound	50%	61%	54%	47%	59%	56%	24%	25%	27%

4.3.12 This outcome is consistent with the analysis of the Melton Mowbray Cordon. The comparison of the modelled flows against counts (discussed in Section 5) shows that there is a good fit between the modelled flows and the observed link flow data within Melton Mowbray. As the analysis of the Melton Mowbray Cordon suggests that, compared with the RSI data, the model understates through Melton Mowbray trips, these 'missing' trips need to be replaced with other movements to meet WebTAG criteria for link flows. To meet these criteria, the analysis of the Melton Mowbray River Screenline suggests that the base year matrices overstate internal Melton Mowbray traffic compared with the RSI data.

4.4 2011 Census Journey to Work Comparison

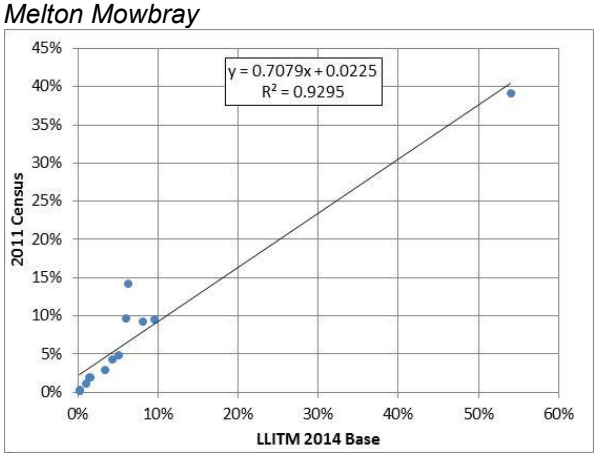
4.4.1 The 2011 Census Journey to Work data provide an insight into commuting demand, but there are some important definitional differences between the data collected as part of the Census (which is usual place of work) and the definition of commuting demand within transport models (commuting trips on an average weekday). In an attempt to account for this, adjustments have been made to the Journey to Work data in an attempt to account for:

- annual leave (assumed to be 5.6 weeks per worker, including Bank Holidays, based on details from gov.uk);
- sick leave (based on an average of 4.21 sick days per worker from analysis of ONS data);
- weekday / weekend commuting (based on analysis of NTEM 7 data);
- proportion of full-time and part-time working (based on analysis of the 2011 Census); and
- trip production change between 2011 and 2015 (based on analysis of NTEM 7 data.

4.4.2 Using this adjusted Census Journey to Work matrix, a comparison has been undertaken between this data source and the LLITM 2014 Base 24-hour commuting matrix for the model's base year. This comparison has considered, at a sector level, the location of attractions for trips produced within Melton Mowbray and the location of trip productions for commuting trips attracted to Melton Mowbray. Scatterplots of these comparisons are shown in Figure 4.8, with the underlying data presented within Table 4.10.

Figure 4.8: Comparison of Highway Commuting Trip-Ends between LLITM 2014 Base and 2011 Census

Attraction location for trips produced within Melton Mowbray



Production location of trips attracted to Melton Mowbray

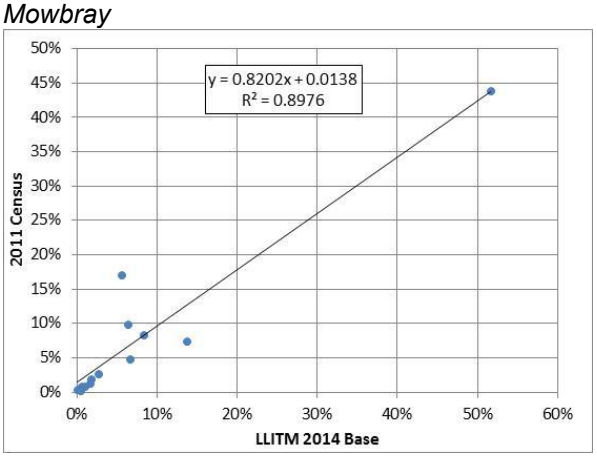


Table 4.10: Comparison of Highway Commuting Trip-Ends between LLITM 2014 Base and 2011 Census

	Attractions for Melton Mowbray Productions		Productions for Melton Mowbray Attractions	
	LLITM	Census	LLITM	Census
Melton Mowbray	54%	39%	52%	44%
Rest of Melton Borough	6%	14%	6%	17%
Leicester City	6%	10%	6%	10%
Harborough and Oadby	1%	2%	2%	2%
Blaby and Hinckley	4%	4%	3%	3%
Charnwood and NW Leics	8%	9%	8%	8%
Nottinghamshire	5%	5%	7%	5%
Derbyshire	1%	1%	1%	1%
Lincolnshire and Rutland	9%	10%	14%	7%
SE External	3%	3%	2%	1%
SW External	1%	2%	1%	1%
NW External	0%	0%	0%	0%
NE External	0%	0%	0%	0%

4.4.3 The scatterplot analysis contained within Figure 4.8 shows that there is a good correlation between the location of trip-ends within the adjusted 2011 Census Journey to Work matrix and the all-day modelled base year commuting demand, with R^2 values around 0.9 for the location of trip attractions and productions.

4.4.4 Considering the results in Table 4.10, this shows that compared with the Census data, the model overstates internal commuting trips within Melton Mowbray. This is consistent with the analysis of RSI data for the Melton Mowbray River Screenline. This overstatement of internal Melton Mowbray commuting is countered by an understatement of commuting trips compared with the Census between Melton Mowbray and the rest of Melton Borough and Leicester City.

4.5 Impact of Matrix Estimation within Melton Borough

4.5.1 Section 10.4 of the main LLITM 2014 Base highway model LMVR provides analysis of the impact of the changes to the prior matrices due to matrix estimation based on the criteria set out within WebTAG. As discussed within this section, there is no guidance within WebTAG as to the subset of the matrix over which these tests should be applied; however the analysis presented focusses on the whole matrix (with the exception of trip-length profile analysis). Additional information, beyond WebTAG requirements, is given for Leicestershire trips which are the subset of the matrix most likely to be impacted by matrix estimation.

4.5.2 Analysis presented within Sections 4.2 and 4.3 give some information on the impact of matrix estimation within Melton Borough, as the analysis presented within these sections show that the matrix statistics do not in general alter significantly between the assignment of the prior matrices and the post-matrix estimation matrices. In addition to this analysis, the analysis required for WebTAG has been repeated but focusing on trips with an origin within Melton Borough.

4.5.3 Considering first the matrix zonal changes for trips with an origin in Melton Borough, Table 4.11 provides the regression statistics for movements within the matrix with an origin within Melton Borough. WebTAG states that the intercept should be near zero, the slope should be between 0.98 and 1.02, and the R^2 value should be in excess of 0.95; however this is assumed to apply to the matrix as a whole.

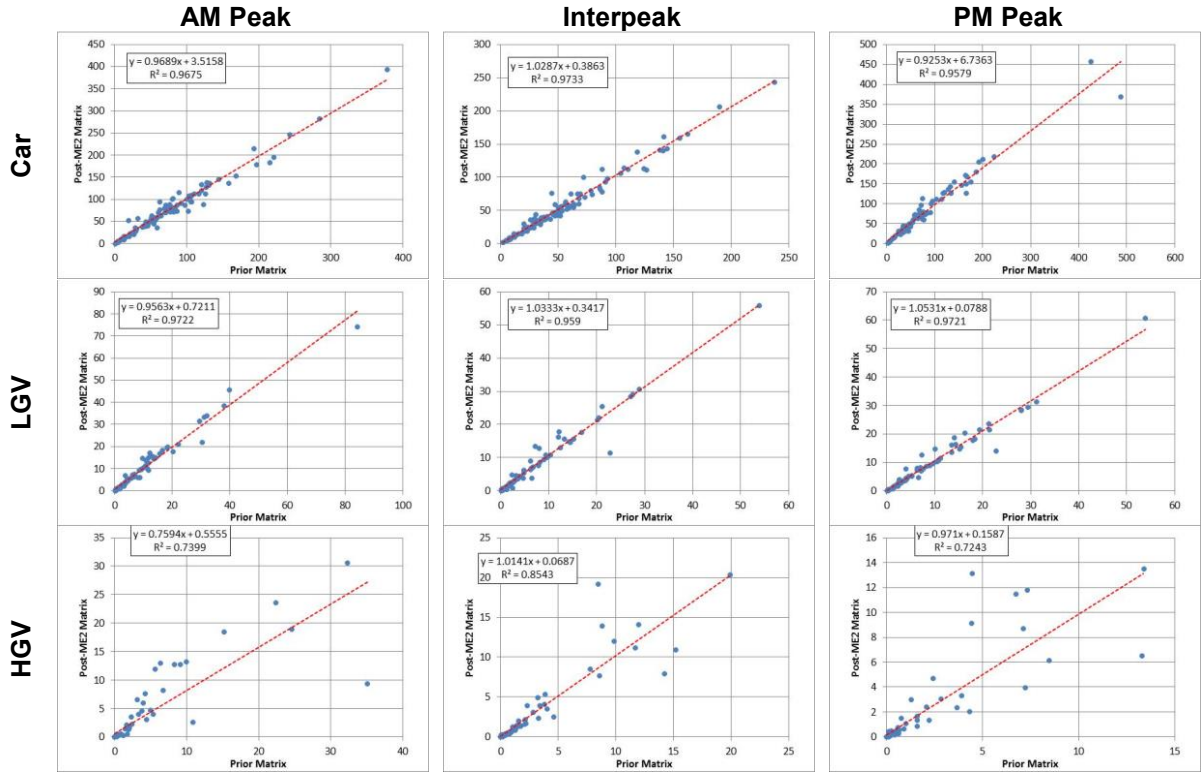
Table 4.11: Matrix Estimation Regression Statistics for Melton Borough Origins – Cell Movements

		AM	IP	PM
Car	Intercept	0.00	0.00	0.00
	Slope	0.97	1.00	0.95
	R^2	0.93	0.96	0.93
LGV	Intercept	0.00	0.00	0.00
	Slope	0.97	0.97	1.00
	R^2	0.91	0.88	0.93
HGV	Intercept	0.00	0.00	0.00
	Slope	0.69	0.93	0.81
	R^2	0.61	0.83	0.66

4.5.4 Table 4.11 shows that for car and LGV demand, the regression statistics are close to meeting WebTAG, with some time periods meeting the criteria set out, and LGV demand generally showing a larger change in matrix cells than car demand due to matrix estimation. HGV demand has the lowest R^2 values, and along with the statistics for LGV demand, demonstrates the greater uncertainty in the demand data source for freight demand compared with car demand.

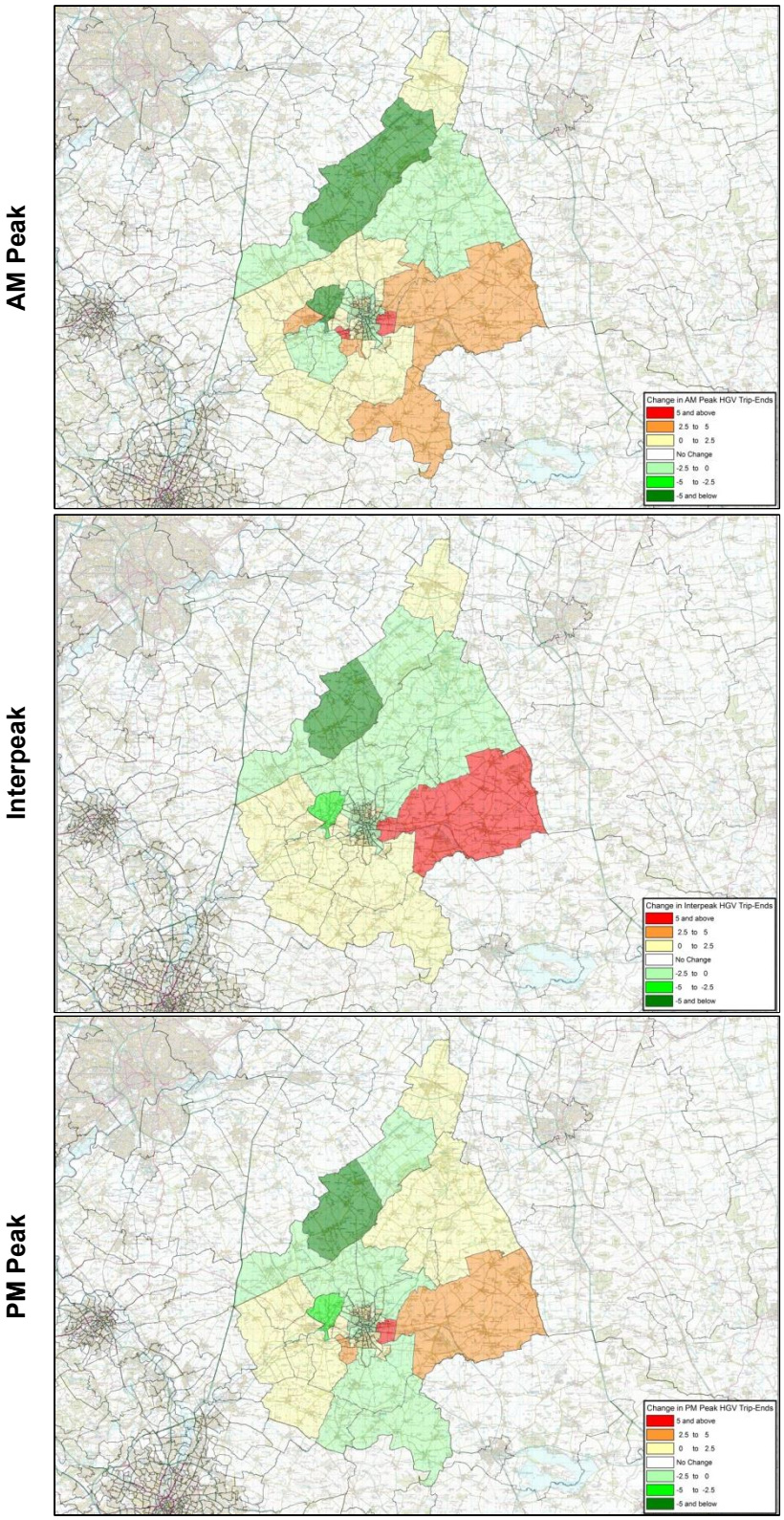
4.5.5 In terms of trip-ends, WebTAG sets out that the intercept should be close to zero, the slope between 0.99 and 1.01, and the R^2 value in excess of 0.98. Figure 4.9 shows the scatterplots for origin trip-ends for trips with an origin within Melton Borough by time period and vehicle type. As with the zonal matrix changes, the regression statistics are close to meeting WebTAG guidelines for car and LGV traffic, with larger changes due to matrix estimation for HGV traffic, even when considering the local study area only.

Figure 4.9: Matrix Estimation Regression Statistics for Melton Borough Origins – Trip Origins



4.5.6 Considering the change in HGV trip-ends due to matrix estimation in more detail, Figure 4.10 shows the change in HGV origin trip-ends due to matrix estimation in the three modelled time periods from the prior matrices to the estimated matrices within Melton Borough.

Figure 4.10: Change in HGV Trip Origins within Melton Borough due to Matrix Estimation



Map contains Ordnance Survey data © Crown copyright and database right 2017

4.5.7 It is firstly important to note the scale of change presented within Figure 4.10 for HGV origin trip-ends. Within each time period there are few zones where the HGV origin trip-end changes by more than 5 vehicles, either increasing or decreasing. The pattern of change in HGV origin trip-ends shows some differences by time period, suggesting that there are no systematic biases in the matrix development. However, the following changes are consistent across time periods:

- increases in HGV trip-ends to the east of Melton Mowbray;
- decreases in HGV trip-ends to the north-west of Melton Mowbray and in the north of the district.

4.5.8 In addition to considering the changes within the matrices at a zonal and trip-end level, WebTAG also sets out guidelines for the changes to the trip-lengths represented within the matrices. Within the main LLITM 2014 Base LMVR this analysis has been undertaken for trips with an origin within Leicestershire, and this has been repeated for those trips with an origin within Melton Borough.

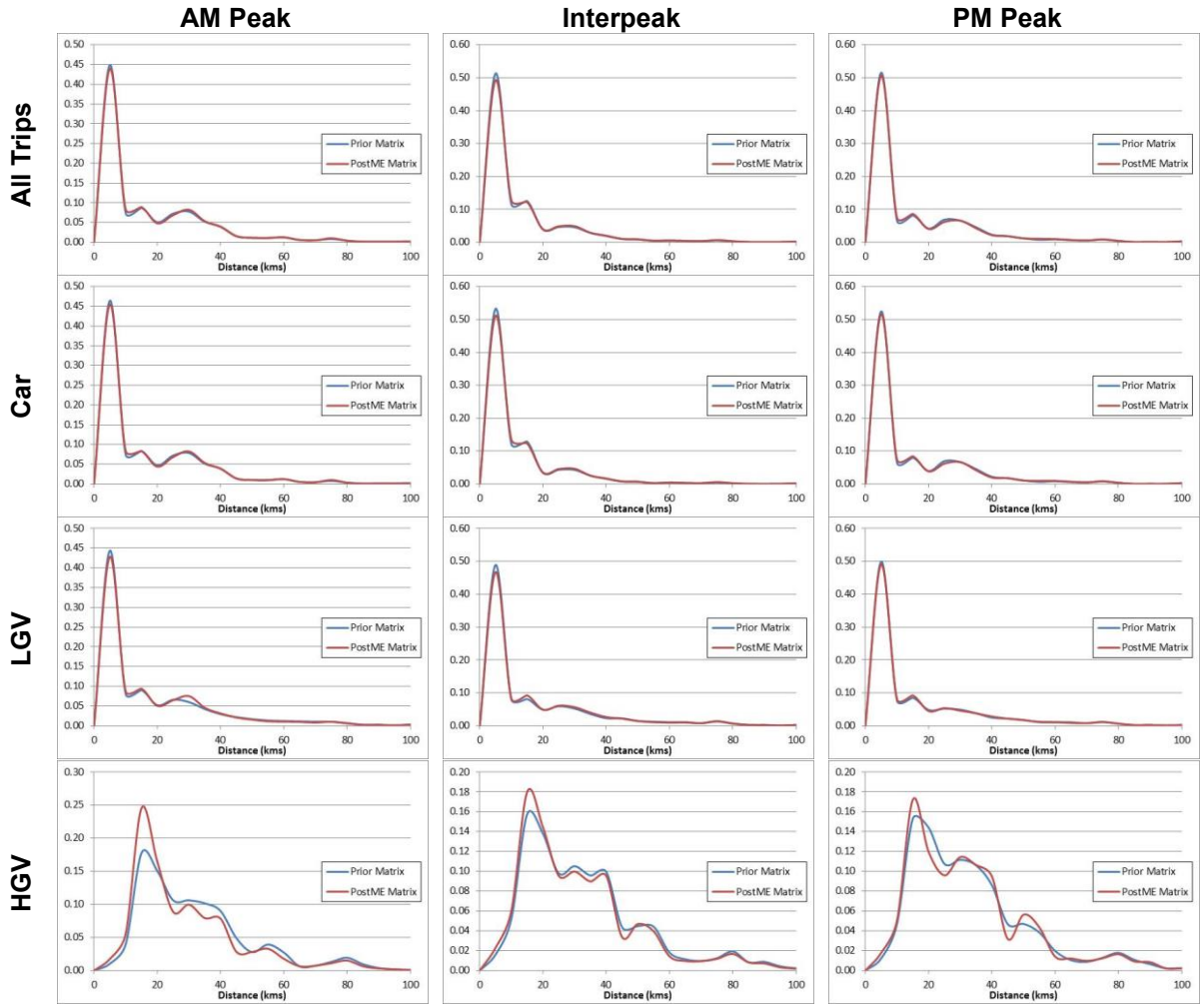
4.5.9 Table 4.12 provides the average trip-lengths and standard deviation of trip-lengths by time period and vehicle type within the prior matrices and the post-matrix estimation matrices. WebTAG sets out that the average trip-length and the standard deviation in trip-lengths should not change by more than 5% due to matrix estimation. In general, the changes in the trip-length statistics for Melton Borough origins are within 5% due to matrix estimation, with some statistics showing a greater change.

Table 4.12: Trip-Length Statistics for Melton Borough Origins

		Prior Avg.	Post-ME Avg.	%Change	Prior St. Dev.	Post-ME St. Dev.	%Change
AM Peak	All trips	17.7	17.7	-0.2%	26.3	25.8	-1.9%
	Car	17.1	17.2	0.7%	26.5	26.1	-1.6%
	LGV	19.1	18.7	-1.9%	27.8	26.7	-3.9%
	HGV	30.4	27.3	-10.3%	21.2	20.4	-3.5%
Interpeak	All trips	13.9	14.8	5.9%	25.8	27.4	6.3%
	Car	13.0	13.9	7.3%	26.0	27.9	7.4%
	LGV	17.5	17.7	1.2%	26.5	26.0	-1.8%
	HGV	31.3	29.7	-5.0%	21.7	21.3	-1.6%
PM Peak	All trips	15.6	16.3	4.6%	24.1	26.2	8.8%
	Car	15.2	16.0	5.0%	24.0	26.4	9.8%
	LGV	17.1	17.1	0.4%	26.0	25.9	-0.4%
	HGV	31.0	30.9	-0.1%	20.7	21.2	2.3%

4.5.10 In addition to the trip-length statistics, Figure 4.11 shows the modelled trip-length profiles before and after the application of matrix estimation by time period and vehicle type. As with other metrics on the changes to the matrices due to matrix estimation, the largest changes to the modelled trip-length profiles are for HGV traffic where the uncertainty in the underlying matrix data is greatest.

Figure 4.11: Trip-Length Profiles for Melton Borough Origins



Section 5 – Assignment Calibration and Validation

5.1 Introduction

5.1.1 The base year highway assignment has been assessed, using WebTAG criteria, against observed count and journey time data across the county. The main highway model LMVR provides details on the model performance against counts and journey times across the wider model. This section provides further detail on the local model performance within Melton Borough, and also compares the modelled flows against the newly collected counts within Melton Mowbray.

5.1.2 As discussed within Section 2, a number of updates to the highway networks have been adopted as part of a detailed review of the network coding within the area of interest. These changes will impact on the assigned flows within the base year model, and therefore potentially impacts on the performance of the model across the county. However, with the exception of the corrections at the A46 / A606 junction, the network updates are local in nature and therefore are not expected to impact on the wider model performance.

5.1.3 This section of the Melton Mowbray local LMVR firstly presents the performance of the model against flows and journey times as reported within the main highway model LMVR. This analysis is then reproduced using the updated base year networks to demonstrate that the changes adopted have not had a negative impact on the wider model performance. Finally, the modelled flows will be compared within the additional count data provided as part of this study, which provides additional flow validation sites within Melton Mowbray.

5.2 Existing Highway Model Performance

5.2.1 The following tables have been extracted from the main highway model LMVR, and show the wider model performance against observed data before the network updates detailed within this report have been applied.

5.2.2 Table 5.1 shows the performance of the model against screenline flows for total vehicle flows by time period, detailing the aggregate difference between modelled and observed flows and the number of screenlines which pass WebTAG criteria. Table 5.2 shows the percentage of links which meet WebTAG guidelines, both including and excluding duplicate count locations. (A duplicate count is one which is used on more than one screenline.) Finally, Table 5.3 shows the percentage of journey time routes which meet WebTAG criteria by time period.

5.2.3 In all of these tables, the reporting area of 'North-East Leicestershire' broadly corresponds with Melton Borough. The performance of the model in this area is therefore an approximation for the performance of the model within the area of interest.

Table 5.1: Original Leicestershire Screenline Performance (Total Vehicle Flows)

	AM Peak Hour		Interpeak Hour		PM Peak Hour	
	Total %	ScnLine Passes	Total %	ScnLine Passes	Total %	ScnLine Passes
Leicester City	0.2%	94%	0.4%	100%	0.7%	100%
North Leicestershire	-0.1%	94%	0.7%	88%	1.1%	88%
North-East Leicestershire	0.1%	86%	0.9%	93%	0.4%	93%
South Leicestershire	-0.6%	85%	0.3%	96%	0.3%	88%
South-West Leicestershire	0.7%	100%	0.1%	100%	1.0%	88%
North-West Leicestershire	-0.5%	88%	-0.5%	100%	-0.2%	94%
County-wide	1.1%	100%	0.5%	100%	0.7%	100%
SRN (Int)	1.7%	100%	1.4%	100%	1.0%	95%
Leicestershire	***0.5%***	***93%***	***0.6%***	***97%***	***0.7%***	***93%***

Table 5.2: Original Leicestershire Link Flow Performance (Total Vehicle Flows)

	AM Peak Hour		Interpeak Hour		PM Peak Hour	
	%Links	%Links (ex dupl.)	%Links	%Links (ex dupl.)	%Links	%Links (ex dupl.)
Leicester City	79%	78%	88%	88%	80%	79%
North Leicestershire	82%	81%	91%	90%	80%	78%
North-East Leicestershire	93%	93%	96%	95%	91%	90%
South Leicestershire	90%	89%	94%	94%	89%	89%
South-West Leicestershire	88%	88%	98%	98%	89%	89%
North-West Leicestershire	94%	93%	95%	95%	93%	92%
County-wide	89%	86%	97%	96%	87%	84%
SRN (Int)	97%	97%	100%	100%	96%	96%
Leicestershire	***87%***	***86%***	***94%***	***93%***	***86%***	***85%***

Table 5.3: Original Journey Time Validation

	No. of Routes	AM %Pass	IP %Pass	PM %Pass
Leicester City	32	91%	84%	84%
North Leicestershire	18	89%	94%	89%
North-East Leicestershire	12	100%	92%	92%
South Leicestershire	18	94%	100%	83%
South-West Leicestershire	24	92%	92%	92%
North-West Leicestershire	24	92%	100%	92%
SRN (Int)	10	90%	100%	100%
Leicestershire	**138**	**92%**	**93%**	**89%**
SRN (Ext)	12	83%	100%	100%

5.3 Revised Highway Model Performance (including network updates)

5.3.1 Table 5.4, Table 5.5 and Table 5.6 provide the same analysis of the model performance against screenline flows, individual link flows and journey times as detailed in Section 5.2, but include the network updates detailed in Section 3.

- In terms of the performance against screenline flows, the proportion of screenlines which meet WebTAG criteria is unchanged from that reported in the main highway model LMVR.
- In terms of individual flows, excluding duplicate counts, the interpeak statistics are unchanged, with some minor changes in the AM Peak hour model, and a small improvement in the model performance across Leicestershire in the PM Peak hour model (from 85% to 86% of links passing).
- For journey times, the interpeak performance is unaffected by the network changes, there are some minor changes in the PM Peak hour model, and a small reduction in the number of routes passing in the AM Peak hour due to journey time routes within North Leicestershire.

5.3.2 It should be noted that there are no changes in these high-level statistics for North-East Leicestershire due to the changes in the network coding applied within the base year model in this area. This suggests that the changes to the wider model performance are largely due to the convergence of the highway assignment and not due to the network changes adopted.

5.3.3 The analysis contained within Table 5.4, to Table 5.6 demonstrates that with the inclusion of the network updates, the highway model meets WebTAG criteria for screenline flows, individual link flows and journey times across the county. In addition to this, within North-East Leicestershire (broadly Melton Borough) the model performs well against observed data.

Table 5.4: Updated Leicestershire Screenline Performance (Total Vehicle Flows)

	AM Peak Hour		Interpeak Hour		PM Peak Hour	
	Total %	ScnLine Passes	Total %	ScnLine Passes	Total %	ScnLine Passes
Leicester City	-0.0%	94%	0.4%	100%	0.6%	100%
North Leicestershire	-0.2%	94%	0.7%	88%	1.1%	88%
North-East Leicestershire	0.2%	86%	1.0%	93%	0.5%	93%
South Leicestershire	-1.1%	85%	0.3%	96%	0.2%	88%
South-West Leicestershire	0.6%	100%	0.1%	100%	1.0%	88%
North-West Leicestershire	-0.6%	88%	-0.5%	100%	-0.2%	94%
County-wide	1.0%	100%	0.5%	100%	0.8%	100%
SRN (Int)	1.5%	100%	1.4%	100%	1.1%	95%
Leicestershire	***0.4%***	***93%***	***0.6%***	***97%***	***0.7%***	***93%***

Table 5.5: Updated Leicestershire Link Flow Performance (Total Vehicle Flows)

	AM Peak Hour		Interpeak Hour		PM Peak Hour	
	%Links	%Links (ex dupl.)	%Links	%Links (ex dupl.)	%Links	%Links (ex dupl.)
Leicester City	79%	78%	88%	88%	81%	80%
North Leicestershire	82%	81%	91%	90%	79%	78%
North-East Leicestershire	93%	93%	96%	95%	91%	90%
South Leicestershire	89%	88%	94%	94%	89%	89%
South-West Leicestershire	88%	88%	98%	98%	90%	90%
North-West Leicestershire	94%	93%	95%	95%	93%	92%
County-wide	89%	87%	97%	96%	87%	84%
SRN (Int)	97%	97%	100%	100%	96%	96%
Leicestershire	***87%***	***86%***	***94%***	***93%***	***86%***	***86%***

Table 5.6: Updated Journey Time Validation

	No. of Routes	AM %Pass	IP %Pass	PM %Pass
Leicester City	32	91%	84%	88%
North Leicestershire	18	78%	94%	89%
North-East Leicestershire	12	100%	92%	92%
South Leicestershire	18	94%	100%	83%
South-West Leicestershire	24	92%	92%	88%
North-West Leicestershire	24	92%	100%	92%
SRN (Int)	10	90%	100%	100%
Leicestershire	**138**	**91%**	**93%**	**89%**
SRN (Ext)	12	83%	100%	100%

5.3.4 In addition to this high-level reporting of the model performance, the following tables and figures provide further details on the model performance within Melton Borough. Table 5.7 provides further details on flow performance for those screenlines identified within Section 2.2, with Table 5.8 providing details on the performance of the journey time routes within Melton Borough (shown in Figure 2.3). Figure 5.1 provides the journey time graphs for these identified journey time routes for each time period. Those screenlines which are used for independent validation are highlighted in orange within Table 5.7.

5.3.5 The following provides a summary of the performance of the highway model against observed count and journey time data within Melton Mowbray:

- All calibration screenlines in the three modelled time period meet WebTAG criteria. (Note that the Melton Mowbray East-West River Screenline contains only two counts, and therefore adopts the adjusted WebTAG criteria detailed within the main highway LMVR.)
- Five out of six validation screenlines meet WebTAG criteria in each of the modelled hours. In the AM Peak and interpeak models, it is the Nottingham Road North-South Screenline in the eastbound direction which fails, and in the PM Peak model it is the same screenline but in the westbound direction.
- In terms of individual link counts, 91%, 94% and 88% of all link counts within Melton Mowbray meet WebTAG criteria in the AM Peak, interpeak and PM Peak models respectively. The proportion of calibration counts which meet WebTAG is 95%, 95% and 90% in the three modelled hours, with 85%, 93% and 85% of validation links meeting the criteria in the three modelled hours.
- Of the twelve journey time routes identified within this local LMVR, all meet WebTAG criteria in the AM Peak hour, with one failure in the interpeak and PM Peak models. In both of these modelled hours it is the Dalby Road / Scalford Road journey time route in the southbound direction which does not meet WebTAG criteria.

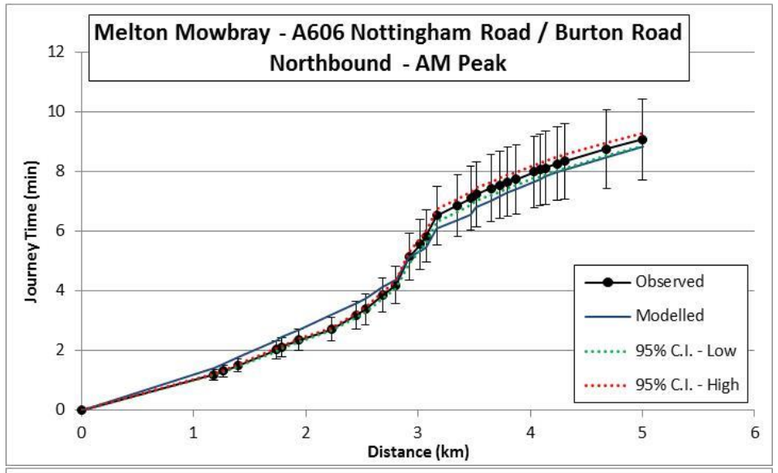
Table 5.7: Flow Performance within Area of Interest (Total Flows)

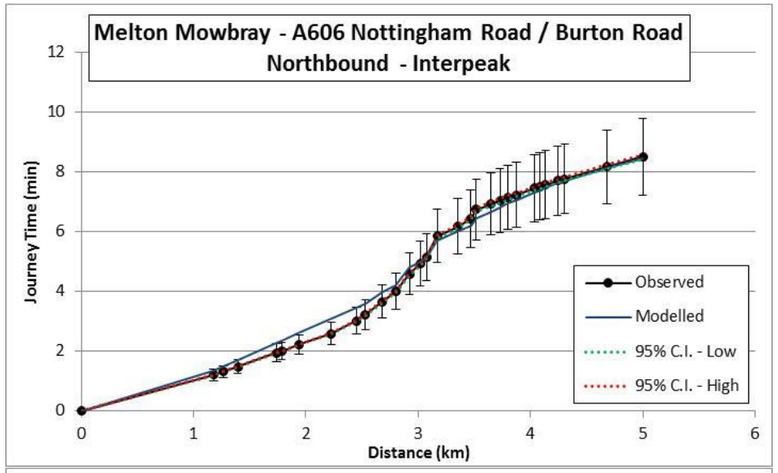
	AM Peak					Interpeak					PM Peak				
	Observed	Modelled	Abs.	%Diff	%Links	Observed	Modelled	Abs.	%Diff	%Links	Observed	Modelled	Abs.	%Diff	%Links
Melton Mowbray Cordon Inbound	3,235	3,200	-35	-1.1%	91%	2,125	2,139	14	0.6%	100%	3,184	3,153	-31	-1.0%	91%
Melton Mowbray Cordon Outbound	3,054	2,974	-80	-2.6%	100%	2,200	2,205	5	0.2%	100%	2,920	2,910	-10	-0.3%	100%
Melton Mowbray North-South Screenline (Nottingham Rd) Eastbound	1,044	1,239	196	18.8%	75%	930	1,033	102	11.0%	100%	1,266	1,313	47	3.7%	100%
Melton Mowbray North-South Screenline (Nottingham Rd) Westbound	1,430	1,455	25	1.7%	60%	1,231	1,255	24	1.9%	60%	1,556	1,680	124	8.0%	60%
Melton Mowbray North-South Screenline (Dalby Rd) Eastbound	1,107	1,104	-4	-0.3%	75%	756	759	3	0.4%	100%	1,054	1,062	8	0.7%	75%
Melton Mowbray North-South Screenline (Dalby Rd) Westbound	944	957	13	1.4%	100%	792	791	-2	-0.2%	100%	1,049	1,052	3	0.3%	100%
Melton Mowbray East-West Screenline (River) Northbound	1,554	1,703	149	9.6%	50%	1,192	1,241	49	4.1%	100%	1,526	1,553	28	1.8%	50%
Melton Mowbray East-West Screenline (River) Southbound	1,494	1,497	4	0.2%	100%	1,301	1,333	32	2.5%	100%	1,686	1,778	92	5.5%	100%
Melton Mowbray East-West Screenline (South) Northbound	1,846	1,762	-84	-4.5%	100%	1,277	1,228	-49	-3.8%	100%	1,830	1,828	-2	-0.1%	100%
Melton Mowbray East-West Screenline (South) Southbound	1,716	1,695	-21	-1.2%	100%	1,333	1,315	-17	-1.3%	100%	1,788	1,733	-55	-3.1%	86%
Melton Mowbray East-West Screenline (North) Northbound	1,031	1,039	8	0.7%	100%	1,138	1,157	19	1.7%	100%	1,728	1,751	23	1.3%	100%
Melton Mowbray East-West Screenline (North) Southbound	1,759	1,745	-14	-0.8%	100%	1,092	1,086	-6	-0.5%	60%	1,451	1,463	12	0.8%	60%
Leicestershire Cordon (North-East) Inbound	4,956	5,021	64	1.3%	97%	2,770	2,791	21	0.7%	97%	4,449	4,495	46	1.0%	94%
Leicestershire Cordon (North-East) Outbound	4,385	4,370	-14	-0.3%	91%	2,826	2,846	20	0.7%	97%	5,036	5,170	134	2.7%	94%

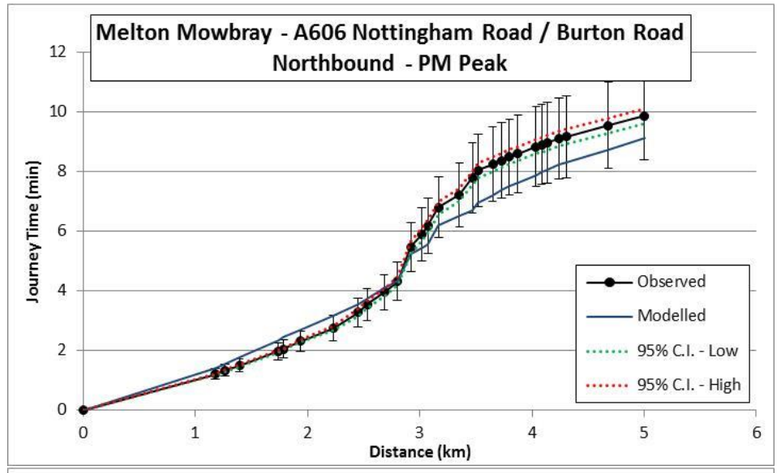
Table 5.8: Journey Time Performance within Area of Interest

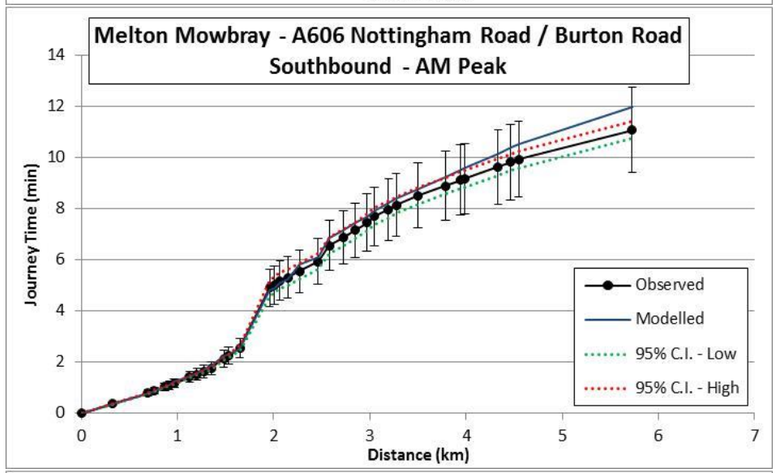
	AM Peak					Interpeak					PM Peak				
	Observed	Modelled	Abs.	%Diff	Pass	Observed	Modelled	Abs.	%Diff	Pass	Observed	Modelled	Abs.	%Diff	Pass
A606 Nottingham Road / Burton Road Northbound	09:04	08:50	-00:14	-2.6%	✓	08:30	08:27	-00:03	-0.5%	✓	09:52	09:07	-00:45	-7.6%	✓
A606 Nottingham Road / Burton Road Southbound	11:05	11:58	00:54	8.1%	✓	10:28	11:08	00:40	6.4%	✓	11:24	11:32	00:09	1.3%	✓
A607 Leicester Road / Thorpe Road Northbound	11:02	10:45	-00:16	-2.5%	✓	10:13	10:44	00:31	5.1%	✓	11:04	11:38	00:35	5.2%	✓
A607 Leicester Road / Thorpe Road Southbound	10:31	09:22	-01:09	-11.0%	✓	09:08	08:48	-00:20	-3.6%	✓	09:50	09:16	-00:34	-5.7%	✓
A6006 to Saxby Road (via Ankle Hill) Eastbound	14:53	13:44	-01:09	-7.7%	✓	12:51	13:25	00:34	4.4%	✓	14:43	13:44	-00:59	-6.7%	✓
A6006 to Saxby Road (via Ankle Hill) Westbound	13:37	13:00	-00:37	-4.5%	✓	12:42	12:48	00:06	0.8%	✓	14:11	13:08	-01:03	-7.5%	✓
Dalby Road / Scalford Road Northbound	09:41	09:11	-00:30	-5.1%	✓	07:50	08:39	00:49	10.4%	✓	09:25	09:21	-00:04	-0.8%	✓
Dalby Road / Scalford Road Southbound	07:44	08:15	00:31	6.7%	✓	06:52	07:59	01:08	16.4%	×	06:56	08:30	01:35	22.7%	×
Kirby Lane Eastbound	05:10	05:34	00:24	7.7%	✓	04:57	05:33	00:36	12.2%	✓	05:07	05:34	00:27	8.8%	✓
Kirby Lane Westbound	04:58	05:37	00:39	13.1%	✓	04:53	05:36	00:42	14.4%	✓	05:08	05:36	00:29	9.4%	✓
A607 (A46 to Melton Mowbray) Northbound	11:09	10:25	-00:44	-6.6%	✓	10:27	09:53	-00:34	-5.4%	✓	10:39	10:23	-00:16	-2.5%	✓
A607 (A46 to Melton Mowbray) Southbound	11:04	10:36	-00:29	-4.3%	✓	10:37	10:06	-00:32	-5.0%	✓	10:32	10:25	-00:07	-1.1%	✓

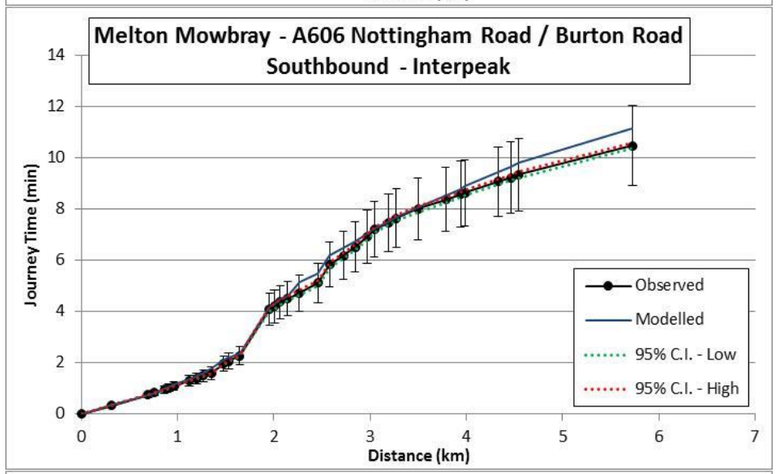
Figure 5.1: Journey Time Graphs within Area of Interest

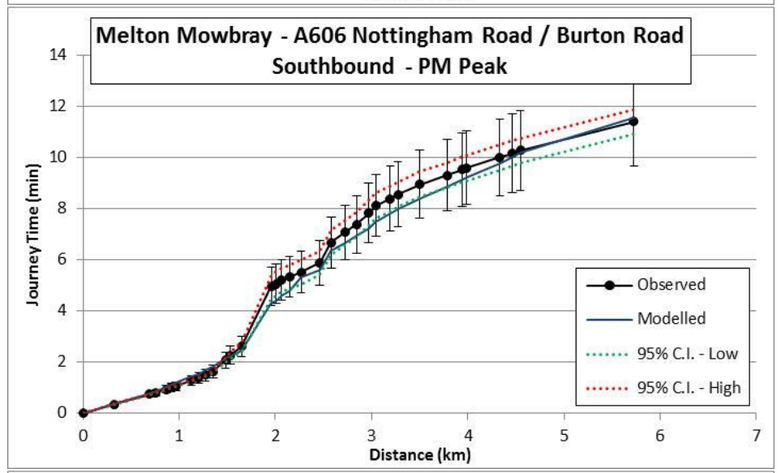


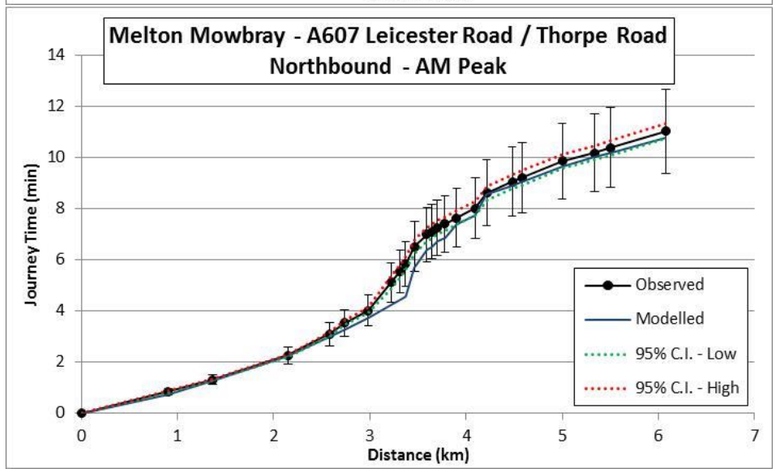


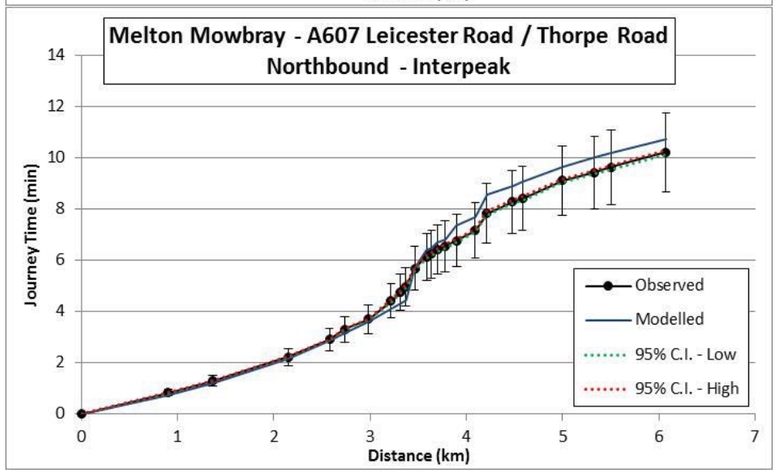


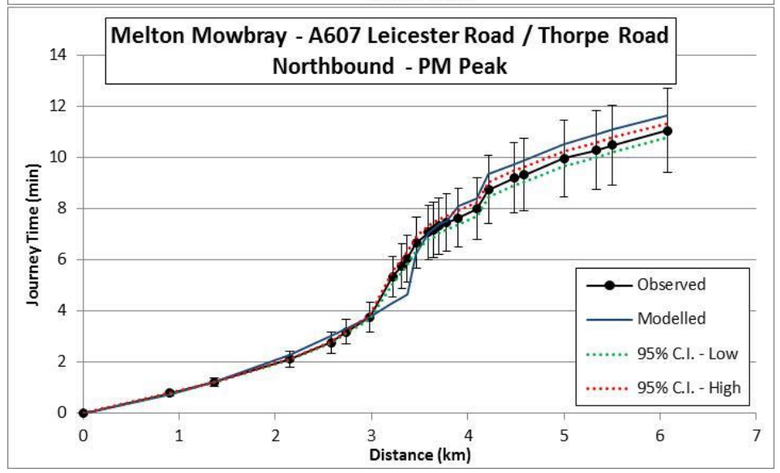


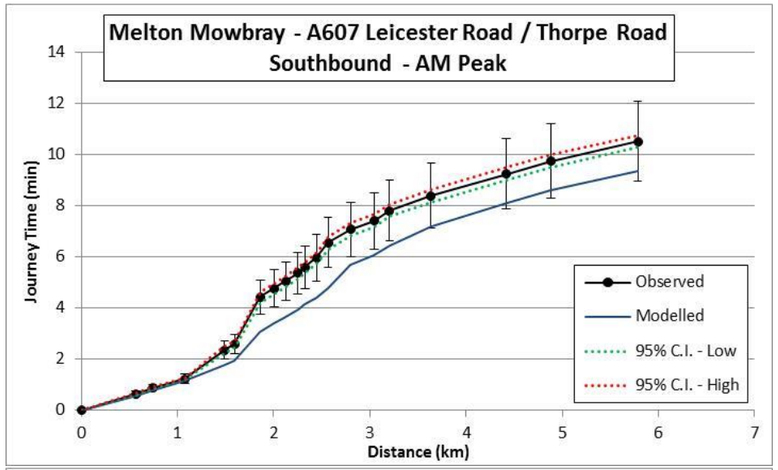


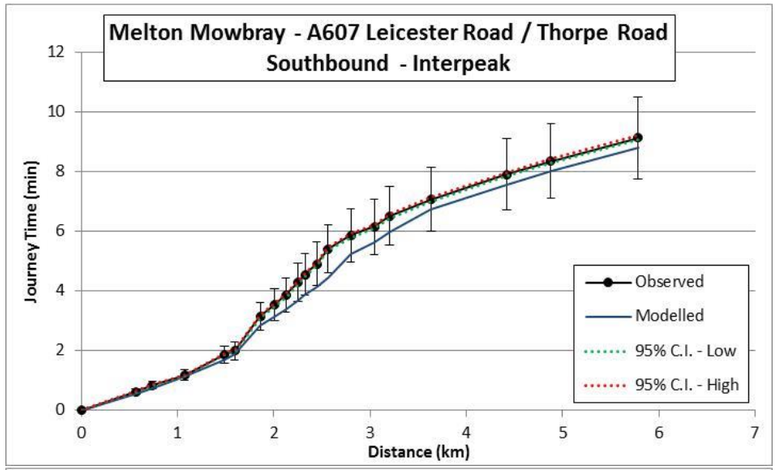


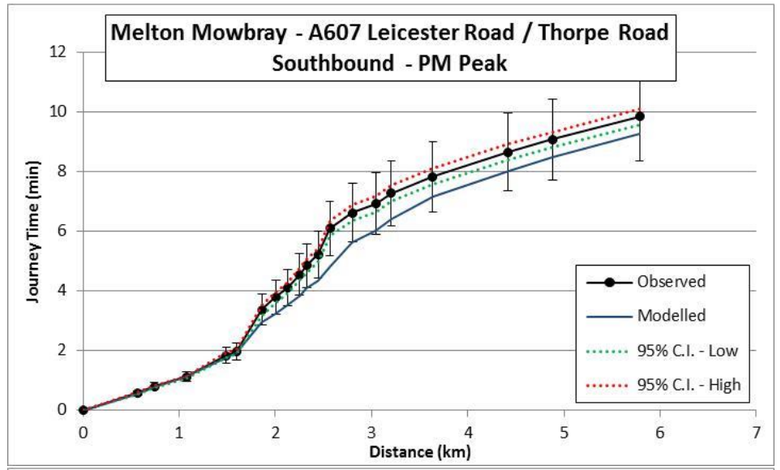


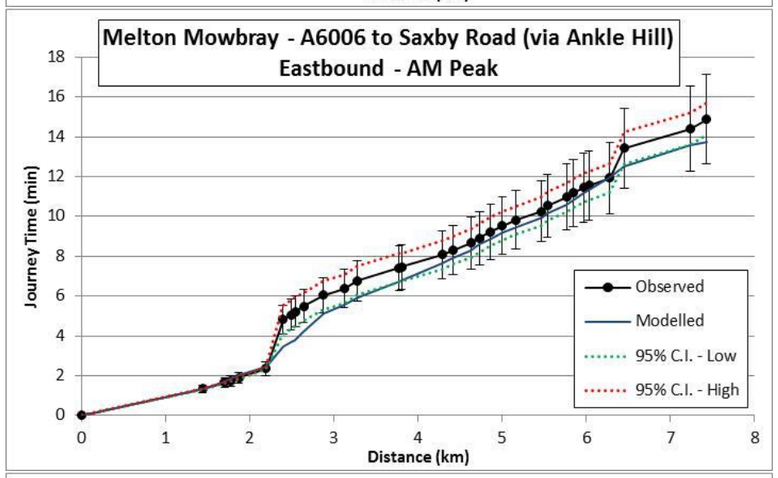


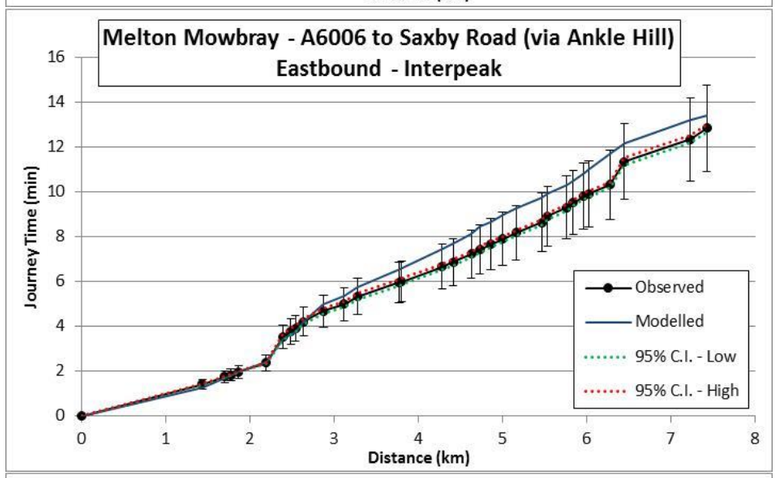


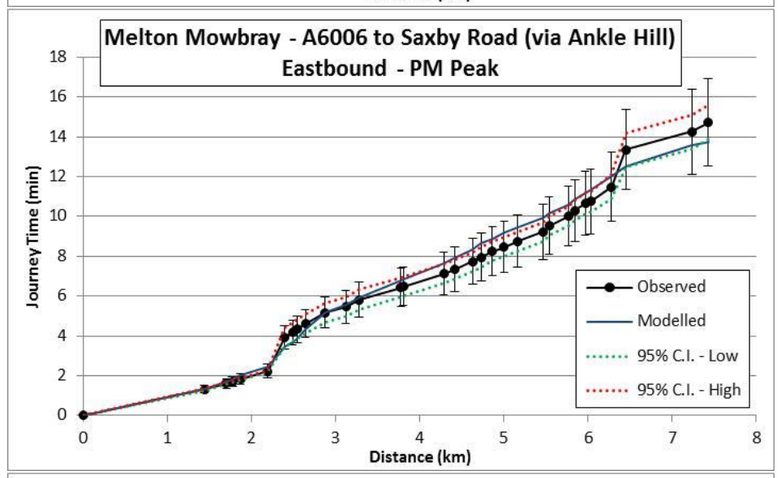

Melton Mowbray - A607 Leicester Road / Thorpe Road
Southbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

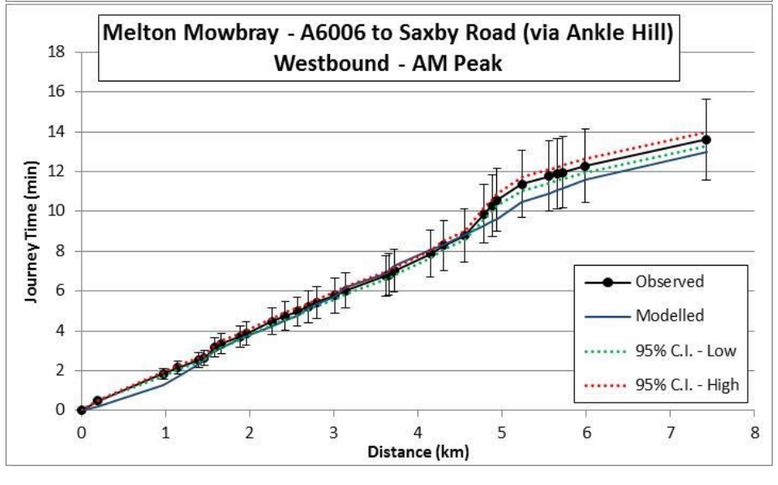

Melton Mowbray - A607 Leicester Road / Thorpe Road
Southbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

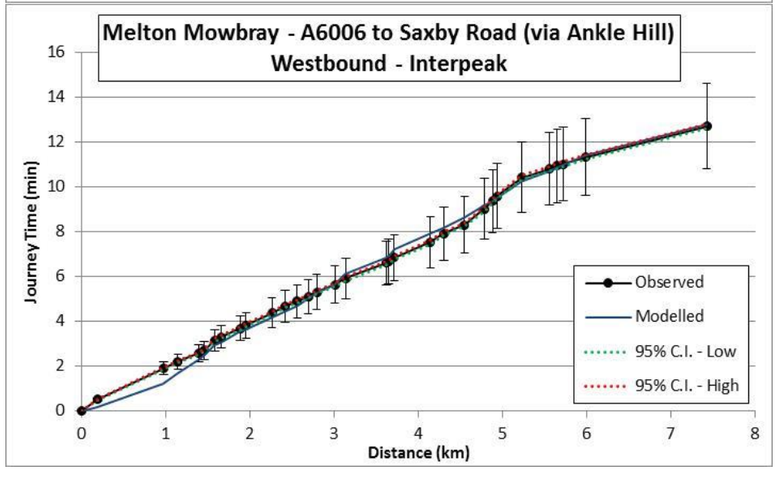

Melton Mowbray - A607 Leicester Road / Thorpe Road
Southbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Mowbray - A6006 to Saxby Road (via Ankle Hill)
Eastbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Mowbray - A6006 to Saxby Road (via Ankle Hill)
Eastbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Mowbray - A6006 to Saxby Road (via Ankle Hill)
Eastbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Mowbray - A6006 to Saxby Road (via Ankle Hill)
Westbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High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Westbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
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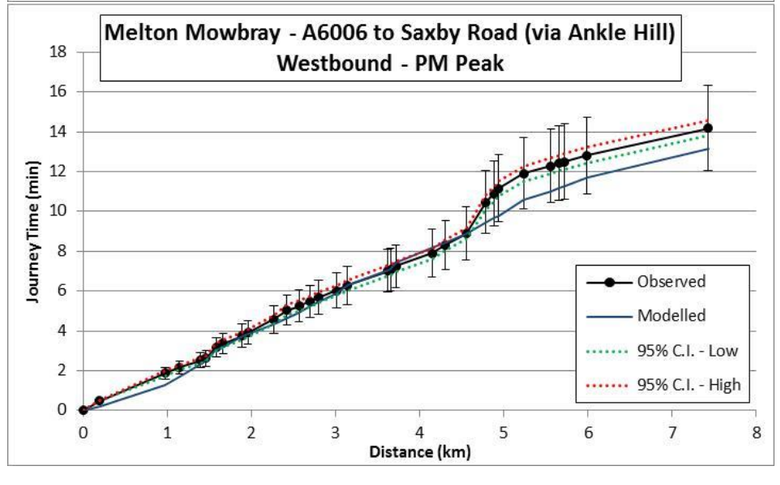
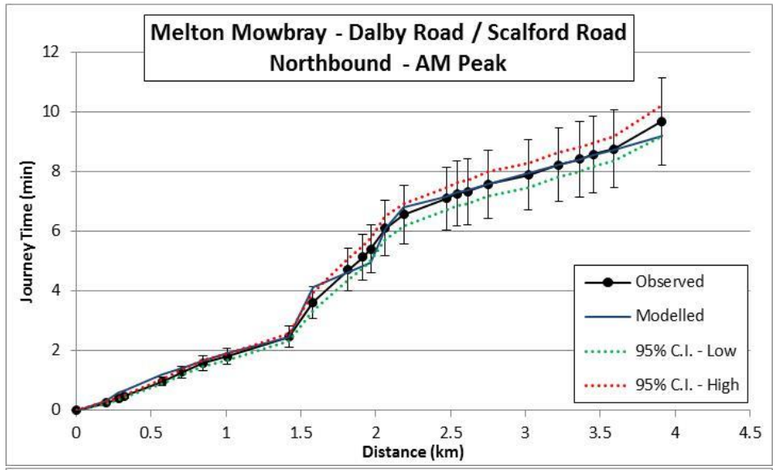
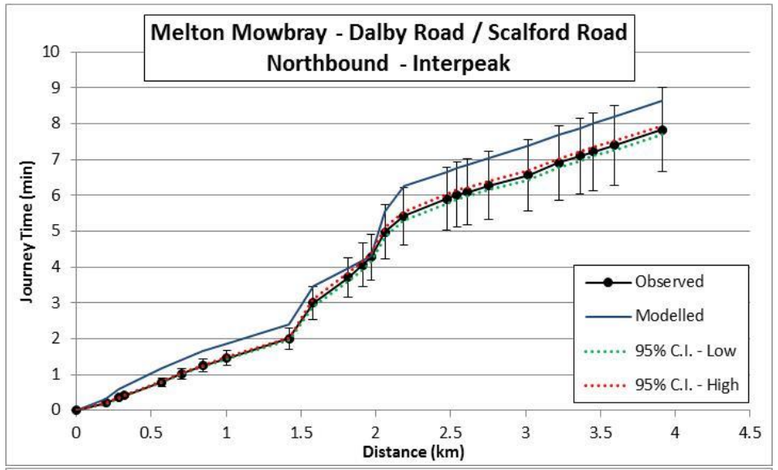
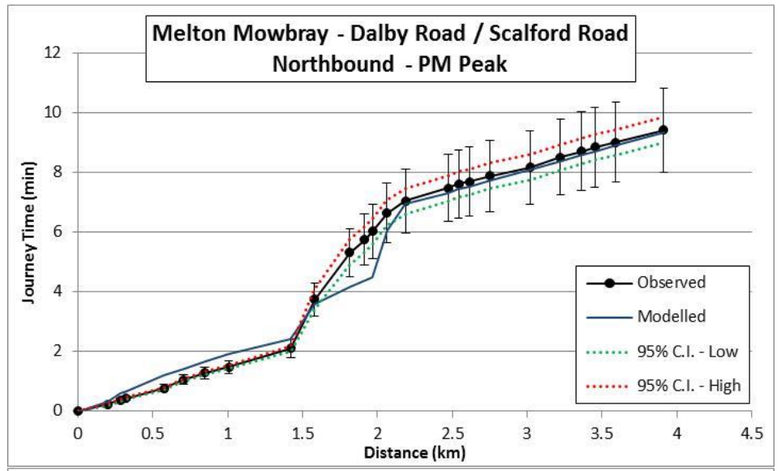
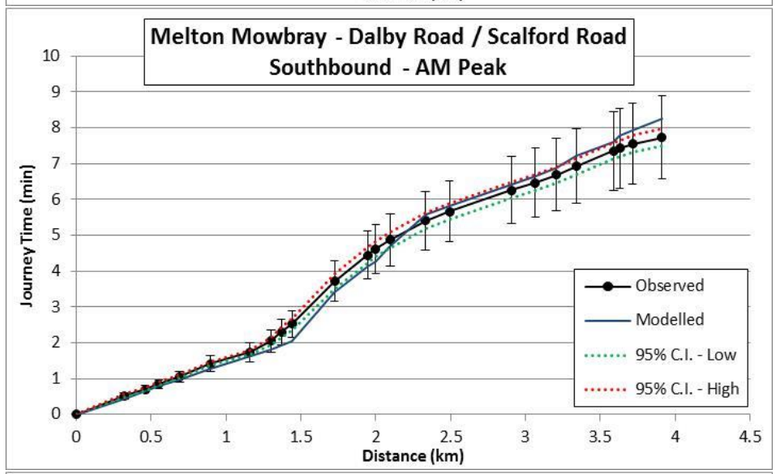
95% C.I. - High

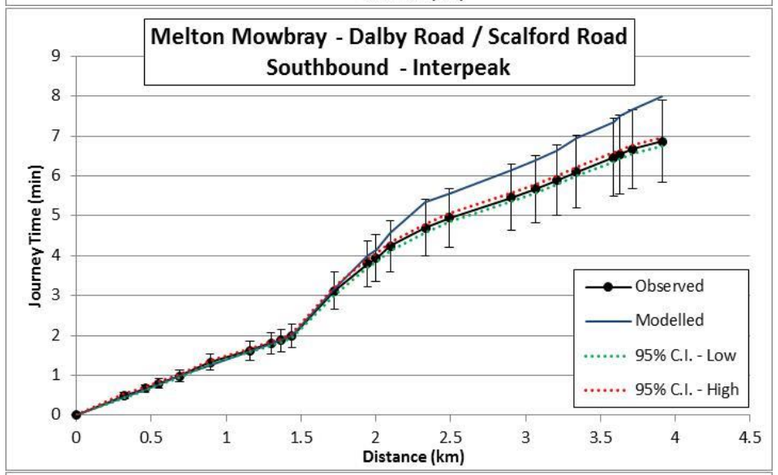

Melton Mowbray - A6006 to Saxby Road (via Ankle Hill)
Westbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

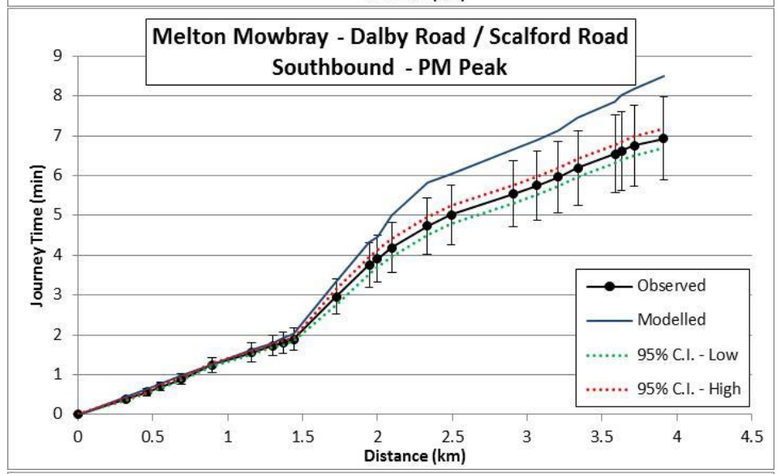

Melton Mowbray - Dalby Road / Scalford Road
Northbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

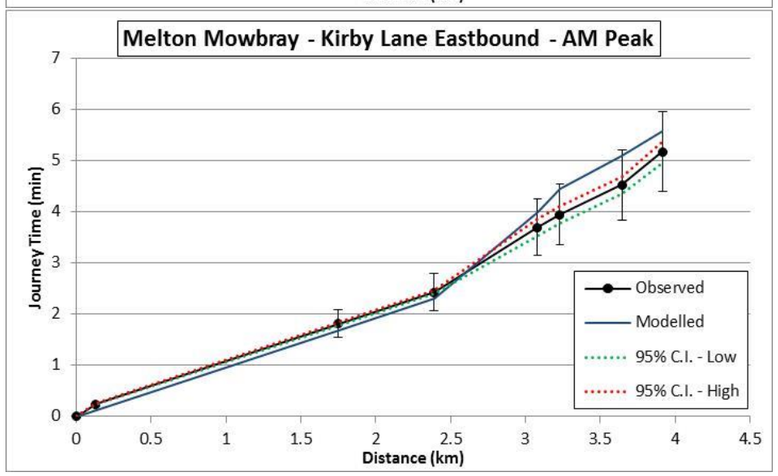

Melton Mowbray - Dalby Road / Scalford Road
Northbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

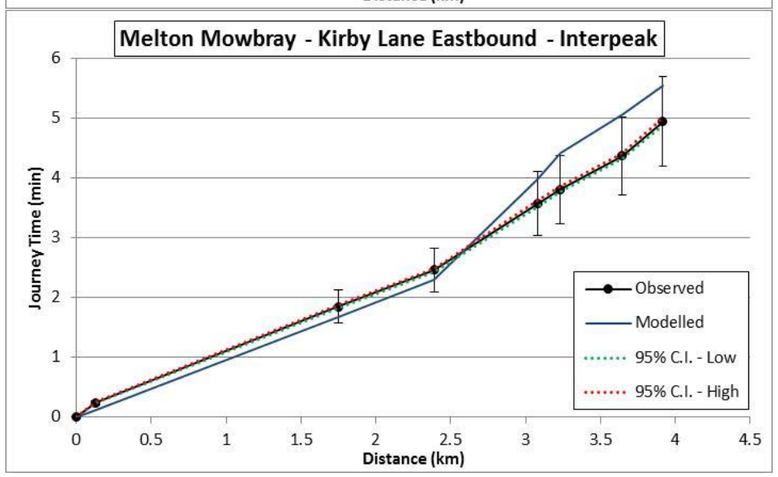

Melton Mowbray - Dalby Road / Scalford Road
Northbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

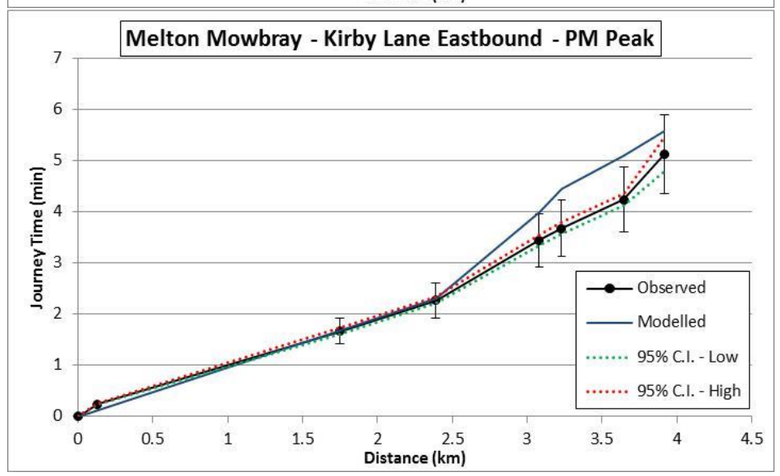

Melton Mowbray - Dalby Road / Scalford Road
Southbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

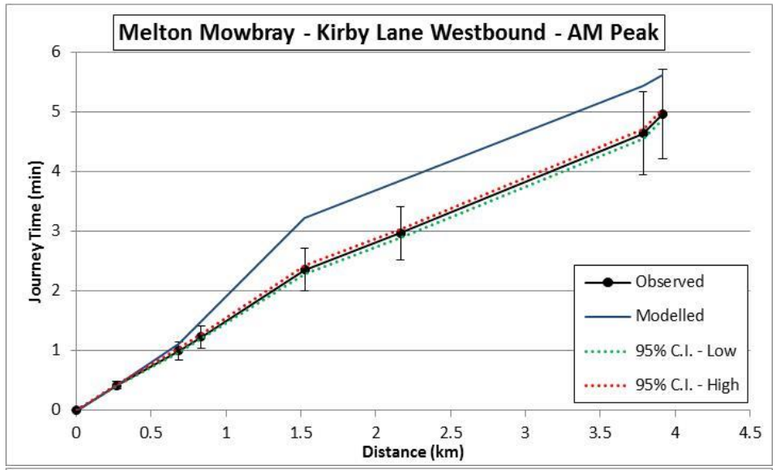

Melton Mowbray - Dalby Road / Scalford Road
Southbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

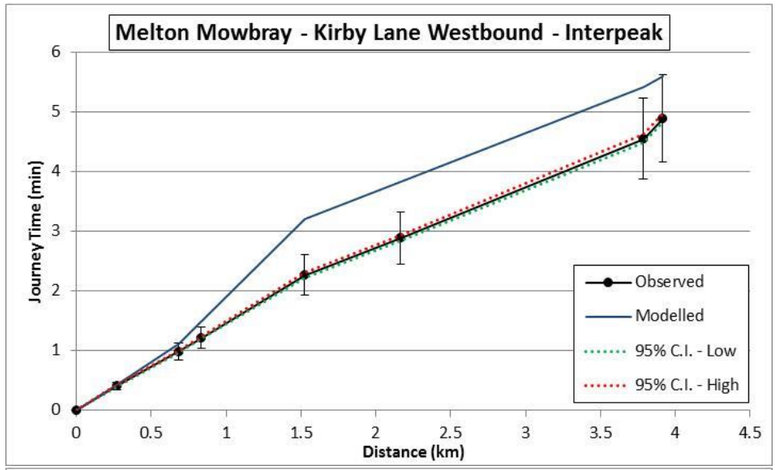

Melton Mowbray - Dalby Road / Scalford Road
Southbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

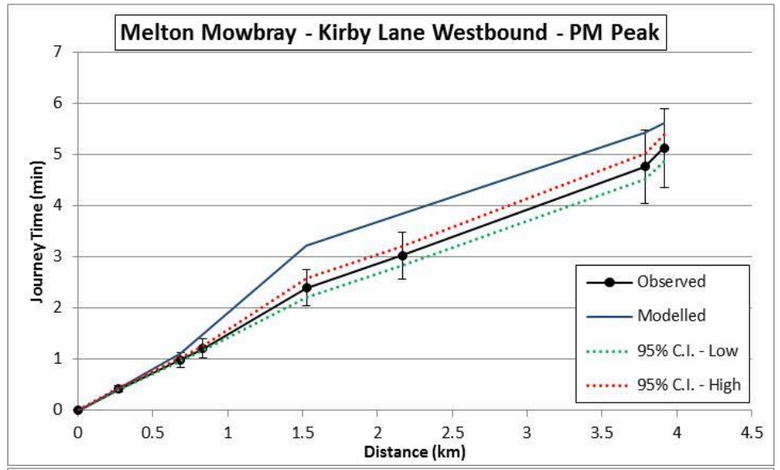

Melton Mowbray - Kirby Lane Eastbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

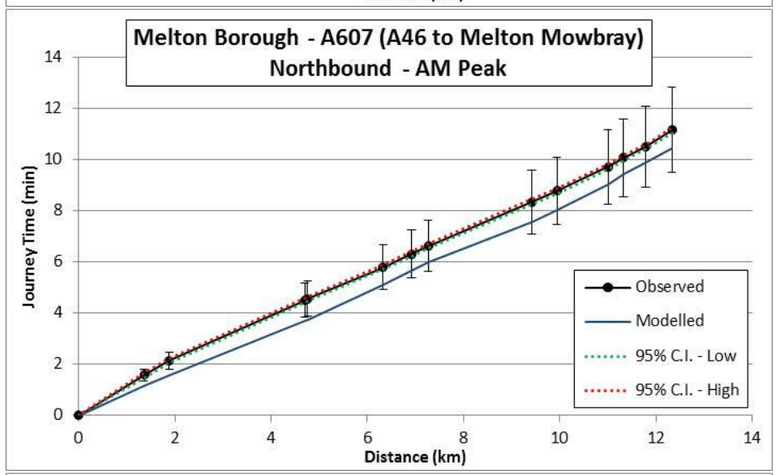

Melton Mowbray - Kirby Lane Eastbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

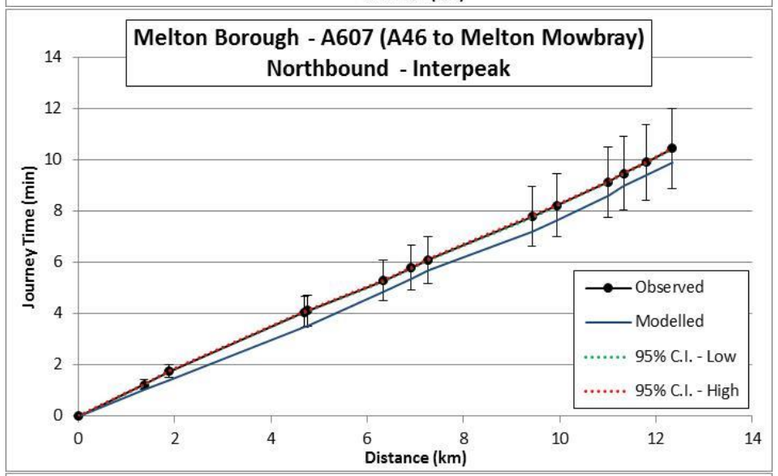

Melton Mowbray - Kirby Lane Eastbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

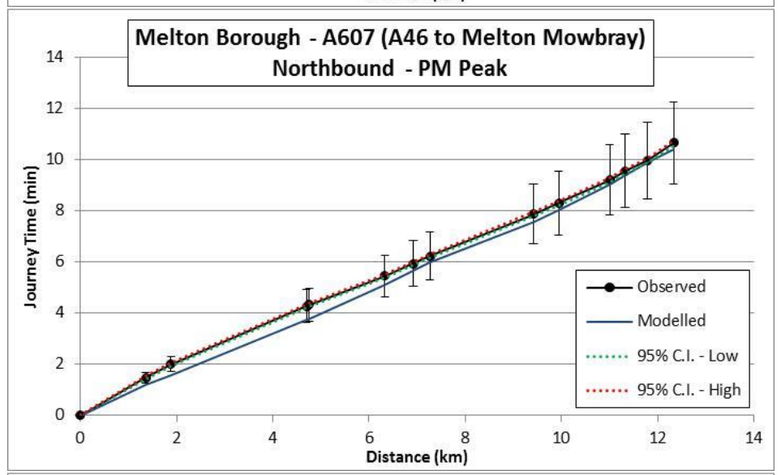

Melton Mowbray - Kirby Lane Westbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

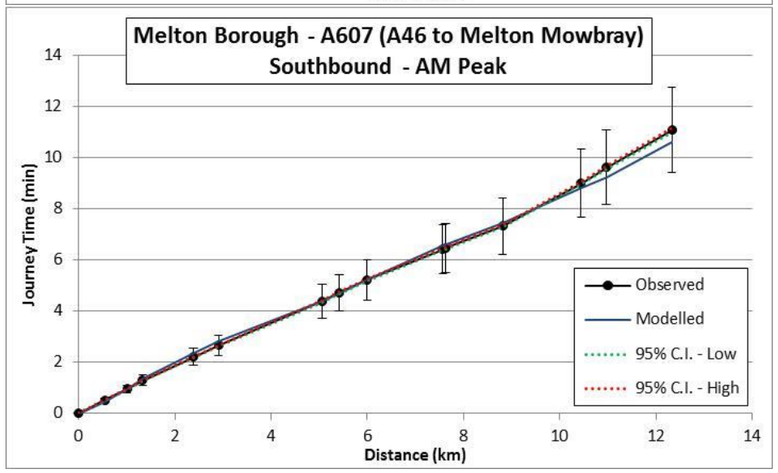

Melton Mowbray - Kirby Lane Westbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

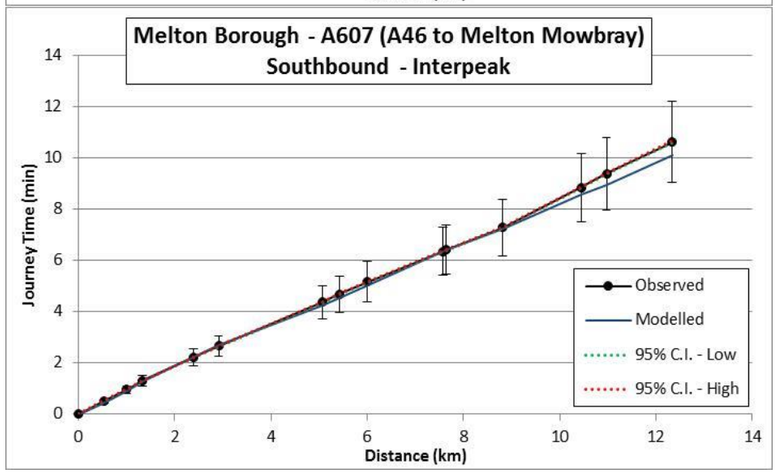

Melton Mowbray - Kirby Lane Westbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

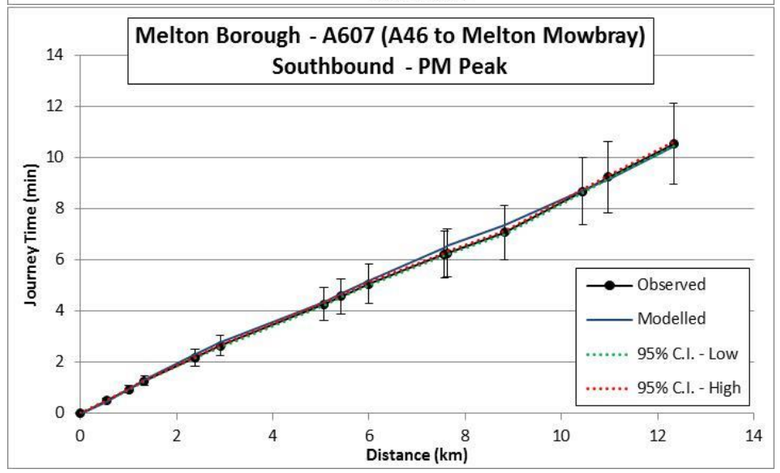

Melton Borough - A607 (A46 to Melton Mowbray)
Northbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Borough - A607 (A46 to Melton Mowbray)
Northbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Borough - A607 (A46 to Melton Mowbray)
Northbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Borough - A607 (A46 to Melton Mowbray)
Southbound - AM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Borough - A607 (A46 to Melton Mowbray)
Southbound - Interpeak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High


Melton Borough - A607 (A46 to Melton Mowbray)
Southbound - PM Peak
Journey Time (min)
Distance (km)
Observed
Modelled
95% C.I. - Low
95% C.I. - High

5.4 Comparison with Additional Count Data

5.4.1 As discussed in Section 2.4, additional count data have been provided within Melton Mowbray, and from this additional dataset 15 counts have been identified and processed for use in validation of the modelled flows within the base year highway model. Two of these counts have been removed due to inconsistencies between count data, leaving 13 additional counts. These counts have not been used as part of the original model development, and as such are over and above the requirements contained within WebTAG.

5.4.2 We would not expect, given that the counts have not been used in the model development, that 85% of these locations meet WebTAG criteria. The local nature of these counts also introduces potential inconsistencies with the defined model zone system, whereby the counts are not located near zone boundaries and therefore the location of the centroid connector can have a significant impact on the apparent model performance.

5.4.3 It should also be recognised that these counts were undertaken during October and November 2016, and have been adjusted using long-term count data to represent flows in April, May and June 2014. This adjustment will add uncertainty to the observed flows, and therefore there is an argument for relaxing the WebTAG criteria to account for this greater uncertainty within the observed data.

5.4.4 Therefore, based on the above comments, any comparison of modelled flows against counts should be viewed as an indication of the model's performance and not as a measure of whether the model meets WebTAG guidelines or not.

5.4.5 Table 5.9 provides a summary on the performance of the modelled flows against the additional count locations within Melton Mowbray by time period for total vehicle flows. Overall, the pass rate is 88% in the AM Peak hour, 85% in the interpeak hour and 73% in the PM Peak hour. This equates to 3 locations in the AM Peak., 4 locations in the interpeak and 7 locations in the PM Peak out of the 26 count locations which do not meet WebTAG criteria for individual link counts.

5.4.6 Considering the count locations which do not meet WebTAG criteria in each time period, no count locations in the AM Peak hour have a GEH statistics of greater than 7.5, with one location having a GEH value of greater than 7.5 in the interpeak hour, and in the PM Peak four locations have a GEH value greater than 7.5.

5.4.7 In the AM Peak and interpeak hours, the performance against these additional counts is consistent with the performance of the model against the calibration and validation counts used in the development of the model. The performance in the PM Peak against these additional counts is below the county and North-East Leicestershire average (as shown in Table 5.5), and below the guideline of 85% of individual links contained within WebTAG. However, given comments above regarding the uncertainty surrounding this additional count data and the fact that these data have not been used in the model development, this analysis does not contradict the good performance of the model against observed data presented elsewhere within this section.

Table 5.9: Model Flow Performance against Additional Counts (Total Flows)

	AM Peak					Interpeak					PM Peak				
	Obs.	Mod.	Diff	GEH	Pass	Obs.	Mod.	Diff	GEH	Pass	Obs.	Mod.	Diff	GEH	Pass
Nottingham Road, North of St Bartholomew's Way, Northbound	402	423	21	1.0	✓	306	318	12	0.7	✓	369	476	107	5.2	×
Nottingham Road, South of Lynton Road, Northbound	448	393	-55	2.7	✓	359	353	-6	0.3	✓	442	513	71	3.3	✓
Nottingham Road, North of Norman Way, Northbound	473	444	-29	1.4	✓	546	470	-76	3.4	✓	692	762	70	2.6	✓
Nottingham Road, North of St Bartholomew's Way, Southbound	355	417	62	3.1	✓	294	265	-29	1.8	✓	490	518	29	1.3	✓
Nottingham Road, South of Lynton Road, Southbound	427	483	56	2.6	✓	344	335	-10	0.5	✓	548	469	-79	3.5	✓
Nottingham Road, North of Norman Way, Southbound	512	491	-21	0.9	✓	455	342	-113	5.7	×	523	346	-177	8.5	×
Scalford Road, near Framland Farm, Northbound	126	107	-19	1.8	✓	85	72	-13	1.5	✓	125	77	-48	4.7	✓
Scalford Road, South of Wymondham Way, Northbound	287	249	-38	2.3	✓	218	219	1	0.1	✓	409	294	-115	6.1	×
Scalford Road, North of Norman Way, Northbound	276	366	90	5.0	✓	391	417	26	1.3	✓	581	588	8	0.3	✓
Scalford Road, near Framland Farm, Southbound	119	113	-6	0.5	✓	95	58	-37	4.3	✓	144	86	-58	5.4	✓
Scalford Road, South of Wymondham Way, Southbound	455	311	-144	7.4	×	227	209	-18	1.2	✓	336	306	-30	1.7	✓
Scalford Road, North of Norman Way, Southbound	610	727	118	4.6	✓	458	496	38	1.7	✓	467	749	282	11.4	×
Thorpe Road, North of hospital, Northbound	404	345	-60	3.1	✓	460	345	-115	5.7	×	559	535	-24	1.0	✓
Thorpe Road, North of hospital, Southbound	492	540	47	2.1	✓	447	470	23	1.1	✓	546	508	-38	1.7	✓
Saxby Road, East of Lag Lane, Eastbound	195	154	-40	3.1	✓	147	112	-35	3.1	✓	209	176	-33	2.4	✓
Saxby Road, West of Brook Street, Eastbound	317	374	57	3.1	✓	240	284	44	2.7	✓	331	379	48	2.6	✓
Saxby Road, East of Lag Lane, Westbound	232	219	-13	0.9	✓	159	132	-26	2.2	✓	189	131	-58	4.6	✓
Saxby Road, West of Brook Street, Westbound	310	259	-51	3.0	✓	230	193	-37	2.6	✓	248	308	60	3.6	✓
Dalby Road, South of Leicester Road, Northbound	300	207	-92	5.8	✓	225	136	-90	6.7	✓	288	152	-136	9.1	×
Dalby Road, South of Leicester Road, Southbound	339	381	42	2.2	✓	327	366	39	2.1	✓	499	444	-55	2.5	✓
Asfordby Road, near West Avenue, Eastbound	443	410	-33	1.6	✓	325	272	-53	3.1	✓	419	330	-89	4.6	✓
Asfordby Road, West of Nottingham Road, Eastbound	530	383	-148	6.9	×	380	251	-128	7.2	×	460	249	-210	11.2	×
Asfordby Road, near West Avenue, Westbound	312	271	-41	2.4	✓	318	245	-73	4.4	✓	450	404	-46	2.2	✓
Asfordby Road, West of Nottingham Road, Westbound	332	212	-120	7.2	×	350	206	-145	8.7	×	480	336	-145	7.2	×
Welby Road, East of Sysonby Street, Eastbound	91	76	-15	1.6	✓	95	56	-39	4.4	✓	138	58	-80	8.0	✓
Welby Road, East of Sysonby Street, Westbound	96	50	-46	5.4	✓	70	51	-19	2.4	✓	101	73	-27	2.9	✓

Section 6 – Conclusions

6.1 Summary

6.1.1 This local LMVR has reviewed the highway model component of LLITM 2014 Base, considering the coding of the highway network, the base year highway demand matrices and the performance of the model against observed data within Melton Borough.

6.1.2 The network coding review highlighted a limited number of minor corrections to the network coding, which have been implemented and shown to have a minimal impact on the model performance against observed data.

6.1.3 In terms of the performance of the model against observed flow and journey time data, across the county the model meets WebTAG guidelines for screenline flows, individual flows and journey times. Within North-East Leicestershire (which broadly represents Melton Borough) the percentage of individual links meeting WebTAG criteria is at or above 90% in all three time periods. Similarly the proportion of journey time routes meeting WebTAG criteria within North-East Leicestershire is above 90% in all three time periods.

6.1.4 Within LLITM 2014 Base there are two sources of demand data for Melton Mowbray: the processed and adopted mobile phone data; and a series of roadside interviews. It is unusual for a model to have two independent sources of demand data to be able to perform a review of the base year demand. There are uncertainties with both sources of data, both of which are samples and therefore subject to biases.

6.1.5 However, there are differences in trip patterns and across the trip length distributions; including for movements likely to be affected by the scheme. The comparison of the base year demand matrices against the independent roadside interview data suggests that the model may understate trips which pass through Melton Mowbray, and overstate trips which are wholly internal to Melton Mowbray.

6.1.6 Given the performance of the highway model against the flow and journey time criteria contained within WebTAG, it is considered that the model is suitable for the central scope of the Outline Business Case, including the noise and air quality assessments of the scheme.

6.1.7 Whilst we do not know the precise implications of the difference in trip patterns observed against the RSI data on the value for money assessment of the scheme, and on the basis of wanting to de-risk any potential uncertainty around the Transport Economic Efficiency benefits, work is being undertaken to recalibrate the base year highway model making use of the roadside interview data within the highway matrices. This alternative base year model will provide a sensitivity test to determine if the differences in the pattern of demand within Melton Mowbray is significant or not to the value for money assessment.

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