NORTH AND EAST MELTON MOWBRAY DISTRIBUTOR ROAD

Proof of Evidence LCC 03: Traffic Modelling

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1. Introduction

1.1 Qualifications and Experience

1.1.1 My name is Mark Dazeley. I am a Regional Director within AECOM, an international engineering company, where I lead the Strategic Modelling team in the South East. I am also the Transport Planning South East District Lead where my responsibilities include upholding the technical excellence of our transport modelling services. I have worked for AECOM for almost 23 years.

1.1.2 My educational qualifications include an honours degree in geography and a master's degree in transport planning from Imperial College. I am a chartered member of the Institute for Logistics and Transport.

1.1.3 I have 23 years' experience as a transport planner. I have specialised in multi-modal development and forecasting demand for travel across all modes of transport. My project experience includes research projects that have contributed to the development of modelling and appraisal guidance and the transport modelling and appraisal of a range of transport schemes such as the NEMMDR.

1.1.4 Relevant project experience includes where I:

- directed the transport modelling and scheme appraisal, using LLITM/PRTM[1], for the A511 MRN Growth Corridor scheme in Coalville, Leicestershire, underpinning the Outline Business Case;
- directed the transport modelling and scheme appraisal, using LLITM, for several successful funding bids to the Department for Transport's Local Sustainable Transport Fund;
- managed the update of the modelling and appraisal, using LLITM, for the Loughborough Inner Relief Road Full Business Case;
- managed the transport modelling, appraisal, and Economic Case for the Lower Thames Crossing Strategic Outline Business Case on behalf of the Department for Transport before the scheme came within Highways England's remit; and

[1] The Pan-Regional Transport Model (PRTM) is a geographically enhanced variant of the Leicester and Leicestershire Integrated Transport Model (LLITM)

- managed the modelling and audit of multiple toll road traffic and revenue forecasting studies in Ireland, France and Spain working for concessionaires and potential lenders.

1.1.5 Since early 2017 I have overseen the use and development of the Leicester and Leicestershire Integrated Transport Model (LLITM) for the forecasting and appraising the proposed NEMMDR scheme, and producing the modelled data used to underpin the Transport Assessment.

1.2 Scope of evidence/Involvement in the Scheme

1.2.1 The purpose of my evidence is to describe the Leicester and Leicestershire Integrated Transport Model (LLITM), how it was applied to produce forecasts for the assessment of the NEMMDR and to explain why those forecasts can be relied upon.

1.3 Declaration of truth

1.3.1 This proof of evidence includes the facts which I regard as being relevant to the opinions that I have expressed and that the inquiry's attention has been drawn to any matter that would affect the validity of that opinion. I believe that the facts stated in this proof are true and that the opinions stated are correct.

1.4 Supporting Documents

1.4.1 The following related reports should be considered alongside this proof of evidence:

- LLITM 2014 Base: Local Melton Borough Highway Model LMVR (AECOM, December 2017) [SAD13]
- LLITM 2014 Base: Melton Mowbray Distributor Road Outline Business Case: Forecasting Report (AECOM, December 2017) [SAD14]
- Melton Mowbray Distributor Road Options Assessment Report (WSP, November 2017) [SAD2]

1.4.2 This proof of evidence also cites several reference documents produced by the Department for Transport which are available to download online[2]:

- TAG Unit M1-1: Principles of Modelling and Forecasting
- TAG Unit M2-1: Variable Demand Modelling
- TAG Unit M3-1: Highway Assignment Modelling
- TAG Unit M4: Forecasting and Uncertainty
- TAG Unit A1-3: User and Provider Impacts
- TAG Unit A2-1: Wider Economic Impacts Appraisal
- TAG Unit A4-1: Social Impact Appraisal
- TAG Unit A4-2: Distributional Impact Appraisal
- TAG Unit A5-1: Active Mode Appraisal

[2] https://www.gov.uk/guidance/transport-analysis-guidance-tag

2. Outline of Evidence

2.1 My proof of evidence is structured as follows:

- In Section 3 I explain why the Leicester and Leicestershire Integrated Transport Model (LLITM) is required, how it was developed, and the overall scope of the model used to assess the scheme.
- In Section 4 I explain why I judge that the LLITM is suitable for testing the impacts of the scheme.
- In Section 5 I describe why forecasting assumptions are required to assess transport interventions. I then set out the assumptions used and how travel demand in Melton Mowbray is forecast to evolve without the scheme.
- In Section 6 I then explain the forecast effects of the scheme on travel demands and travel conditions.
- In Section 7 I describe the methodologies used to appraise the scheme and present the results for each aspect of the appraisal.
- In Section 8 I explain how uncertainties in modelling transport schemes are considered and present the outputs of sensitivity tests designed to understand the implications of these uncertainties for the forecasts.
- In Section 9 I then summarise the implications of my evidence.

3. The Need for and the Development of the Leicester and Leicestershire Integrated Transport Model

3.1 Introduction

3.1.1 The purpose of this section is to explain the development and the role of the Leicester and Leicestershire Integrated Transport Model (LLITM) to inform the design and the appraisal of the scheme.

3.1.2 I first explain the need for transport models and explain how the outputs are used to appraise and inform the design of transport schemes. I then describe what capabilities transport models are expected to have. Finally, I describe how the LLITM was developed, including its validation, to ensure that it was suitable for use in supporting the design and appraisal of the scheme.

3.1.3 All transport models apply functions representing behaviour to observations of travel derived from surveys. In this section I consider the suitability of the functions used in the LLITM and the adequacy of the surveys undertaken to provide a model representing travel in Melton Borough. In Section 4 of my proof I then consider whether the model is sufficiently detailed, accurate and responsive to judge its suitability specifically for preparing forecasts for the scheme.

3.2 The Need for Transport Models

3.2.1 Transport schemes are designed to serve transport needs. A scheme such as the NEMMDR takes time to plan and construct and is intended to serve users' needs for many decades. This requires an understanding of how transport needs may evolve.

3.2.2 Developing the business case for a transport scheme draws together evidence of its performance and its likely impacts. The process involves a careful, structured process to:

- understand the problems;
- define objectives; and
- formulate, test and appraise economic, environmental and social implications of solution options.

3.2.3 At the heart of this process is a requirement to test and appraise options. This testing and appraisal of options requires a forecast of the effects they will have. For major

transport schemes, such as the NEMMDR, these forecasts of the effects on the transport system are produced by a transport model.

3.2.4 The transport model used in the context of the NEMMDR has been developed to support the scheme's business case and reflects the most appropriate guidance and assumptions available at the time. All transport models are, however, subject to changes and developments over time. Such changes and developments in terms of modelling guidance and assumptions will continue as the scheme is developed further.

3.3 The Model Outputs

3.3.1 A transport model, such as the LLITM, is used to provide a range of outputs to inform design and appraisal. The outputs help understand travel demand and are used to inform a range of impacts, for example:

Traffic flows, i.e. the number of vehicles travelling along roads	These outputs are used to interpret the operational performance of the highway network and are used by other specialists to assess the emission of pollutants and the noise generated by traffic
Traffic congestion, such as delays incurred by road users	
Travel patterns, such as the origin, destination, purpose, and time of day of journeys	These outputs are used to derive the economic benefits of the scheme and its alternatives
Travel times and costs by time of day for journeys	

3.4 Modelling Functionality

3.4.1 The Department for Transport sets out guidance on modelling and appraisal of transport schemes in TAG (Transport Analysis Guidance)[3]. In the following paragraphs, I refer to the published guidance followed throughout the development of the LLITM and its use in preparing the forecasts that are the subject of my evidence.

[3] https://www.gov.uk/guidance/transport-analysis-guidance-tag

3.4.2 The LLITM forecasts for the NEMMDR are based on the March 2017 version of TAG (then referred to as WebTAG) which was the latest available version of the guidance during the model development and forecasting. Updates have been implemented to TAG since March 2017; however, these revisions do not include any changes that would have altered the adopted modelling approach.

3.4.3 TAG Unit M3-1 details the guidance on the development of a model for highway traffic to assess schemes such as the NEMMDR. This includes discussion on the specification of the highway assignment model and the calibration and validation standards for the model against observed data. TAG also discusses the interaction between the highway assignment model and the remaining components of the LLITM, namely the public transport assignment model, the demand model, and the land-use model.

3.4.4 The role of the land-use model is to take information on the location and size of residential and employment developments along with the costs of travel to forecast the location of population and jobs. This is undertaken within constraints of population and employment growth set out by the Department for Transport in its National Trip-End Model version 7.2.

3.4.5 The role of the demand model is to provide forecasts of travel demand, distinguishing the mode (car, public transport, or active modes (walking and cycling)) and time of travel, together with the origin and destination for the journeys.

3.4.6 Two types of processes are employed in demand models. The first is to reflect changes in land-use forecast by the land-use model. If residential development results in more people living an area, then the demand for travel from that area would be expected to increase. The second is to reflect changes in travel conditions, that is the time and the monetary cost required to make journeys.

3.4.7 Travellers prefer to make quicker, easier, more comfortable, or cheaper journeys. The integration of a multimodal transport model involves representing a balance between the demand choices and the level of service (that is the journey time and cost) provided by the transport networks.

3.4.8 The role of the highway assignment model is to represent the performance of the highway network. The models include a representation of the roads and junctions. Congestion is caused by the volume of traffic traversing the network and the models

include functions to represent the level of delay caused as traffic increases. Car drivers, however, choose their route taking account of the time and cost of different routes. Thus, drivers can use 'rat runs' or indirect routes to avoid congestion. The highway models represent this routeing behaviour and the balance between this and the level and location of congestion.

3.4.9 The public transport assignment model provides a similar role in representing how many passengers use different public services. The models include a representation of the service timetable and stop locations, together with the scope to access or transfer between services. In addition to the in-vehicle time, wait time, and fare, a passenger's choice of route is influenced by the location of stops or stations that they can access, and by where it is reasonable to transfer between services.

3.4.10 Models are intended to provide outputs to assist in reaching informed decisions. Investment in transport models should be proportionate to the intended use. This involves careful consideration of the detail required. Within TAG, the DfT states the requirement to *'consider the trade-off between developing the model (in terms of its accuracy and functionality) and carrying out additional forecasting work to test for sensitivity and uncertainty'* [TAG Unit M1-1, Section 2.3.6] and that it *'may not be necessary to use the most sophisticated or detailed models'* [TAG Unit M1-1, Section 2.4.3].

3.4.11 Large models of counties, such as the LLITM, are typically designed to represent the overall patterns of demand and performance of the transport networks and in most cases do not represent, with a high degree of accuracy, the detailed performance of individual roads and public transport services. This provides outputs of sufficient quality to inform decisions on strategy and feasibility of major transport schemes.

3.4.12 The LLITM has been maintained and developed over time to enhance its capabilities to respond to new requirements in this way, as I next describe.

3.5 Initial Development of the LLITM (2009-2010)

3.5.1 In 2007, Derby City Council, Derbyshire County Council, Leicester City Council, Leicestershire County Council, Nottingham City Council and Nottinghamshire County Council received Transport Innovation Funding to undertake a congestion management study.

3.5.2 To build on this study, further investigation, development, refinement, and appraisal of options was required. To this end, Leicestershire County Council, in partnership with Leicester City Council, commissioned AECOM (then Faber Maunsell), Scott Wilson and David Simmonds Consultancy to develop the Leicester and Leicestershire Integrated Transport Model.

3.5.3 This model represented a base year of (September) 2008 and was developed over the course of 2009 and 2010. Whilst the model includes a representation of mainland Great Britain, the focus of the model is on Leicester City and Leicestershire, and this is where the level of detail is greatest.

3.5.4 During the model's lifetime several updates were made, mainly enhancing the performance of the highway assignment model included in the model suite. During this time the model was used to underpin major scheme business cases, the development of local Core Strategies and the assessment of proposed major developments within Leicestershire.

3.6 Update to the LLITM (2014-2015)

3.6.1 A comprehensive refresh of the model was undertaken to update the model to reflect a (April, May and June) 2014 base year making use of 2011 Census data and emerging techniques around the use of mobile network data to derive highway travel demand matrices. The Area of Detailed Modelling was also extended as part of the update to include additional areas outside Leicestershire, primarily around the western half of the county.

3.6.2 As part of the update to the model to reflect a 2014 base year, travel demand data were collected in the form of mobile network data for highway travel, and electronic ticket data for public transport. A comprehensive data collation and collection programme was also undertaken to provide observed flow data (for highway and public transport) and highway journey time data against which to calibrate and validate the assignment models.

3.6.3 The highway demand data covered travel for one month in 2014, with the public transport ticket data capturing all travel by rail and travel on most bus services in the county. These data were collated to provide information on the nature of travel, that is

to understand how, where, why, and when travel in Leicester and Leicestershire is made.

3.6.4 In terms of the traffic flow data, a total of 618 count locations were used to define 39 screenlines and 15 cordons[4] within the model. Of these screenlines and cordons, a cordon around Melton Mowbray was defined along with five screenlines within Melton Mowbray and a further screenline running across Melton Borough parallel to the A606. In terms of journey time data, 75 routes where defined in the model, including five journey time routes within Melton Mowbray, each of which is assessed for both directions of travel.

3.6.5 In addition to the collection of highway travel demand data from mobile network data, a series of roadside interviews were undertaken across the county. Roadside interviews were undertaken in 2013/14 at 106 locations capturing 107,479 interviews which include a cordon around Melton Mowbray and a River Eye screenline. As the use of mobile network data was an emerging technique at the time of the model development, these roadside interviews provided an alternative source of travel demand data if required, and were also used as part of the checking and verification of the mobile network data.

3.6.6 The quantity of roadside interview data collected for the development of the LLITM is atypical, and when combined with the mobile network data, the resulting data set is a rich source of travel demand information. Therefore, in my view these data have sufficient detail and quality to understand travel patterns and network performance in Melton Mowbray. Accordingly, the data were used to develop the demand model, highway assignment model, and public transport assignment model included in the LLITM.

3.6.7 Throughout the development of the LLITM, an independent peer reviewer was appointed by Leicestershire County Council to review and challenge the approach and

[4] Screenlines are abstract lines typically drawn along features such as rivers or railways, which have a minimum number of crossing points, making it more manageable to count traffic going from one side to the other. Cordons are screenlines or groups of screenlines that enclose areas of interest and are generally roughly circular in shape.

For example, a screenline drawn in an east-west orientation across north/south roads can be used to calibrate (i.e. adjust) and validate (i.e. check against independent data) traffic flows in the northbound and southbound direction. Screenlines therefore concern high level vehicle movements across a model rather than the specific route choice between competing parallel roads.

outcomes of the model development. For the initial model development, this peer reviewer role was performed by Andy Skinner, with Miles Logie undertaking the role as part of the model update.

3.6.8 In addition to this, a representative from Highways England, namely Craig Drury, also provided review and challenge as part of the model development. The Department for Transport has also reviewed the model development as part of the Outline Business Case (OBC) submission for the scheme. The DfT has stated its approval for the use of LLITM to assess the NEMMDR, and has also provided comments in relation to the OBC Economic Case. These comments and questions were answered in January 2018, and where appropriate, have been considered in subsequent scheme assessment.

3.6.9 This version of the model was used as part of an initial assessment of the scheme and an alternative western option as part of a refresh of the Options Assessment Report [SAD2] in early-2017. This Options Assessment Report [SAD2] was prepared by WSP prior to AECOM's involvement in the project and documents the sifting of a long-list of schemes. It also covers the assessment of eastern and western options for the scheme.

3.6.10 As part of this assessment for the Options Assessment Report [SAD2], it was found that the transport user benefits for the eastern option were around 55% higher than those for the western option, and the estimated scheme costs were also around 13% higher for the western option. Whilst this work has not been audited by AECOM, it is understood to have been carried out in accordance with TAG and derives transport user benefits using the DfT's TUBA software (see Paragraph 7.2.1 for a description of this tool). This assessment formed part of the decision-making process to proceed with the eastern alignment for the scheme.

3.7 Local Updates for Scheme Assessment

3.7.1 As part of the study looking at the NEMMDR, a detailed review of the LLITM within the expected area of impact of the scheme was undertaken. This considered the underlying structure of the model (model zone detail, highway network coverage), the representation of the highway network in the model, and the performance of the model against the observed traffic flow and journey time data.

3.7.2 This review found that the model performed well against observed traffic flow and journey time data and had sufficient zone and network detail for the assessment of the

scheme; however, some minor corrections to the representation of the highway network in Melton Mowbray were recommended. Following the implementation of these improvements, the performance of the highway assignment model against observed data remained unchanged, with the performance meeting TAG criteria within Melton Mowbray and the surrounding area.

3.7.3 This review of the LLITM for the purposes of assessing the scheme concluded that, following the minor highway corrections: *'given the performance of the highway model against the flow and journey time criteria contained within TAG, 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'*.

3.8 Summary

3.8.1 In this section I have described the development of the LLITM. I have explained that the model development was undertaken in accordance with best practice set out in TAG. I have also described how due care has been taken to review the capabilities of the model for the assessment of the scheme. This care has ensured that the LLITM is a suitable tool for the assessment of the scheme.

3.8.2 While I have demonstrated in this section that the model has been developed from a satisfactory observed evidence base and that it has appropriate functions, I have not demonstrated its suitability for use in preparing forecasts for the scheme, which I consider in the following section.

4. Suitability of the Leicester and Leicestershire Integrated Transport Model

4.1 Introduction

4.1.1 The purpose of this section is to explain why I judge that the LLITM is suitable to assess the NEMMDR scheme. As highlighted in Paragraph 3.6.8, the Department for Transport has reviewed the development of the LLITM and also stated its approval for the use of the model to assess the scheme, as part of its review of the Outline Business Case submission in 2017/2018.

4.1.2 I have explained in Section 3 that the model was developed using sufficient data and with suitable functional capability to forecast the effects of the scheme on the highway network, and to forecast how travel demand would change as a result of the scheme. I also explained that the model can provide the range of outputs required.

4.1.3 My specific assessment of model's suitability rests, therefore, on:

- model detail, that is whether the model is sufficiently detailed to represent the scheme;
- model accuracy, that is whether the model outputs adequately reproduce observed conditions and demand; and
- model sensitivity, that is whether the model responds appropriately to changes in input assumptions.

4.1.4 In this section I explain how I have assessed the model performance regarding these questions in turn. I then conclude this section by explaining how I satisfied myself that the outputs are being used appropriately.

4.2 Model Detail

4.2.1 Models aggregate space into zones, or areas, from which trips start or finish. TAG Unit M3-1 sets out principles for defining zones, which should be developed based primarily on Census Output Areas and designed to capture areas with similar land-use and similar access to / from the modelled highway network. The model zone should also be designed such that, in the Area of Detailed Modelling, the *'resultant numbers of trips to and from individual zones should be approximately the same for most zones and that the numbers of trips to and from each zone should be some relatively small*

number' [TAG Unit M3-1, Section 2.3.11]. I am satisfied that the LLITM zoning system complies with this guidance for the purpose of assessing the scheme.

4.2.2 The highway model includes a representation of the road links and junctions, including information on the speed and capacity of links, and the type and capacity of junctions. In terms of the links which are included in the model, TAG Unit M3-1, Section 2.4.1 states that *"all roads that carry significant volumes of traffic"* should be included and more generally that networks *"should be of sufficient extent to include all realistic choices of route available to drivers"*. TAG Unit M3-1 goes on to say that, in practice, this means that *"the network should include all main roads, as well as those secondary routes, and roads in residential areas (especially 'rat-runs'), that are likely to carry traffic movements which could use the scheme being assessed, either in the base year or in future years"*.

4.2.3 Travel levels, patterns and trip purposes vary across the day and therefore the model is required to capture this variation. TAG Unit M3-1, Section 2.5.1 states that *'highway assignment models should therefore normally represent the morning and evening peaks and the interpeak period separately as a minimum'*.

4.2.4 Different road users incur different vehicle operating costs for a journey and have different perceptions around the value they apply to time savings. The model is therefore required to provide a specification of user classes which captures the key variations in the model area. As a minimum, TAG Unit M3-1, Section 2.6.2 states that *'cars on business, other cars, LGVs and HGVs should be treated as individual user classes'*. I am satisfied that the LLITM user classes (presented below) are suitable for the assessment of the scheme.

- HGV demand;
- LGV demand;
- business demand;
- 'other' low value of time demand;
- 'other' medium value of time demand;
- 'other' high value of time demand;
- commuting low value of time demand;
- commuting medium value of time demand; and

- commuting high value of time demand.

4.3 Model Accuracy

4.3.1 In Section 3 of my proof I explained how the LLITM was developed in accordance with guidance, and involved careful verification of the data's integrity. Having confirmed that the model has suitable detail for the requirements of the scheme assessment, I now consider whether the model is sufficiently accurate for this purpose. I refer to and use the DfT acceptability guidelines to consider the performance of the LLITM in the vicinity of the NEMMDR scheme.

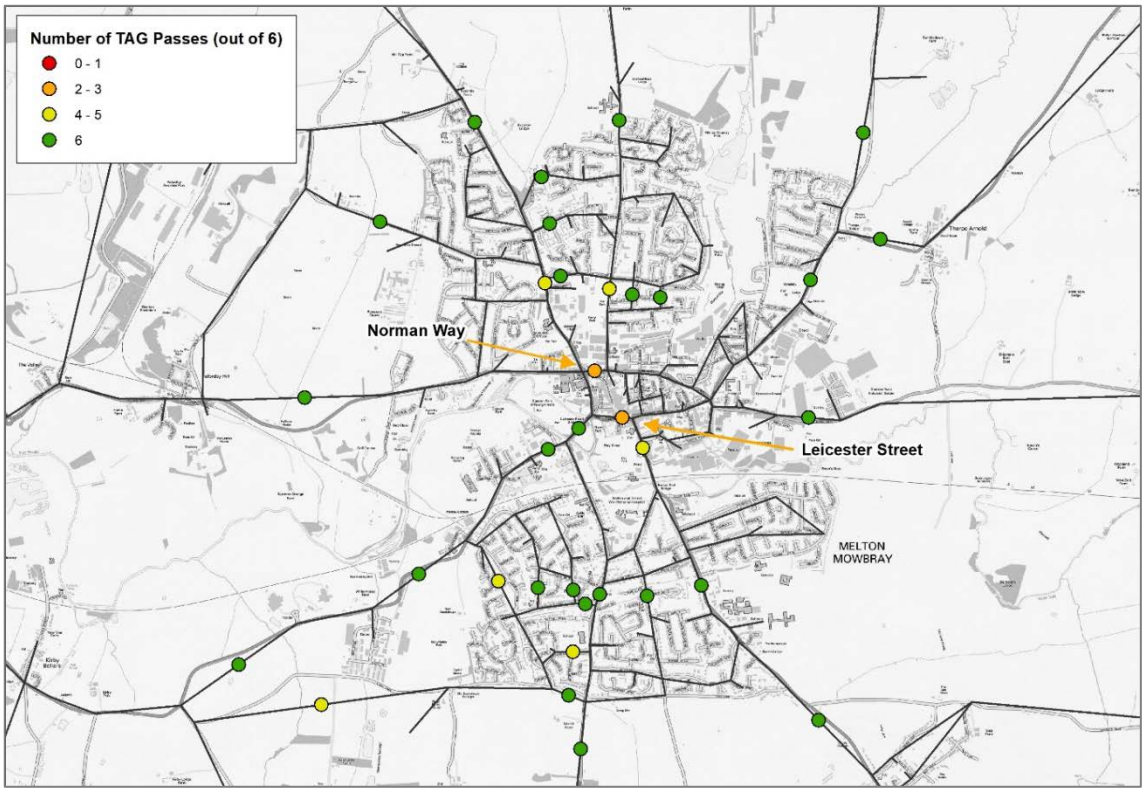
4.3.2 Highway model accuracy is tested by comparing modelled traffic flows and journey times against observed data. These data are independent from those used to build the model and are used to test how well the highway model represents traffic flows, queues and delays, together with their effects on traffic routeing.

4.3.3 TAG Unit M3-1 sets out criteria to test model flows against observed data. The comparison undertaken demonstrates that 93%, 95% and 90% of flows at count sites in 'north-east Leicestershire' (broadly aligned with Melton Borough) are within the TAG criteria in the AM Peak, interpeak and PM Peak hours, respectively. This is in excess of the acceptability guideline of 85% in TAG and indicates a good reproduction of observed flows in the vicinity of the scheme.

4.3.4 The roads in 'north-east Leicestershire' where modelled vehicle flows do not meet TAG criteria are as follows, with their locations illustrated in Figure 1:

- Kirby Lane eastbound (AM Peak and PM Peak hours)
- Norman Way westbound (AM Peak, interpeak, and PM Peak hours)
- Norman Way eastbound (AM Peak hour)
- Leicester Street westbound (AM Peak, interpeak, and PM Peak hours)
- Swallowdale Road eastbound (AM Peak and PM Peak hours)
- A606 Burton Street northbound (AM Peak and PM Peak hours)
- A606 Nottingham Road southbound (interpeak and PM Peak hours)
- Scalford Road southbound (interpeak and PM Peaks)
- Edendale Road southbound (PM Peak hour)

Figure 1: LLITM Link Flow Performance in Melton Mowbray[5]



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4.3.5 In terms of scheme appraisal, the materiality of any such instance where TAG guidance is not met depends on:

- its location and the type of road in the context of the scheme; and
- the scale of difference between the observed and modelled vehicle volumes, and whether this difference is positive or negative.

4.3.6 Of key interest to the scheme is the link flow performance on roads in the vicinity of the NEMMDR alignment. As shown in Figure 1, along the length of the alignment of the NEMMDR (not shown) the model meets TAG link flow criteria in all time periods and directions.

4.3.7 The model's most significant deviation from observed data occurs on the inner ring road. In the westbound direction on Leicester Street (see annotation), the model overstates traffic volumes by 320 vehicles (~55%), 359 vehicles (~73%) and 359 vehicles (~56%) in the AM Peak, interpeak and PM Peak hours, respectively. However, the model underestimates the traffic volumes on the parallel Norman Way (see

[5] The link performance is shown in terms of passes out of a maximum of six (the product of two directions and three time periods per location).

annotation) by 184 vehicles (~36%), 286 vehicles (~53%), and 170 vehicles (~26%) in the same time periods.

4.3.8 Whilst not of exactly the same magnitude, these opposite deviations are suggestive of local routing issues on the inner ring road, rather than a strategic one. In considering this and the location of these issues, I do not consider this to be of material significance for the purpose of assessing the scheme.

4.3.9 The model's representation of traffic volumes on the A606 Burton Street and A606 Nottingham Road is of particular importance due to the A606's function as a north/south route and consequent interaction with the scheme. On A606 Burton Street in the northbound direction, the model overestimates traffic volumes by around 160 vehicles/hr (approximately 20%) in the AM Peak and PM Peak hours. The representation of southbound traffic volumes on the A606 Nottingham Road is below observed values by approximately 100 vehicles (~26%) in the interpeak, and 170 vehicles (~33%) in the PM Peak hour.

4.3.10 On both A606 Burton Street and A606 Nottingham Road, however, traffic data from at least one additional location on the same route (slightly further out from the town centre) are available where TAG criteria are met in all three time periods. This suggests that the non-compliance with TAG on these two routes closer to the town centre is a result of local routing imperfections in the model, rather than a strategic one. Consequently, for the purpose of assessing the scheme, the impact of this issue is low.

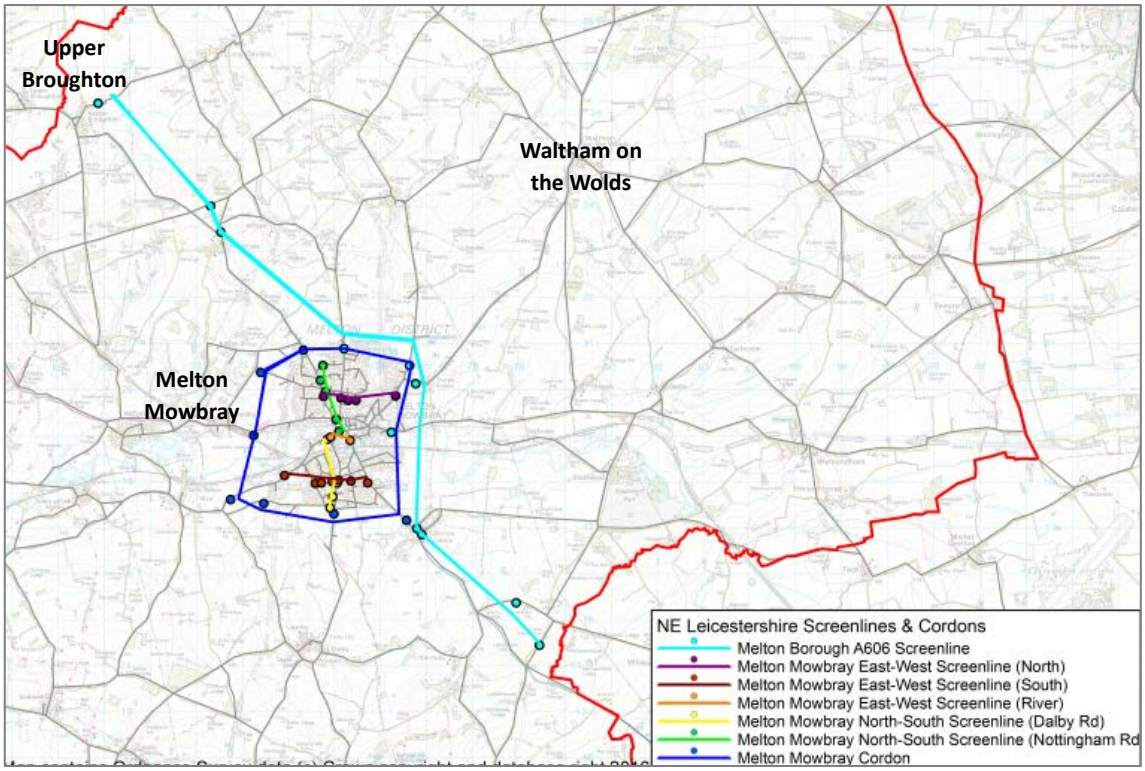
4.3.11 Similarly, whilst modelled southbound traffic volumes on Scalford Road do not meet TAG guidance near the town centre in the interpeak and PM Peak hours, the model does meet TAG criteria in all three time periods at a count location on this route further north at the edge of the town.

4.3.12 The remaining instances where TAG criteria are not met in all time periods and directions terms of traffic volumes (i.e. those shown in yellow in Figure 1) are not considered material due to the nature and location of these routes in the context of the NEMMDR.

4.3.13 In addition to validating vehicle flows at individual count locations, TAG Unit M3-1 also sets out criteria to test modelled traffic volumes across sets of count locations, grouped

together in screenlines and cordons. The screenlines and cordon in 'north-east Leicestershire' are shown in Figure 2.

Figure 2: Screenlines and cordon in Melton Borough



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4.3.14 The model meets TAG criteria across 86%, 93% and 93% of screenlines in 'north-east Leicestershire' in the AM Peak, interpeak, and PM Peak hours, respectively. This is marginally below TAG guidance which recommends that *"all or nearly all screenlines (i.e. 95%)"* should match observed vehicle volumes within a 5% tolerance.

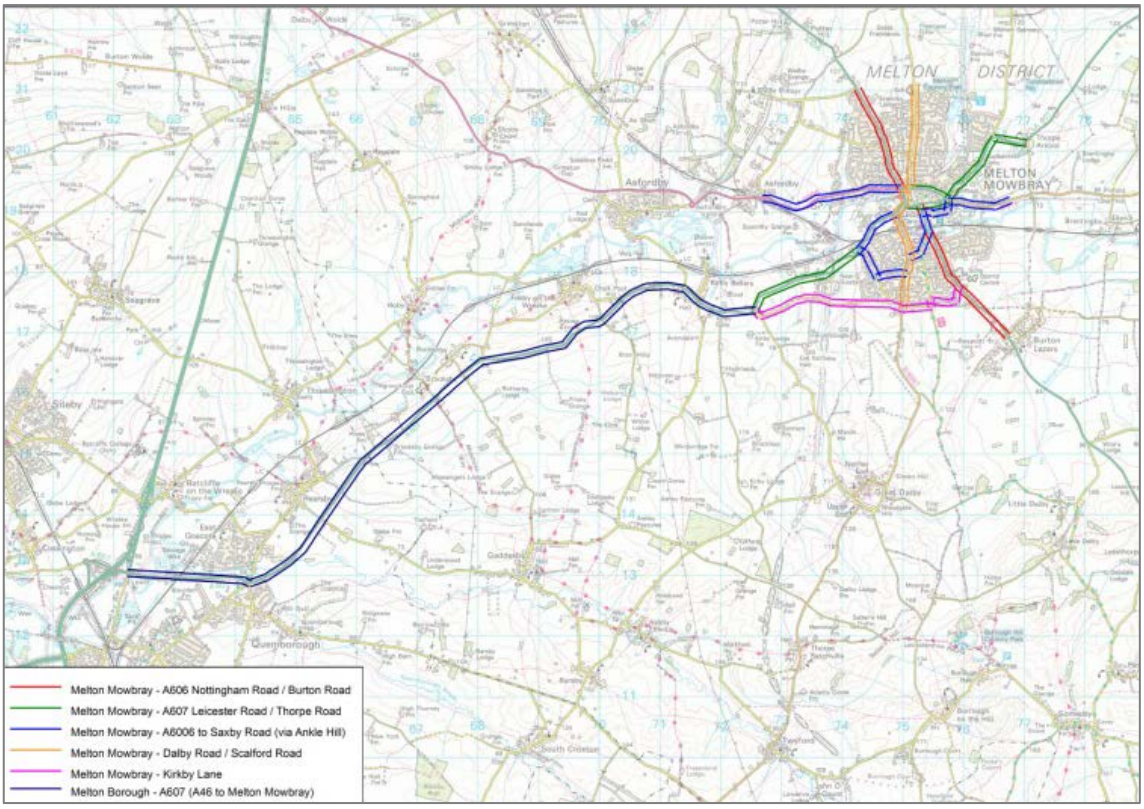
4.3.15 The screenlines in 'north-east Leicestershire' that do not meet TAG criteria are as follows:

- Melton Mowbray North-South (Nottingham Road) eastbound (AM Peak hour overestimation by around 19% and interpeak overestimation by around 11%)
- Melton Borough A606 (north-eastbound) (AM Peak hour underestimation by around 8%)
- Melton Mowbray North-South (Nottingham Road) westbound (PM Peak hour overestimation by 8%)

4.3.16 In the context of assessing the scheme, accurate representation of northbound/southbound vehicle movements is more critical than for eastbound/westbound movements. Given that the three screenlines capturing northbound/southbound movements within Melton Mowbray (as well as the cordon around the town) meet TAG criteria in all three time periods, I do not consider the deviation from TAG guidance described above to be of material significance for scheme assessment.

4.3.17 The final set of criteria in relation to the validation of highway models in TAG Unit M3-1 is to test modelled journey times against observed data. The comparison of modelled and observed journey times in 'north-east Leicestershire' (presented in Figure 3) shows that all journey time routes are within the TAG criterion in the AM Peak hour, with 92% of routes within the criterion in the interpeak and PM Peak hours. This exceeds the acceptability guideline of 85%. The journey time route that does not meet TAG criteria in the interpeak and PM Peak hours is Dalby Road / Scalford Road in the southbound direction.

Figure 3: Journey Time Routes in Melton Borough



4.3.18 The deviation from the acceptable tolerance set out in TAG during the interpeak is relatively minor (+16.4% versus a maximum difference of 15% recommended in TAG). In the PM Peak hour, however, the model is 23% slower than the observed data. This deviation is primarily due to larger than observed delay in the model along the route's central section around the town's inner ring road.

4.3.19 Given the scale of the discrepancy from observed data and the model's overall compliance with TAG criteria in the vicinity of the scheme, I do not consider this localised discrepancy to significantly affect the assessment of the scheme and I regard this as presenting a good fit and a sound basis for using the model in the context assessing the impact of the scheme.

4.4 Model Sensitivity

4.4.1 Given that the model demonstrates a good reproduction of demand and travel times, the final consideration of its suitability rests with its responsiveness. This tests how well the outputs of the model change as a result of changes to the model inputs. Guidance on reasonable sensitivity ranges is set out in TAG Unit M2-1. This guidance is defined in terms of how sensitive it is reasonable for a model to be. Thus, for example, if fuel costs were to increase by 10%, traffic forecasts by the model should reduce by about 3%. This LLITM fuel cost elasticity test responses comply with this guidance, both in aggregate terms and when reviewing the model response across time periods and journey purposes.

4.4.2 Other sensitivity tests that have validated the LLITM responses to changes in input assumptions are:

- A car journey time elasticity test, where TAG advises that the elasticity of car trips with respect to car journey times should be (intuitively) negative, and not have a magnitude in excess of 2.
- A public transport fare elasticity test where TAG advises that the elasticity of public transport trips with respect to public transport fares should be in the range -0.2 to -0.9. Further tests have been undertaken to assess the bus and rail fare elasticity separately.

- A parking charge elasticity test, where TAG suggests that, where parking is modelled, a car trip elasticity to parking charges should be calculated. It does not give any specific advice regarding what elasticities are appropriate.

4.4.3 Finally, a series of demonstration tests have been undertaken to assess how the LLITM responds in defined forecasting scenarios:

- A new park-and-ride site scenario, consisting of a new park-and-ride site and associate services and a bus lane.
- A public transport fare and policy change scenario, consisting of a Leicester City fare reduction and service frequency changes.
- A marginal social cost road pricing scenario, where drivers pay the additional cost to society that results from making their journeys (i.e. internalising the negative externalities).
- A Kibworth Bypass scenario, building a bypass around the villages of Kibworth Beauchamp and Kibworth Harcourt.
- A cordon charge scenario, whereby a charge is applied in Leicester City to incoming traffic, excluding buses, when crossing either the inner or outer ring roads towards the city centre.

4.4.4 In considering the methodologies and data used to develop the model and the series of sensitivity tests and demonstration tests that have been used to validate its responses to changes in inputs, I am satisfied that the LLITM has been developed with appropriate rigour in accordance with the methods set out in TAG, has suitable functional scope and detail, the outputs comply with the TAG criteria tolerances, and that it responds appropriately. I conclude that the LLITM is suitable to produce forecasts for the NEMMDR.

4.4.5 I will now consider how the outputs were used in the environmental statement, Outline Business Case and junction design.

4.5 Air Quality and Noise

4.5.1 Traffic flows, composition and speeds are used to forecast traffic noise and traffic emissions by specialists in these fields.

4.5.2 The transport model outputs were aggregated to provide forecasts of the morning, interpeak, evening and night-time periods, 18-hour, and 24-hour periods that are

required for noise and air quality appraisal. Local traffic count data were used to extrapolate from the time periods explicitly modelled. These data were then provided to the noise and air quality experts for detailed analysis.

4.6 Outline Business Case

4.6.1 The transport model outputs are used directly to assess the economic implications of the scheme. The first stage in this process is to extrapolate from the April/May/June average weekday that is represented in the transport model to establish annual impacts. Annual count data were used to establish total annual traffic flows (demand), and factors were derived to extrapolate to this from the modelled periods.

4.6.2 Economic benefits were calculated using DfT TUBA (Transport Users Benefit Appraisal) software based on travel demand and journey times forecast by the LLITM.

4.7 Summary

4.7.1 In this section I have explained how I have reviewed the performance of the LLITM and concluded that it is suitable for the purpose of providing forecasts for the NEMMDR.

4.7.2 I have explained why the LLITM outputs are suitable for preparing the Outline Business Case and appraising environmental impacts of the scheme.

5. Core Forecast Scenario – Without the Scheme

5.1 Introduction

5.1.1 The LLITM is used to forecast travel demand and associated network conditions. Forecasts are developed in the LLITM by applying changes to the representation of travel in its base year of 2014. For example, if population and/or the number of jobs increases, demand for travel will correspondingly increase. Conversely, if the cost of travel increases, there will be a reduction in travel demand. The model was applied to forecast change from the 2014 base year to produce forecasts for 2021, 2026, 2031 2036, 2041, 2046 and 2051.

5.1.2 This section describes the forecasts of future travel demand in Melton Mowbray without the scheme. For context, these "without scheme" forecasts include the northern section of the NEMMDR (A606 Nottingham Road to Melton Spinney Road – i.e. roundabouts 1 to 3) and a southern link road (A606 Burton Road to A607 Leicester Road). These are considered to come forward to support urban extensions (see para 5.2.5) and are separate to the scheme as defined for transport modelling and appraisal. The "scheme" in transport modelling terms therefore extends from Melton Spinney Road to the A606 Burton Road (i.e. roundabouts 3 to 6 – see section 6.2 for further details).

5.2 Forecasting Assumptions

5.2.1 Travel demand and travel conditions are affected by a range of factors including: economic change and prices; land-use changes and socio-economic developments; and changes in the transport network (e.g. highway infrastructure, public transport services, walking/cycling infrastructure).

5.2.2 Section 2 of the Forecasting Report [SAD14] describes how the LLITM uses inputs to develop a forecast scenario, and Section 3 sets out and justifies (where appropriate) the assumptions used.

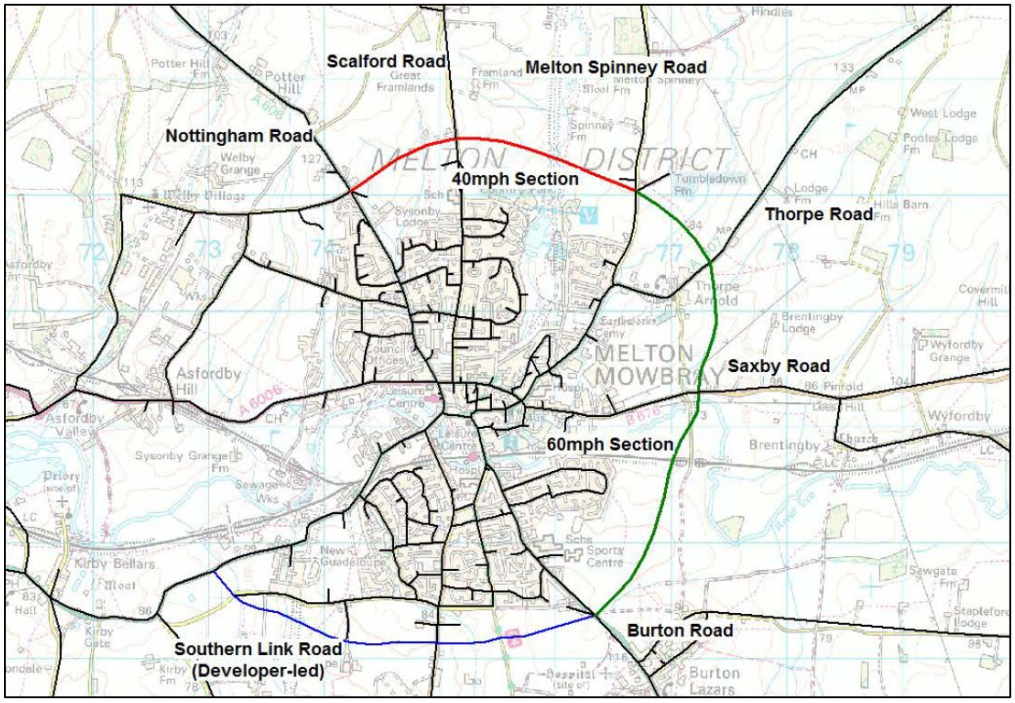
5.2.3 In accordance with TAG Unit M4, only "near certain" and "more than likely" planning inputs (i.e. proposed changes to the transport network and proposed housing and employment developments) have been included in the LLITM NEMMDR forecasting. Planning inputs deemed "reasonably foreseeable" or "hypothetical" have been excluded from forecast scenarios.

5.2.4 Specific attention has been paid within the uncertainty log (Tables 3.3 to 3.8 in the Forecasting Report [SAD14]) to provide comments justifying the level of TAG uncertainty allocated, and importantly to directly cross-reference planning approvals and planning application references to those sites that are “near certain” or “more than likely”. Where planning references are not provided, local knowledge of Melton Borough Council planners has been used to best define the level of certainty.

5.2.5 Of particular relevance to the assessment of this scheme are the forecasting assumptions concerning the additional highway network in Melton Mowbray and the town’s northern and southern “sustainable urban extensions” (SUEs). It has been assumed that northern SUE and southern SUE are included in the forecasting assumptions assumed for the purpose of this modelling.

5.2.6 To deliver this growth, it has been assumed that the northern section of the NEMMDR (A606 Nottingham Road to Melton Spinney Road – shown in Figure 4 in red) and a southern link road (A606 Burton Road to A607 Leicester Road – shown in Figure 4 in blue) would be delivered and have therefore been included in both the “without scheme” and “with scheme” scenarios. The northern section (between roundabouts 1 and 3) and the southern link road (A606 Burton Road to A607 Leicester Road) are modelled as 40mph single carriageway routes.

Figure 4: NEMMDR Plan (plus southern link road)



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5.2.7 The assumed growth in housing, population and employment has been controlled to forecasts provided by the DfT as part of their TEMPro software. This control has been applied across Leicester, Leicestershire and the surrounding counties (as shown in Figure 3.1 of the Forecasting Report [SAD14]). This ensures that the growth in the region is aligned with government forecasts, with the allocation of this growth based local data regarding planning applications.

5.2.8 In terms of economic assumptions, most of these assumptions (such as GDP growth and vehicle operating costs such as fuel costs) have been sourced from the latest available version of the DfT's TAG data book at the time of the assessment. This was the March 2017 version of the TAG data book.

5.2.9 The forecasting assumptions were assembled from relevant sources to represent, in accordance with guidance, a coherent and most likely view of the future at the time of the modelling in 2017. Based on the latest information available at this time, I consider these assumptions to be suitable for forecasting the impact of the scheme. I comment on forecast uncertainties in Section 8 of my proof.

5.3 Future without the Scheme – Melton Borough

5.3.1 The LLITM Forecasting Report [SAD14] presents information on how travel demand in Melton Mowbray and Leicestershire more broadly is forecast to change over the forthcoming decades. The change in travel demand is driven primarily by assumptions of growth in terms of local population and employment. In Melton Borough, the population increase from 2014 is assumed to be 14% to 2021, 23% to 2036, and 22% to 2041. In terms of employment, the assumed increases are 6% to 2021, 16% to 2036, and 20% to 2041. In-line with the assumed change in population and employment since 2014, the overall production of trips (for all modes of travel) in Melton Borough is forecast to increase by around 14% to 2021, 30% to 2036, and 32% to 2041.

5.3.2 The monetary cost (per kilometre) of travel by car is assumed to reduce over time which will generate growth in car travel. An increase in traffic congestion, however, will moderate forecast highway growth. Overall, the production of highway (person) trips in Melton Borough is forecast to increase by 17% to 2021, 38% to 2036, and 41% to 2041. The proportionally larger growth in highway trips versus trips for all modes of travel (see Paragraph 5.3.1) is driven by a forecast modal shift. The share of highway

trips is forecast to increase from 72% in 2014, to 73% in 2021, 76% in 2036, and 76% in 2041.

5.3.3 At the Melton Borough level, vehicle distance (measures in vehicle-kms) in the AM Peak hour is forecast to increase by 15% to 2021, 27% to 2036, and 29% to 2041. This leads to forecast highway network delays increasing by 23%, 58%, and 70%, respectively.

5.3.4 Public transport fares are forecast to increase over time, and act in conjunction with increased travel time (due to traffic congestion) to moderate demand for travel by public transport that might be expected from the population growth. The forecasts suggest that the mode share of public transport trips (both bus and rail) will not change significantly over time, staying at around 1%-2% of trips produced in Melton Borough.

5.3.5 Given the rise in highway mode share and a lack of change in terms of public transport mode share, it is active modes (i.e. walking and cycling) that are forecast to see a proportional reduction over time. The share of trips made by active modes is forecast to decrease from 26% in 2014, to 25% in 2021, 22% in 2036, and 22% in 2041.

5.4 Future without the Scheme – Melton Mowbray

5.4.1 Traffic growth in Melton Mowbray is forecast to impose additional pressure on the road network. In the AM Peak hour, vehicle distance (vehicle-kms) is forecast to increase by 16% to 2021, 35% to 2036, and 40% to 2041. This leads to delay (vehicle-hours) increasing by 17%, 42%, and 54%, respectively, over the same time interval. The roads forecast to experience the largest traffic increases are generally located in the town centre, and in particular to the north-west of the town centre in the AM Peak hour, and to the north, south and west of the town centre in the PM Peak hour.

5.4.2 In 2036, forecasts show that the sections of the highway network in Melton Mowbray with the highest hourly vehicle flow (i.e. above 1,000 vehicles per peak hour) are as follows:

- around the town's inner ring road (Norman Way, Sherrard Street and Wilton Road), in particular its western half;
- Burton Street between the town centre and the railway station; and
- the A607 Leicester Road between the southern link road and Station Lane.

5.4.3 2036 forecasts also show that the town's main radial routes such as the A606 Nottingham Road, the A606 Burton Road, the A607 Thorpe Road, Scalford Road, and Asfordby Road are all forecast to experience volumes of 500-1,000 vehicles per peak hour. Vehicle volumes follow a similar trend in the interpeak period, albeit generally of lower magnitude (except sections of the town's ring road where volumes are still forecast to exceed 1,000 vehicles per hour).

5.4.4 Most parts of the northern section and southern link in the "without scheme" scenarios (see Paragraph 5.2.5) are forecast to experience traffic volumes of between approximately 200-350 vehicles per peak hour in 2036 (depending on direction and time period). Modelling shows, however, that the western section of the southern link (between Kirby Lane and A607 Leicester Road) might expect between 450-650 vehicles per peak hour. The higher volumes on this section of the southern link indicate its use as a route between the A607 Leicester Road and the southern part of the town via Kirby Lane.

5.4.5 Appendix B of the Forecasting Report [SAD14] provides forecast traffic volume plots for all modelled time periods and modelled years. Appendix C contains forecast volume-capacity plots, and Appendix D contains junction delay plots.

5.4.6 These forecast delay plots show the locations of the significant delays within Melton Mowbray. The largest delays are generally at junctions around the inner ring road in the two peak hours. There are no locations within Melton Mowbray where the forecast junction delay increases significantly and beyond plausible levels. For example, in the AM Peak hour, there are 6 modelled links in Melton Mowbray that have a volume over capacity ratio of between 80% and 100% (all instances are on or near the town's inner ring road). In the PM Peak hour, there are 10 links in this category, and one with a ratio of 101%.

5.4.7 When comparing 2014 and 2036, driving times between the following selected destinations in Melton Mowbray are almost all forecast to increase by up to around half a minute in the AM Peak hour and interpeak, and by up to around one minute in the PM Peak hour:

- Melton Vale Sixth Form College
- Melton Mowbray Sainsbury's

- Melton Mowbray Hospital
- Chapel Street Car Park
- Long Field Academy
- John Ferneley College

5.4.8 An exception to this general trend concerns certain journeys to / from John Ferneley College in the north of the town. This part of the town benefits from improved accessibility through the NEMMDR's northern section in forecast years. Accordingly, routes between other destinations that make use of the northern link also see a forecast reduction in driving time between 2014 and 2036, e.g. Asfordby to Thorpe Arnold (time saving of around 3.5 minutes depending on the time period).

5.4.9 In terms of modelled highway freight trips in 2036, vehicle volumes in the town are higher in the AM Peak hour than the PM Peak hour and are largely concentrated on the town's radial routes and inner ring road. The highest HGV volumes (between 40 and 65 HGVs per hour) are forecast on the A606 Burton Road, A607 Leicester Road, and on the western half of the inner ring road.

5.4.10 LGV traffic follows a similar general trend, although the volumes are higher than for HGVs. The highest volumes (around 200 to 250 LGVs per hour) are forecast to occur on the western half of the inner ring road and on the A607 Leicester Road to the west of its junction with the southern link. The A606 Burton Road, A606 Nottingham Road and A607 Leicester Road between the southern link and town centre are also forecast to experience hourly LGV volumes more than 100 vehicles per peak hour.

5.4.11 Figure 4.26 and Figure 4.27 in the Forecasting Report [SAD14] illustrate the routeing of through traffic within Melton Mowbray in the AM Peak hour in the 2014 base year and 2036 forecast year, respectively. In 2014, modelling shows notable levels of through traffic on the A606 (travelling north-west to/from south-east) along Nottingham Road and Burton Road via the inner ring road.

5.4.12 By 2036, forecasts suggest that some of this through traffic will shift onto the southern link between the A606 and the A607. This link provides a more attractive route for longer distance trips travelling between the west and south-east of Melton Mowbray.

5.4.13 The effect of this southern link on the highway network performance in Melton Mowbray has not been the focus of AECOM's modelling work, however, it can be

approximated using available forecast scenarios. Figure 4.13 of the Forecasting Report [SAD14] shows that the introduction of the southern link in 2036 does have a temporary alleviating effect on congestion levels in Melton Mowbray versus previous forecast years (particularly in the AM Peak hour). This delay alleviation is evident both in terms of total vehicle delay and delay per kilometre. Overall, however, the general trend is that delays rise over time despite the presence of the southern link.

5.5 Summary

5.5.1 In this section I have explained how the expected growth in population and employment, together with changes in congestion and the cost of travel, are forecast to result in an increase in travel demand in Melton Mowbray.

5.5.2 I have also explained that traffic growth in the town is forecast to impose additional pressure on the road network, resulting in increasing delays particularly at junctions on the inner ring road.

6. Forecast Effect of the Scheme

6.1 Introduction

6.1.1 Having explained, in Section 5, how demand for travel is likely to develop in Melton Mowbray in the absence of the proposed scheme, in this section I explain the forecast impacts of its introduction. I will first set out how the scheme has been represented in the LLITM and then describe the forecasting results.

6.1.2 Transport models are applied to compare the effects of a scheme. Given the effort involved in preparing forecasts, it is not efficient to undertake forecasts for many different future years. Instead, interpolation is applied to establish how outcomes would vary over time. In preparing forecasts for the NEMMDR, I have undertaken tests to show what the effects of the scheme would be at five-year intervals from 2021 to 2051 inclusive.

6.2 Representation of the Scheme

6.2.1 The first modelled year in which the proposed scheme is represented is 2021[6]. For the purposes of transport modelling and for the appraisal in this document, the scheme is defined as a 60mph single carriageway route between Melton Spinney Road and the A606 Burton Road (i.e. between roundabouts 3 and 6 and as illustrated in green in Figure 4). The proposed route creates a number of new junctions and amends some existing junctions. The following details the assumptions adopted for each of these junctions:

- Melton Spinney Road: a new five-arm roundabout with flared approaches, including the new link to the A606 Nottingham Road and relocated access to/from Twinlakes Park.
- Thorpe Road: a new four-arm roundabout with flared approaches
- Saxby Road: a new four-arm roundabout with flared approaches
- Burton Road: a new five-arm roundabout with flared approaches, including the new link to the A607 Leicester Road and access to/from the residential development to the south of Melton Mowbray

[6] 2021 was selected as the scheme's predicted opening year through consultation with LCC and was based on the information available when modelling was undertaken in 2017.

6.2.2 The northern section of the NEMMDR (A606 Nottingham Road to Melton Spinney Road – i.e. roundabouts 1 to 3) and a southern link road (A606 Burton Road to A607 Leicester Road) are included as 40mph roads in both the "without scheme" and "with scheme" scenarios, as discussed in Paragraph 5.2.6.

6.3 Future with the Scheme – Impact on Traffic Flows

6.3.1 The introduction of the scheme as defined for transport modelling purposes (i.e. a 60mph road between Melton Spinney Road and the A606 Burton Road) is forecast to have a significant impact on traffic patterns in Melton Mowbray. There is a forecast reduction in traffic (measured in vehicle-kilometres) of approximately 10% (depending on time period and year) within Melton Mowbray itself and an increase in traffic of between 3% to 5% (depending on time period and year) within Melton Borough as traffic shifts onto the NEMMDR.

6.3.2 The number of highway person trips produced in Melton Borough is forecast to increase due to the scheme by 0.2% in 2021, 2036 and 2041. At Leicestershire level, the equivalent values are 0.04%, 0.01% and 0.04%. This shows that the 3% to 5% increase in traffic in Melton Borough is largely due to rerouteing of existing traffic, rather than any significant induced demand in Melton Borough or Leicestershire overall due to the scheme.

6.3.3 At borough and town level, the introduction of the scheme results in a reduction in vehicle-delays and correspondingly a rise in average network speeds. Depending on time period and year, this increase in speeds is between 4% and 9% at borough level, and between 2% and 19% within Melton Mowbray itself.

6.3.4 The volume of traffic forecast to use the NEMMDR varies by section and direction as well as by time period and forecast year. Modelling of 2036 shows that approximately 600-700 vehicles per hour use the southern part of the scheme (between the A606 Burton Road and Saxby Road) in each direction in the two peak hours. In the interpeak, the equivalent figure is 550-600 vehicles per hour.

6.3.5 Between Melton Spinney Road and Saxby Road in the AM Peak hour, vehicle flows range from approximately 650-800 per hour in the southbound direction and 350-450 vehicles per hour in the northbound direction. In the PM Peak hour, the trend is

reversed with 400-550 vehicles in the southbound direction and 550-800 vehicles in the northbound direction.

6.3.6 On the northern section of the NEMMDR between the A606 Nottingham Road and Melton Spinney Road in the 2036 AM Peak hour, the introduction of the scheme is expected to increase eastbound vehicle flows by approximately 200-350 per hour and 100-150 per hour in the westbound direction. In the PM Peak hour, the trend is reversed with an additional 100-200 eastbound vehicles and 150-300 westbound vehicles.

6.3.7 On the southern link between the A606 Burton Road and the B6047 Dalby Road, westbound 2036 traffic flows are forecast to increase by around 150 vehicles per hour in the AM Peak and PM Peak hours as a result of the scheme. In the eastbound direction, the increase is approximately 50 vehicles per hour in the AM Peak hour and 150 in the PM Peak hour. Modelling does not suggest that the introduction of the scheme will significantly impact traffic volumes between the B6047 Dalby Road and the A607 Leicester Road.

6.3.8 On the A606 Burton Road to the south of the proposed roundabout with the NEMMDR, traffic volumes are not expected to rise by more than 150 vehicles per hour as a result of the scheme in 2036. The same applies on the B676 Saxby Road and on the A607 to the east of the NEMMDR. North of its proposed roundabout with the NEMMDR, 2036 traffic flows on Melton Spinney Road are forecast to increase by approximately 50 vehicles per hour due to the introduction of the scheme.

6.3.9 The largest reductions in traffic levels due to the introduction of the scheme are forecast on the A606 Burton Road to the south-east of the town centre. 2036 forecasts show a reduction in vehicle flows at this location in both directions and peak hours of 250-300 vehicles per hour. The equivalent reduction in interpeak traffic ranges from 200-300 vehicles per hour.

6.3.10 There is also a notable reduction in traffic on the A607 Thorpe Road to the north-east of the town centre. Traffic volumes at this location are forecast to reduce by around 150-250 in the peak hours and by around 150 in the interpeak. Appendix E of the Forecasting Report [SAD14] provides forecast traffic volume change plots as a result of the scheme for all modelled time periods and modelled years.

6.3.11 The forecast changes in volume-capacity ratios show a similar pattern as the forecast flow changes; areas with larger forecast reductions in traffic due to the scheme are also forecast to see the largest reductions in volume-capacity ratios. The largest reductions in 2036 forecasts (approximately 20-40% depending on time period) are on Burton Street between the town centre and the railway station. A reduction in volume-capacity ratio of up to 30% is also forecast on certain approaches to the B767 Saxby Road / A607 Thorpe Road Junction. The volume-capacity ratio figures for all modelled time periods and modelled years are given in Appendix F of the Forecasting Report [SAD14].

6.3.12 When considering the journeys between the selected locations listed below, the introduction of the scheme is forecast to reduce driving times for 88 of the 110 origin / destination combinations in the AM Peak hour, 86 in the interpeak hour, and 85 in the PM Peak hour.

- Melton Vale VI Form College
- Melton Mowbray Sainsbury's
- Melton Mowbray Hospital
- Chapel Street Car Park
- Long Field Academy
- John Ferneley College
- Melton Foods
- Burton Lazars
- Asfordby
- Thorpe Arnold
- Ab Kettleby

6.3.13 The largest reductions in driving time are for trips to / from Burton Lazars (i.e. journeys using the A606 Burton Road) and Thorpe Arnold (i.e. journeys using the A607 Thorpe Road), which reflects the improved accessibility offered by the NEMMDR to these corridors. Journeys within the town itself are forecast to experience lower time savings.

6.3.14 The small proportion of origin / destination combinations forecast to have a longer travel time as a result of the scheme are primarily those which use the northern link (e.g. Ab Kettleby to Thorpe Arnold). The introduction of the scheme is forecast to

increase traffic volumes on the northern section and consequently delays for drivers using this part of the network are expected to rise. Note that these increases are expected to be no more than half a minute.

6.3.15 In terms of HGV traffic in 2036, the largest impact of the introduction of the scheme is in the AM Peak hour. A reduction of between 10 and 15 AM Peak hour vehicles (approximately 30%) is forecast on the A606 Burton Road. A reduction of approximately 10 HGVs per hour is forecast in the eastbound direction on Mill Street / Regent Street / Brook Street, and in the eastbound direction on Norman Way in the town centre. Between around 5 and 10 fewer hourly HGVs are expected in Thorpe Arnold on Melton Spinney Road and the A607 Thorpe Road.

6.3.16 Elsewhere, small reductions in HGV volumes (less than 10 HGVs per hour) are forecast on the A606 Nottingham Road, Melton Spinney Road (between Thorpe Arnold and the town centre), and on the B676 Saxby Road. A small increase of less than 5 HGVs per hour is forecast on the A607 Leicester Road towards the town centre in the PM Peak hour and outbound from the town centre in the AM Peak hour.

6.3.17 The impact of the scheme on LGV traffic in 2036 is also forecast to be largest in the AM Peak hour. The largest reduction (of approximately 25-50 hourly vehicles or 35-70%) is forecast to occur on the A606 Burton Road between the town centre and its connection with the NEMMDR. 25 to 50 fewer LGVs per hour are forecast to use the A607 Thorpe Road between Thorpe Arnold and the town centre, which represents a reduction of around 40-45%. In the northbound direction on A606 Nottingham Road, a reduction of around 30 LGVs per hour (around 30-50%) is forecast. In the clockwise direction on the inner ring road, modelling suggests a decrease in LGV volumes of between 30-40 vehicles per hour, or 15-20%.

6.3.18 As shown in Figure 5.7 of the Forecasting Report [SAD14], the NEMMDR carries a significant proportion of the Melton Mowbray through traffic, removing these vehicles from the urban area.

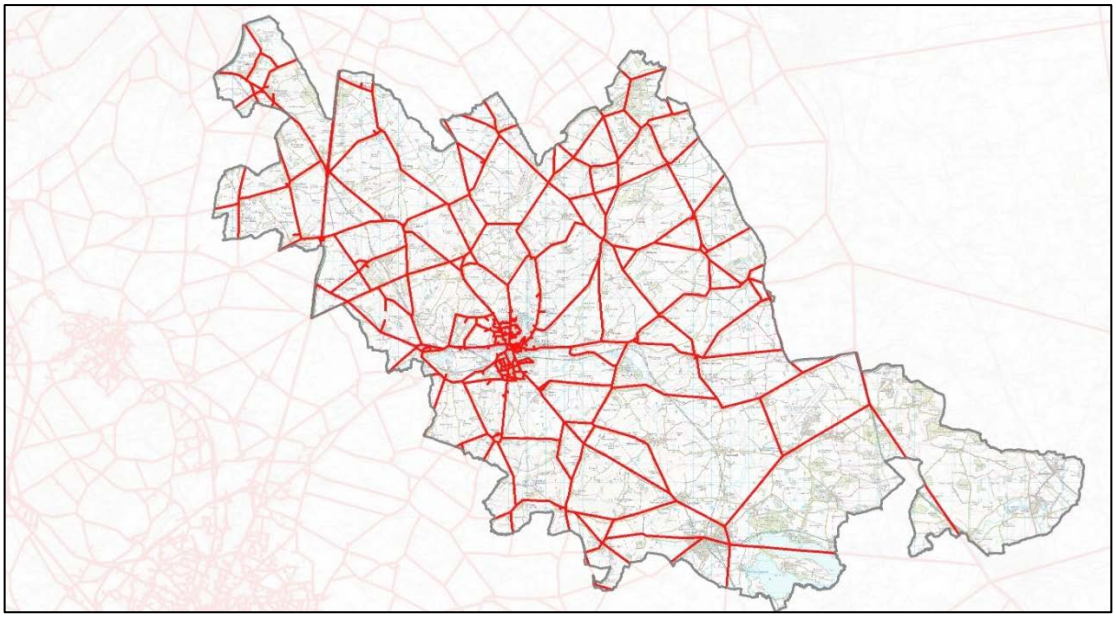
6.3.19 The monetised assessment of the journey time savings brought about by the scheme is presented in Section 7.

6.4 Future with the Scheme – Impact on Highway Safety/Accidents

6.4.1 In addition to forecasting the effect of the scheme on traffic flows, the LLITM outputs have also been used to estimate the scheme's impact on highway safety in terms of accidents. CoBA-LT (Cost and Benefit to Accidents – Light Touch) is a cost-benefit analysis package available from the DfT that forecasts the numbers of accidents and casualties associated with a change to the highway network.

6.4.2 The assessment of the scheme's impact on highway safety has been spatially limited to an "area of influence" (AoI). The AoI includes all roads on which the scheme is forecast to change traffic flows by more than 5%. To remove roads 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. The AoI is illustrated in Figure 5.

Figure 5: Accident Analysis Area of Influence (AoI)



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6.4.3 Despite the proposed scheme itself having a relatively low accident rate, the wider impact of the scheme is a forecast increase in the number of slight (+114.9), serious (+23.2) and fatal (+5.2) accidents within the AoI over the standard 60 year appraisal period.

6.4.4 The main driver of this disbenefit is the additional traffic that is attracted to the AoI due to the improved connectivity provided by the scheme. This increase is forecast to be 3.3%, 3.5% and 3.6% for 2021, 2036 and 2041, respectively. The additional traffic is

a result of rerouteing in the assignment, as well as an element of trip redistribution, and some minor mode-choice effects in the demand forecasts.

6.4.5 It is this forecast increase in the traffic travelling within the AoI which is the key driver of the forecast increase in accidents within the AoI rather than the assumed accident rate for the NEMMDR itself.

6.4.6 An alternative methodology for assessing the safety impact of the scheme would be to include the entire modelled area (i.e. Great Britain) rather than just the AoI. This may have the benefit of capturing the wider rerouteing caused by the scheme, however, would also capture distant model "noise" elsewhere (i.e. rerouteing that is far away from the scheme and caused by model convergence imperfections that are not relevant to the scheme).

6.4.7 Section 7 presents a monetised assessment of the impact on accidents brought about by the scheme.

6.5 Summary

6.5.1 In this section I have explained that the introduction of the scheme is expected to substantially change traffic patterns in Melton Mowbray. Whilst traffic volumes are expected to increase at the borough level, a larger decrease is expected in the town due to the use of the proposed scheme for through trips. As expected, the largest reductions in traffic volumes are anticipated to occur in and around the town centre.

6.5.2 Within the AoI defined for this work, the number of accidents is expected to be higher as a result of the scheme. This is a function of the higher traffic volumes that are to be expected with the introduction of this type of scheme. This is, in part, a product of the assessment methodology followed rather than an indication that the NEMMDR will lead to significantly worse local road safety outcomes.

7. Scheme Assessment

7.1 Introduction

7.1.1 Having explained in Section 5 and Section 6 the transport forecasts without and with the scheme, in this section I describe the process by which these forecasts where used to undertake an economic appraisal of the scheme. As stated previously, the definition of the scheme for the purposes of appraisal is a 60mph road between Melton Spinney Road and the A606 Burton Road (i.e. between roundabouts 3 and 6, and as shown in Figure 4 in green).

7.1.2 This scheme appraisal considered a range of forecast impacts of the scheme on transport (such as travel time savings and journey time reliability improvements) and transport-related impacts of the scheme (such as noise and air quality impacts). In this section I will describe the assessment of these impacts for the scheme appraisal.

7.2 Appraisal of Transport Impacts

7.2.1 The appraisal of transport impacts has been undertaken using the Department for Transport's TUBA software (v1.9.9). This takes information from the LLITM on travel demand, travel distances, and travel times and uses TAG assumptions for economic parameters (such as the monetary cost of time and fuel costs) to calculate transport benefits. This calculation of transport benefits considers the monetary change in journey times, vehicle operating costs, indirect tax revenues for government, and greenhouse gases.

7.2.2 To derive the monetary value of changes in journey times, TUBA first calculates the difference in journey time for each origin-destination pair (by user class and for each modelled year and time period) between the LLITM "Core" scenario and the "with scheme" scenario. The resulting time saving for each modelled trip is then monetised using the relevant value of time. The value of time is defined by the Department for Transport and varies according to vehicle type, trip purpose, person type, and year. In accordance with Department for Transport guidance, TUBA accounts for inflation and also applies an annual discounting rate of 3.5% from year 1 to year 30, and 3% from year 31 onwards to adjust for the "social time preference". The "present value of benefits" is calculated by TUBA in the Department's current base year of 2010.

7.2.3 The appraisal of the transport impacts is undertaken over a 60-year period in-line with TAG and includes an assumed opening year of 2021, a design year 15 years after opening in 2041, and an intermediate year of 2036. The benefits are therefore assessed over the period from 2021 to 2080.

7.2.4 To assess the transport benefits over a 60-year appraisal period, factors are required to convert the modelled data from the three modelled hours on an average weekday in April/May/June to represent travel across the year. This process has considered both the observed level of traffic across the year from long-term count data around Melton Mowbray and the observed pattern of trip purposes across the day. The adopted annualisation process therefore considers both the level of traffic and the type of travel during weekdays and weekends across the year.

7.2.5 This assessment of the scheme forecast that transport benefits over the 60-year appraisal period would be around £117m. This includes forecasts of around £117.5m in travel time benefits, £8m of vehicle operating cost disbenefits, £14.5m increase in indirect tax revenues, and £7m of greenhouse gas disbenefits.

7.2.6 The scheme is therefore forecast to generate significant travel time savings; however, the scheme is also forecast to increase typical travel distances, resulting in increased vehicle operating costs (and therefore indirect tax revenues) and increased greenhouse gas emissions.

7.3 Appraisal of Accident Impacts

7.3.1 The monetary assessment of the forecast change in accidents has been undertaken using the Department for Transport's CoBA-LT (Cost and Benefit to Accidents – Light Touch) software. This takes forecasts for annual average daily traffic from the LLITM for the assessment years (2021, 2036 and 2041) and information on the design standard of routes to calculate the change in accidents forecast due to the scheme.

7.3.2 The forecast flows from the LLITM are required to be converted to annual average daily traffic from the three modelled hours. As with the annualisation of transport benefits, this conversion has made use of factors derived from local traffic count data.

7.3.3 To convert traffic flows into an estimate of accidents, accident rates are required. CoBA-LT includes default, national average accident rates by road type, and an assessment of local accident data has been undertaken to compare these local accident rates with the

national averages. The local accident rates for A-roads were found to not be statistically different from the national averages; however, local rates for non-A-roads were found to be statistically different from the national averages and were used in the assessment.

7.3.4 Local accident rates for non-A-roads with a 30mph or 40mph speed limit were found to be lower than the national average, whereas local accident rates for non-A-roads with a speed limit above 40mph were found to be higher than the national average.

7.3.5 For the NEMMDR itself, observed accident rates were used based on data for the nearby Oakham Bypass. The Oakham Bypass opened in 2007 and is of a comparable design standard, has traffic flow that is comparable with that forecast for the NEMMDR, and has a similar function (to act as a bypass / distributor road). The Oakham Bypass is therefore considered to be a suitable proxy for the proposed scheme in deriving accident rates.

7.3.6 As discussed in Section 6, the scheme is forecast to increase traffic in the corridor and this results in an increase in the forecast number of accidents over the 60-year appraisal period. Using the assumptions contained in CoBA-LT regarding the monetary value of accidents, this increase in forecast accidents results in a forecast accident disbenefit of around £7.7m due to the scheme.

7.4 Appraisal of Construction Delays

7.4.1 As part of the construction of the scheme, there are expected to be delays to road users where temporary traffic lights will be required to control traffic through the works. These works are focussed on the construction of the six new junctions along the existing routes around Melton Mowbray. Due to the lack of available diversion routes, the works are assumed to operate using shuttle-working (one lane open at all times, with the direction of traffic alternating using temporary traffic lights).

7.4.2 It is assumed that the northern section of the scheme (between A606 Nottingham Road and Melton Spinney Road) and a southern link (between A606 Burton Road and A607 Leicester Road) would be delivered as part of expected residential development to the north and south of Melton Mowbray, and therefore these junctions would still need to be constructed if the scheme is not delivered; however, this construction is

expected to be undertaken at a later date. This has been accounted for in the assessment of the construction delays for the scheme.

7.4.3 The assessment of construction delays has been undertaken using Highway England's QUADRO (Queues And Delays at Roadworks) software. This uses forecast traffic flows from the LLITM and information on the assumed nature of the temporary roadworks. This includes the expected duration of the roadworks and the nature of the works (assumed to be shuttle-working), which have been provided by Carillion, the (then) ECI contractor.

7.4.4 This assessment of construction delays results in a forecast disbenefit of around £88k to road users during the construction phase. Considering the scheme in isolation, the forecast disbenefits of construction are around £900k. However, four of the six new junctions are assumed to be built even if the scheme is not constructed, the disbenefit of which is estimated to be around £810k. The net disbenefit of the scheme is therefore around £88k.

7.5 Appraisal of Journey Time Reliability

7.5.1 The change in journey time reliability has been estimated based on the guidance contained within TAG Unit A1-3, Section 6.3 for urban roads. This approach considers the ratio of the assigned time (i.e. including forecast congestion) to the free-flow time as a measure of the standard deviation in journey times, and monetises this using the same economic and annualisation assumptions as adopted within the TUBA assessment of the forecast scheme impacts.

7.5.2 Over the 60-year appraisal period, this process results in forecast benefits of around £7.25m for journey time reliability due to the scheme.

7.5.3 In addition to these monetised journey time reliability benefits following the methodology defined in TAG, there are also non-monetised benefits of the scheme in terms of network resilience. Given the location of Melton Mowbray on both the A606 and A607, these routes can be used as alternative routes when there are incidents (accidents or roadworks for example) elsewhere on the network. For example, closures on the A1 between Stamford and Grantham can (and do) result in additional traffic routeing through Melton Mowbray.

7.5.4 The NEMMDR will help to minimise the impacts of these events on the residents of Melton Mowbray by providing a route for these movements which avoids the town centre. The proposed additional network would also provide an alternative route when there are incidents within Melton Mowbray itself.

7.6 Appraisal of Noise and Air Quality Impacts

7.6.1 As discussed in Section 4.5.2, traffic flows from the LLITM have been extracted and processed for use in the appraisal of the noise and air quality impacts. This appraisal was undertaken by specialist in the environmental team and is not discussed within this proof.

7.7 Appraisal of Physical Activity Impacts

7.7.1 Given the nature and location of the NEMMDR, it is anticipated the largest physical activity impact will be on cycle users and hence this is the focus of the assessment of the impacts on physical activity. As a result of the orbital nature of the route, and travel distances between junctions, benefits to pedestrians were considered to be small, and thus are not formally quantified.

7.7.2 For this appraisal, an elasticity approach linked to the sketch plan method in TAG Unit A5-1 has been used. This is one of the Department for Transport's suggested approaches to estimating the impact of a scheme on cycling demand.

7.7.3 Cycle commuters and non-commute cyclists were estimated from 2011 Census data and national travel survey information and adjusted according to TEMPro v7.2 growth forecasts for future years. Additional consideration was given to forthcoming housing growth in relation to the planned sustainable urban extensions.

7.7.4 An elasticity methodology was then used to predict the impact of the new infrastructure on cycling in the area. This resulted in an uplift in cycling demand in Melton Mowbray of 4.05% as a result of the inclusion of the scheme.

7.7.5 The cycle infrastructure created as part of the NEMMDR was assessed over a 20-year appraisal period, as recommended in the TAG Unit A4-1 Appendix B.4.2. These impacts were assessed using advice contained in TAG Unit A5-1 ('Active Mode Appraisal') and Unit A4-1 ('Social Impact Appraisal') and using the associated TAG active mode health benefits worksheet. This process resulted in a forecast benefit for physical activity of around £345k.

7.8 Appraisal of Wider Economic Impacts

7.8.1 The wider economic benefit assessment of the scheme was undertaken by David Simmonds Consultancy in accordance with guidance set out in TAG Unit A2-1. TAG Unit A2-1 provides guidance on the assessment of the following impacts:

- agglomeration;
- output change in imperfectly competitive markets; and
- tax revenue from labour market impacts.

7.8.2 Two sets of LLITM forecasts were produced for the assessment of wider economic impacts: a set of "without scheme" forecasts; and a set of "with scheme" forecasts where the forecast land-use is allowed to change in response to the scheme. In all other aspects of the assessment, the land-use is assumed to be fixed "without" and "with" the scheme.

7.8.3 This calculation of wider economic impacts of the scheme forecast benefits of the scheme of around £21.5m.

7.9 Appraisal of Distributional Impacts

7.9.1 As defined within TAG Unit A4-2, distributional impacts consider the variance of transport intervention impacts across different social groups. Both the beneficial and / or adverse impacts should be taken into consideration as well as the socio-economic groups affected.

7.9.2 TAG specifies the consideration of distributional impacts for user benefits, noise, air quality, accidents, security, severance, accessibility, and personal affordability. Only some socio-economic groups are considered to be particularly sensitive to each indicator and therefore it is only necessary to investigate these groups in detail.

7.9.3 For each indicator, in-line with TAG, a three-step process has been undertaken. This firstly considers a screening process to identify the likely impacts for each indicator. Only those indicators which pass the screening process are taken forward to the next step which is the assessment of the distributional impacts. Following this assessment, an appraisal of the forecast impacts is undertaken.

7.9.4 Of the identifiers detailed in TAG, only user benefits, noise, air quality and accidents were taken forward from the screening process and assessed.

7.9.5 For user benefits, the distribution of the forecast user benefits and disbenefits of the scheme are assessed for three income levels. The analysis showed that the forecast user benefits and disbenefits of the scheme falls disproportionally on the highest income band; however, the scheme does provide overall user benefits for all income bands.

7.9.6 For noise impacts, the distribution of forecast impacts by income and for sensitive receptors (such as schools, hospitals, places of worship and community centres, and children and older people) has been assessed. The assessment by income found that the forecast noise increases generated by the scheme disproportionally affect the less well off, especially at night.

7.9.7 At the non-residential sensitive receptors, noise impacts are forecast to be negligible, and in most cases (33 out of 42) the forecast impact is a decrease in noise levels. Based on the assessments of magnitude of impacts on local amenities, and in particular on schools, the overall assessment score for the impact on children and older people is considered to be neutral for the scheme.

7.9.8 For air quality impacts, the distribution of forecast impacts by income and the forecast impact on children has been assessed. Children are considered more at risk from air pollution given that they tend to spend more time outside and therefore have the longest exposure.

7.9.9 All income bands are forecast to be net winners in terms of air quality emissions (PM_{10} and NO_2); however, residents in the highest income band are forecast to experience a disproportionately lower share of these benefits.

7.9.10 In terms of vulnerable users, the locations of schools and hospitals within 200m of the air quality affected network were identified. The scheme is forecast to decrease levels of PM_{10} at five of the eight identified sensitive receptors, increase levels at one location, and have negligible impacts at the remaining two sensitive receptors. In terms of NO_2 emissions, six of the eight identified sensitive receptors are forecast to experience a decrease in emissions, with increases at one location, and negligible impacts at the remaining location. Overall, the forecast air quality impact of the scheme is positive and disproportionally more positive for the more vulnerable groups.

7.9.11 Observed accident data were analysed to identify how casualties impacted groups vulnerable to accidents (children, older people and young males, and pedestrians, cyclists and motorcyclists) and to calculate the estimated number of casualties for each of these vulnerable groups.

7.9.12 This assessment found that the scheme had a moderate beneficial impact on children, a moderate adverse impact on young adults, and a slight adverse impact on older people. For vulnerable modes of travel, the scheme was found to have a moderate beneficial impact on pedestrians and cyclists and a slight adverse impact on motorcyclists.

7.10 Summary

7.10.1 In this section I have detailed how the LLITM forecasts for the NEMMDR have been used as part of the assessment and appraisal of the scheme impacts.

7.10.2 I have detailed that this assessment and appraisal has followed the approach and assumptions detailed in TAG throughout and has used Department for Transport and Highways England software where appropriate.

7.10.3 Considering the monetised benefits I have described in this section and the forecast cost of construction and maintenance of the scheme, the benefit-cost ratio of the scheme is 3.12. Based on the Department for Transport's Value for Money framework, the scheme represents 'high' value for money.

8. Forecasting Uncertainty and Sensitivity Testing

8.1 Introduction

8.1.1 The forecasts I described in Sections 5 and 6 of my proof depend on assumptions. Best practice is to consider the implications of forecasting uncertainties.

8.1.2 By its nature, there are uncertainties in forecasting travel behaviour and conditions into the future. In this section I discuss the sensitivity testing which was undertaken to provide confidence in the analysis presented in Section 7.

8.1.3 The forecasts I discuss in Section 7 represent the Central Case for the scheme following advice on developing transport forecasts and appraising those forecasts within TAG. In this section I discuss the impacts on the scheme assessment of assessing the scheme using alternative assumptions.

8.1.4 The objective of these tests is to understand the sensitivity of the scheme assessment to changes in forecasting assumptions and to provide a possible range of transport benefits for the scheme.

8.2 High / Low Growth Forecasts

8.2.1 Travel demand arises from the desire of individuals to undertake activities. Travel demand is thus dependent on land-uses and the associated population and employment patterns. The willingness or ability to travel also depends on the monetary costs and the time required.

8.2.2 The first set of sensitivity tests I discuss are the 'high' / 'low' growth scenarios. These are based on the approach defined in TAG Unit M4, Section 4 and are aimed to understand whether the scheme is still effective in reducing congestion under high demand assumptions and if under low demand assumptions the scheme remains economically viable.

8.2.3 The process of developing the 'high' / 'low' growth scenario is based on the guidance contained in TAG Unit M4, Section 4.2. This defines the 'high' / 'low' growth scenarios by adding or subtracting a proportion of the base year travel demand from the central forecasts based on the number of years a given forecast year is from the model's base year. This approach adds / subtracts a greater proportion of the base year demand from the central forecasts for later future years, reflecting the additional uncertainty over time.

8.2.4 The assessment of transport user benefits has been undertaken using the same approach I discussed in Section 7. With the central forecasts the transport user benefits were estimated to be around £117m. With the 'high' growth assumptions, these transport user benefits are forecast to increase to around £146.5m and are forecast to decrease to around £94m in the 'low' growth scenario.

8.2.5 Considering the 'low' growth scenario, recalculating the benefit-cost gives a value of 2.58 (compared with 3.12 for the central forecasts). This demonstrates that in the TAG 'low' growth scenario, the scheme remains 'high' value for money.

8.3 Including 2051 Forecasts

8.3.1 The DfT requested that changes in time, distance and demand brought about by the scheme are constant after the final forecast year (2041 in the assessment detailed in Section 7), to enable like-for-like comparison of the scheme against other schemes. However, with congestion is forecast to increase after 2041 this potentially understates the benefits of the scheme.

8.3.2 As the LLITM includes functionality to forecast to 2051, this forecast year has been included within a sensitivity test for the forecast scheme benefits.

8.3.3 Including transport forecasts for 2051 increases the transport user benefits from around £117m to around £139.5m. This in turn, increases the benefit-cost ratio from 3.12 to 3.40.

8.4 Alternative Base Year

8.4.1 At the time of developing the LLITM representing a base year of 2014, the use of mobile network data as the source of travel demand data was an emerging technique. As discussed in Section 3, in addition to collecting mobile network data, a series of roadside interview surveys were undertaken across the county. Prior to the use of mobile network data in transport modelling, roadside interview surveys would have formed the basis of base year travel demand data.

8.4.2 There are uncertainties with both sources of demand data; both of which are samples and therefore subject to biases. Therefore, to understand the possible impact of this change in data source for the base year highway travel demand data on the scheme assessment, an alternative version of the LLITM was developed using data from the roadside interview surveys for travel through Melton Mowbray by car and LGV (the

sample for HGV traffic in the roadside interview data was insufficient to provide a reliable estimate of travel).

8.4.3 This alternative base year has been used to provide forecasts using the same methodology and assumptions as detailed for the central forecasts. An assessment of the scheme using this alternative base year model results in forecast transport user benefits decreasing from around £117m to around £102m. This resulted in a reduction of the benefit-cost ratio from 3.12 to 2.77. This shows that with the alternative base year model, the scheme remains 'high' value for money.

8.5 COVID-19 Pandemic

8.5.1 The development of the proposals for the NEMMDR predates the COVID-19 pandemic. The COVID-19 pandemic has resulted in a dramatic reduction in personal travel following the imposition of restrictions in March 2020 and again in December 2020. Monitoring carried out by the Department for Transport shows a significant recovery in traffic volumes as lockdown restrictions were eased during Summer 2020 and again in Spring 2021.

8.5.2 However, the extent to which COVID-19 will influence the demand for travel in the longer-term is difficult to determine. This will depend upon the impact of the pandemic on levels of economic activity, structural changes in the economy and changes in working patterns that affect the way people will travel. It would, at this stage be misleading to draw inferences from the trends over the short-term, as a predictor of longer-term impacts.

8.5.3 At the time of writing, restrictions are being relaxed but it is unknown the length of time it may take for travel behaviour to stabilise following the lifting of restrictions. Furthermore, it is likely to be a significant length of time before longer-term trends are fully understood.

8.5.4 A key potential impact of the pandemic on travel behaviour is the increase in working from home. The Office for National Statistics published a report in April 2021 looking at the trends in working from home between 2011 and 2020, including the impact of the COVID-19 pandemic[7].

7 https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/articles/homeworkinghoursrewardsandopportunitiesintheuk2011to2020/2021-04-19

8.5.5 The Office for National Statistics report states that 'of the employed population, 35.9% did some work at home in 2020, an increase of 9.4 percentage points compared with 2019; this also includes a change in the type of people who worked from home in 2020'.

8.5.6 The ONS report finds that there are significant variations in the rates of working from home by sector of the economy and geographically within Great Britain. Rates of working from home were highest in London, the South East and the East of England at around 40%, with rates lowest in Northern Ireland, the North East and Scotland at around 26% to 27%.

8.5.7 As travel restrictions are lifted, it is expected that there will be impacts on travel behaviour in the medium and longer-term. At present there is no consensus on what these impacts will be and the likely scale of these changes.

8.5.8 Based upon the observed changes in behaviour since March 2020, the following changes in travel behaviour might be expected:

- increased homeworking and more flexible working patterns;
- increased use of web-based meetings and video conferencing reducing the need for business travel;
- increased use of online shopping and home deliveries;
- changes to leisure and personal business trips; and
- a reluctance to use public transport, especially crowded services.

8.5.9 Whilst some of the above represent long-term trends that pre-date the COVID-19 pandemic, it is likely that the COVID-19 pandemic and the associated restrictions have accelerated these trends in travel behaviour. For example, having been exposed to homeworking some individuals will continue this way of working on either a full-time or part-time basis in the longer-term.

8.5.10 At present there is no evidence or guidance to reliably forecast the medium or long-term impacts on travel of the COVID-19 pandemic.

8.6 Summary

8.6.1 In this section I have detailed the testing which has been undertaken to determine the sensitivity of the assessment of the scheme to changes in modelling assumptions. This has included the 'high' / 'low' growth scenarios defined in TAG Unit M4, the inclusion

of transport forecasts for 2051, and the use of an alternative base year model using data from roadside interview surveys.

8.6.2 I have detailed how the transport user benefits are forecast to change in these sensitivity tests and that, based on the Department for Transport's Value for Money framework, the scheme represents 'high' value for money in all sensitivity tests.

9. Summary & Conclusions

9.1 Scope of Evidence

9.1.1 The purpose of my evidence is to describe the Leicester and Leicestershire Integrated Transport Model (LLITM), how it was applied to produce forecasts and to explain why those forecasts can be relied on. I explain that the forecasts have been used to inform the NEMMDR business case.

9.2 The need for a Transport Model

9.2.1 Developing the business case for a transport scheme draws together evidence of its performance and its likely impacts. At the heart of this process is a requirement to test and appraise options. This requires forecasts which are produced by a model. The design of the model is crucial to ensuring that outputs can be produced at an appropriate level of detail. I have shown how the LLITM has been developed to achieve this.

9.3 Model Functionality

9.3.1 The LLITM has been developed in accordance with Department for Transport guidance on modelling (TAG), with the model structured in a format that is consistent with that set out in TAG Unit M1-1 (Principles of Modelling and Forecasting), consisting of four main components or sub-models: a land-use model (prepared by David Simmonds Consultancy), a demand model, a highway assignment model, and a public transport assignment model.

9.4 Model Suitability for Assessing the NEMMDR

9.4.1 The existing LLITM was reviewed and refined for use in assessing the scheme. Its structure and functionality are suitable for assessing the scheme, and the data used to develop the model have sufficient detail and quality to understand travel patterns and network performance in and around Melton Mowbray. I have explained that the model development was undertaken in accordance with best practice set out in TAG.

9.4.2 In addition to having suitable functionality, in explaining my view that LLITM is suitable for assessing the scheme I have also shown that the model:

- is sufficiently detailed to represent the scheme;
- outputs adequately reproduce observed conditions and demand; and
- responds appropriately to input changes.

9.4.3 I am satisfied that the LLITM has been developed with appropriate rigour, in accordance with the methods set out in TAG, has suitable functional scope and detail, the outputs comply with the TAG criteria tolerances and that it responds appropriately. I conclude that the LLITM is suitable to produce forecasts for the scheme assessment.

9.4.4 I consider that the LLITM outputs are suitable for preparing the business case and appraising the impacts of the scheme. However, I do not consider that the outputs are directly suitable for use in junction design.

9.5 Future Year Forecasts without the Scheme

9.5.1 I have described how the future year scenario without the scheme has been prepared. I have explained that the expected growth in population, together with the changes in congestion, are forecast to result in an increase travel demand in Melton Mowbray.

9.6 Future Year Forecasts with the Scheme

9.6.1 I have explained how the scheme has been represented in the LLITM.

9.6.2 The scheme improves journey times for through traffic by providing an alternative route avoiding the town centre, which in-turn reduces congestion within the town centre and improves journey times, and journey time reliability, within Melton Mowbray.

9.6.3 The scheme is forecast to have accident disbenefits, although this is largely a reflection of the improved network connectivity that the scheme provides, hence resulting in an increase in overall traffic levels in the area of detailed traffic modelling.

9.6.4 The economic appraisal of the scheme concludes that the scheme represents 'high' value for money.

9.7 Uncertainty in Forecasts

9.7.1 All forecasts have an element of uncertainty. There are uncertainties in the level of future growth without the scheme and therefore uncertainties in the forecast impacts of the scheme. I have used LLITM to explore these uncertainties and to understand what impact they may have on the demand forecasts.

9.8 Conclusions

9.8.1 I am satisfied that the LLITM has been developed in accordance with DfT TAG to inform the traffic, economic, and environmental appraisal underpinning the business case of the scheme, and has been accepted by the DfT in providing the evidence base to underpin the Outline Business Case as well as other business case submissions[8].

9.8.2 I therefore consider the LLITM is suitable for the assessment of the scheme and that its outputs can be relied on for these purposes.

[8] Loughborough Inner Relief Road Full Business Case;
Three Local Sustainable Transport Fund funding applications; and
A511 MRN Growth Corridor Outline Business Case.

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