Leicestershire County Council (A511 Growth Corridor) (Side Roads) Order 2023

Leicestershire County Council (A511 Growth Corridor) Compulsory Purchase Order 2023

LLC2: Proof of Evidence: 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 have worked for AECOM for 25 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 25 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 A511 Growth Corridor Scheme.

1.1.4 Relevant project experience includes where I:

- directed the transport modelling and scheme appraisal, using PRTM[1], for the North and East Melton Mowbray Distributor Road scheme in Melton Mowbray, Leicestershire, underpinning the Outline Business Case (OBC) and subsequently the Full Business Case (FBC), and where I stood as an expert witness;
- directed the transport modelling and scheme appraisal, using LLITM/PRTM[2], for the A511 MRN (Major Road Network) Growth Corridor scheme in Coalville, Leicestershire, underpinning the OBC; and

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

- directed the transport modelling and scheme appraisal, using LLITM/PRTM, for several successful funding bids to the Department for Transport's (DfT) Local Sustainable Transport Fund.

1.2 Scope of evidence/Involvement in the Scheme

1.2.1 The purpose of my evidence is to describe the Pan-Regional Transport Model (PRTM), how it was applied to produce forecasts for the assessment of the A511 Growth Corridor Scheme (the Scheme) and to explain why those forecasts can be relied upon.

1.2.2 Since early 2019 I have overseen the use and development of PRTM for the forecasting and appraising of the proposed A511 Growth Corridor Scheme, first supporting the development and submission of the OBC in January 2020, and latterly to develop the evidence to support a FBC submission to the DfT. For this, a post-COVID-19 variant of the PRTM has been developed, discussed below (called the A511 Strategic Transport Model (ASTM)). This ASTM has been developed specifically for the assessment of the Scheme, and therefore by definition is suitable for use.

1.3 Declaration of truth

1.3.1 The facts and matters set out in this proof of evidence are within my own knowledge. The facts set out below are true to the best of my knowledge and belief. Where reference is made to facts which are outside my knowledge, I set out the source of my information and I believe such information to be true.

1.3.2 I have been assisted by other professional advisors and officers with the preparation of this proof of evidence, some of whom will also provide evidence to the inquiry.

1.4 Supporting Documents

1.4.1 This proof of evidence cites several reference documents produced by the Department for Transport which are available to download online and included as Document NP19 in the List of Documents)[3]:

- 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
- TAG Uncertainty Toolkit

[3] 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 ASTM 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 ASTM 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 Coalville 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 Scheme of the A511 Strategic Transport Model

3.1 Introduction

3.1.1 The purpose of this section is to explain the development and the role of the ASTM and how it developed from PRTM 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 ASTM 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 ASTM and the adequacy of the surveys undertaken to provide a model representing travel in Coalville and the area that is influenced by the Scheme (the Area of Influence, or AoI). 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 A511 Growth Corridor 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 Scheme, 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 A511 Growth Corridor has been developed to support the Scheme's business case and reflects the most appropriate guidance and assumptions available at the time of its development. 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 ASTM, 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 DfT sets out guidance on modelling and appraisal of transport schemes in TAG (Transport Analysis Guidance)[4] (Document NP4 in the List of Documents). In the following paragraphs, I refer to the published guidance followed throughout the development of the PRTM and its use in preparing the forecasts that are the subject of my evidence.

3.4.2 The ASTM forecasts for the A511 Growth Corridor are based on the November 2023 version of TAG which was the latest available version of the guidance during the model development and forecasting. Some minor updates have been implemented to TAG since November 2023; 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 highway traffic model to assess schemes such as the A511 Growth Corridor. 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 ASTM, namely the public transport assignment model and the demand model.

3.4.4 The role of the demand model (guidance can be found in TAG Unit M2-1) is to provide forecasts of travel demand in response to changes in factors such as fuel prices, fuel consumption/efficiency, fares and congestion, distinguishing by mode (car, public transport, walk/cycle) and time of travel, together with the origin and destination of journeys.

3.4.5 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.

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

3.4.6 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.

3.4.7 The public transport assignment model provides a similar role in representing how many passengers use different public transport 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.

3.4.8 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].

3.4.9 Large models of counties, such as the PRTM (from which the ASTM is developed), 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.

3.4.10 The PRTM has been maintained and developed over time to enhance its capabilities; these enhancements have been carried over to the ASTM, a derived version of the PRTM, in order to provide the transport modelling evidence for the Scheme, as I next describe.

3.5 Provenance of the LLITM/PRTM models (2009 to 2013)

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 (LLITM).

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 included a representation of mainland Great Britain, the focus of the model was on Leicester City and Leicestershire, and this is where the level of detail is greatest.

3.5.4 Throughout the development of the LLITM, an independent peer reviewer was appointed by the Council to review and challenge the approach and 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.

3.5.5 In addition to this, a representative from Highways England (now National Highways), namely Craig Drury, also provided review and challenge as part of the model development. The Department for Transport also reviewed the model development, and has since accepted the model for business cases, including the OBC for the A511

Growth Corridor Scheme (as part of the ongoing FBC for the Scheme, we are now engaging with DfT to obtain its support).

3.6 Provenance of the LLITM/PRTM models (2014 to date)

3.6.1 During the model's lifetime several updates were made mainly enhancing the performance of the highway assignment model included in the model suite or rebasing the model. 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.

3.6.2 The most significant update was a comprehensive refresh of the model to update it to reflect a 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. This version of the model was renamed from LLITM to the PRTM.

3.6.3 The Area of Detailed Modelling was extended as part of the update to include additional areas outside Leicestershire, primarily around the western half of the county, and the update process was supported by an extensive data collection programme, including traffic and passenger counts and over 100 roadside interview surveys.

3.6.4 The quantity of roadside interview data collected for the development of the PRTM is atypical, and when combined with the mobile network data, the resulting data set was a rich source of travel demand information.

3.6.5 This version of the PRTM was used by WSP as part of an initial assessment of the Scheme and for assessing alternative package options: 28 interventions were included in the long list of which 13 were shortlisted. The DfT's Early Appraisal Sifting Tool (EAST) (Document NP20 in the List of Documents) was used to assess five scheme packages against the Scheme objectives. Of these five, Package 1 was identified as the preferred option, containing nine elements. The Optioneering process and outcomes was documented in an Option Assessment Report.

3.6.6 There is now an ongoing major update of the PRTM to extend to model with a post-COVID-19 2023 base year; this model will not be complete until mid-2025. COVID-19 delayed this major update, and so an interim PRTM with a 2019 base year was developed, updating networks, using new mobile network data (2019) and available count data, drawing on traffic counts taken from the Council's extensive network of permanent traffic counters. This model is currently the production version of PRTM that the Council is using for Local Plan development and developers are using to assess development impacts.

3.7 Development of the ASTM for the A511 Growth Corridor Scheme FBC (2023-2024)

3.7.1 As part of the study looking at the A511 Growth Corridor, a detailed review of the PRTM (2019) 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. Some minor corrections to the representation of the local highway network in Coalville were made following this review.

3.7.3 Given the age of the underlying demand data and the possible impacts of COVID-19 on travel patterns, the decision was made to use a new set of mobile phone data to derive travel patterns and input demand data. These mobile phone data represent travel demand from 2023 and so should incorporate the latest impacts from COVID-19 on travel patterns. Data collection for the ongoing PRTM 2023 update was complete, and so a large dataset consisting of 2023 traffic counts and journey time data was available.

3.7.4 The PRTM 2019 model was thus rebased to a 2023 base year and recalibrated for the purposes of assessing the Scheme, with performance statistics (flow and journey times) that exceed the requirements of TAG Unit M3-1 (Highway Assignment Modelling). The resulting model is known as the A511 Strategic Transport Model

(ASTM) and is considered to be suitable for assessing the Scheme to support in the development of the Final Business Case'.

3.8 Summary

3.8.1 In this section I have described the provenance of the LLITM/PRTM model and the development of the ASTM from PRTM. 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 ASTM 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 A511 Strategic Transport Model

4.1 Introduction

4.1.1 The purpose of this section is to explain why I judge that the ASTM is suitable to assess the Scheme. We are currently engaging with DfT on the specifics of the model development and aim to gain the DfT's approval of the use of the model for the assessment of the Scheme for the FBC.

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 ASTM 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 ASTM user classes (presented below) are suitable for the assessment of the Scheme.

- HGV demand;
- LGV demand;
- business demand;
- commuting demand; and
- other demand.

4.3 Model Accuracy

4.3.1 In Section 3 of my proof I explained how the ASTM 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 ASTM in the vicinity of the 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 94%, 96% and 92% of flows at count sites in North West Leicestershire (broadly aligned with North West Leicestershire district) 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 Some of the roads in North West Leicestershire where modelled vehicle flows do not meet TAG criteria are as follows:

- Discovery Way in Ashby-de-la-Zouch;
- Charnwood Wood in Shepshed; and
- Market Street in Ashby-de-la-Zouch.

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 The locations where modelled traffic flows do not meet TAG criteria should not have a material impact on the Scheme assessment. This is due to the location of those roads on the network, which are well away from Coalville and the Scheme, in areas such as Ashby-de-la-Zouch. We can also infer that the lack of fit to TAG criteria at these locations does not detrimentally affect flows on the Scheme, as traffic count locations close to the Scheme do show a good fit against modelled flows.

4.3.7 To demonstrate this, of key interest to the Scheme is the link flow performance on roads in the vicinity of the A511 and in the alignment of the Scheme.

4.3.8 'Screenlines' are used to assess the link flow performance of a traffic model, whereby traffic counts collected on broadly parallel roads are aggregated and compared with the modelled traffic volumes in the base year highway model taken from the same roads. Such comparisons at screenline level provide information on the quality of the trip matrices.

4.3.9 Cordons are a different form of screenline, whereby they enclose a geographical area.

4.3.10 There are three screenlines/cordons in the vicinity of Coalville and the Scheme (shown in red in Figure 4-1), namely:

- Coalville Cordon (intercepting traffic entering/leaving Coalville);
- Bardon Hill Cordon (intercepting traffic entering/leaving Bardon Hill); and
- M1 Screenline (intercepting traffic crossing the M1 in a broadly east-west axis).

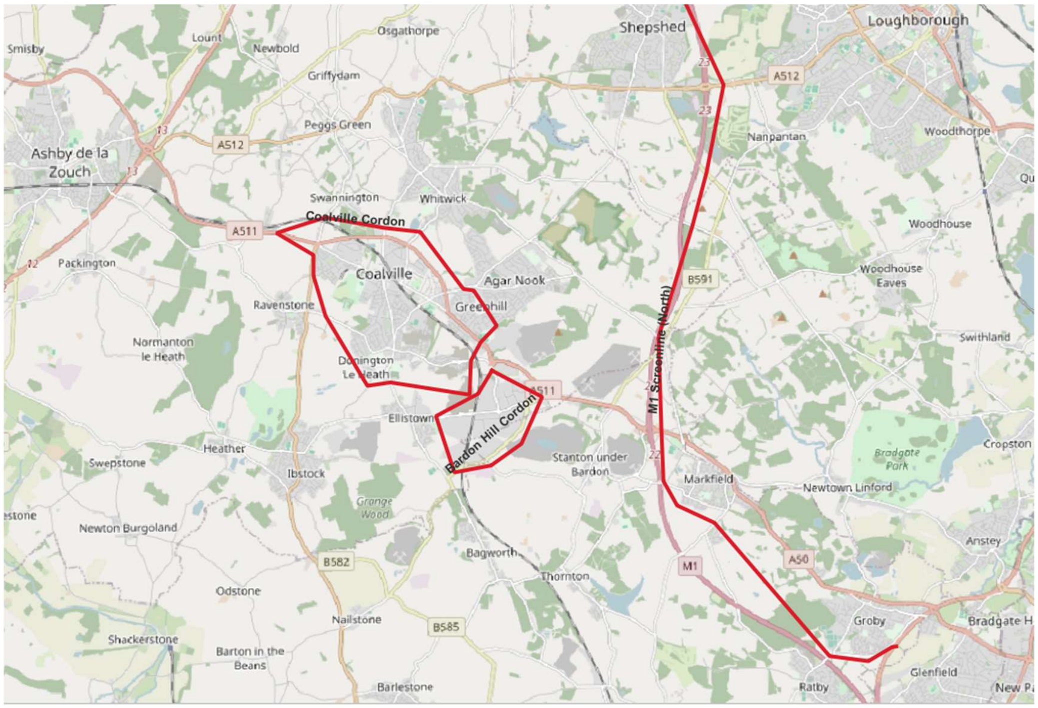

Figure 4-1 Screenlines/Cordons in the Vicinty of the Scheme

4.3.11 These comprise a total of 70 counts, by direction. For the AM period, all 70 count sites catch the TAG criteria, while only two and four sites fail in the interpeak and PM peak periods respectively. This is well within TAG criteria and shows the good match of observed and modelled flows in the immediate network around the Scheme.

4.3.12 Another measure of the quality of the model is the match between observed journey times from surveys and modelled journey times. This comparison is undertaken for several routes. The journey time routes which are closest to the Scheme and Coalville area are shown below in Figure 4-2.

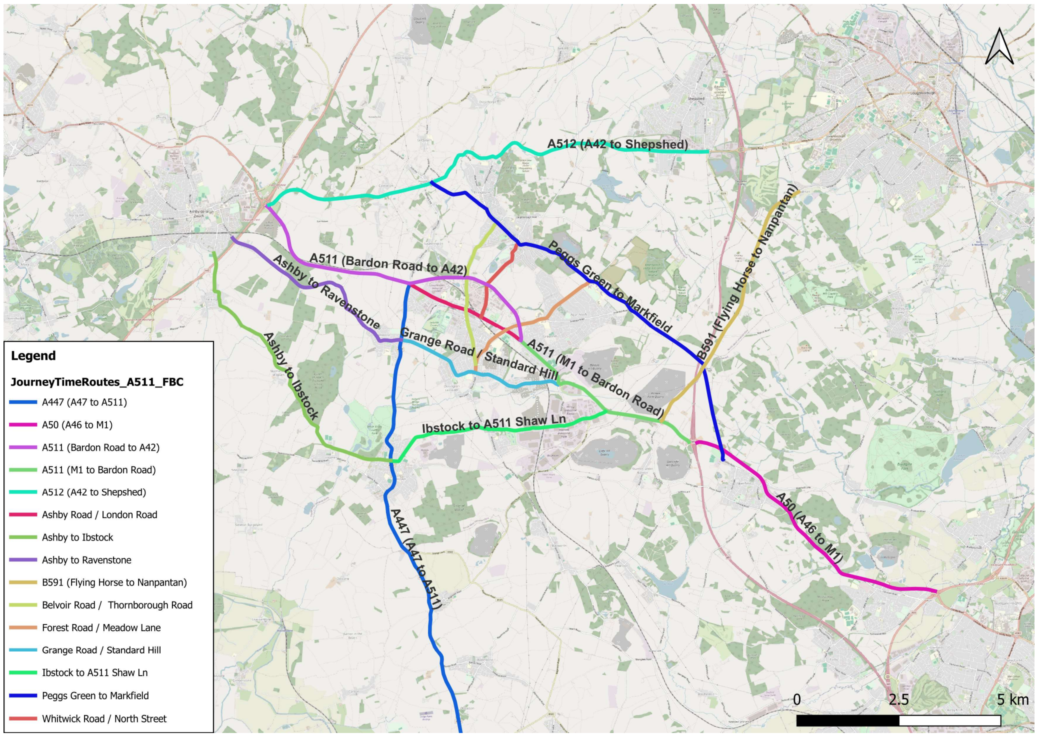

Figure 4-2 Journey Time Routes in the Vicinity of the Scheme

4.3.13 For the 15 journey time routes shown in Figure 4-2, observed survey times are compared against modelled time in both directions. This results in 30 journey times for each of the three modelled time periods, to validate modelled journey times against.

4.3.14 TAG recommends that modelled journey times are within 15% of the observed times (or within one minute). In each of the time periods, the modelled journey times for all 30 routes are within 15% of the observed times. This demonstrates that the model reflects observed highway network speeds (and hence delays) accurately.

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, assessing 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 (Variable Demand Modelling).

4.4.2 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%. Within the ASTM, this fuel cost elasticity test produces expected responses, with an overall elasticity of -0.327 for car. The demand model responses comply with TAG Unit M2-1, both in aggregate terms and with expected variation by purpose, income group and time period, such as:

- business trips have a lower sensitivity to fuel cost compared with other demand segments, reflecting the higher value that business travellers attach to their time relative to other groups;
- lower income groups have a greater sensitivity to fuel cost than higher income groups; and
- the fuel cost sensitivity is greater in the interpeak (compared with the peaks), reflecting the mix of travel purposes in the interpeak and the fact that there is generally less capacity restraint (i.e. congestion) in the interpeak, which acts to dampening the fuel cost response in the model.

4.4.3 Other sensitivity tests that have validated the ASTM 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.

4.4.4 I note that there is a forthcoming change to TAG Unit M2-1, due at the end of May 2024. The demand responses outlined above are also consistent with this emerging guidance, documented in the DfT's *'Forthcoming change: modelling guidance updates'*, dated 25th April 2024 (Document NP24 in the List of Documents)[5].

4.4.5 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 ASTM 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 ASTM is suitable to produce forecasts for the Scheme.

4.4.6 I will now consider how the outputs have previously been used in the OBC (using PRTM), how they will be used in the FBC and junction design (using ASTM).

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 are 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 are used to extrapolate from the time periods explicitly modelled. These data are then provided to the noise and air quality experts for detailed analysis, noting that it has been agreed with the Department for Transport that the noise and air quality assessment undertaken for the OBC does not need to be updated for the FBC.

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5 https://www.gov.uk/government/publications/tag-forthcoming-changes/forthcoming-change-modelling-guidance-updates

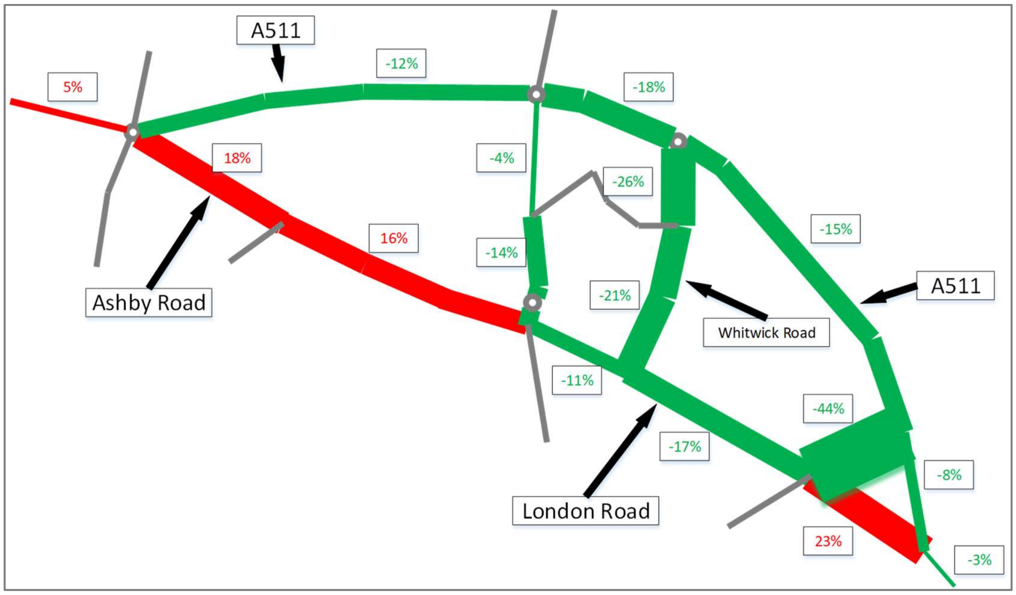

Figure 4-3 AM Peak Traffic Flow Changes – FBC minus OBC

4.5.3 Figure 4-3 illustrates the difference in forecast flows between the OBC and FBC forecasts for the AM peak hour, with the green bandwidths indicating reductions in flows for the FBC forecasts relative to the OBC (red indicates increases). Where there are areas of possible sensitive receptors for noise and air quality (such as around Coalville), most links show a reduction in flow, with would have a corresponding reduction in impact on noise and air quality.

4.5.4 This indicates that the OBC assessment of noise and air quality would represent a conservative scenario for the assessment of those impacts.

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 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 are derived to extrapolate to this from the modelled periods.

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

4.7 Junction Design

4.7.1 Forecast traffic data have been extracted from the ASTM (and previously the PRTM) and provided to highway engineer experts to aid the design of the junctions included in the Scheme. Traffic forecast data from the ASTM have been used recently to check and verify the Scheme junction designs.

4.8 Summary

4.8.1 In this section I have explained how I have reviewed the specification, detail, performance and sensitivity of the ASTM. I have demonstrated that the ASTM is able to replicate current travel conditions in terms of traffic volumes and journey times within an acceptable degree of accuracy. I have also demonstrated that the model performs well in terms of its sensitivity to changes in travel costs and concluded that it is suitable for the purpose of providing forecasts for the Scheme.

4.8.2 I have explained why the ASTM outputs are suitable for preparing the FBC and appraising impacts of the Scheme.

5. Core Forecast Scenario – Without the Scheme

5.1 Introduction

5.1.1 The ASTM is used to forecast travel demand and associated network conditions. Forecasts are developed in the ASTM by applying changes to the representation of travel in its base year of 2023. 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 2023 base year to produce forecasts for 2027, 2035, 2042, 2051 and 2061.

5.1.2 This section describes the forecasts of future travel demand in Coalville and the surrounding local highway network, before the opening of the Scheme. The main parts of the network we assess include the A511 between the A42 and the M1, the A50 west of the M1 as it passes around Markfield and the main local side roads which connect to the A511. I focus on a discussion of forecast travel conditions in 2027 (the assumed opening year of the Scheme) and 2042 (a forecast year usually used for design elements of the Scheme, known as the 'design year').

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 A range of publicly available data sources was used in the forecasting process. This includes forecast of population and employment growth provided by the DfT through a model known as the NTEM (National Trip End Model). The latest NTEM version 8.1 (released in 2022) is used in the ASTM forecasts.

5.2.3 Other sources of forecast information include the forecasts of freight growth in the National Road Traffic Projections (NRTP) released in 2022. The NRTP was also used for forecasting speed changes in external, more distant, parts of the highway network.

5.2.4 The DfT also releases a wide range of forecast data known as the TAG data book, which contains data on a range of factors including GDP growth, value of time growth, the cost of operating vehicles as well as other economic factors. All of these have been used as part of the forecasting process. The version of the TAG data book used for ASTM forecasts was version 1.22 which was released in November 2023.

5.2.5 In accordance with TAG Unit M4 (Forecasting and Uncertainty), 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 ASTM forecasting. All assumptions on the certainties associated with each development, as well as information on the scale and buildout rates of the development, are recorded in a dataset called the Uncertainty Log. Planning inputs deemed "reasonably foreseeable" or "hypothetical" have been excluded from forecast scenarios.

5.2.6 Specific attention has been paid within the Uncertainty Log 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". The Uncertainty Log was also shared with planning officers from the Council to ensure that all assumptions made in the Uncertainty Log were correct and up to date.

5.2.7 Given the importance of the Coalville Sustainable Urban Extension (SUE) to the Scheme (as the Bardon Link Road connects into the SUE spine road), particular attention was paid to the scale and buildout of the SUE. These were checked with the Council to ensure that the assumptions about the buildout by year and the final number of homes were reasonable and accurate (the Council maintains a planning data uncertainty log that is used in the ASTM forecasts with information taken from developers' Transport Assessments (TAs)). When calculating the demand from the SUE, the agreed trip rates that were assumed in the TA for the development were also included within the ASTM forecasting.

5.2.8 As described above, 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 ASTM modelling in 2024. Based on the latest information available at this time, I consider these assumptions to be suitable for forecasting the impact of the Scheme.

5.3 Definition of Area of Influence

5.3.1 An Area of Influence (AoI) has been defined whereby the impact of the Scheme is significant. This was done using initial forecasts, identifying roads which experienced a forecast flow change of +/- 5 percent and where the traffic flow in the Without Scheme is at least 250 vehicles. The result of this analysis is shown in Figure 5-1.

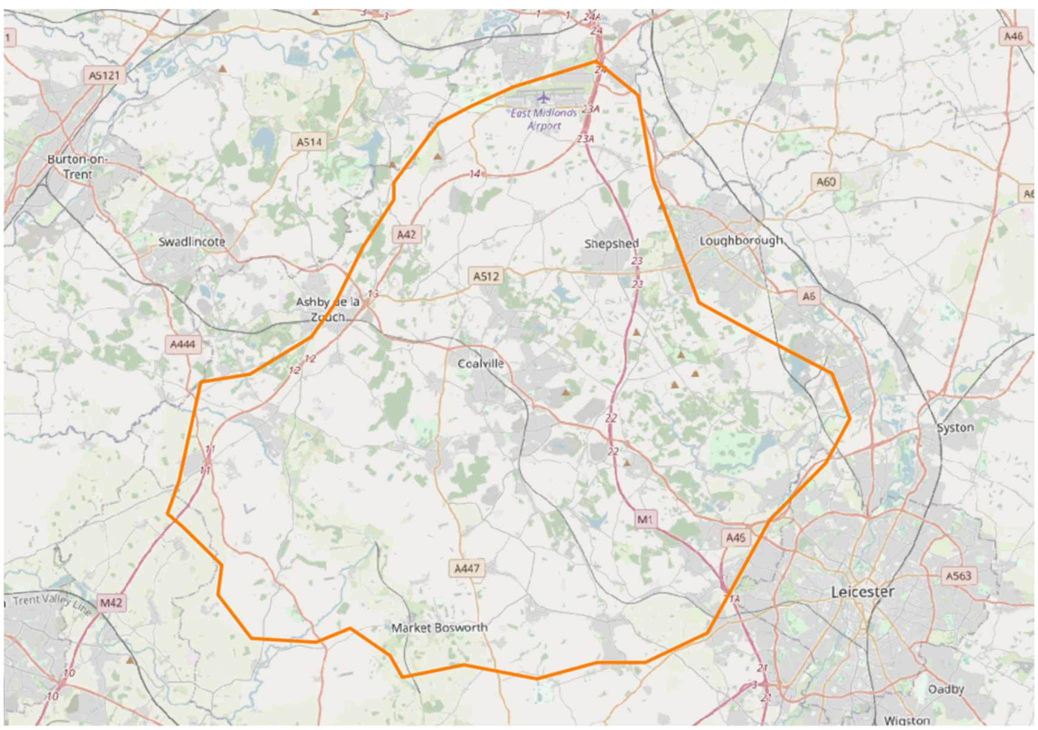

Figure 5-1 Area of Influence due to the Scheme

5.4 Future without the Scheme: Within the Area of Influence

5.4.1 In line with common practice in the transport planning industry, a scheme assessment considers the network conditions both with and without the Scheme under consideration. In this section, I will highlight some of the expected impacts on the highway network in the AoI of the Scheme, but without the Scheme in place.

5.4.2 The change in travel demand within the forecasts produced by the ASTM is driven primarily by assumptions of growth in terms of local population and employment. In the AoI, the population increase from 2023 is assumed to be 5.3% to 2027 (the Scheme opening year) and 21.2% to 2042 (the design year). In terms of employment, the assumed increases are 5.3% to 2027 and 9.8% to 2042. In line with the assumed change in population and employment since 2023, the overall production of trips (for all modes of travel) in the AoI is forecast to increase by around 4.5% to 2027 and 16.4% to 2042.

5.4.3 The data provided by DfT in the TAG data book contain assumptions that the cost of operating vehicles, primarily cars, will get cheaper in the future. The monetary cost (per kilometre) of travel by car is assumed to reduce over time which will contribute to generating growth in car travel. Increases in traffic congestion, however, will moderate forecast that highway growth. Overall, the production of highway (person) trips in the AoI is forecast to increase, from 2023, by 5.2% to 2027 and 17.8% to 2042.

5.4.4 Across the AoI, vehicle distance travelled (measured in vehicle-kms) in the AM peak hour is forecast to increase from 2023 to increase by 5% to 2027 and 19% to 2042. For the PM peak hour vehicle-kms are forecast to increase by 5% to 2027 and 22% to 2042.

5.4.5 These increases in the vehicle-kms then lead to further networks effects, such as increased congestion. In terms of congestion (measured in vehicle-hours) in the AM peak hour, congestion increases by 7% to 2027 and 45% to 2042. For the PM peak congestion is forecast to increase by 4% to 2027 and 35% to 2042.

5.5 Future without the Scheme: Within Coalville

5.5.1 Within the vicinity of Coalville, the A511 provides an important link between the A42 at Junction 13 and the M1 at Junction 22. As the A511 travels between these two points it passes to the north of the town centre Coalville and by the area of the SUE in Bardon before then travelling on to join the M1.

5.5.2 The critical points of the network with the highest modelled flow in the 2023 base are located at:

- A511 just west of Coalville and the Hoo Ash roundabout;
- A511 between Birch Tree roundabout and Charnwood Arms roundabout; and
- A511 between the Flying Horse roundabout and the M1.

5.5.3 The table below shows the flows for each of these points on the network and the forecast traffic flows in total vehicles for the 2023 base year and forecast years of 2027 and 2042. The flows are two-directional total vehicle flows for the AM and PM peaks.

Table 5-1 Forecast Traffic Flows without the Scheme

Location	2023 Flows		2027 Flows		2042 Flows	
	AM	PM	AM	PM	AM	PM
A511 West of Hoo Ash roundabout	1,840	1,793	1,901	1,851	1,962	1,950
A511 west of Flying Horse roundabout	3,699	3,882	3,929	4,074	4,197	4,508

5.5.4 From the table above, the model is forecasting an increase in flow on the A511 west of Hoo Ash of approximately 120 vehicles in the AM peak by 2042. To the east of Coalville, on the section of the A511 between Flying Horse roundabout and the M1, the increases are more substantial and are forecast to be an increase of approximately 500 vehicles in the AM peak. In the PM peak, the traffic flow increases are larger, with forecast flows increases on the A511 of approximately 150 vehicles at Hoo Ash roundabout and 630 vehicles at Flying Horse roundabout by 2042.

5.5.5 The ASTM has detailed coding and simulation of junctions in the Coalville area and thus represents congestion and delay at junctions as accurately as the modelling software allows. Forecast journey time data for the route have been extracted from the model to understand the impact of the traffic flow increases on congestion and travel delay.

5.5.6 The route for which modelled travel time data has been extracted is shown in Figure 5.2 below. The route extends from Hoo Ash roundabout to the west of Coalville to a point east of the Field Head roundabout at Markfield.

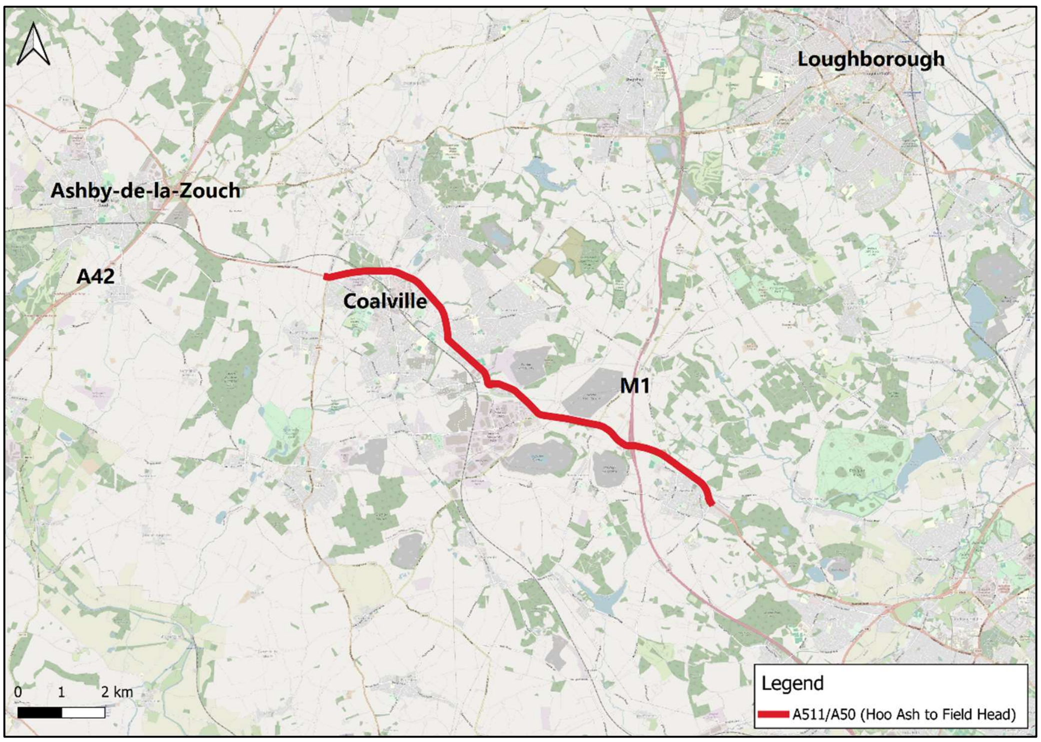

Figure 5-2 Journey Time Route used for Analysis

5.5.7 The model forecasts that journey times for the route, in the AM peak, will increase by approximately half a minute in 2027 and by one and a one minute 20 seconds in 2042. For the PM peak, the respective figures are increases of approximately half a minute in 2027 and by one minute and 40 seconds in 2042.

5.6 Summary

5.6.1 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 Coalville.

5.6.2 In particular, the forecasts show significant increases in traffic growth to the east of Coalville on the A511 in the direction of the M1. These increases are forecast to be approximately 15% on the A511 by 2042, with corresponding increases in journey time and congestion.

5.6.3 Population and employment increases in the SUE and other developments in Coalville concentrate travel in the A511 Growth Corridor and will lead to significant growth in travel demand in the surrounding highway network. This growth is forecast to increase travel times along the A511/A50 route with increased congestion at some of the key junctions impacting on both local and longer distance traffic.

5.6.4 While the overall trends for growth in traffic for other areas in North West Leicestershire are lower, the increases on the A511 east of Coalville show the importance of this particular link for network resilience in the area and for accessibility to the Strategic Road Network, including the M1.

6. Forecast Impact of the Scheme

6.1 Introduction

6.1.1 Having explained, in Section 5, how demand for travel is likely to develop in Coalville in the absence of the 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 ASTM 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 numerous different future years. Instead, interpolation is applied to establish how outcomes would vary over time. In preparing forecasts for the Scheme, I have undertaken tests to show what the effects of the Scheme would be at key years during the Scheme's life.

6.1.3 Five future years have been represented for traffic forecasting purposes, these being as follows:

- 2027 – Opening of the Scheme
- 2035 – Expected completion of Coalville Sustainable Urban Extension
- 2042 – To provide traffic data for design purposes
- 2051 – Intermediate Forecast Year
- 2061 – Horizon Forecast Year

6.2 Representation of the Scheme

6.2.1 The first modelled year in which the Scheme is represented is 2027[6]. For the purposes of transport modelling and for the appraisal in this document, the Scheme improvements are defined by the addition of capacity on the approach or at existing roundabouts between the A511/A447 junction on the west side of Coalville and the A50 Field Head junction at Markfield, a distance of about 11km. In addition, one

[6] 2027 was selected as the scheme's predicted opening year through consultation with the Council .

section of the A511 is to be dualled and the Bardon Link Road is to be provided connecting the Coalville SUE to the A511 at the Bardon Road roundabout.

6.2.2 Of the eight junctions to be modified seven are roundabouts and one is signalled and consist of the following:

- A511/A447 Hoo Ash roundabout;
- A511/Thornborough Road roundabout;
- A511/Whitwick Road roundabout;
- A511/Broom Leys Road signals;
- A511/Bardon Road roundabout (including [SUE]/Bardon Link Road);
- A511/Birch Tree roundabout;
- A511/Flying Horse roundabout; and
- A50/Field Head roundabout (Markfield).

6.2.3 All improvements to these junctions, the dual carriageway between Thornborough Road and Whitwick Road junctions and the Bardon Link Road, are scheduled to be completed by 2027.

6.2.4 At all of the above junctions the Scheme will provide additional capacity. Signals will be installed at Field Head junction with operation during the morning and evening peak periods only. Bardon Road junction will be enlarged to accommodate the new Bardon Link Road. At Flying Horse junction some movements to and from the B591 and Stanton Lane will no longer be available to reduce the number of conflicting movements at this junction.

6.3 Future with the Scheme – Impact on Traffic

6.3.1 The impacts of the Scheme are reported in the following sections for 2027, as this is the year by which the Scheme is due to be completed, and for 2042, as that is year is generally used for design purposes and by that year the Coalville SUE will also be fully built-out.

6.3.2 In terms of overall impacts the new Bardon Link Road is forecast to contribute significantly to relieving traffic impacts in the Coalville area as it enables traffic from the SUE and the southern area of Coalville to access the A511 more directly. It thereby reduces traffic on the eastern part of Grange Road and on the A511 between Birch Tree and Bardon Road junctions. It also further reduces traffic on Waterworks Road and Cropston Drive between the A511 and Greenhill Road.

6.3.3 In the AM peak hour in 2027 the Scheme is forecast to reduce traffic on Bardon Road by about 90 vehicles compared to the Without Scheme scenario. There is a reduction of between 120 to 140 vehicles on Cropston Road and Waterworks Road and a reduction of about 180 vehicles on Grange Road east of the SUE access junction. In the PM peak hour the forecast reductions in traffic due to the Scheme are marginally lower on Bardon Road and Waterworks Road but there is a greater reduction on Grange Road of about 210 vehicles.

6.3.4 In the AM peak hour in 2042 the Scheme is forecast to reduce traffic on Bardon Road by about 170 vehicles compared to the Without Scheme scenario. There is a similar reduction on Waterworks Road and Cropston Road and a reduction of about 290 vehicles on Grange Road east of the SUE access junction. In the PM peak hour the Scheme is forecast to reduce traffic by about 370 vehicles on Grange Road between the A511 and the SUE access junction.

6.3.5 As the Scheme increases capacity along the A511 it results in traffic using this strategic route rather than using less suitable roads to the north and south of the A511 such as the secondary route between the B591 at Copt Oak and the A512 at Pegg’s Green (formerly the B587) passing through Whitwick, and the route between Hugglescote and Ravenstone and beyond towards Ashby.

6.3.6 In the PM peak hour in 2027 there are forecast reductions through Whitwick of about 80 vehicles with reductions of 50 vehicles at Ravenstone.

6.3.7 In 2042 in the AM peak hour, the forecast reductions in traffic due to the Scheme through Whitwick are around 100 vehicles and about 50 vehicles through Ravenstone.

Due to traffic transferring to the A511 the Scheme also results in a reduction in delays at a number of other junctions in Coalville, Hugglescote and Ravenstone.

6.3.8 The Scheme results in additional traffic travelling along the A50/A511 for most of the route between Markfield and Coalville with the highest increases forecast between the M1 Junction 22 and Flying Horse junction. In the 2027 AM peak the increase on this section is forecast to be about 470 vehicles partially due to the removal of most of the conflicting movements at Flying Horse junction.

6.3.9 In the PM peak hour in 2027 the corresponding increase is forecast to be around 370 vehicles. By 2042 the increase in traffic on this section is forecast to be around 835 vehicles in the AM peak and 760 vehicles in the PM peak.

6.3.10 Although the capacity enhancements to the A511 & A50 junctions result in more traffic along the route, traffic congestion and delays are still forecast to be lower than without the Scheme. The more significant reductions in delay occur at Flying Horse junction due to the reduction in conflicting movements.

6.3.11 The improvements to the A511 junctions result in a reduction in journey time between Markfield (Field Head junction) and west Coalville (Hoo Ash junction) compared to the Without Scheme scenario. Over the 11.2km, the journey time in the busier eastbound direction in the AM peak is 14.6 minutes in 2027 without the improvements and 13.8 minutes with the improvements or a saving of 0.8 minutes per vehicle. The respective times in the busier westbound direction in the PM peak are 14.9 minutes without the improvements and 14.1 minutes with the improvements resulting in a time saving of 0.8 minutes per vehicle.

6.3.12 By 2042 the journey time in the busier eastbound direction in the AM peak is forecast to be 15.6 minutes without the Scheme and 14.4 minutes with the Scheme or a saving of 1.2 minutes per vehicle. The respective times in the busier westbound direction in the PM peak are 16.3 minutes without the improvements and 14.7 minutes with the improvements resulting in a time saving of 1.6 minutes per vehicle.

6.3.13 Across the Area of Influence the traffic modelling forecasts that in 2027 the Scheme will result in a reduction in overall travel time of 53 hours in the AM peak hour compared to the Without Scheme scenario. The Scheme is forecast to marginally reduce the distance travelled by all vehicles across the AoI of about 40km. During the AM peak hour in 2027 the Scheme is forecast to increase average vehicle speeds by 0.4kph compared to the Without Scheme scenario.

6.3.14 In the PM peak hour in 2027 the Scheme is forecast to reduce overall travel time by 27 hours and increase distance travelled by vehicles by 74km across the AoI. During the PM peak hour the Scheme is forecast to also increase average vehicle speeds by 0.2kph compared to the Without Scheme scenario.

6.3.15 In an average interpeak hour in 2027 the Scheme is forecast to reduce overall travel time by 30 hours and overall distance travelled by vehicles is forecast to increase by about 400km as the improvement to the A511 is forecast to result in additional traffic routing through this area. During the interpeak the Scheme is forecast to increase average vehicle speeds by 0.3kph compared to the Without Scheme scenario.

6.3.16 By 2042 the Scheme is forecast to result in a reduction in overall travel time of 87 hours in the AM peak hour and a reduction in distance travelled by vehicles of about 500km. During the AM peak hour the Scheme is forecast to increase average vehicle speeds by 0.4kph compared to the Without Scheme scenario.

6.3.17 In the PM peak hour in 2042 the Scheme is forecast to reduce overall travel time by 80 hours and reduce distance travelled by vehicles by about 400km. During the PM peak hour the Scheme is forecast to increase average vehicle speeds by 0.4kph compared to the Without Scheme scenario.

6.3.18 In an average interpeak hour in 2042 the Scheme is forecast to reduce aggregate travel time for all vehicles by 49 hours although aggregate distance travelled is forecast to increase by about 200km. During the interpeak the Scheme is also forecast to increase average vehicle speeds by 0.4kph compared to the Without Scheme scenario.

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

6.4.1 As there is a reduction in vehicle distance travelled with the Scheme in the peak periods compared to that without the Scheme there may be a reduction in overall accident costs due to the Scheme. This reduction should be greater given that traffic generally diverts from lower to higher standard roads which have lower accident rates when compared on a like for like basis.

6.4.2 An accident assessment has been undertaken using the DfT COBALT software. This calculates that the Scheme is expected to marginally reduce Personal Injury Accidents by 19 over the 60-year assessment period. Dualling of the section of A511 between Whitwick and Thornborough junctions accounts for most of these accident savings.

6.5 Summary

6.5.1 In this section I have explained that the Scheme will reduce travel times and delays in and around Coalville and beyond. The Scheme is forecast to transfer traffic from less suitable roads onto the MRN and reduce overall vehicle distance by shortening the road distance between southeast Coalville and areas to the north and west via the A511.

6.5.2 As the Scheme improves capacity along the A50 & A511 it will result in a reduction in end-to-end journey times and will also improve journey time reliability by reducing congestion within the A511 corridor and at some of the key junctions.

6.5.3 The Scheme will reduce conflicting movements at Flying Horse junction and at Birch Tree junction and reduce traffic along Bardon Road. Due to reductions in vehicles travelling on minor roads is expected to result in an overall reduction in accidents compared to the without Scheme scenario.

7. Scheme Appraisal

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 are being used to undertake an economic appraisal of the Scheme.

7.1.2 This appraisal considers 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.

7.1.3 It should be noted that due to the current stage of the Scheme's FBC programme, a full appraisal of the Scheme using FBC forecasts is not possible. I have therefore sought to use FBC analysis where possible, and then drawing on OBC analysis where required. The use of OBC material has been identified in the text below.

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 (v19.17.2) using economic parameter values derived from the November 2023 TAG data Book. This takes information from the ASTM 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 and indirect tax revenues for government.

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 ASTM 'With Scheme' and 'Without Scheme' scenarios.

7.2.3 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 DfT and varies according to vehicle type, trip purpose, person type, and year. In accordance with DfT guidance, TUBA accounts for inflation and 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[7]". The "present value of benefits" is calculated by TUBA in the Department's current base year of 2010.

7.2.4 The appraisal of the transport impacts is undertaken over a 60-year period in-line with TAG and includes an assumed opening year of 2027, a design year 15 years after opening in 2042, and further modelled years of 2035, 2051 and 2061, reflecting TAG M4 which states that "*for economic appraisal it is best if the final forecast year is as far into the future as possible*". The benefits are assessed over the period from 2027 to 2086.

7.2.5 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 Coalville 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.

7.2.6 This assessment of the Scheme forecast that transport benefits over the 60-year appraisal period would be around £57.5m. This includes forecasts of around £54.5m in travel time benefits, £3.6m of vehicle operating cost benefits and a £0.6m reduction in indirect tax revenues.

7.2.7 The Scheme is therefore forecast to generate significant travel time savings, and is forecast to reduce typical travel distances, resulting in reduced vehicle operating costs.

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[7] The value that society places on present consumption relative to future consumption

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 COBALT (Cost and Benefit to Accidents – Light Touch) software. This takes forecasts for annual average daily traffic from the ASTM for the assessment years 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 ASTM 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. COBALT includes default, national average accident rates by road type, which have been used in accordance with TAG A4.1 Section 2.3.11.

7.3.4 As discussed in Section 6, although the Scheme is forecast to cause generally increased traffic in the corridor the increases are relatively modest. In 2027 there is a forecast increase of about 3600 vehicle-kms over an average day but by 2042 that change is forecast to be lower at around 2300 vehicle-km.

7.3.5 However these additional vehicle-km are concentrated on the MRN which generally has a lower accident rate (accidents per vehicle-km) than non-MRN roads. This results in a reduction in the forecast number of accidents over the 60-year appraisal period due to the Scheme. Using the assumptions contained in COBALT regarding the monetary value of accidents, this reduction in forecast accidents results in a benefit of around £1.12m 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. This assessment was not done at OBC stage, and has not yet been undertaken for the FBC, and so the forecast impacts cannot be quantified at present. However, the disbenefit associated with this will only be marginal; for context, similar analysis for anther MRN scheme calculated a disbenefit of ~£0.5m.

7.5 Appraisal of Journey Time Reliability

7.5.1 The appraisal of the change in journey time reliability has not yet been estimated for the Scheme FBC. For the OBC, this was 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 used in the TUBA assessment of the forecast Scheme impacts.

7.5.2 For the OBC, over the 60-year appraisal period, the assessment resulted in forecast benefits of around £3.05m for journey time reliability due to the Scheme. When calculated for the FBC, I anticipate a broadly similar figure.

7.6 Appraisal of Noise and Air Quality Impacts

7.6.1 The DfT has agreed that the reassessment of noise and air quality impacts is not required for the FBC assessment of the Scheme, primarily due to the lower traffic growth that is forecast in the FBC, reflecting changes in DfT economic assumptions.

7.6.2 For the OBC, as discussed in Section 4.5.2, traffic flows from the PRTM (which was used for the OBC assessment for the Scheme) were 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 as part of the OBC assessment and is not discussed within this proof.

7.7 Appraisal of Physical Activity Impacts

7.7.1 The appraisal of the physical activity impacts has not yet been estimated for the Scheme FBC. Given the nature and location of the scheme it is anticipated the only impact will be on cycle users resulting from the construction of 460 metres of new carriageway, which will incorporate 3-metre-wide footway and cycleway on both sides (i.e. 920 metres of new cycle infrastructure).

7.7.2 For the OBC assessment, an elasticity approach linked to the sketch plan method in TAG Unit A5.1 was used, one of the DfT's suggested approaches to estimating the impact of a scheme on cycling demand.

7.7.3 The overall monetised benefits from the increase in demand for cycling as a result of the Scheme is expected to be small, therefore a more detailed assessment of these benefits was not undertaken as part of the overall economic assessment of the scheme at OBC stage, and this will also be the case for the FBC.

7.8 Appraisal of Wider Economic Impacts

7.8.1 The appraisal of wider economic impacts has not yet been estimated for the Scheme FBC. Wider economic impacts refer to economic impacts which are additional to the conventional transport user benefits. They arise because the conventional transport appraisal, i.e. TUBA, assumes that markets operate under conditions of perfect competition, which in practice is not the case. This results in the appraisal failing to capture the impacts in secondary markets (non-transport markets), such as the labour, product and land markets. It means that the full welfare impact of a transport investment may not only be reflected in the transport market as it is also likely to have wider impacts.

7.8.2 TAG Unit A2.1 ("Wider Economic Impacts Appraisal") indicates there are three types of impacts which are relevant to the appraisal of the Scheme:

- **Agglomeration (or productivity) impacts** are location-based effects in which individuals and firms derive productivity benefits from locating near other individuals and firms. Agglomeration benefits arise from improved labour market interactions, knowledge spill over and linkages between suppliers and consumers.

- **Labour market impacts** consider how changes in transport costs are likely to affect the incentives of individuals to work and hence the overall level of labour supply in the economy.
- **Output changes from imperfectly competitive markets** reflect changes in the level of economic activity as a result of transport investment. Because the market is not perfectly competitive, improved transport infrastructure can increase production beyond the cost of the increase of delivering the infrastructure.

7.8.3 These impacts result in monetary benefits which are additional to those captured in the conventional transport appraisals. TAG states that these benefits can be significant, with agglomeration impacts usually providing the largest benefits.

7.8.4 To assess the wider impacts of the scheme, the DfT's WITA software was used for the OBC. WITA implements the calculations of wider impacts as described in TAG, and the WITA methodology seeks only to capture the part of the above impacts that are not already captured in the TUBA assessment.

7.8.5 The overall wider economic impacts that were calculated for the OBC are as follows:

- Agglomeration £13.6m
- Labour market impacts £0.2m
- Output changes £1.5m

7.8.6 The last of these wider economic impacts (output changes from imperfectly competitive markets) has been recalculated for the FBC, estimated as a benefit of £2.2m.

7.8.7 For the FBC, agglomeration and labour market impacts are expected to be broadly similar to the OBC, and so total wider economic impacts can be assumed to be £16m (£13.6m + £0.2m + £2.2m).

7.9 Appraisal of Distributional Impacts

7.9.1 The appraisal of distributional impacts has not yet been estimated for the Scheme FBC. As set out in TAG Unit A4.2, distributional impacts consider the variance of transport intervention impacts across different social groups. Both the beneficial and / or adverse impacts are taken into consideration as well as the socio-economic groups affected.

7.10 Summary of Monetised Scheme Impacts

7.10.1 At the time of writing, the monetised impacts of the Scheme that have been refreshed for the Scheme FBC are the TUBA assessment, accident assessment and part of the wider economic impact assessment. The TUBA assessment, which has been updated, is by far the most significant contributor to the assessment of Scheme benefits.

7.10.2 Taking these revised assessments into account, drawing on OBC assessment where required (some wider impacts, journey time reliability, noise, local air quality and greenhouse gases), and using the latest cost estimates for the Scheme (£28.24m in 2010 prices and values), the current best view of Scheme benefits is a benefit cost ratio (BCR) of 1.9, rising to an adjusted BCR of 2.6 when journey time reliability and wider economic impacts are included. These BCR values of 1.9 and 2.6 equate to medium and high value for money respectively within the DfT's Value for Money Framework (Document NP25 in the List of Documents)[8], which is the same outcome as at the Scheme's OBC stage.

7.11 Summary

7.11.1 In this section I have detailed the analysis that has been undertaken to appraise the impacts of the Scheme. These demonstrate that the Scheme is expected to provide significant benefits in terms of travel time savings of £54.5m. It is also forecast that the Scheme will result in a reduction in accidents compared to the Without Scheme scenario.

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[8] https://assets.publishing.service.gov.uk/media/5f6237408fa8f5106d15640c/value-for-money-framework.pdf

7.11.2 From earlier analysis undertaken the Scheme is also forecast to result in journey time reliability benefits and benefits from wider economic impacts.

7.11.3 The resulting benefit cost ratios consequently place this Scheme in the medium to high value for money category.

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 Low / High 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 Low/High 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 Low/High growth scenario is based on the guidance contained in TAG Unit M4, Section 4.2. This defines the Low/High 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 (derived from TUBA) were estimated to be around £57.49m. With the High growth assumptions, these transport user benefits are forecast to increase to around £91.4m and are forecast to decrease to around £35.6m in the 'low' growth scenario.

8.2.5 The range of outcomes for the Low/High growth scenarios reflects changes to TAG M4 that have been made in the last 18 months, which have had the effect of widening the range of forecasts in these scenarios.

8.2.6 With this in mind, the 'low' growth scenario implies an adjusted BCR of 1.8 (compared with 2.6 for the Central forecasts); recalculating the BCR for the High growth scenario yields a BCR of 3.8.

8.3 Common Analytical Scenarios

8.3.1 The DfT has recently introduced the concept of 'Common Analytical Scenarios' (CAS), documented in the TAG Uncertainty Toolkit (Document NP26 in the List of Documents)[9]. These are central to how DfT intends to approach uncertainty in transport analysis. They are a set of seven standardised, off-the-shelf, cross-modal scenarios exploring national level uncertainties which have been developed by DfT for use in forecasting and appraisal.

8.3.2 The guidance set out in the TAG Uncertainty Toolkit requires interpretation as to which, if any, of the CAS should be applied to the assessment of the Scheme. If the Scheme can be considered to be of 'low impact', then the Low/High tests undertaken for the

[9] https://assets.publishing.service.gov.uk/media/65a6bc74867cd8000d5ae9b3/tag-uncertainty-toolkit.pdf

Scheme's FBC (documented above) are appropriate. Based on the content of Table 1 in the TAG Uncertainty Toolkit, the Scheme is at the lower end of medium impact and some of the CAS tests may be required.

8.3.3 The Uncertainty Toolkit is not definitive, and so I am currently in discussion with the DfT to establish which, if any, of the CAS should be applied. For the purposes of this Proof of Evidence, the scenario testing is therefore limited to the Low/High tests.

8.4 Summary

8.4.1 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 Low/High growth scenarios defined in TAG Unit M4, and consideration of the DfT's Common Analytical Scenarios.

8.4.2 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 either medium or high value for money in all sensitivity tests when taking into account journey time reliability and wider economic impacts.

9. Summary & Conclusions

9.1 Scope of Evidence

9.1.1 My evidence has described the provenance of the LLITM/PRTM model and the development of the ASTM from PRTM. 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 ASTM is a suitable tool for the assessment of the Scheme..

9.2 The need for a Transport Model

9.2.1 I have reviewed the specification, detail, performance and sensitivity of the ASTM and demonstrated that the ASTM is able to replicate current travel conditions in terms of traffic volumes and journey times within an acceptable degree of accuracy. I have also demonstrated that the model performs well in terms of its sensitivity to changes in travel costs, and concluded that it is suitable for the purpose of providing forecasts for the Scheme and appraising impacts of the Scheme.

9.3 Model Suitability for Assessing the Scheme

9.3.1 I have reviewed the specification, detail, performance and sensitivity of the ASTM and demonstrated that the ASTM is able to replicate current travel conditions in terms of traffic volumes and journey times within an acceptable degree of accuracy. I have also demonstrated that the model performs well in terms of its sensitivity to changes in travel costs, and concluded that it is suitable for the purpose of providing forecasts for the Scheme and appraising impacts of the Scheme.

9.4 Core Forecast Scenario – Without the Scheme

9.4.1 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 Coalville. Forecasts show significant increases in traffic growth to the east of Coalville on the A511 in the direction of the M1, with corresponding increases in journey time and congestion. Population and employment increases in Coalville is forecast to increase travel times along the A511 Growth Corridor with increased congestion at some of the key junctions impacting on both local and longer distance traffic.

9.5 Future Year Forecasts with the Scheme

9.5.1 The Scheme will reduce travel times and delays in and around Coalville and beyond. The Scheme is forecast to transfer traffic from less suitable roads onto the MRN and reduce overall vehicle distance by shortening the road distance between southeast Coalville and areas to the north and west via the A511. As the Scheme improves capacity along the A50 & A511 it will result in a reduction in end-to-end journey times and will also improve journey time reliability by reducing congestion within the A511 corridor and at some of the key junctions.

9.5.2 The Scheme will reduce conflicting movements at Flying Horse junction and at Birch Tree junction and reduce traffic along Bardon Road. Due to reductions in vehicles travelling on minor roads is expected to result in an overall reduction in accidents compared to the Without Scheme scenario..

9.6 Scheme Appraisal

9.6.1 The Scheme is expected to provide significant benefits in terms of travel time savings of £54.5m. It is also forecast that the Scheme will result in a reduction in accidents compared to the Without Scheme scenario. The Scheme is also forecast to result in journey time reliability benefits and benefits from wider economic impacts. The resulting benefit cost ratios consequently place this Scheme in the medium to high value for money category.

9.7 Uncertainty in Forecasts

9.7.1 The Scheme represents either medium or high value for money in all sensitivity tests when taking into account journey time reliability and wider economic impacts..

9.8 Conclusions

9.8.1 I therefore consider the ASTM is suitable for the assessment of the Scheme and that its outputs can be relied on for these purposes.

Signed: ______________ Dated: 20 May 2024

MARK DAZELEY