In Parliament – Session 2022 - 2023

HS2

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

Volume 5: Appendix TR-005-00000

Traffic and transport

Transport Assessment Part 4 Addendum

Q79

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Department for Transport

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- Section 2 Policy and guidance
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Transport Assessment Part 4 Addendum – Route-wide assessment and Annexes

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15 Introduction

15.1.1 A number of changes to the original scheme reported by community area in Section 5.2, 6.2, 7.2, 8.2 and 9.2 of this SES1 and AP1 ES TA mean that Section 20 of the Transport Assessment (TA) for the original scheme (hereafter referred to as the main TA), presented in the High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES) published in January 2022 (the main ES), is substantially replaced by Section 20 in this document. Where there is no replacement the text in the main TA remains valid.

15.1.2 The terms used in this report to differentiate between the original proposals assessed as part of the main ES and subsequent changes are set out in the SES1 and AP1 ES Volume 5, Appendix: TR-001-00000, TA Part 1 Addendum.

15.1.3 This section provides an overview of the route-wide traffic and transport impacts for the AP1 revised scheme in construction. There are no changes to route-wide impacts in operation or any off-route impacts reported in the main ES and consequently these are not included in this SES1 and AP1 ES TA.

15.1.4 An assessment of route-wide impacts on traffic and transport during operation, together with an assessment of off-route impacts, will be provided in a separate, future Supplementary Environmental Statement 2 (referred to as SES2) and Additional Provision 2 Environmental Statement (referred to as AP2 ES) and will include an assessment of all community areas and off-route works.

16 Route-wide assessment

16.1 Introduction and baseline

16.1.1 Section 20.1 of the main TA set out the route-wide baseline for the original scheme. This section of the main TA is unchanged. However, it should be noted that the AP1 revised scheme includes changes that would change route-wide impacts, as set out in the assessment below.

16.2 Route-wide construction assessment

Impacts on the strategic highway network during construction

16.2.1 The impacts of construction traffic are primarily focussed on the road network close to the original scheme, which includes the principal routes for movement of excavated material. These local impacts are considered within the main TA. These assessments consider the impacts of construction activity on roads extending from the original scheme to the strategic road network (SRN).

16.2.2 The AP1 revised scheme results in a net reduction in total number of construction HGV compared to the original scheme; the reduction in overall HGV is in the order of 1.6 million lorry movements, which is a reduction of 24% from the original scheme and is predominantly related to the following design changes:

- Removal of the HS2 West Coast Main Line connection (SES1-004-001), which results in the removal of all compounds and associated HGV in the Broomedge to Glazebrook (MA04) and Risley to Bamfurlong (MA05) areas and four compounds and associated HGV in the Pickmere to Agden and Hulseheath area (MA03);
- Removal of MA02 Borrow Pit D, north of Moss Lane (SES1-002-002); and
- Reductions in the movement of excavated material by road between construction compounds along the route of the Proposed Scheme associated with removal of the HS2 West Coast Main Line connection (SES1-004-001) and MA02 Borrow Pit D (SES1-002-002).

16.2.3 Traffic generated by construction on roads from the AP1 revised scheme to the SRN has been assessed in the SES1 and AP1 ES TA, with measures proposed to mitigate the effect of this traffic. However, despite the reduction in overall HGV movements, the conclusion from the main TA for the original scheme that the combined impacts across community areas are not considered to represent a substantial route-wide impact is unchanged. In addition, the conclusion from the main TA that the impacts outside community areas are not considered likely to result in any substantial route-wide impacts on the SRN is also unchanged.

Impacts on the railway network during construction

16.2.4 The analysis of the impacts of those possessions and blockades that are of sufficient scale that they could potentially create route-wide disruption and delay to rail passenger and freight services on the WCML are set out in Section 20.2 of the main TA for the original scheme.

16.2.5 The changes in the numbers of possessions and blockades between the original scheme and the AP1 revised scheme as set out in Table 220-1 indicates that there are only minor differences in possessions and blockades in the Hough to Walley's Green area (MA01) and Wimboldsley to Lostock Gralam area (MA02). Of most note is the reduction in the number of blockades in the Hough to Walley's Green area (MA01) from three to two as a result of a removal of one nine-day blockade associated with signalling commissioning for the Crewe Northern Connection.

16.2.6 The main TA reported that connections to the West Coast Main Line (WCML) south of Wigan via the HS2 WCML connection would require possessions and blockades on the WCML Crewe to Carlisle between Golborne junction and Springs Bank junction in the Risley to Bamfurlong area (MA05). These works comprised three blockades of between four and six days duration plus a series of associated 27-hour, 54-hour and 72-hour weekend possessions. Removal of the HS2 WCML connection (SES1-004-001) results in the removal of these possessions and blockades and the consequential removal of the impacts on rail passengers and freight associated with these, as reported in the main TA.

16.2.7 Overall, there is a 20% reduction in total possessions in community areas MA01-MA03 as a result of the design changes in the AP1 revised scheme, and a 50% reduction in blockades. However, at a route-wide level, the conclusion of the main TA that the substantial number and extended duration of the possessions and blockades will lead to a substantial impact on WCML rail passengers and freight, is unchanged as a result of the AP1 revised scheme.

Table 220-1: Summary of likely route-wide possession and blockade requirements

Route-wide possessions and blockades affecting WCML users with the potential for route-wide impacts	27-hour (difference between original scheme and AP1 revised scheme)	54-hour (difference between original scheme and AP1 revised scheme)	72-hour (difference between original scheme and AP1 revised scheme)	100-hour (difference between original scheme and AP1 revised scheme)	Blockades (difference between original scheme and AP1 revised scheme)
Hough to Walley's Green area (MA01)	3	0	0	0	-1
Wimboldsley to Lostock Gralam area (MA02)	0	1	0	0	0

Route-wide possessions and blockades affecting WCML users with the potential for route-wide impacts	27-hour (difference between original scheme and AP1 revised scheme)	54-hour (difference between original scheme and AP1 revised scheme)	72-hour (difference between original scheme and AP1 revised scheme)	100-hour (difference between original scheme and AP1 revised scheme)	Blockades (difference between original scheme and AP1 revised scheme)
Risley to Bamfurlong area (MA05)	-4	-29	-1	0	-3
Total	**-1**	**-28**	**-1**	**0**	**-4**

Annexes

Introduction

The main TA contained seven Annexes which comprised a Framework Travel Plan as Annex A, and six model performance reports (Annexes B–G) covering the performance of the transport models used to inform the assessment of the original scheme. Annexes A, B and C of the main TA are unchanged. Annexes D–G of the main TA are replaced by Annexes D–G in this SES1 and AP1 ES TA.

Annex D: Model performance report – M6 Junction 19 Model

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1 Introduction

1.1 Hybrid Bill

1.1.1 For the assessment of the route of the Proposed Scheme at hybrid Bill (the original Scheme), Mott MacDonald WSP Joint Venture (MWJV) used the M6 Junction 19 Model to develop forecasts of the Pickmere to Agden and Hulseheath area (MA03), and the Hulseheath to Manchester Airport area (MA06) to assess the impact of the original scheme at both the operational and construction stages.

1.1.2 National Highways released copies of the latest available M6 Junction 19 Model versions (as of January 2017) to High Speed Two (HS2) Ltd.

1.1.3 The M6 Junction 19 Model has subsequently been updated by HS2 Ltd transport consultants, MWJV, to include localised improvements within the High Speed Rail (Crewe – Manchester) area of interest. This is described in the M6 Junction 19 Model hybrid Bill Model Performance Report.

1.1.4 For the purpose of assessment, the HS2 route is split into a number of geographical areas referred to as community areas. The M6 Junction 19 Model, updated for the hybrid Bill, has been utilised to provide an evidence base for the Transport Assessment for the community areas Pickmere to Agden and Hulseheath (MA03), and Hulseheath to Manchester Airport (MA06).

1.1.5 Reference should be made to Figure 1 which shows the geographic coverage of strategic transport models that have been utilised for the Transport Assessment.

1.2 Additional Provision 1 Environmental Statement

1.2.1 Additional Provision (AP) amendments are changes to the scheme that include requirements for additional powers in the High Speed Rail (Crewe – Manchester) Bill.

1.2.2 Following the main Environmental Statement (ES), further model development has been undertaken by MWJV. The Baseline and Future Baseline models have been updated for the assessment of the AP1 revised scheme to reflect:

- use of some additional traffic count information and refinement of network coding to improve model performance in key areas of interest and in response to stakeholder feedback;

- inclusion of recently consented, committed or completed transport schemes and development proposals that have come forward since the models used in the assessment reported in the main ES were developed;
- refinements to future baseline traffic demand to reflect changes to future growth patterns since the models used in the main ES were developed and the release of updated road traffic forecasts by the Department of Transport (DfT);
- the change in the future baseline forecast year from 2046 in the main ES to 2051 for the Supplementary Environmental Statement 1 (SES1) and AP1 ES; and
- updates to value of time parameters to reflect the latest release of the DfT's Transport Analysis Guidance (TAG) data book.

1.3 Purpose of this report

1.3.1 This report provides documentation of the model performance review that has been carried out for the HS2 AP1 revised scheme M6 Junction 19 Model.

1.3.2 The purpose of this report is to provide evidence that this highway assignment model is suitable to support the Transport Assessment of the High Speed Rail (Crewe – Manchester) SES1 and AP1 ES.

1.4 Model framework

1.4.1 The M6 Junction 19 Model consists of the following:

- Variable Demand Model (DIADEM); and
- Strategic Highway Assignment Model.

1.4.2 For the SES1 and AP1 ES Transport Assessment, only the strategic highway assignment model has been utilised by MWJV to provide an evidence base.

1.4.3 The M6 Junction 19 Model is a strategic highway assignment model that has been developed within the SATURN model software platform (version 11.3.12).

1.4.4 The detailed modelled study area covers M6/M56/A556 triangle and surrounding areas. There is supporting network and zone system detail to provide a representation of the external area supply and demand. Reference should be made to Figure 2.

1.4.5 The original M6 Junction 19 Model is representative of 2015 base year transport conditions.

1.5 Model development

1.5.1 The M6 Junction 19 Model has been developed by National Highways appointed transport consultants to provide an evidence base to support the business case for the M6 Junction 19 improvement scheme.

1.6 Model description

1.6.1 The original M6 Junction 19 Model has been developed with the following years:

- 2015 base year;
- 2021 first future year;
- 2036 second future year; and
- 2051 horizon future year.

1.6.2 The model is representative of the following time periods:

- average AM peak hour - 07:00–10:00;
- average inter peak hour - 10:00–16:00; and
- average PM peak hour - 16:00–19:00.

1.6.3 The model is comprised of the following demand user-classes:

- car commute;
- car employers business;
- car other;
- light goods vehicles; and
- other goods vehicles.

1.7 Model application objectives

1.7.1 For the assessment of the AP1 revised scheme, the M6 Junction 19 Model provides:

- preliminary traffic data to inform scheme design;
- traffic data for the construction and operational phases of the AP1 revised scheme on which to base the assessment of significant effects for the ES;
- changes in traffic flows, congestion and journey times to inform the Transport Assessment for the AP1 revised scheme; and
- changes in traffic flows between the base year and forecast scenarios for application to local models.

1.7.2 The M6 Junction 19 Model has been used primarily to assess the likely impacts of HS2 construction and operational traffic in order to provide an evidence base for the Transport Assessment for the AP1 revised scheme.

Figure 1: Strategic Transport Model coverage for the High Speed Rail (Crewe – Manchester) Transport Assessment

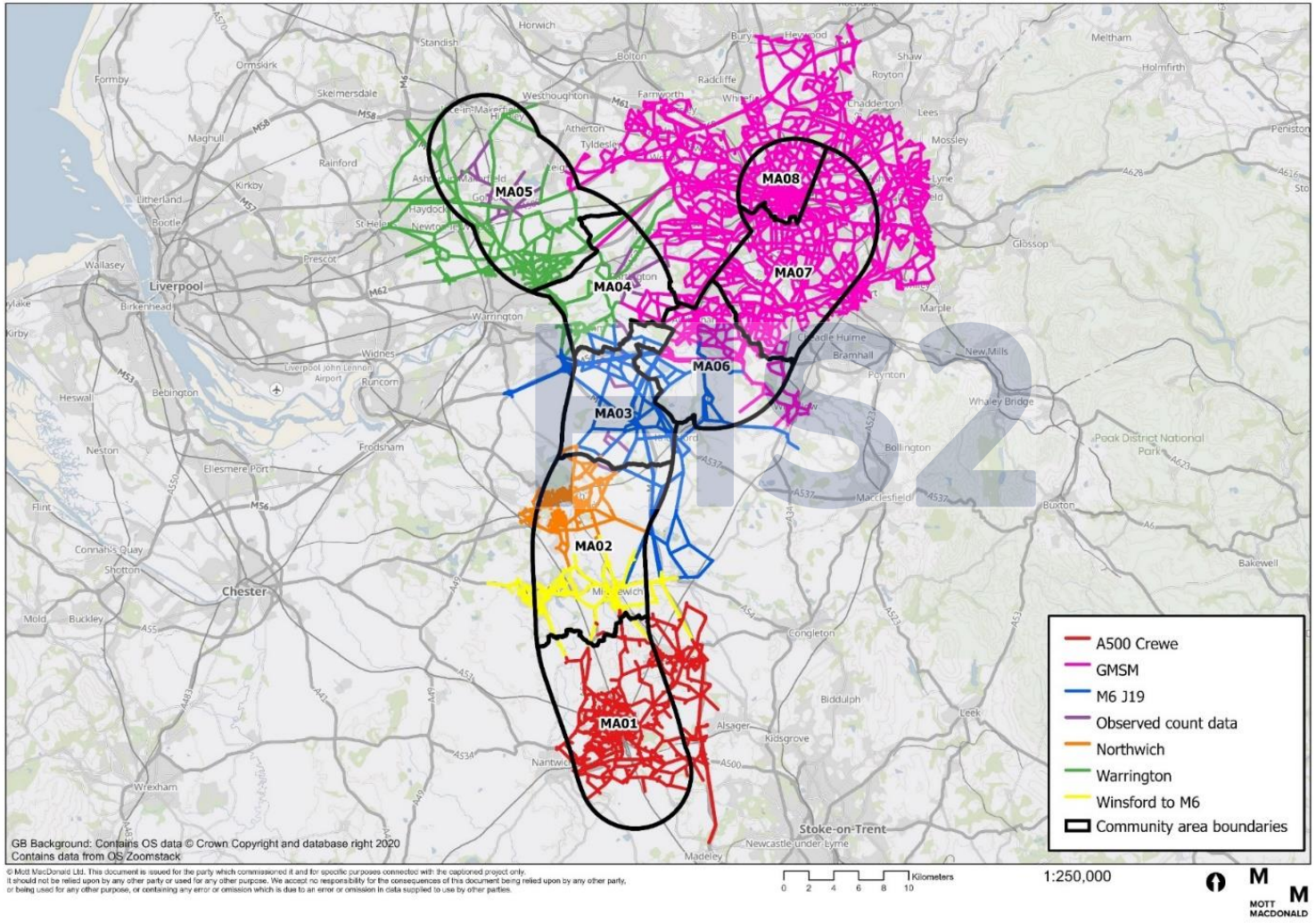
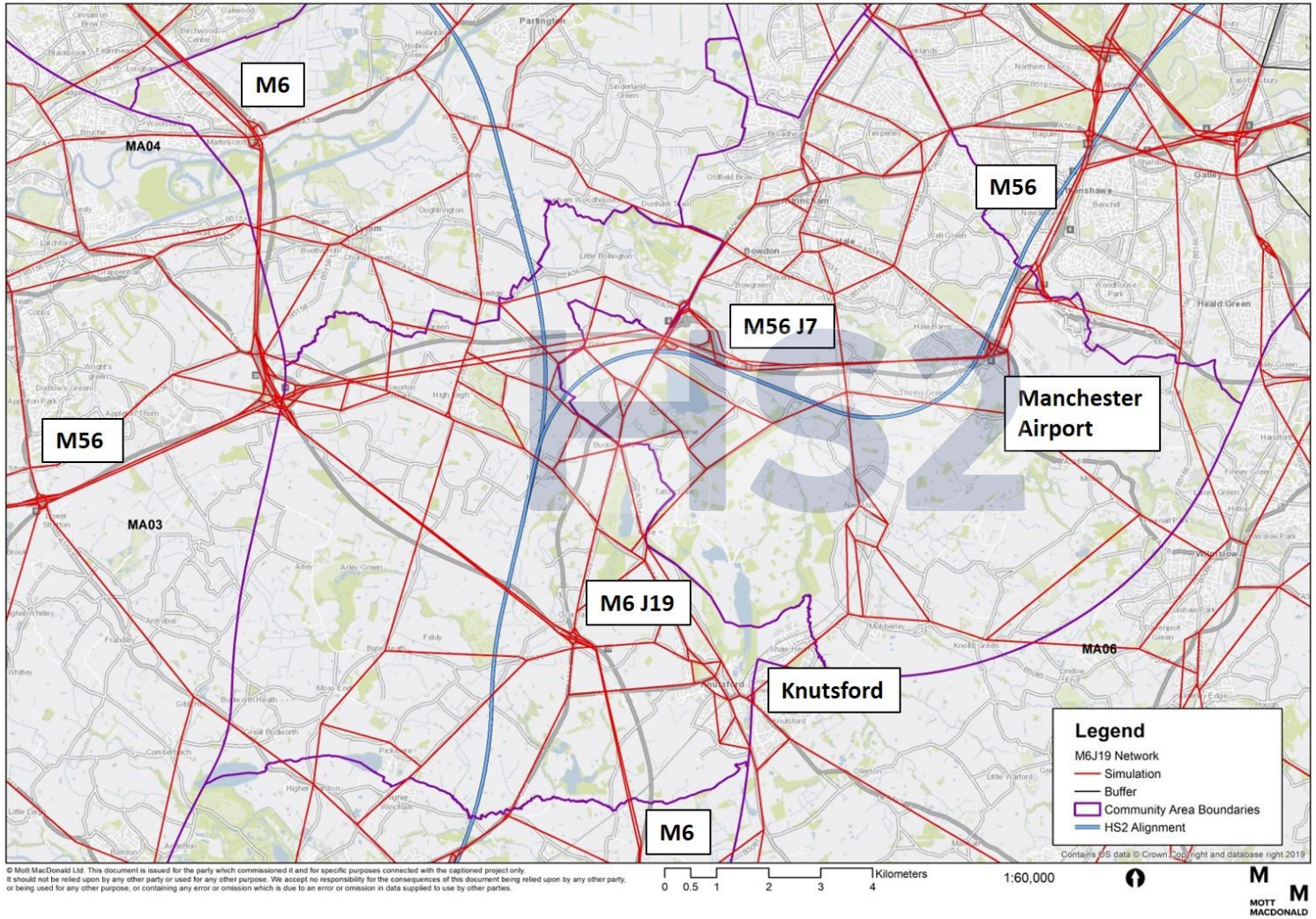


Figure 2: Model study area



2 Guidance used

2.1 Introduction

2.1.1 This strategic highway model development makes reference to the following TAG as published by the Department for Transport (DfT): TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2 Highway model guidance

2.2.1 In relation to providing an assessment of model calibration and validation performance, reference has been made to Section 3.2 of TAG Unit M3.1 (Table 1 and Table 2).

2.2.2 The criteria for the assessment of model calibration and validation of traffic flows and journey time performance are presented in Table 1 below.

Table 1: DfT – TAG validation criteria

Criteria	Acceptability guideline
Assigned hourly flows	
Individual flows within +/-15% for flows 700-2,700vph	>85% of cases
Individual flows within +/-100vph for flows <700vph	>85% of cases
Individual flows within +/-400vph for flows >2,700vph	>85% of cases
Screenline flows (normally >5 links) to be within 5%	All or nearly all screenlines
Geoffrey Havers (GEH) statistic	
Individual flows GEH <5	>85% of cases

Credit. Table 1 and Table 2 DfT TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2.3 The criteria for the assessment of highway model assignment convergence is presented in Table 2 below.

Table 2: Summary of convergence measures and base model acceptable values

Measures of convergence	Acceptability guideline
Delta and %GAP	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) <1%	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) <1%	Four consecutive iterations greater than 98%
Percentage change in total user costs of links with flow change (V) <1%	Four consecutive iterations less than 0.1% (SUE only)

Credit. Table 4 DfT TAG Unit M3.1 Highway Assignment Modelling (May 2020).

3 Data for model development

3.1 Overview

3.1.1 This section of the report presents details of traffic count data that has been collected for the purpose of calibrating the M6 Junction 19 Model study area. The same data set was used at hybrid Bill and also for the SES1 and AP1 ES for model calibration, but with the opportunity taken to use some additional counts for the SES1 and AP1 ES, alongside the new dataset. The following section describes the traffic survey data commissioned to collect this data.

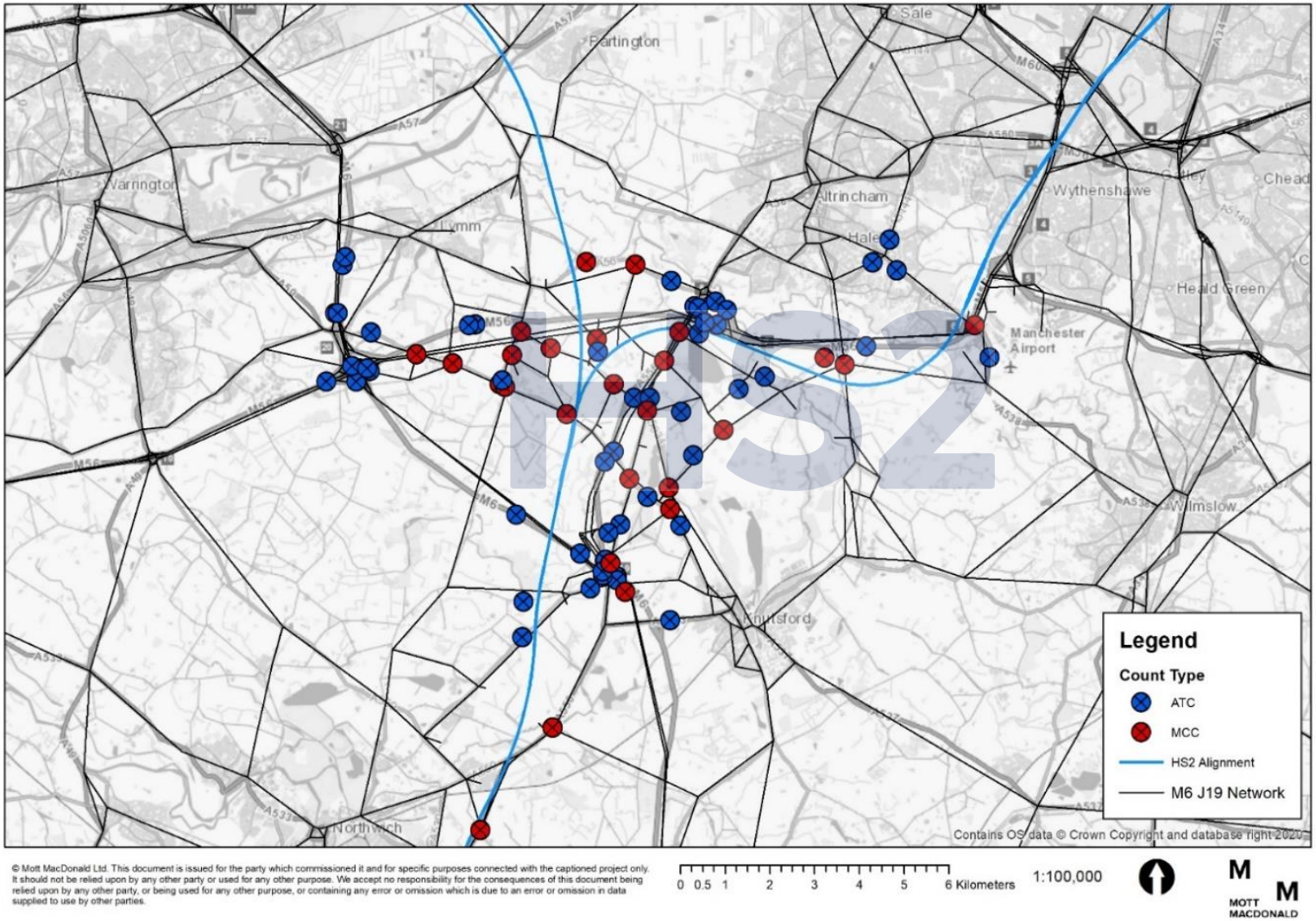
3.2 Traffic survey data commission

3.2.1 MWJV commissioned a programme of traffic count surveys in 2017/2018 to support the assessment of the original scheme.

3.2.2 Traffic count data has also been sourced from the National Highways programme of traffic surveys in 2020 (prior to COVID-19) and WebTRIS data for motorway and trunk road links within the local study area.

3.2.3 Traffic count surveys have been used from different years and months to update the base year model. The traffic counts have been factored to June 2018 to develop a consistent dataset. Figure 3 shows the location of traffic surveys.

Figure 3: Location of traffic counts (MWJV survey commission)



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4 Model development

4.1 Overview

4.1.1 At SES1 and AP1 ES, a review of base year model traffic flows identified that there was scope to undertake some localised improvements to the traffic model in order to provide a more robust assessment in the AP1 revised scheme area of interest.

4.1.2 For both hybrid Bill and SES1 and AP1 ES, the 2015 base year model has been updated to a 2018 (June) base year model by MWJV using traffic count survey data that was collected between November 2017 and March 2020 (prior to COVID-19). Traffic count data has been normalised to June 2018 traffic conditions using local count data.

4.1.3 This localised model update has focussed on the improvement to the validation of traffic flows at hybrid Bill and covering the AP1 revised scheme area of interest.

4.1.4 The model time periods represent the following peak hours, when the highest traffic volumes and most significant impacts are expected to occur:

- AM peak hour - 08:00–09:00; and
- PM peak hour - 17:00–18:00.

4.1.5 The model time periods were converted from an average hour to a peak hour by using local traffic data.

4.2 Transport supply

4.2.1 The original M6 Junction 19 Model future year networks supplied by National Highways include the new A556 Knutsford to Bowdon Improvement Scheme which was opened to traffic in March 2017. This scheme is included in the hybrid Bill and SES1 and AP1 ES Baseline models which represent 2018.

4.2.2 A review of the highway network detail and attributes has been completed for the model area that is included in the study areas in Pickmere to Agden and Hulseheath (MA03), and the Hulseheath to Manchester Airport (MA06).

4.2.3 The following network attributes have been reviewed and checked:

- links: distance, speeds, capacity, bus lanes, traffic regulation orders;
- junctions: type; turn saturation flows, capacity, and lane utilisation;
- traffic signal control: timings, phasing, and staging; and
- routes: minimum cost paths.

4.2.4 The review highlighted that there is a good level of detailed highway network representation within the study areas, and that this compared well with local datasets.

4.2.5 Network coding changes were implemented for the SES1 and AP1 ES to improve model representation. This includes:

- some capacity refinements at locations along the M6, M56 and A556;
- improved junction representation for Chester Road/Mereside Road/Chapel Lane, and A50/Chester Road junction; and
- more accurate network free flow speeds for Wrenshot Lane, and Pickmere Lane.

4.2.6 The generalised cost values (PPM/PPK) for model assignment have also been updated to reflect the latest values from the DfT TAG databook (July 2020 version).

4.2.7 The model includes a sufficiently detailed level of network infrastructure to support Transport Assessment.

4.3 Transport demand

4.3.1 The original M6 Junction 19 Model includes a detailed representation of spatial demand. The model zone system contains 275 model zones and accounts for future land-use development zones.

4.3.2 For the SES1 and AP1 ES, adjacent to the A556, two zones were disaggregated into four zones to better represent traffic flow distribution on the minor rural roads in Moston, Bucklow Hill, Mere and Rostherne areas.

4.3.3 At hybrid Bill, the demand matrices were adjusted from 2015 to 2018 by carrying out an interpolation between base and 2021 future year matrices. For both the hybrid Bill and SES1 and AP1 ES, this interpolated 2018 matrix has then been subject to matrix estimation using the available 2018 count data; and a localised traffic flow calibration exercise has been carried out to improve the correlation between observed and modelled traffic flows within the local areas of interest.

4.3.4 The count data collected from the traffic survey data commission in 2017/2018 has been applied in matrix estimation in the same way at both hybrid Bill and for the SES1 and AP1 ES, but with some additional counts for the SES1 and AP1 ES sourced from the National Highways programme of traffic surveys in 2020 (prior to COVID-19) and WebTRIS data.

5 Model performance

5.1 Overview

5.1.1 This section of the report focusses on the performance of the 2018 base model for the SES1 and AP1 as produced by MWJV against observed traffic flow data.

5.1.2 The prior trip matrix assignment is the model assignment before matrix estimation is applied. This uses an interpolated parent model matrix adjusted to the HS2 zone system with an updated network that corresponds to HS2 base year. The updated network also includes revisions identified following a network review.

5.1.3 Matrix estimation uses the prior matrix and updated network mentioned above and creates an updated matrix to match count data. The post trip matrix assignment is the model assignment using this updated matrix and the same updated network used in prior assignments.

5.1.4 It is the post matrix assignment that is taken forward and used in the Transport Assessment.

5.2 Traffic flow

5.2.1 Observed and modelled traffic flows have been compared for the count site locations within the Pickmere to Agden and Hulseheath area (MA03), and the Hulseheath to Manchester Airport area (MA06). In total, 176 individual link counts by direction have been compared.

5.2.2 Table 3 and Table 4 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the prior matrix assignment. The comparison shows that both time periods fall below the DfT TAG individual link count criteria of greater than 85% of comparisons achieving the flow or GEH criteria.

Table 3: AP1 M6 Junction 19 Model – individual link flow – total all vehicle – prior

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	176	110	63%	82	47%	113	64%
PM peak hour	176	100	57%	72	41%	101	57%

Table 4: AP1 M6 Junction 19 Model – individual link flow – car vehicle type – prior

Time period	Car flow comparison (vehicles)						
	Number of Sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	176	106	60%	83	47%	109	62%
PM peak hour	176	99	56%	80	45%	106	60%

5.2.3 Figure 4 and Figure 5 show the locations of the link counts and the respective AM and PM peak hour model performance for the prior matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.4 Table 5 and Table 6 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the post matrix estimation assignment. The comparison shows that both time periods meet the DfT TAG individual link count criteria of greater than 85% of comparisons achieving flow and GEH criteria.

5.2.5 The results show an overall improvement on the results at hybrid Bill.

Table 5: AP1 M6 Junction 19 Model – individual link flow – total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	176	163	93%	149	85%	163	93%
PM peak hour	176	153	87%	148	84%	156	89%

Table 6: AP1 M6 Junction 19 Model – individual link flow – car vehicle type – post ME

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	176	164	93%	152	86%	164	93%
PM peak hour	176	154	88%	148	84%	157	89%

5.2.6 Figure 6 and Figure 7 show the locations of the link counts and the respective AM and PM peak hour model performance for the post matrix assignment. These show links passing

TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.7 Reference should be made to Table 11 and Table 12, Appendix A, which presents supporting details of the individual link flow performance for AM and PM time periods, post matrix estimation.

Figure 4: AM peak hour – traffic flow performance – prior

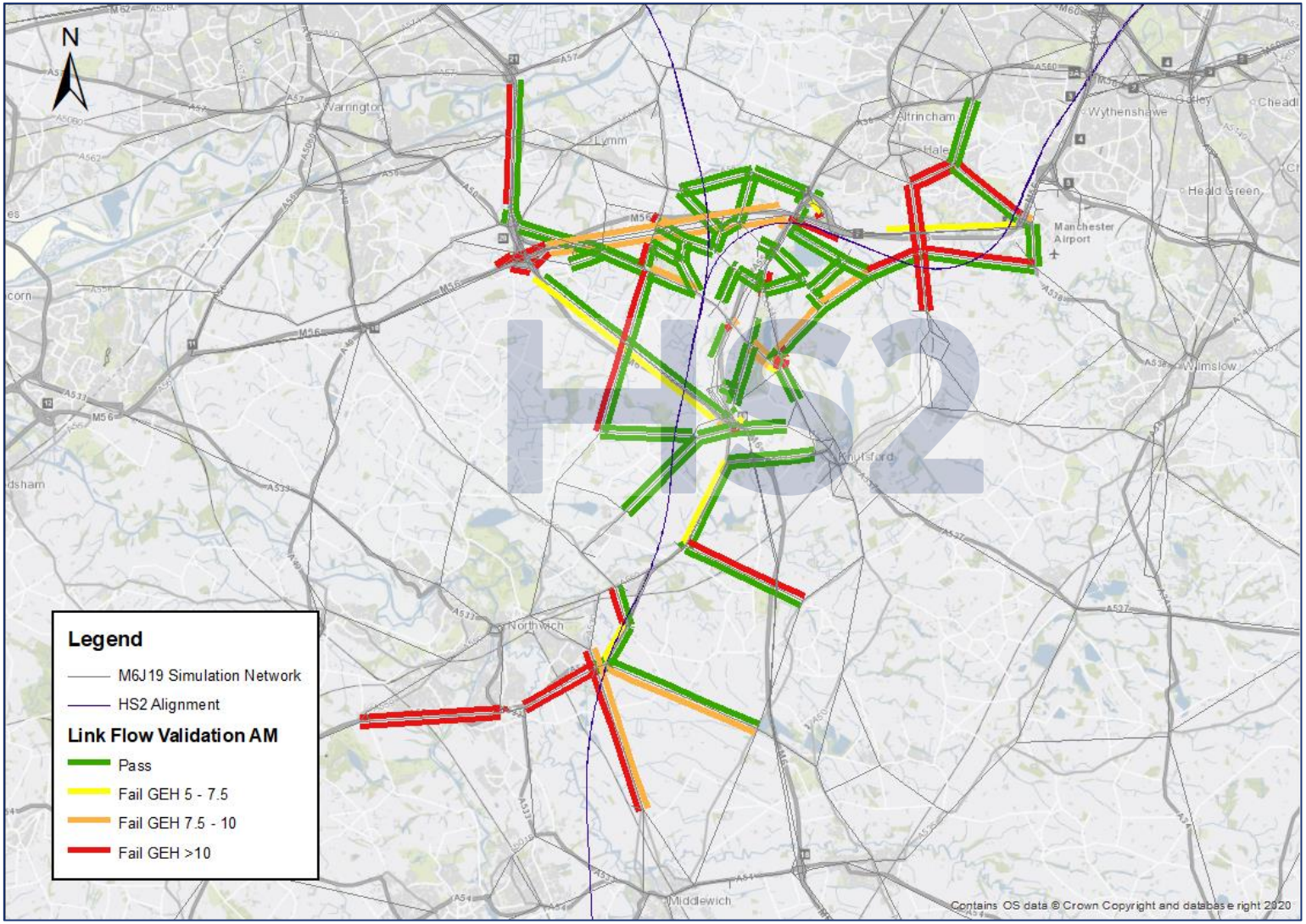


Figure 5: PM peak hour – traffic flow performance – prior

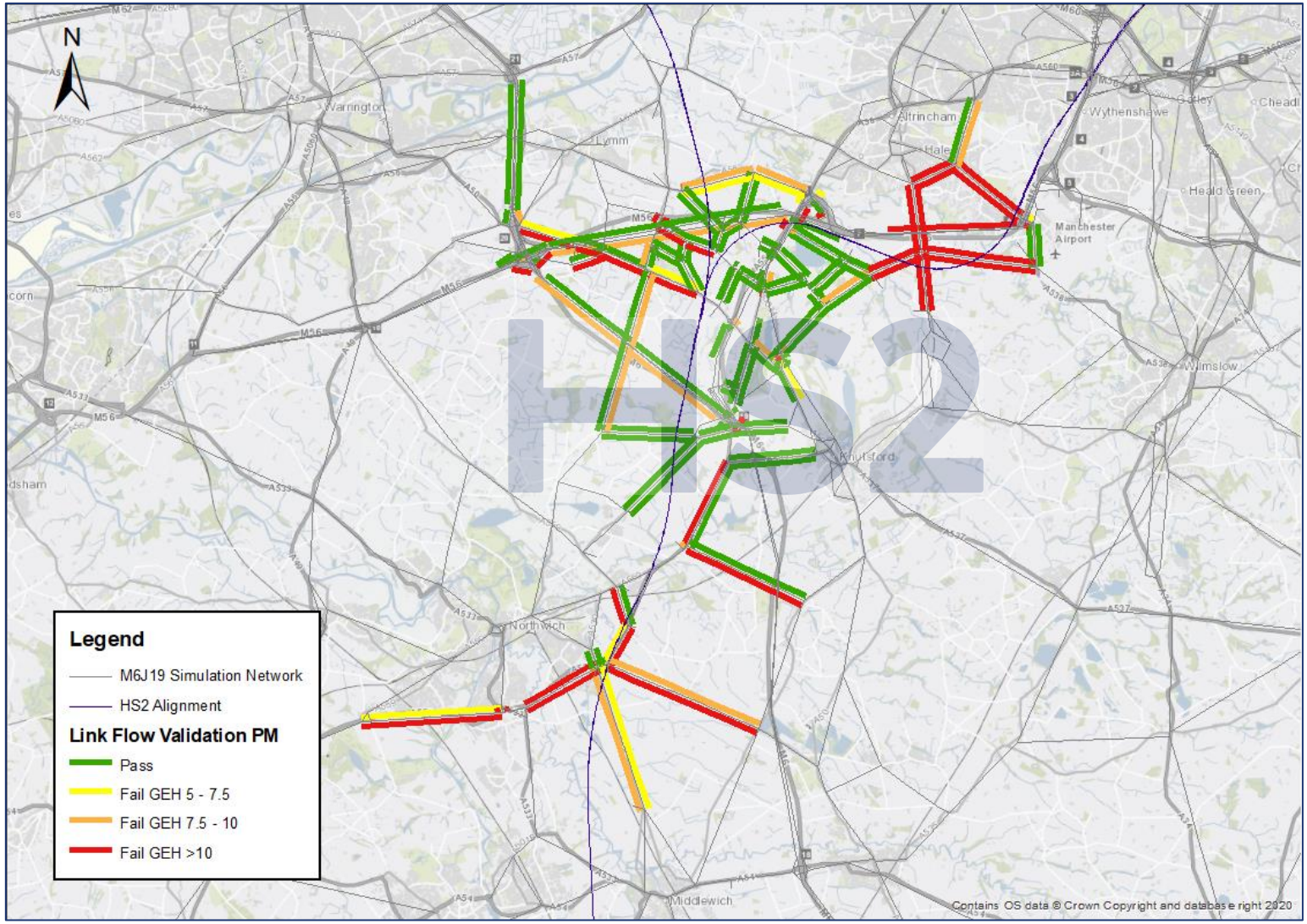


Figure 6: AM peak hour – traffic flow performance – post

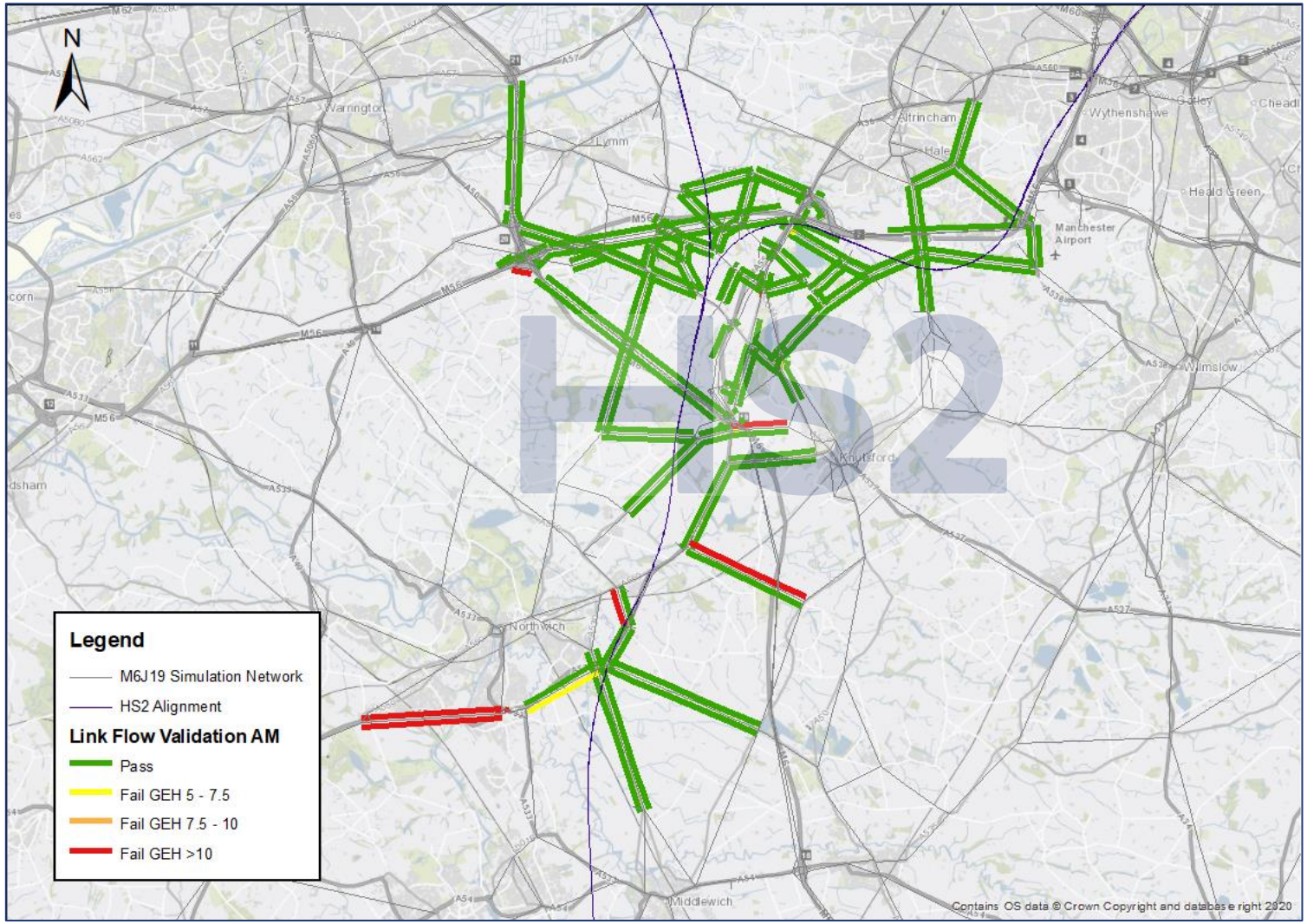
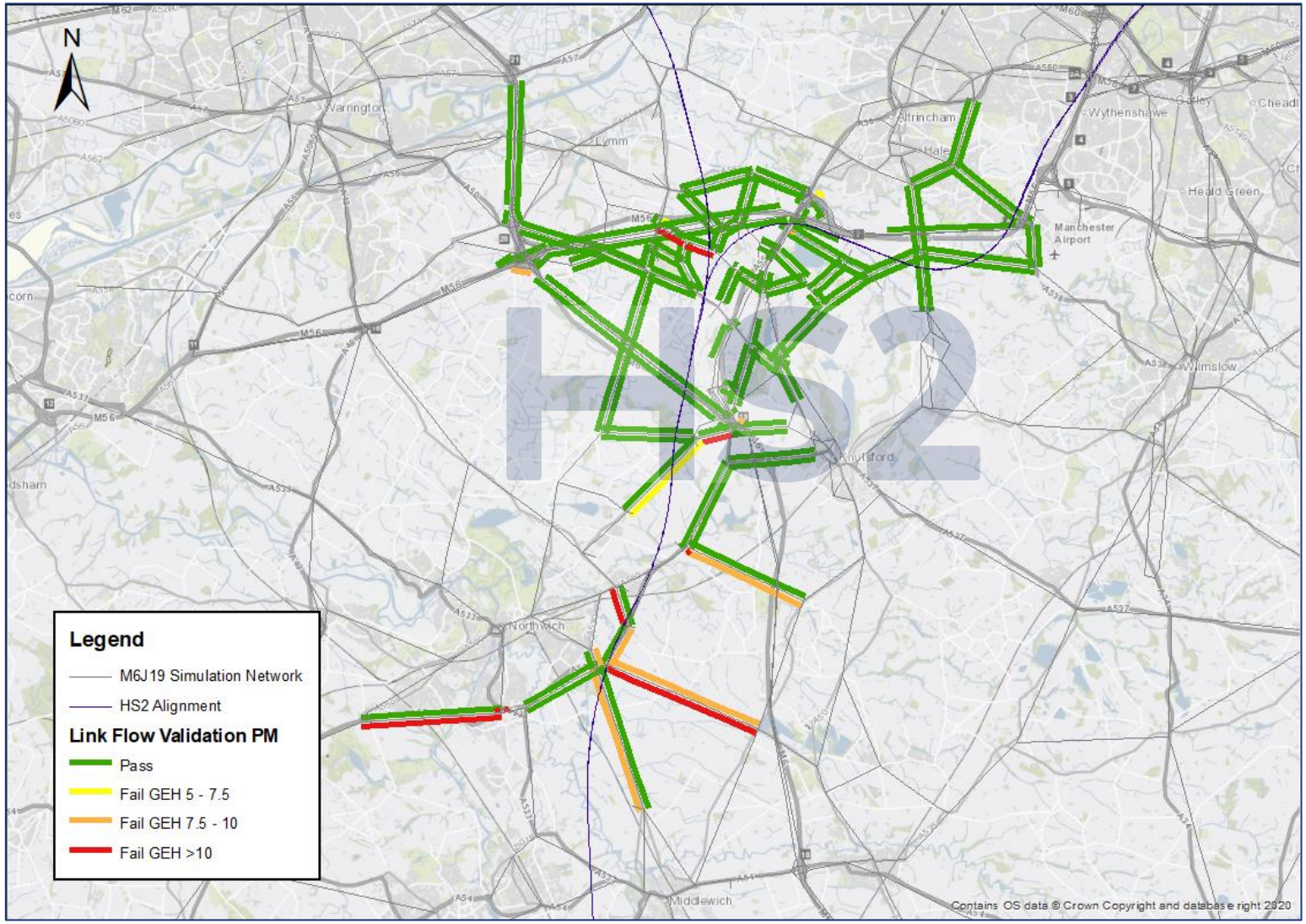


Figure 7: PM peak hour – traffic flow performance – post



6 Model convergence

6.1.1 Achieving a suitable level of model convergence is necessary to provide stable, consistent, and robust model results and to differentiate between real changes and those associated with differing degrees of convergence.

6.1.2 DfT TAG provides guidance on highway model convergence with recommendations on acceptable variations in link flows and costs between iterations helping to ensure the model is sufficiently stable.

6.1.3 Table 7 presents a summary of the 2018 base year highway model convergence statistics for the AP1 revised scheme by time period. Both models converge satisfactorily.

Table 7: AP1 M6 Junction 19 Model 2018 baseline model convergence

Criteria	Loop	Target	AM	PM
Flow change	N-3	>98%	98.70	99.90
	N-2		99.80	98.30
	N-1		99.70	98.10
	N		99.90	99.80
Delays change	N-3	>98%	99.20	99.00
	N-2		99.30	99.10
	N-1		99.50	99.10
	N		99.40	98.80
Delta		<0.1%	0.0036/8	0.0053/7
% GAP		<0.1%	0.0037	0.0068

7 Summary and conclusions

7.1.1 For the assessment of the AP1 revised scheme, the M6 Junction 19 Model highway assignment 2015 base year, supplied by National Highways, has been further developed for the SES1 and AP1 ES. This includes refinement of the network coding to improve model performance in key areas of interest and use of the same count data applied at hybrid Bill, but with inclusion of some additional counts for the SES1 and AP1 ES sourced from the National Highways programme of traffic surveys in 2020 (prior to COVID-19) and WebTRIS data. The count data has been applied to a 2018 uplifted matrix during model calibration for matrix estimation.

7.1.2 Presented below is a summary of the individual link flow model performance for all modelled time periods for the SES1 and AP1 ES. The comparison shows that both time periods exceed the 85 percent threshold of individual links meeting either the DfT TAG flow range or GEH less than five criteria.

Table 8: AP1 M6 Junction 19 Model - individual link flow - total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG Flow Criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	176	163	93%	149	85%	163	93%
PM peak hour	176	153	87%	148	84%	156	89%

7.1.3 Both the AM and PM models converge satisfactorily.

7.1.4 In conclusion, the updated M6 Junction 19 Model for the SES1 and AP1 ES provides a reliable forecasting base and forms a suitable tool for the assessment of HS2 construction and operational impacts within the High Speed Rail (Crewe – Manchester) area of interest.

8 List of acronyms

Table 9: List of acronyms

Acronym	Description
ATC	Automatic traffic count
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
ES	Environmental Statement
GEH	Geoffrey Havers (statistic)
JTC	Junction turning count
LMVR	Local Model Validation Report
MCC	Manual Classified count
MPR	Model Performance Report
SMP	Smart Motorway Programme
TA	Transport Assessment

9 References

Department for Transport (2020), *TAG unit M1.2 Data Sources and Surveys.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m1-2-data-sources-and-surveys.

Department for Transport (2020), *TAG unit M3.1 Highway Assignment Modelling.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m3-1-highway-assignment-modelling.

10 Appendix A – Model performance

Individual link flow performance

Table 11: AP1 M6 Junction 19 Model – AM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A50 Warrington Road	Chester Road – Clamhunger Lane	WB	357	40	17	415	356	39	15	409	-6	-1%	0.28	✓	✓	✓
B5569 Chester Road	South of A50	NB	84	14	6	105	168	14	5	187	82	78%	6.77	×	✓	✓
A50 Warrington Road	Chester Road – Clamhunger Lane	EB	362	56	16	435	364	55	16	436	0	0%	0.02	✓	✓	✓
Clamhunger Lane	A50 – A5034	SB	25	4	1	30	32	4	1	37	7	23%	1.20	✓	✓	✓
A50 Warrington Road	Clamhunger Lane – Mereside Road	WB	403	41	19	464	324	35	13	372	-92	-20%	4.51	✓	✓	✓
A50 Warrington Road	Clamhunger Lane – Mereside Road	EB	423	42	31	497	309	42	14	365	-132	-27%	6.36	×	×	×
A5034 Mereside Road	A50 – Mereheath Lane	SB	583	52	26	666	547	51	13	611	-55	-8%	2.19	✓	✓	✓
Clamhunger Lane	A50 – A5034	NB	53	9	3	65	55	13	3	71	6	9%	0.70	✓	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	NB	182	25	10	217	183	24	4	211	-6	-3%	0.40	✓	✓	✓
B5569 Chester Road	South of A50	SB	51	14	5	70	72	14	8	94	24	35%	2.70	✓	✓	✓
A50	A556 – Chester Road	WB	368	43	19	432	394	44	19	457	25	6%	1.19	✓	✓	✓
A50	A556 – Chester Road	EB	355	56	15	428	358	56	18	431	3	1%	0.14	✓	✓	✓
A50 Cliff Lane	East of M6	WB	214	29	14	257	216	29	12	258	1	0%	0.04	✓	✓	✓
B5159 West Lane	Beechtree Lane – Beechtree Farm Close	SB	267	32	5	305	180	29	5	214	-91	-30%	5.64	×	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A50	Swineyard Lane – Mag Lane	EB	399	79	21	500	368	64	20	452	-48	-10%	2.18	✓	✓	✓
A50	Mag Lane – Heath Lane	WB	197	21	15	232	185	21	12	218	-14	-6%	0.93	✓	✓	✓
A50 Cliff Lane	East of M6	EB	376	74	16	468	387	74	20	481	13	3%	0.60	✓	✓	✓
A56 Lymm Road	Dunham Road – Reddy Lane	WB	224	41	6	272	218	37	5	260	-12	-4%	0.75	✓	✓	✓
A50	Mag Lane – Heath Lane	EB	377	87	20	486	368	64	20	451	-34	-7%	1.58	✓	✓	✓
A50	Swineyard Lane – Mag Lane	WB	207	24	14	244	199	24	12	235	-9	-4%	0.59	✓	✓	✓
West Lane	Beechtree Lane – Beechtree Farm Close	NB	306	39	4	350	299	40	4	343	-8	-2%	0.41	✓	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	WB	123	11	1	135	60	11	3	74	-61	-45%	5.98	×	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	EB	251	23	3	277	233	25	5	263	-14	-5%	0.87	✓	✓	✓
A56 Lymm Road	Dunham Road – Reddy Lane	EB	634	57	5	697	634	57	5	696	-1	0%	0.04	✓	✓	✓
Wrenshot Lane	West Lane – Rensherds Placeace	EB	51	6	0	57	0	0	0	0	-57	-100%	10.65	×	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	NB	194	21	10	225	169	13	3	185	-40	-18%	2.79	✓	✓	✓
Rostherne Lane	Marsh Lane – Ashley Road	SB	20	6	0	26	20	2	1	23	-2	-9%	0.48	✓	✓	✓
Rostherne Lane	Chester Road – New Road	SB	9	5	1	14	4	1	0	5	-9	-67%	3.00	✓	✓	✓
Chester Road	A556 SB Offslip – Millington Lane	NB	38	15	5	57	31	9	0	40	-17	-29%	2.39	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Millington Lane	Chester Road – Millington Hall Lane	WB	12	7	2	20	21	8	0	30	9	47%	1.90	✓	✓	✓
Rostherne Lane	Marsh Lane – Ashley Road	NB	5	4	0	9	4	4	1	9	0	0%	0.01	✓	✓	✓
Rostherne Lane	Chester Road – New Road	NB	3	1	1	4	0	0	0	0	-4	-100%	2.83	✓	✓	✓
Budworth Road	Cann Lane – Old Hall Lane	WB	15	13	1	30	15	5	0	20	-11	-35%	2.13	✓	✓	✓
Agden Lane	Thowler Lane – Agden Park Lane	NB	12	2	1	14	10	2	0	13	-1	-9%	0.34	✓	✓	✓
Boothbank Lane	Thowler Lane – Boothbank Lane	WB	12	4	1	16	12	4	0	16	1	5%	0.19	✓	✓	✓
Reddy Lane	Millington Lane – Lymm Road	NB	23	7	1	31	23	7	0	30	0	-1%	0.07	✓	✓	✓
Reddy Lane	Millington Lane – Lymm Road	SB	20	5	1	25	3	2	0	6	-19	-78%	4.97	✓	✓	✓
Boothbank Lane	Thowler Lane – Boothbank Lane	EB	16	4	1	21	21	4	0	25	5	23%	1.01	✓	✓	✓
Agden Lane	Thowler Lane – Agden Park Lane	SB	15	3	1	18	10	3	0	13	-5	-28%	1.26	✓	✓	✓
Budworth Road	Cann Lane – Old Hall Lane	EB	21	20	1	42	6	3	0	10	-33	-77%	6.42	×	✓	✓
Millington Lane	Chester Road – Millington Hall Lane	EB	4	3	2	9	8	3	0	11	2	24%	0.67	✓	✓	✓
Wrenshot Lane	Broad Oak Lane – A50	NB	3	3	0	6	0	0	0	0	-6	-98%	3.37	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Broadoak Lane	Peacock Lane – Wrenshot Lane	NB	8	1	0	9	0	0	0	0	-8	-99%	4.05	✓	✓	✓
Peacock Lane	Broadoak Lane – West Lane	WB	23	3	1	27	13	3	1	16	-11	-40%	2.30	✓	✓	✓
Peacock Lane	Broadoak Lane – West Lane	EB	67	5	0	73	66	5	0	72	-2	-2%	0.20	✓	✓	✓
Broadoak Lane	Peacock Lane – Wrenshot Lane	SB	7	1	0	8	0	0	0	0	-7	-96%	3.68	✓	✓	✓
Wrenshot Lane	Broad Oak Lane – A50	SB	3	1	0	3	0	0	0	0	-3	-91%	2.14	✓	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	SB	226	26	21	275	223	28	13	264	-11	-4%	0.65	✓	✓	✓
A56 Lymm Road	Agden Park Lane – Reddy Lane	EB	579	50	5	637	611	50	5	666	29	5%	1.15	✓	✓	✓
A56 Lymm Road	Agden Park Lane – Reddy Lane	WB	231	35	4	271	215	35	4	254	-17	-6%	1.04	✓	✓	✓
Birches Lane	A556 – A559	WB	130	23	3	155	0	0	5	5	-150	-97%	16.78	×	×	×
A556	Penny's Lane – Birches Lane	NB	989	118	67	1175	966	120	63	1149	-26	-2%	0.77	✓	✓	✓
A556	Penny's Lane – Birches Lane	SB	836	141	94	1075	821	140	81	1042	-32	-3%	1.00	✓	✓	✓
A556	A530 – Penny's Lane	EB	1312	168	74	1556	1321	170	74	1565	9	1%	0.23	✓	✓	✓
A530	Middlewich Road – A556	SB	624	108	27	759	615	108	26	749	-11	-1%	0.39	✓	✓	✓
A556	A530 – Penny's Lane	WB	1133	167	90	1397	1144	176	92	1411	14	1%	0.36	✓	✓	✓
A530	Middlewich Road – A556	NB	330	62	15	409	340	66	20	426	17	4%	0.82	✓	✓	✓
Mobberley Road	Ashley Rd – Breach House Lane	NB	450	39	2	490	374	37	1	412	-78	-16%	3.66	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Mobberley Road	Ashley Rd – Breach House Lane	SB	326	35	2	362	321	25	3	349	-13	-4%	0.72	✓	✓	✓
M56 J7/8 - slip road from M56 WB to A556 SB	M56 J7/8	SB	1280	256	153	1692	1266	201	149	1616	-76	-5%	1.88	✓	✓	✓
M56 J7/8 - slip road from A556 NB to Bowdon Roundabout	M56 J7/8	NB	433	87	52	573	435	61	19	515	-58	-10%	2.48	✓	✓	✓
M56 J7/8 - slip road from Bowdon Roundabout to A556 SB	M56 J7/8	SB	734	147	88	971	735	146	91	973	2	0%	0.06	✓	✓	✓
A556 NB mainline	M6 J19 – A50	NB	1214	309	421	1947	1391	310	204	1905	-42	-2%	0.95	✓	✓	✓
M6 J20 to J19 SB mainline	M6 J19 – J20	SB	2138	543	742	3429	2142	542	742	3426	-3	0%	0.05	✓	✓	✓
M56 J7/8 - slip road from Bowdon Roundabout to M56 EB	M56 J7/8	EB	1639	328	195	2167	1575	333	197	2105	-63	-3%	1.36	✓	✓	✓
M56 J7/8 - slip road M56 WB to Bowdon Roundabout	M56 J7/8	EB	315	63	38	417	318	13	4	334	-82	-20%	4.24	✓	✓	✓
M56 EB mainline	M56 J7/8-J6	EB	3240	824	1125	5196	3249	827	875	4951	-245	-5%	3.44	✓	✓	✓
B5569	Chester Road – A556	EB	188	24	7	219	188	16	5	209	-9	-4%	0.65	✓	✓	✓
B5569	Chester Road – A556	WB	79	10	8	98	81	14	8	103	5	5%	0.47	✓	✓	✓
B5391 Pickmere Lane	Budworth Lane – Park Lane	NB	91	19	3	113	72	29	5	106	-7	-6%	0.67	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
B5391 Pickmere Lane	Budworth Lane – Park Lane	SB	56	13	4	73	55	28	5	88	15	20%	1.67	✓	✓	✓
Chapel Lane	Hulseheath Lane – Chester Road	EB	43	6	1	50	44	6	0	50	0	0%	0.01	✓	✓	✓
Chapel Lane	Hulseheath Lane – Chester Road	WB	21	3	1	26	23	7	0	30	4	17%	0.82	✓	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	NB	218	52	7	276	218	27	6	252	-25	-9%	1.52	✓	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	SB	61	10	4	75	61	12	4	77	2	2%	0.19	✓	✓	✓
A50 Manchester Road	Moss Lane – Green Lane	NB	482	42	19	545	493	48	17	558	13	2%	0.54	✓	✓	✓
A50 Manchester Road	Moss Lane – Green Lane	SB	476	60	24	561	532	70	27	629	67	12%	2.76	✓	✓	✓
A5034 Chester Road	Millington Hall Lane – Chapel Lane	NB	14	5	3	21	20	6	0	26	5	25%	1.08	✓	✓	✓
A5034 Chester Road	Millington Hall Lane – Chapel Lane	SB	500	37	15	554	529	51	14	593	39	7%	1.64	✓	✓	✓
Cherry Tree Lane	Millington Lane – Ashley Road	EB	11	2	0	13	11	2	0	13	0	1%	0.04	✓	✓	✓
Cherry Tree Lane	Millington Lane – Ashley Road	WB	1	1	0	3	3	1	1	5	3	99%	1.34	✓	✓	✓
A556 NB mainline	North of M6 J19	NB	1568	329	209	2105	1576	326	208	2111	5	0%	0.12	✓	✓	✓
A556 SB mainline	North of M6 J19	SB	1254	258	238	1750	1250	258	183	1691	-59	-3%	1.42	✓	✓	✓
M6 J19 EB onslip merge	M6 J19	EB	756	263	99	1117	729	143	104	976	-141	-13%	4.36	✓	✓	✓
M6 J19 WB offslip diverge	M6 J19	WB	1147	164	127	1438	913	160	127	1201	-238	-17%	6.54	×	×	×

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
M6 J19 WB onslip merge	M6 J19	WB	340	90	22	452	337	89	29	455	3	1%	0.14	✓	✓	✓
M6 J19 EB offslip diverge	M6 J19	EB	555	123	111	789	553	122	44	719	-70	-9%	2.55	✓	✓	✓
B5569 Chester Road	North of A50	SB	121	18	12	151	74	18	7	98	-52	-35%	4.71	✓	✓	✓
A5034 Mereside Road	Ashley Road – Chester Road	NB	32	10	5	47	20	10	0	30	-16	-34%	2.59	✓	✓	✓
A5034 Mereside Road	Ashley Road – Chestern Road	SB	527	51	22	605	518	44	10	572	-33	-5%	1.36	✓	✓	✓
A50	West Lane – Swineyard Lane	NB	246	27	15	288	248	28	15	291	3	1%	0.20	✓	✓	✓
A50	West Lane – Swineyard Lane	SB	478	71	34	582	479	71	23	572	-10	-2%	0.42	✓	✓	✓
Thowler Lane	Peacock Lane – Boothbank Lane	NB	5	5	1	10	64	9	1	74	63	609%	9.78	×	✓	✓
Thowler Lane	Peacock Lane – Boothbank Lane	SB	5	5	1	11	31	7	1	39	28	262%	5.64	×	✓	✓
A556	Northwich Road – Plumley Moor Road	NB	1109	136	70	1315	1119	167	76	1362	47	4%	1.29	✓	✓	✓
A556	Northwich Road – Plumley Moor Road	SB	989	182	89	1263	976	180	111	1268	5	0%	0.13	✓	✓	✓
Plumley Moor Road	A556 – B508	EB	337	48	6	392	182	10	1	193	-199	-51%	11.64	×	×	×
Plumley Moor Road	A556 – B5081	WB	220	32	7	259	189	10	1	200	-60	-23%	3.95	✓	✓	✓
A556	Plumley Moor Road – A556	SB	1059	185	92	1340	1014	174	111	1298	-42	-3%	1.15	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A556	Plumley Moor Road – A556	NB	1296	156	72	1524	1308	157	75	1541	17	1%	0.43	✓	✓	✓
B5569 Chester Road	Bentleyhurst Lane – B5569	NB	10	5	1	15	10	2	0	12	-2	-15%	0.60	✓	✓	✓
B5569 Chester Road	Bentleyhurst Lane – B5569	SB	22	4	2	27	22	4	0	26	0	-1%	0.03	✓	✓	✓
Halliwells Brow	A50 – Budworth Road	SB	110	18	1	129	108	18	10	136	7	6%	0.63	✓	✓	✓
Halliwells Brow	A50 – Budworth Road	NB	132	19	3	153	124	19	2	145	-7	-5%	0.60	✓	✓	✓
Hulseheath Lane	Chapel Lane – Bucklowhill Lane	SB	20	3	1	24	0	0	0	0	-23	-99%	6.75	×	✓	✓
Hulseheath Lane	Chapel Lane – Bucklowhill Lane	NB	20	5	1	25	0	0	0	0	-25	-100%	7.07	×	✓	✓
Chapel Lane	Hulseheath Lane – Back Lane	WB	65	7	1	72	23	7	0	30	-43	-59%	5.95	×	✓	✓
Chapel Lane	Hulseheath Lane – Back Lane	EB	72	6	1	78	44	6	0	50	-29	-36%	3.56	✓	✓	✓
Wrenshot Lane	West Lane – Rensherds Place	WB	48	8	0	56	0	0	0	0	-56	-100%	10.55	×	✓	✓
Peacock Lane	Broadoak Lane – Back Lane	EB	68	7	1	75	66	5	1	72	-4	-5%	0.42	✓	✓	✓
Peacock Lane	Broadoak Lane – Back Lane	WB	27	3	1	31	13	3	1	16	-14	-46%	2.92	✓	✓	✓
A5144	Hale Road – A560	NB	384	34	9	429	405	34	9	448	19	4%	0.90	✓	✓	✓
A5144	Hale Road – A560	SB	507	61	17	593	581	84	22	687	94	16%	3.71	✓	✓	✓
A538 Hale Road	B5162 – M56 J6	EB	589	46	21	673	638	51	21	710	37	6%	1.41	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A538 Hale Road	B5162 – M56 J6	WB	657	74	21	760	652	55	9	716	-44	-6%	1.62	✓	✓	✓
B5162 Park Road	A538 – Ashley Road	SB	285	49	9	345	296	14	1	310	-35	-10%	1.91	✓	✓	✓
B5162 Park Road	A538 – Ashley Road	NB	349	16	4	372	345	21	2	368	-4	-1%	0.21	✓	✓	✓
A538 Wilmslow Road	Hale Four Seasons Roundabout – Runger Lane	WB	1193	209	71	1487	1169	138	33	1340	-147	-10%	3.91	✓	✓	✓
A538 Wilmslow R0ad	Hale Four Seasons Roundabout – Runger Lane	EB	863	142	63	1077	984	147	88	1219	142	13%	4.20	✓	✓	✓
A556 NB mainline	M56 J7/8 – Cherry Tree Lane	NB	1539	231	166	1940	1618	342	210	2169	229	12%	5.06	×	✓	✓
A556 SB mainline	M56 J7/8 – Cherry Tree Lane	SB	1469	239	143	1859	1707	295	189	2190	331	18%	7.37	×	×	×
Cicely Mill Road	Mereside Road – Rostherne Lane	EB	4	4	2	10	15	1	0	16	6	64%	1.73	✓	✓	✓
Cicely Mill Road	Mereside Road – Rostherne Lane	WB	5	7	1	13	0	0	0	0	-13	-100%	5.14	×	✓	✓
Marsh Lane	Rostherne Lane – Birkinheath Lane	EB	2	3	2	7	4	4	1	9	2	37%	0.87	✓	✓	✓
Marsh Lane	Rostherne Lane – Birkinheath Lane	WB	4	4	2	9	1	1	1	3	-7	-71%	2.71	✓	✓	✓
Birkinheath Lane	Cherry Tree Lane – Ashley Road	EB	10	9	2	21	10	5	0	15	-5	-26%	1.26	✓	✓	✓
Birkinheath Lane	Cherry Tree Lane – Ashley Road	WB	3	3	2	8	3	3	0	6	-2	-27%	0.81	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A5034 Mereside Road	Chester Road – Cicely Mill Lane	EB	562	59	11	636	533	44	10	587	-49	-8%	1.97	✓	✓	✓
A5034 Mereside Road	Chester Road – Cicely Mill Lane	WB	117	17	3	137	20	10	0	30	-107	-78%	11.68	×	×	×
B5569 Chester Road	Mereside Road – A50	SB	55	14	7	75	55	13	4	72	-3	-4%	0.37	✓	✓	✓
B5569 Chester Road	Mereside Road – A50	NB	50	9	7	65	38	4	0	42	-23	-35%	3.14	✓	✓	✓
London Road	A533 – A556	NB	1015	81	17	1129	263	17	4	284	-845	-75%	31.78	×	×	×
London Road	A533 – A556	SB	1298	120	50	1477	448	72	25	544	-933	-63%	29.34	×	×	×
A556 Chester Road	London Road – A559	WB	826	123	38	992	571	78	13	663	-329	-33%	11.45	×	×	×
A556 Chester Road	London Road – A559	EB	1531	112	38	1687	1039	81	38	1157	-530	-31%	14.05	×	×	×
A530	A556 – King Street	SB	478	83	53	616	473	81	55	609	-6	-1%	0.26	✓	✓	✓
A530	A556 – King Street	NB	503	67	34	605	514	72	35	621	15	3%	0.62	✓	✓	✓
A556	A533 – A530	WB	1257	141	57	1460	1030	141	57	1228	-232	-16%	6.32	×	×	×
A556	A533 – A530	EB	1106	121	57	1285	1148	121	56	1325	40	3%	1.11	✓	✓	✓
B5082	A556 – Byley Road	SB	360	48	7	417	355	50	11	416	-1	0%	0.04	✓	✓	✓
B5082	A556 – Byleyn Road	NB	321	32	9	367	325	35	9	370	3	1%	0.14	✓	✓	✓
Birches Lane	A556 – A559	EB	1	4	3	7	0	0	0	0	-7	-100%	3.75	✓	✓	✓
Cow Lane	Back Lane – Castle Mill Lane	NB	486	47	3	536	441	47	3	490	-46	-9%	2.01	✓	✓	✓
Cow Lane	Back Lane – Castle Mill Lane	SB	348	26	3	377	354	27	3	383	5	1%	0.28	✓	✓	✓
Back Lane	Cow Lane – Tanyard Lane	EB	222	21	3	246	202	21	3	226	-21	-8%	1.34	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Back Lane	Cow Lane – Tanyard Lane	WB	61	16	2	79	61	8	1	70	-9	-11%	0.99	✓	✓	✓
Ashley Road	Cow Lane – Lamb Lane	WB	123	15	2	140	123	15	1	140	-1	-1%	0.08	✓	✓	✓
Ashley Road	Cow Lane – Lamb Lane	EB	298	37	2	337	298	37	4	339	2	1%	0.10	✓	✓	✓
A538 Wilmslow Road	Mill Lane – M56 J6	NB	843	92	26	961	835	91	25	951	-10	-1%	0.32	✓	✓	✓
A538 Wilmslow Road	Mill Lane – M56 J6	SB	951	104	29	1084	1045	108	32	1186	102	9%	3.04	✓	✓	✓
M6 NB main line	M56 J20 – J21	NB	4353	1107	1511	6983	4348	1109	1223	6680	-302	-4%	3.66	✓	✓	✓
M6 SB main line	M56 J21 – J20	SB	3939	1001	1368	6319	3934	1010	1293	6237	-82	-1%	1.04	✓	✓	✓
M56 EB main line	M56 J9	EB	1065	271	370	1708	1066	271	369	1706	-2	0%	0.05	✓	✓	✓
M56 WB main line	M56 J9	NB	2326	466	277	3069	2315	467	277	3059	-10	0%	0.18	✓	✓	✓
M6 NB offslip	M6 J20	WB	551	110	66	728	310	30	2	341	-386	-53%	16.70	×	×	×
M56 WB main line	M56 J7/8 – J9	WB	2047	520	711	3284	2035	520	656	3212	-72	-2%	1.27	✓	✓	✓
M56 EB main line	M56 J9 – J7/8	EB	1983	504	688	3180	1984	507	685	3176	-4	0%	0.07	✓	✓	✓
M56 J9 WB offslip	M56 J9	WB	1195	239	142	1577	1179	241	142	1562	-15	-1%	0.38	✓	✓	✓
M6 NB onslip from M56 J9 WB loop	M56 J9/M6 J20	NB	965	193	115	1273	954	193	118	1265	-8	-1%	0.22	✓	✓	✓
M6 NB onslip from A50 Cliff Lane	M6 J20	NB	377	75	45	497	376	75	42	493	-4	-1%	0.16	✓	✓	✓
M6J20 SB offslip to A50	M6 J20	SB	627	125	75	827	610	125	74	809	-18	-2%	0.62	✓	✓	✓
M56 J9 WB onslip from M6 J20 north	M56 J9/M6 J20	WB	1648	330	197	2175	1655	336	199	2190	15	1%	0.32	✓	✓	✓
M56 J8 WB main line	M56 J7/8	WB	1691	430	587	2713	1742	468	604	2814	101	4%	1.93	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
M6 J20 to J19 NB main line	M6 J19 – J20	NB	2076	528	721	3331	2075	527	800	3403	72	2%	1.24	✓	✓	✓
Swineyard Lane	Heath Lane – A50	NB	111	18	2	131	111	9	2	122	-9	-7%	0.83	✓	✓	✓
Swineyard Lane	Heath Lane – A50	SB	49	6	2	57	49	6	3	57	0	0%	0.03	✓	✓	✓
A50	Wrenshot Lane - Halliwell's Bow	WB	198	23	15	236	201	23	12	237	1	1%	0.08	✓	✓	✓
A50	Wrenshot Lane - Halliwell's Bow	EB	424	68	18	511	436	72	18	526	15	3%	0.64	✓	✓	✓
West Lane	A50 – Wrenshot Lane	NB	243	0	15	258	235	30	3	268	10	4%	0.64	✓	✓	✓
West Lane	A50 – Wrenshot Lane	SB	225	0	15	240	223	35	8	267	27	11%	1.67	✓	✓	✓
B5391 Pickmere Lane	A556 – Budworth Road	EB	73	57	5	136	72	56	5	132	-3	-2%	0.28	✓	✓	✓
B5391 Pickmere Lane	A556 – Budworth Road	WB	57	43	5	105	56	38	5	99	-6	-6%	0.64	✓	✓	✓
Tabley Hill Lane	A556 – Green Lane	EB	253	39	5	297	73	44	0	117	-180	-61%	12.51	×	×	×
Tabley Hill Lane	A556 – Green Lane	WB	77	19	3	99	2	2	0	4	-95	-96%	13.27	×	✓	✓
A5033 Northwich Road	A556 – Ladies Mile	EB	482	0	48	530	503	25	7	535	5	1%	0.22	✓	✓	✓
A5033 Northwich Road	A556 – Ladies Mile	WB	429	0	45	474	418	96	33	547	73	15%	3.22	✓	✓	✓

Directions: NB = north-bound, EB = east-bound, SB = south-bound, WB = west-bound

Table 12: AP1 M6 Junction 19 Model – PM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A50 Warrington Road	Chester Road – Clamhunger Lane	WB	724	45	11	782	739	45	10	795	12	2%	0.44	✓	✓	✓
B5569 Chester Road	South of A50	NB	126	7	4	139	124	11	3	138	-1	-1%	0.06	✓	✓	✓
A50 Warrington Road	Chester Road – Clamhunger Lane	EB	257	10	5	273	227	15	4	246	-27	-10%	1.67	✓	✓	✓
Clamhunger Lane	A50 – A5034	SB	47	6	0	53	49	6	1	56	2	4%	0.31	✓	✓	✓
A50 Warrington Road	Clamhunger Lane – Mereside Road	WB	798	49	14	861	690	39	10	739	-122	-14%	4.32	✓	✓	✓
A50 Warrington Road	Clamhunger Lane – Mereside Road	EB	259	12	7	278	205	13	4	222	-56	-20%	3.55	✓	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	SB	389	20	6	415	359	21	20	399	-16	-4%	0.78	✓	✓	✓
Clamhunger Lane	A50 – A5034	NB	22	3	0	25	22	3	0	24	0	-1%	0.03	✓	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	NB	195	13	3	211	191	13	2	206	-4	-2%	0.30	✓	✓	✓
B5569 Chester Road	South of A50	SB	81	9	2	92	106	9	1	117	25	27%	2.43	✓	✓	✓
A50	A556 – Chester Road	WB	892	64	15	972	895	61	14	971	-1	0%	0.03	✓	✓	✓
A50	A556 – Chester Road	EB	275	9	4	290	243	19	4	266	-23	-8%	1.41	✓	✓	✓
A50 Cliff Lane	East of M6	WB	599	64	14	679	592	54	15	661	-18	-3%	0.68	✓	✓	✓
B5159 West Lane	Beechtree Lane – Beechtree Farm Close	SB	312	19	2	335	196	19	1	216	-119	-35%	7.16	×	×	×
A50	Swineyard Lane – Mag Lane	EB	300	24	7	332	295	17	6	318	-14	-4%	0.77	✓	✓	✓
A50	Mag Lane – Heath Lane	WB	569	57	18	646	546	46	15	607	-39	-6%	1.56	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A50 Cliff Lane	East of M6	EB	260	17	5	283	335	20	6	360	77	27%	4.32	✓	✓	✓
A56 Lymm Road	Dunham Rd – Reddy Lane	WB	629	30	3	664	608	36	3	647	-17	-3%	0.65	✓	✓	✓
A50	Mag Lane – Heath Lane	EB	286	25	8	319	295	17	5	317	-2	-1%	0.10	✓	✓	✓
A50	Swineyard Lane – Mag Lane	WB	579	48	18	647	580	47	17	644	-3	0%	0.12	✓	✓	✓
West Lane	Beechtree Lane – Beechtree Farm Close	NB	366	23	0	388	361	22	3	385	-3	-1%	0.15	✓	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	WB	136	6	1	142	140	11	3	154	12	9%	1.01	✓	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	EB	157	5	0	162	114	6	2	123	-39	-24%	3.26	✓	✓	✓
A56 Lymm Rd	Dunham Road – Reddy Lane	EB	238	18	2	259	237	21	2	260	1	0%	0.06	✓	✓	✓
Wrenshot Lane	West Lane – Rensherds Place	EB	45	2	0	48	0	0	0	0	-48	-100%	9.81	×	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	NB	120	6	2	128	127	6	2	135	7	5%	0.61	✓	✓	✓
Rostherne Lane	Marsh Lane – Ashley Road	SB	7	2	0	9	11	2	0	14	5	52%	1.39	✓	✓	✓
Rostherne Lane	Chester Road – New Road	SB	3	0	0	3	3	0	0	3	0	2%	0.03	✓	✓	✓
Chester Road	A556 SB Offslip – Millington Lane	NB	44	1	1	46	32	3	0	35	-11	-23%	1.69	✓	✓	✓
Millington Lane	Chester Road – Millington Hall Lane	WB	14	1	0	14	25	3	0	29	14	103%	3.14	✓	✓	✓
Rostherne Lane	Marsh Lane – Ashley Road	NB	5	2	0	7	6	2	0	8	2	26%	0.62	✓	✓	✓
Rostherne Lane	Chester Road – New Road	NB	6	1	1	7	0	0	0	0	-7	-100%	3.75	✓	✓	✓
Budworth Road	Cann Lane – Old Hall Lane	WB	52	28	3	83	122	4	1	127	44	53%	4.27	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Agden Lane	Thowler Lane – Agden Park Lane	NB	40	1	0	40	90	5	0	94	54	135%	6.62	×	✓	✓
Boothbank Lane	Thowler Lane – Boothbank Lane	WB	50	2	0	52	23	2	1	26	-26	-50%	4.15	✓	✓	✓
Reddy Lane	Millington Lane – Lymm Road	NB	22	6	1	28	6	1	0	7	-20	-73%	4.80	✓	✓	✓
Reddy Lane	Millington Lane – Lymm Road	SB	13	4	1	17	13	0	0	14	-3	-20%	0.87	✓	✓	✓
Boothbank Lane	Thowler Lane – Boothbank Lane	EB	6	1	0	7	6	1	1	7	1	15%	0.36	✓	✓	✓
Agden Lane	Thowler Lane – Agden Park Lane	SB	8	2	0	9	5	1	0	7	-2	-23%	0.74	✓	✓	✓
Budworth Road	Cann Lane – Old Hall Lane	EB	14	8	1	24	6	1	0	7	-17	-72%	4.40	✓	✓	✓
Millington Lane	Chester Road – Millington Hall Lane	EB	13	0	0	13	13	4	0	17	5	37%	1.21	✓	✓	✓
Wrenshot Lane	Broad Oak Lane - A50	NB	4	1	0	5	0	0	0	0	-4	-97%	2.87	✓	✓	✓
Broadoak Lane	Peacock Lane – Wrenshot Lane	NB	3	0	0	3	0	0	0	0	-2	-95%	2.06	✓	✓	✓
Peacock Lane	Broadoak Lane – West Lane	WB	131	11	0	142	7	2	1	10	-132	-93%	15.12	×	×	×
Peacock Lane	Broadoak Lane – West Lane	EB	20	1	0	23	14	1	1	15	-7	-31%	1.63	✓	✓	✓
Broadoak Lane	Peacock Lane – Wrenshot Lane	SB	10	1	0	10	0	0	0	0	-10	-97%	4.30	✓	✓	✓
Wrenshot Lane	Broad Oak Lane – A50	SB	4	1	0	5	0	0	0	0	-4	-94%	2.74	✓	✓	✓
A5034 Mereside Road	A50 – Mereheath Lane	SB	277	15	7	299	268	21	20	308	9	3%	0.52	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A56 Lymm Rd	Agden Park Lane – Reddy Lane	EB	231	29	2	262	231	20	2	253	-9	-4%	0.58	✓	✓	✓
A56 Lymm Rd	Agden Park Lane – Reddy Lane	WB	612	38	3	655	595	35	3	633	-22	-3%	0.87	✓	✓	✓
Birches Lane	A556 – A559	WB	165	15	0	180	0	0	17	17	-163	-91%	16.42	×	×	×
A556	Penny's Lane – Birches Lane	NB	1010	75	47	1135	939	78	43	1060	-75	-7%	2.26	✓	✓	✓
A556	Penny's Lane – Birches Lane	SB	1357	107	33	1498	1033	117	25	1175	-323	-22%	8.84	×	×	×
A556	A530 – Penny's Lane	EB	1261	106	50	1419	1337	112	48	1497	78	6%	2.05	✓	✓	✓
A530	Middlewich Road – A556	SB	549	59	14	624	783	52	33	868	244	39%	8.94	×	×	×
A556	A530 – Penny's Lane	WB	1654	147	35	1838	1574	157	31	1763	-75	-4%	1.76	✓	✓	✓
A530	Middlewich Road – A556	NB	603	71	9	684	615	74	16	705	21	3%	0.82	✓	✓	✓
Mobberley Road	Ashley Road – Breach House Lane	NB	351	23	2	375	310	23	1	334	-41	-11%	2.16	✓	✓	✓
Mobberley Road	Ashley Road – Breach House Lane	SB	355	18	1	374	287	18	1	305	-69	-18%	3.72	✓	✓	✓
M56 J7/8 - slip road from M56 WB to A556 SB	M56 J7/8	SB	1564	143	70	1782	1506	144	68	1718	-64	-4%	1.52	✓	✓	✓
M56 J7/8 - slip road from A556 NB to Bowdon Roundabout	M56 J7/8	NB	649	59	29	739	645	59	28	732	-7	-1%	0.24	✓	✓	✓
M56 J7/8 - slip road from Bowdon	M56 J7/8	SB	1019	93	45	1160	926	85	42	1054	-106	-9%	3.19	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Roundabout to A556 SB																
A556 NB main line	M6 J19 – A50	NB	1229	184	297	1712	1420	159	97	1676	-36	-2%	0.87	✓	✓	✓
M6 J20 to J19 SB main line	M6 J19 – J20	SB	2331	350	564	3249	2314	355	611	3280	32	1%	0.55	✓	✓	✓
M56 J7/8 - slip road from Bowdon Roundabout to M56 EB	M56 J7/8	EB	1595	145	71	1816	1318	147	71	1536	-280	-15%	6.84	×	×	×
M56 J7/8 - slip road M56 WB to Bowdon Roundabout	M56 J7/8	EB	467	42	21	532	472	18	10	500	-32	-6%	1.41	✓	✓	✓
M56 EB main line	M56 J7/8 – J6	EB	2998	450	725	4176	2988	449	724	4161	-15	0%	0.24	✓	✓	✓
B5569	Chester Road – A556	EB	90	11	3	104	123	11	3	137	34	32%	3.06	✓	✓	✓
B5569	Chester Road – A556	WB	138	12	3	154	117	12	2	130	-24	-15%	1.99	✓	✓	✓
B5391 Pickmere Lane	Budworth Lane – Park Lane	NB	51	12	1	65	29	11	1	42	-23	-36%	3.18	✓	✓	✓
B5391 Pickmere Lane	Budworth Lane – Park Lane	SB	154	18	1	173	240	41	5	285	112	65%	7.40	×	×	×
Chapel Lane	Hulseheath Lane – Chester Road	EB	16	2	0	18	16	2	0	18	0	-1%	0.04	✓	✓	✓
Chapel Lane	Hulseheath Lane – Chester Road	WB	54	5	0	59	97	6	0	103	44	75%	4.91	✓	✓	✓
Ashley Road	Rostherne Lane – Mereside Road	NB	68	16	1	85	107	7	3	116	31	37%	3.12	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Ashley Road	Rostherne Lane – Mereside Road	SB	112	12	1	125	138	12	3	153	28	23%	2.40	✓	✓	✓
A50 Manchester Road	Moss Lane – Green Lane	NB	762	35	8	807	817	45	12	875	68	8%	2.35	✓	✓	✓
A50 Manchester Road	Moss Lane – Green Lane	SB	431	39	6	476	471	34	24	530	53	11%	2.38	✓	✓	✓
A5034 Chester Road	Millington Hall Lane – Chapel Lane	NB	15	3	0	18	18	3	0	21	2	14%	0.56	✓	✓	✓
A5034 Chester Road	Millington Hall Lane – Chapel Lane	SB	318	23	3	344	331	20	17	368	24	7%	1.27	✓	✓	✓
Cherry Tree Lane	Millington Lane – Ashley Road	EB	9	2	0	11	9	1	0	10	-1	-9%	0.30	✓	✓	✓
Cherry Tree Lane	Millington Lane – Ashley Road	WB	3	1	0	5	3	1	0	4	0	-8%	0.17	✓	✓	✓
A556 NB main line	North of M6 J19	NB	1768	158	102	2028	1541	169	101	1811	-217	-11%	4.94	✓	✓	✓
A556 SB main line	North of M6 J19	SB	1825	218	129	2172	1826	200	79	2105	-67	-3%	1.46	✓	✓	✓
M6 J19 EB onslip merge	M6 J19	EB	1438	106	13	1557	1130	81	36	1246	-311	-20%	8.29	×	×	×
M6 J19 WB offslip diverge	M6 J19	WB	1091	100	54	1245	1056	101	53	1210	-35	-3%	0.99	✓	✓	✓
M6 J19 WB onslip merge	M6 J19	WB	472	39	2	513	475	43	30	548	35	7%	1.52	✓	✓	✓
M6 J19 EB offslip diverge	M6 J19	EB	467	41	44	551	466	49	15	531	-20	-4%	0.87	✓	✓	✓
B5569 Chester Road	North of A50	SB	179	11	2	192	179	15	2	196	4	2%	0.29	✓	✓	✓
A5034 Mereside Road	Ashley Road – Chester Road	NB	101	10	1	113	106	9	0	114	2	2%	0.16	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A5034 Mereside Road	Ashley Road – Chester Road	SB	268	14	3	285	270	15	17	301	17	6%	0.99	✓	✓	✓
A50	West Lane – Swineyard Lane	NB	609	62	20	691	737	61	19	816	126	18%	4.59	✓	×	✓
A50	West Lane – Swineyard Lane	SB	342	25	11	377	375	24	7	406	29	8%	1.46	✓	✓	✓
Thowler Lane	Peacock Lane – Boothbank Lane	NB	3	6	1	10	101	6	1	108	98	946%	12.71	×	✓	✓
Thowler Lane	Peacock Lane – Boothbank Lane	SB	4	3	1	8	14	4	1	18	11	144%	3.02	✓	✓	✓
A556	Northwich Road – Plumley Moor Road	NB	935	94	50	1081	1029	105	49	1183	101	9%	3.02	✓	✓	✓
A556	Northwich Road – Plumley Moor Road	SB	1480	121	37	1639	1339	138	43	1521	-119	-7%	2.98	✓	✓	✓
Plumley Moor Road	A556 – B5081	EB	186	16	1	203	187	16	1	204	1	0%	0.07	✓	✓	✓
Plumley Moor Road	A556 – B5081	WB	373	35	3	410	236	3	1	240	-170	-41%	9.41	×	×	×
A556	Plumley Moor Road – A556	SB	1757	143	38	1939	1328	135	43	1505	-435	-22%	10.47	×	×	×
A556	Plumley Moor Road – A556	NB	1025	98	49	1174	1015	102	48	1165	-10	-1%	0.28	✓	✓	✓
B5569 Chester Road	Bentleyhurst Lane – B5569	NB	32	0	1	33	22	4	0	26	-7	-20%	1.23	✓	✓	✓
B5569 Chester Road	Bentleyhurst Lane – B5569	SB	10	1	1	12	10	1	0	11	0	0%	0.01	✓	✓	✓
Halliwells Brow	A50 – Budworth Road	SB	229	23	1	253	270	16	4	290	37	15%	2.27	✓	✓	✓
Halliwells Brow	A50 – Budworth Road	NB	136	12	1	148	135	11	0	146	-2	-1%	0.13	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Hulseheath Lane	Chapel Lane – Bucklowhill Lane	SB	28	5	0	32	1	0	0	1	-31	-97%	7.64	×	✓	✓
Hulseheath Lane	Chapel Lane – Bucklowhill Lane	NB	4	1	0	5	0	0	0	0	-5	-100%	3.00	✓	✓	✓
Chapel Lane	Hulseheath Lane – Back Lane	WB	89	6	0	95	96	6	0	102	8	8%	0.76	✓	✓	✓
Chapel Lane	Hulseheath Lane – Back Lane	EB	18	4	0	23	16	2	0	18	-5	-22%	1.10	✓	✓	✓
Wrenshot Lane	West Lane – Rensherds Place	WB	31	3	0	34	0	0	0	0	-34	-100%	8.20	×	✓	✓
Peacock Lane	Broadoak Lane – Back Lane	EB	24	0	0	25	14	1	1	16	-9	-36%	2.00	✓	✓	✓
Peacock Lane	Broadoak Lane – Back Lane	WB	144	10	0	154	7	2	1	10	-143	-93%	15.83	×	×	×
A5144	Hale Road – A560	NB	559	32	11	602	559	31	7	597	-5	-1%	0.20	✓	✓	✓
A5144	Hale Road – A560	SB	432	26	6	464	404	35	2	440	-24	-5%	1.11	✓	✓	✓
A538 Hale Road	B5162 – M56 J6	EB	569	29	4	605	569	32	4	604	-1	0%	0.03	✓	✓	✓
A538 Hale Road	B5162 – M56 J6	WB	692	32	10	736	694	48	10	752	16	2%	0.59	✓	✓	✓
B5162 Park Road	A538 – Ashley Road	SB	278	13	5	296	280	15	0	294	-2	-1%	0.09	✓	✓	✓
B5162 Park Road	A538 – Ashley Road	NB	358	24	5	388	358	20	4	381	-7	-2%	0.33	✓	✓	✓
A538 Wilmslow Road	Hale Four Seasons Roundabout – Runger Lane	WB	1327	99	18	1455	1273	98	17	1388	-67	-5%	1.78	✓	✓	✓
A538 Wilmslow Road	Hale Four Seasons Roundabout – Runger Lane	EB	937	82	22	1044	934	81	24	1039	-5	0%	0.16	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A556 NB main line	M56 J7/8 – Cherry Tree Lane	NB	1762	94	94	1956	1752	175	98	2025	70	4%	1.56	✓	✓	✓
A556 SB main line	M56 J7/8 – Cherry Tree Lane	SB	1829	59	87	1978	2049	205	95	2348	371	19%	7.97	×	×	×
Cicely Mill Road	Mereside Road – Rostherne Lane	EB	4	4	1	9	6	0	0	6	-3	-30%	0.98	✓	✓	✓
Cicely Mill Road	Mereside Road – Rostherne Lane	WB	3	4	1	8	4	1	0	5	-3	-41%	1.31	✓	✓	✓
Marsh Lane	Rostherne Lane – Birkinheath Lane	EB	2	1	1	4	2	1	0	3	-1	-27%	0.62	✓	✓	✓
Marsh Lane	Rostherne Lane – Birkinheath Lane	WB	5	3	1	10	2	2	0	4	-5	-55%	2.02	✓	✓	✓
Birkinheath Lane	Cherry Tree Lane – Ashley Road	EB	14	8	2	23	14	4	1	19	-5	-20%	1.02	✓	✓	✓
Birkinheath Lane	Cherry Tree Lane – Ashley Road	WB	3	3	1	7	8	3	0	11	4	55%	1.29	✓	✓	✓
A5034 Mereside Road	Chester Road – Cicely Mill Lane	EB	273	20	1	295	276	15	17	308	12	4%	0.71	✓	✓	✓
A5034 Mereside Road	Chester Road – Cicely Mill Lane	WB	116	15	1	131	110	9	0	119	-12	-9%	1.05	✓	✓	✓
B5569 Chester Road	Mereside Road – A50	SB	90	8	2	100	81	8	1	89	-11	-11%	1.11	✓	✓	✓
B5569 Chester Road	Mereside Road – A50	NB	33	2	1	35	15	1	0	16	-19	-55%	3.84	✓	✓	✓
London Road	A533 – A556	NB	1015	67	2	1088	414	34	1	449	-639	-59%	23.04	×	×	×
London Road	A533 – A556	SB	1057	80	12	1155	436	43	5	484	-671	-58%	23.45	×	×	×
A556 Chester Road	London Road – A559	WB	1524	86	15	1627	878	81	5	963	-664	-41%	18.44	×	×	×

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A556 Chester Road	London Road – A559	EB	984	106	18	1108	1052	85	18	1155	47	4%	1.41	✓	✓	✓
A530	A556 – King Street	SB	728	69	28	827	864	80	28	972	145	18%	4.85	✓	×	✓
A530	A556 – King Street	NB	670	75	33	779	898	99	35	1032	253	33%	8.42	×	×	×
A556	A533 – A530	WB	1405	118	29	1554	1399	118	30	1547	-7	0%	0.17	✓	✓	✓
A556	A533 – A530	EB	1158	81	33	1272	1053	72	22	1147	-125	-10%	3.60	✓	✓	✓
B5082	A556 – Byley Road	SB	262	20	2	283	398	33	6	437	154	54%	8.11	×	×	×
B5082	A556 – Byley Road	NB	329	30	2	361	545	38	6	589	228	63%	10.47	×	×	×
Birches Lane	A556 – A559	EB	1	1	0	2	0	0	0	0	-2	-100%	1.73	✓	✓	✓
Cow Lane	Back Lane - Castle Mill Lane	NB	417	29	0	446	419	29	4	452	6	1%	0.28	✓	✓	✓
Cow Lane	Back Lane – Castle Mill Lane	SB	375	26	0	400	317	23	1	341	-60	-15%	3.10	✓	✓	✓
Back Lane	Cow Lane – Tanyard Lane	EB	113	10	2	124	68	8	1	77	-47	-38%	4.68	✓	✓	✓
Back Lane	Cow Lane – Tanyard Lane	WB	191	15	1	206	181	15	3	199	-7	-3%	0.50	✓	✓	✓
Ashley Road	Cow Lane – Lamb Lane	WB	238	24	0	262	243	24	3	269	7	3%	0.45	✓	✓	✓
Ashley Road	Cow Lane – Lamb Lane	EB	208	17	0	225	209	17	4	230	5	2%	0.35	✓	✓	✓
A538 Wilmslow Road	Mill Lane – M56 J6	NB	895	58	10	963	891	58	10	959	-4	0%	0.13	✓	✓	✓
A538 Wilmslow Road	Mill Lane – M56 J6	SB	1029	67	11	1108	1040	66	13	1119	11	1%	0.34	✓	✓	✓
M6 NB main line	M56 J20 – J21	NB	4741	712	1147	6605	4667	702	973	6342	-263	-4%	3.27	✓	✓	✓
M6 SB main line	M56 J21– J20	SB	4700	706	1137	6548	4700	700	1136	6536	-12	0%	0.15	✓	✓	✓
M56 EB main line	M56 J9	EB	1251	188	303	1743	1248	185	303	1736	-7	0%	0.17	✓	✓	✓
M56 WB main line	M56 J9	NB	2303	210	103	2616	2131	205	149	2485	-131	-5%	2.59	✓	✓	✓
M6 NB offslip	M6 J20	WB	547	50	24	622	369	15	17	401	-220	-35%	9.74	×	×	×

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
M56 WB main line	M56 J7/8 – J9	WB	3144	472	760	4380	3055	463	679	4197	-183	-4%	2.80	✓	✓	✓
M56 EB main line	M56 J9 – J7/8	EB	2133	320	516	2972	2120	320	672	3112	140	5%	2.53	✓	✓	✓
M56 J9 WB offslip	M56 J9	WB	1794	164	80	2038	1754	159	80	1993	-45	-2%	1.00	✓	✓	✓
M6 NB onslip from M56 J9 WB loop	M56 J9/M6 J20	NB	1321	120	59	1500	1298	142	71	1511	12	1%	0.30	✓	✓	✓
M6 NB onslip from A50 Cliff Lane	M6 J20	NB	549	50	24	623	526	77	29	633	9	1%	0.37	✓	✓	✓
M6J20 SB offslip to A50	M6 J20	SB	908	83	40	1031	916	76	40	1032	1	0%	0.02	✓	✓	✓
M56 J9 WB onslip from M6 J20 north	M56 J9/M6 J20	WB	1954	178	87	2219	1967	178	131	2276	57	3%	1.20	✓	✓	✓
M56 J8 WB main line	M56 J7/8	WB	2737	411	662	3814	2680	437	660	3777	-36	-1%	0.59	✓	✓	✓
M6 J20 to J19 NB main line	M6 J19 – J20	NB	2065	310	499	2876	2045	311	730	3086	210	7%	3.85	✓	✓	✓
Swineyard Lane	Heath Lane – A50	NB	85	9	2	95	85	7	1	94	-2	-2%	0.18	✓	✓	✓
Swineyard Lane	Heath Lane – A50	SB	228	24	1	252	161	15	2	178	-74	-29%	5.05	×	✓	✓
A50	Wrenshot Lane – Halliwell's Bow	WB	741	49	13	804	737	49	13	799	-5	-1%	0.18	✓	✓	✓
A50	Wrenshot Lane – Halliwell's Bow	EB	287	22	5	315	255	23	4	281	-33	-11%	1.93	✓	✓	✓
West Lane	A50 – Wrenshot Lane	NB	265	0	8	273	260	17	3	280	7	2%	0.40	✓	✓	✓
West Lane	A50 – Wrenshot Lane	SB	222	0	10	232	273	33	10	316	84	36%	5.08	×	✓	✓
B5391 Pickmere Lane	A556 – Budworth Road	EB	44	33	2	79	44	20	1	66	-13	-16%	1.53	✓	✓	✓
B5391 Pickmere Lane	A556 – Budworth Road	WB	144	74	5	225	367	49	5	421	196	87%	10.91	×	×	×
Tabley Hill Lane	A556 – Green Lane	EB	82	15	1	97	1	0	0	1	-96	-99%	13.65	×	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Tabley Hill Lane	A556 – Green Lane	WB	95	16	1	111	102	17	0	119	8	7%	0.74	✓	✓	✓
A5033 Northwich Road	A556 – Ladies Mile	EB	445	0	26	471	465	18	10	493	22	5%	1.00	✓	✓	✓
A5033 Northwich Road	A556 – Ladies Mile	WB	715	0	47	762	850	17	28	895	133	17%	4.62	✓	×	✓

Directions: NB = north-bound, EB = east-bound, SB = south-bound, WB = west-bound

Annex E: Model performance report – Winsford and Middlewich Model

Contents

Tables

Figures

1 Introduction

1.1 Hybrid Bill

1.1.1 For the assessment of the Proposed Scheme at hybrid Bill (the original scheme), Mott MacDonald WSP Joint Venture (MWJV) used the Winsford and Middlewich Model to develop forecasts of the Winsford and Middlewich area to assess the impact of the original scheme at both the operational and construction stages.

1.1.2 The local authority, Cheshire West and Chester Council (CWAC) released copies of the latest available Winsford and Middlewich Model versions (as of January 2019) to High Speed Two (HS2) Ltd.

1.1.3 The Winsford and Middlewich Model has subsequently been updated by HS2 Ltd transport consultants, MWJV, to include localised improvements within the High Speed Rail (Crewe – Manchester) area of interest. This is described in the Winsford and Middlewich Model hybrid Bill Model Performance Report (MPR).

1.1.4 For the purpose of assessment, the route of the original scheme is split into a number of geographical areas referred to as community areas. The Winsford and Middlewich Model, updated for the hybrid Bill, has been utilised to provide an evidence base for the Transport Assessment for the community area Wimboldsley to Lostock Gralam (MA02).

1.1.5 Reference should be made to Figure 1 which shows the geographic coverage of strategic transport models that have been utilised for the Transport Assessment.

1.2 Additional Provision 1 Environmental Statement

1.2.1 Additional Provision (AP) amendments are changes to the scheme that include requirements for additional powers in the High Speed Rail (Crewe – Manchester) Bill.

1.2.2 Following the main Environmental Statement (ES), further model development has been undertaken by MWJV. The baseline and future baseline models have been updated for the assessment of the AP1 revised scheme to reflect:

- use of some additional traffic count information and refinement of network coding to improve model performance in key areas of interest and in response to stakeholder feedback;
- inclusion of recently consented, committed or completed transport schemes and development proposals that have come forward since the models used in the assessment reported in the main ES were developed;

- refinements to future baseline traffic demand to reflect changes to future growth patterns since the models used in the main ES were developed and the release of updated road traffic forecasts by the Department of Transport (DfT);
- the change in the future baseline forecast year from 2046 in the main ES to 2051 for the Supplementary Environmental Statement 1 (SES) and AP1 ES; and
- updates to value of time parameters to reflect the latest release of the DfT's Transport Analysis Guidance (TAG) data book.

1.3 Purpose of this report

1.3.1 This report provides documentation of the model performance review that has been carried out for the HS2 AP1 revised scheme Winsford and Middlewich Model.

1.3.2 The purpose of this report is to provide evidence that this highway assignment model is suitable to support the Transport Assessment of the High Speed Rail (Crewe – Manchester) SES1 and AP1 ES.

1.4 Model framework

1.4.1 The Winsford and Middlewich Model is a strategic highway assignment model that has been developed within the SATURN model software platform (version 11.3.1).

1.4.2 The detailed modelled study area covers Winsford, Middlewich and surrounding areas. There is supporting network and zone system detail to provide a representation of the external area supply and demand. Reference should be made to Figure 1.

1.4.3 The original Winsford and Middlewich Model is representative of 2014 base year transport conditions.

1.5 Model development

1.5.1 The Winsford and Middlewich Model has been developed by CWAC's appointed transport consultants to provide an evidence base to support the Winsford transport strategy study.

1.6 Model description

1.6.1 The original Winsford and Middlewich Model has been developed with the following years:

- 2014 base year; and
- 2030 future year.

1.6.2 The model is representative of the following time periods:

- AM peak hour - 07:45–08:45;
- average inter peak hour - 10:00–16:00; and

- PM peak hour - 17:00–18:00.

1.6.3 The model is comprised of the following demand user-classes:

- car commute;
- car employers' business;
- car other;
- Light Goods Vehicles (LGV); and
- other goods vehicles.

1.7 Model application objectives

1.7.1 For the assessment of the AP1 revised scheme, the Winsford and Middlewich Model provides:

- preliminary traffic data to inform scheme design;
- traffic data for the construction and operational phases of the AP1 revised scheme on which to base the assessment of significant effects for the SES1 and AP1 ES;
- changes in traffic flows, congestion and journey times to inform the Transport Assessment for the AP1 revised scheme; and
- changes in traffic flows between the base year and forecast scenarios for application to local models.

1.7.2 The Winsford and Middlewich Model has been used primarily to assess the likely impacts of HS2 construction and operational traffic in order to provide an evidence base for the Transport Assessment for the AP1 revised scheme.

Figure 1: Strategic transport Model coverage for the High Speed Rail (Crewe – Manchester) Transport Assessment

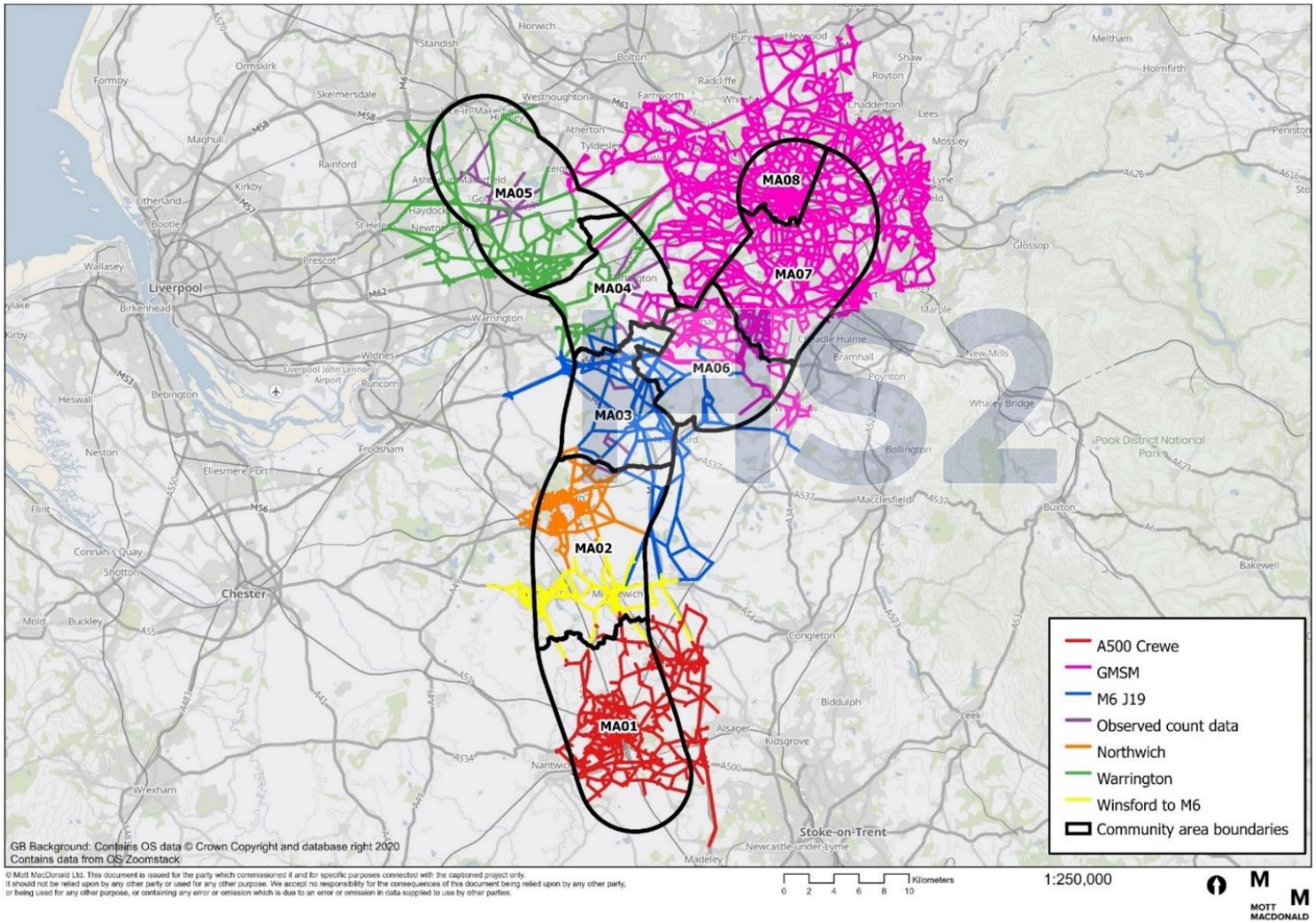


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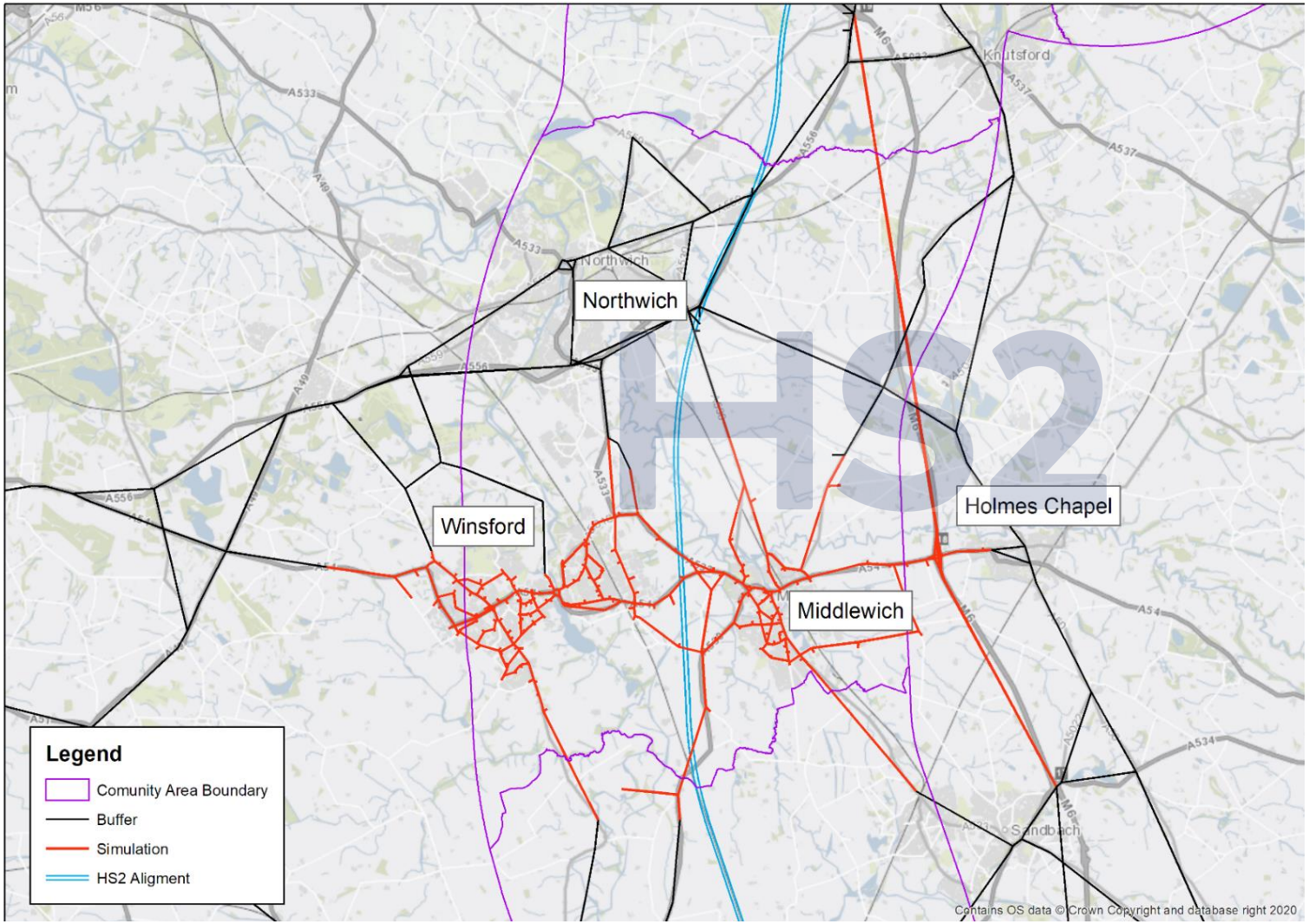
Figure 2: Model study area



2 Guidance used

2.1 Introduction

2.1.1 This strategic highway model development makes reference to the following TAG as published by the Department for Transport (DfT): TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2 Highway model guidance

2.2.1 In relation to providing an assessment of model calibration and validation performance, reference has been made to Section 3.2 of TAG Unit M3.1 (Table 1 and Table 2).

2.2.2 The criteria for the assessment of model calibration and validation of traffic flows and journey time performance are presented in Table 1 below.

Table 1: DfT – TAG validation criteria

Criteria	Acceptability guideline
Assigned hourly flows	
Individual flows within +/-15% for flows 700-2,700 vph	>85% of cases
Individual flows within +/-100 vph for flows <700 vph	>85% of cases
Individual flows within +/-400 vph for flows >2,700 vph	>85% of cases
Screenline flows (normally >5 links) to be within 5%	All or nearly all screenlines
Geoffrey Havers (GEH) statistic	
Individual flows GEH <5	>85% of cases

Credit. Table 1 and Table 2 DfT TAG Unit M3.1 highway assignment modelling (May 2020).

2.2.3 The criteria for the assessment of highway model assignment convergence is presented in Table 2 below.

Table 2: Summary of convergence measures and base model acceptable values

Measures of convergence	Acceptability guideline
Delta and %GAP	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) <1%	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) <1%	Four consecutive iterations greater than 98%
Percentage change in total user costs of links with flow change (V) <1%	Four consecutive iterations less than 0.1% (SUE only)

Credit. Table 1 and Table 2 DfT TAG Unit M3.1 highway assignment modelling (May 2020).

3 Data for model development

3.1 Overview

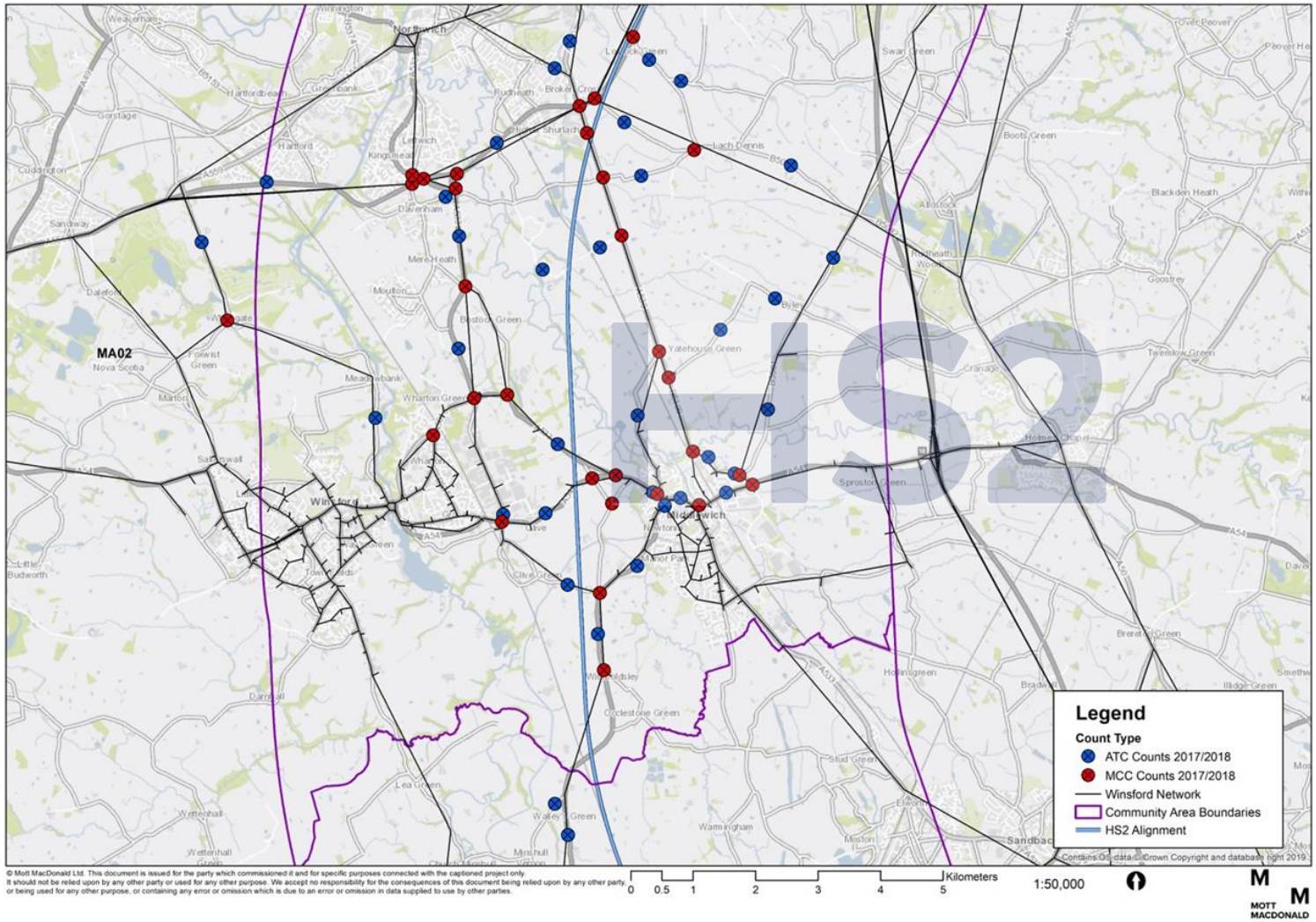
3.1.1 This section of the report presents details of traffic count data that has been collected for the purpose of calibrating the Winsford and Middlewich Model study area. The same data set was used at hybrid Bill and also for the SES1 and AP1 ES for model calibration, but with the inclusion of a count at Coalpit Lane at SES1 and AP1 ES. The following section describes the traffic survey data commissioned to collect this data.

3.2 Traffic survey data commission

3.2.1 MWJV commissioned a programme of traffic count surveys in 2017/2018 to support the assessment of the original scheme.

3.2.2 Traffic count surveys have been used from different years and months to update the base year model. The traffic counts have been factored to June 2018 to develop a consistent dataset. Figure 3 shows the location of traffic surveys.

Figure 3: Location of traffic counts (MWJV survey commission)



4 Model development

4.1 Overview

4.1.1 For the SES1 and AP1 ES, a review of base year model traffic flows identified that there was scope to undertake some localised improvements to the traffic model in order to provide a more robust assessment in the AP1 revised scheme area of interest.

4.1.2 For both hybrid Bill and the SES1 and AP1 ES, the 2014 base year model has been updated to a 2018 (June) base year model by MWJV using traffic count survey data that was collected between November 2017 and March 2020 (prior to COVID-19). Traffic count data has been normalised to June 2018 traffic conditions using local count data.

4.1.3 This localised model update has focussed on the improvement to the validation of traffic flows at hybrid Bill and covering the AP1 revised scheme area of interest.

4.1.4 The model time periods represent the following peak hours, when the highest traffic volumes and most significant impacts are expected to occur:

- AM peak hour - 08:00–09:00; and
- PM peak hour - 17:00–18:00.

4.1.5 The model time periods were converted from an average hour to a peak hour by using local traffic data.

4.2 Transport supply

4.2.1 A review of the highway network detail and attributes has been completed for the model area that is included in the Wimboldsley to Lostock Gralam area (MA02).

4.2.2 The following network attributes have been reviewed and checked:

- links: distance, speeds, capacity, bus lanes, traffic regulation orders;
- junctions: type; turn saturation flows, capacity, and lane utilisation;
- traffic signal control: timings, phasing, and staging; and
- routes: minimum cost paths.

4.2.3 The review highlighted that there is a good level of detailed highway network representation within the study area, and that this compared well with local datasets.

4.2.4 Network coding changes were implemented for the AP1 revised scheme for some roundabout junctions in the model simulation area to improve representation of junction queues and delays. This was at the locations listed below:

- A54 Holmes Chapel Road/Pochin Way;
- A533 Booth Lane/Middlewich Eastern Bypass (affects future year only);

- A533 Bostock Road/Road One; and
- B5309 Centurian Way/Pennymoor Drive.

4.2.5 In addition for the SES1 and AP1 ES, Coalpit Lane was included in the model network in order to provide additional information on likely scheme impacts.

4.2.6 The generalised cost values (PPM/PPK) for model assignment have also been updated to reflect the latest values from the DfT TAG databook (version: July 2020).

4.2.7 The model includes a sufficiently detailed level of network infrastructure to support Transport Assessment.

4.3 Transport demand

4.3.1 The original Winsford and Middlewich Model includes a detailed representation of spatial demand. The model zone system contains 207 model zones and accounts for future land use development zones.

4.3.2 To account for the Crewe North Rolling Stock Depot, an additional zone was added to enable a more accurate representation of future demand, giving 208 modelled zones for the AP1 revised scheme.

4.3.3 At hybrid Bill, the demand matrices were adjusted from 2014 to 2018 by carrying out an interpolation between base and 2030 future year matrices. For both the hybrid Bill and the SES1 and AP1 ES, this interpolated 2018 matrix has then been subject to matrix estimation using the available 2018 count data; and a localised traffic flow calibration exercise has been carried out to improve the correlation between observed and modelled traffic flows within the local areas of interest.

4.3.4 The count data collected from the traffic survey data commission in 2017/2018 has been applied in matrix estimation in the same way at both hybrid Bill and the SES1 and AP1 ES, but with an additional count included on Coalpit Lane for the AP1 revised scheme.

5 Model performance

5.1 Overview

5.1.1 This section of the report focusses on the performance of the 2018 base model for the AP1 revised scheme, as produced by MWJV against observed traffic flow data.

5.1.2 The prior trip matrix assignment is the model assignment before matrix estimation is applied. This uses an interpolated parent model matrix adjusted to the HS2 zone system with an updated network that corresponds to HS2 base year. The updated network also includes revisions identified following a network review.

5.1.3 Matrix estimation uses the prior matrix and updated network mentioned above and creates an updated matrix to match count data. The post trip matrix assignment is the model assignment using this updated matrix and the same updated network used in prior assignments.

5.1.4 It is the post matrix assignment that is taken forward and used in the Transport Assessment.

5.2 Traffic flow

5.2.1 Observed and modelled traffic flows have been compared for the count site locations within the Wimboldsley to Lostock Gralam area (MA02). In total, 121 individual link counts by direction have been compared.

5.2.2 Table 3 and Table 4 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the prior matrix assignment. The comparison shows that both time periods fall below the DfT TAG individual link count criteria of greater than 85 percent of comparisons achieving the flow or GEH criteria.

Table 3: AP1 Winsford and Middlewich Model individual link flow – total all vehicle – prior

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	121	56	46%	51	42%	61	50%
PM peak hour	121	73	60%	61	50%	73	60%

Table 4: AP1 Winsford and Middlewich Model – individual link flow – car vehicle type – prior

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	121	61	50%	53	44%	63	52%
PM peak hour	121	67	55%	56	46%	70	58%

5.2.3 Figure 4 and Figure 5 show the locations of the link counts and the respective AM and PM peak hour model performance for the prior matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.4 Table 5 and Table 6 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the post matrix estimation assignment. The comparison shows that both time periods meet the DfT TAG individual link count criteria of greater than 85% of comparisons achieving flow and GEH criteria.

5.2.5 The results show an overall improvement on the results at hybrid Bill.

Table 5: AP1 Winsford and Middlewich Model – individual link flow – total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	121	109	90%	107	88%	111	92%
PM peak hour	121	114	94%	109	90%	114	94%

Table 6: AP1 Winsford and Middlewich Model – individual link flow – car vehicle type – post ME

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	121	109	90%	106	88%	111	92%
PM peak hour	121	113	93%	108	89%	113	93%

5.2.6 Figure 6 and Figure 7 show the locations of the link counts and the respective AM and PM peak hour model performance for the post matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.7 Reference should be made to Table 11 and Table 12, Appendix A, which presents supporting details of the individual link flow performance for AM and PM time periods, post matrix estimation.

Figure 4: AM peak hour – traffic flow performance – prior

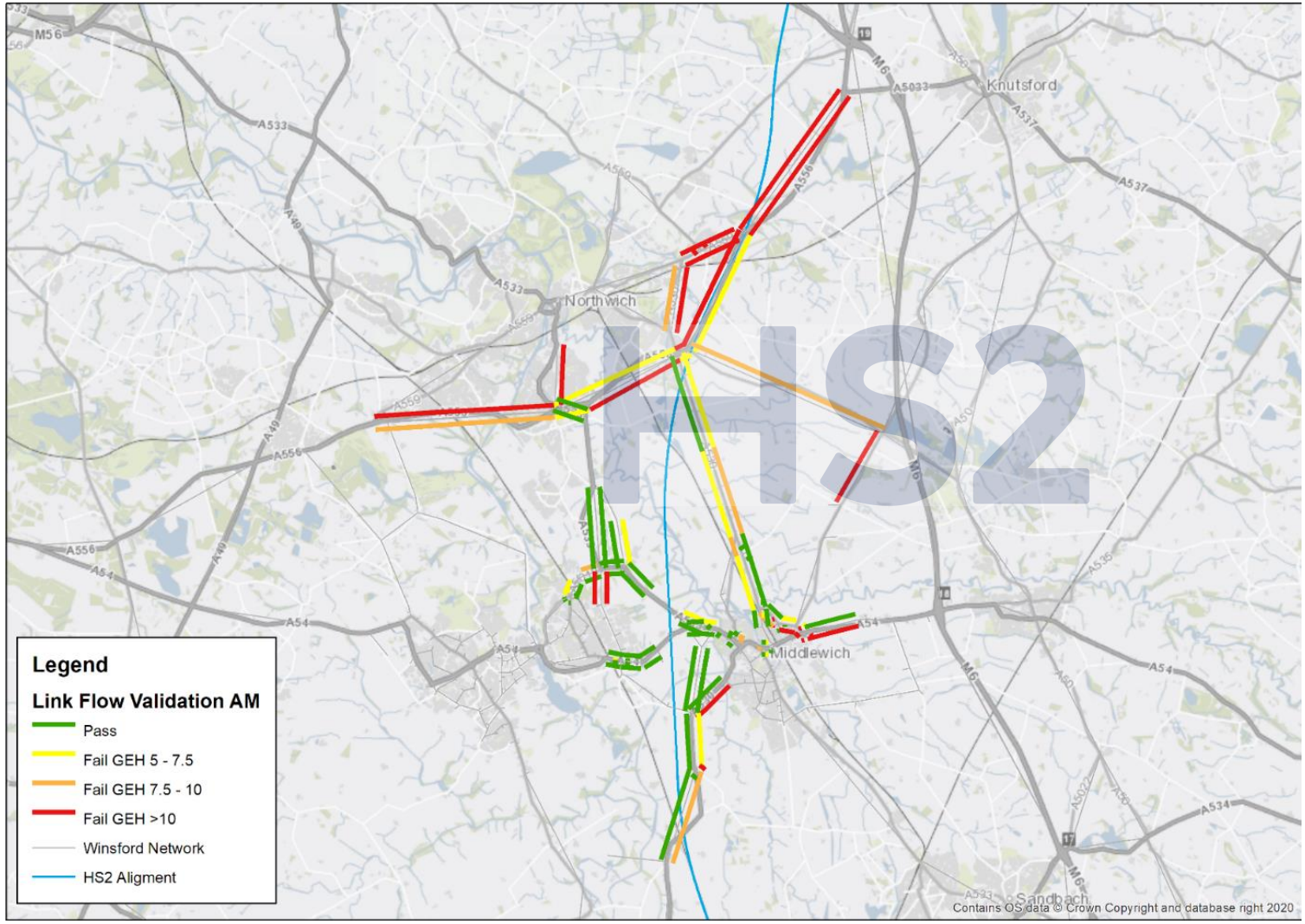


Figure 5: PM peak hour – traffic flow performance – prior

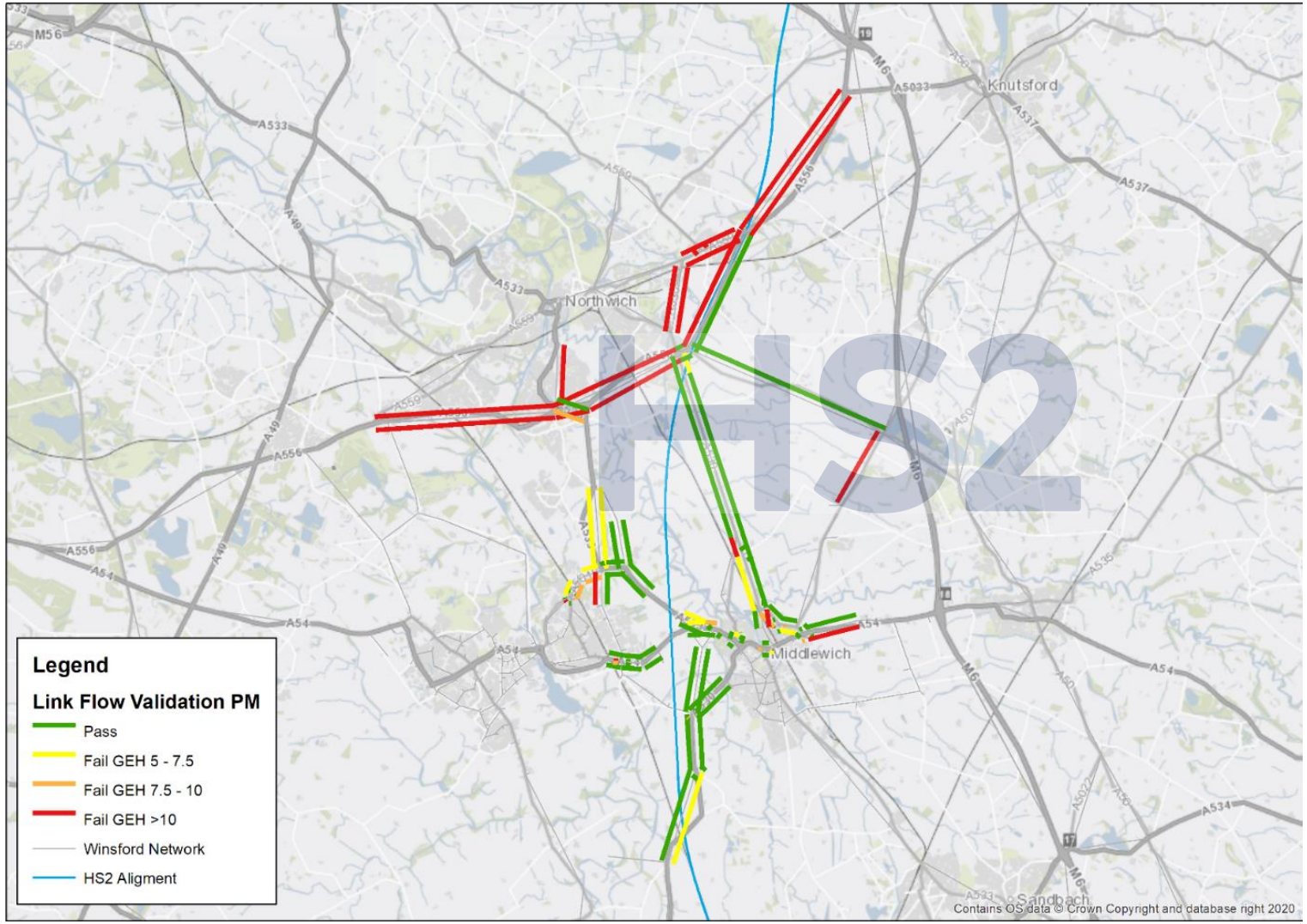


Figure 6: AM peak hour – traffic flow performance – post

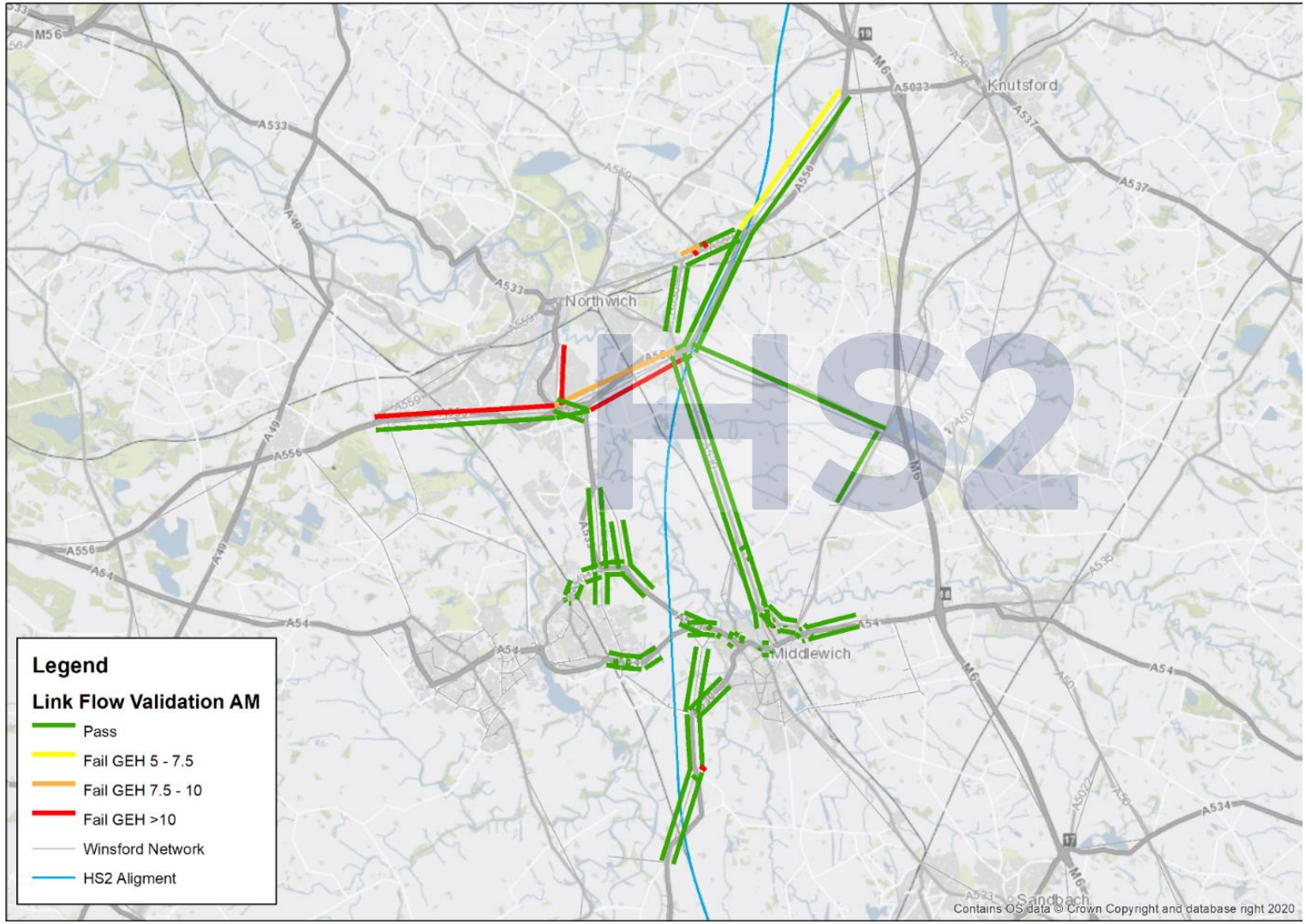
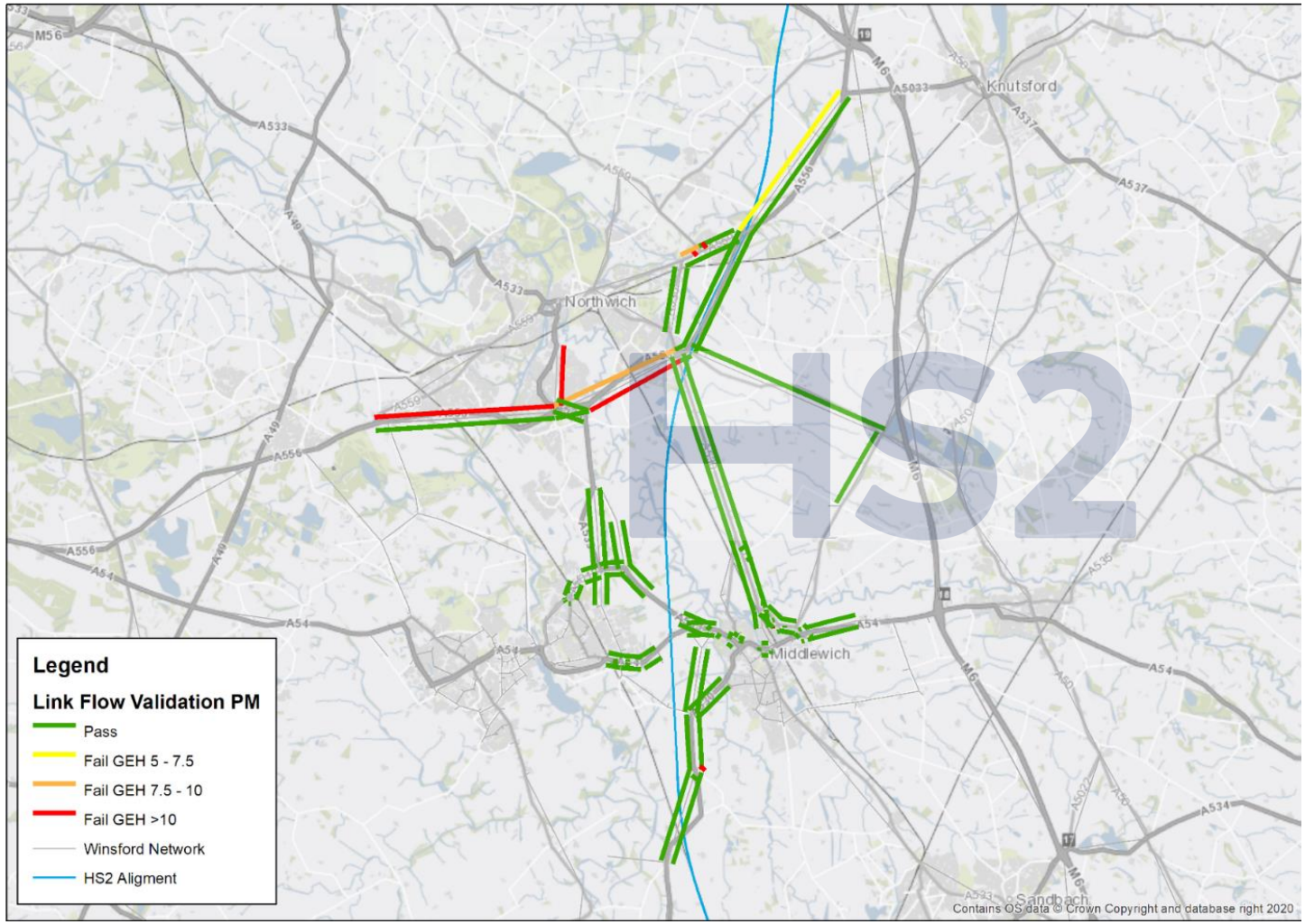


Figure 7: PM peak hour – traffic flow performance – post



6 Model convergence

6.1.1 Achieving a suitable level of model convergence is necessary to provide stable, consistent, and robust model results and to differentiate between real changes and those associated with differing degrees of convergence.

6.1.2 DfT TAG provides guidance on highway model convergence with recommendations on acceptable variations in link flows and costs between iterations helping to ensure the model is sufficiently stable.

6.1.3 Table 7 presents a summary of the 2018 base year highway model convergence statistics for the AP1 revised scheme by time period. Both models converge satisfactorily.

Table 7: AP1 Winsford and Middlewich Model 2018 baseline model convergence

Criteria	Loop	Target	AM	PM
Flow change	N-3	> 98%	99.5	99.6
	N-2		99.5	99.6
	N-1		99.4	99.6
	N		99.6	99.6
Delays change	N-3	> 98%	99.7	99.7
	N-2		99.8	99.6
	N-1		99.8	99.6
	N		99.9	99.6
Delta		< 0.1%	0.0375/20	0.0420/20
% GAP		< 0.1%	0.045	0.045

7 Summary and conclusions

7.1.1 For the assessment of the AP1 revised scheme , the Winsford and Middlewich Model highway assignment 2014 base year, supplied by CWAC, has been further developed for the SES1 and AP1 ES. This includes refinement of the network coding and inclusion of Coalpit Lane to improve model performance in key areas of interest and use of the same count data applied at hybrid Bill plus a count on Coalpit Lane. The count data has been applied to a 2018 uplifted matrix during model calibration for matrix estimation.

7.1.2 Presented below is a summary of the individual link flow model performance for all modelled time periods for the SES1 and AP1 ES. The comparison shows that both time periods exceed the 85 percent threshold of individual links meeting either the DfT TAG flow range or GEH less than five criteria.

Table 8: AP1 Winsford and Middlewich Model – individual link flow – total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	121	109	90%	107	88%	111	92%
PM peak hour	121	114	94%	109	90%	114	94%

7.1.3 Both the AM and PM models converge satisfactorily.

7.1.4 In conclusion, the updated Winsford and Middlewich Model provides a reliable forecasting base and forms a suitable tool for the assessment of HS2 construction and operational impacts within the High Speed Rail (Crewe – Manchester) area of interest.

8 List of acronyms

Table 9: List of acronyms

Acronym	Description
ATC	Automatic Traffic Count
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
ES	Environmental Statement
GEH	Geoffrey Havers (statistic)
HGV	Heavy Goods Vehicle
JTC	Junction Turning Count
LMVR	Local Model Validation Report
MCC	Manual Classified Count
MPR	Model Performance Report
PPM	Pence Per Mile
PPK	Pence Per Kilometre
TA	Transport Assessment

9 References

Department for Transport (2020), *TAG unit M1.2 Data Sources and Surveys.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m1-2-data-sources-and-surveys.

Department for Transport (2020), *TAG unit M3.1 Highway Assignment Modelling.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m3-1-highway-assignment-modelling.

10 Appendix A – Model performance

Individual link flow performance

Table 11: AP1 Winsford and Middlewich Model – AM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A54 Middlewich Road	West of Clive Lane	WB	473	87	30	590	472	73	53	598	8	1%	0.32	✓	✓	✓
Bostock Road	North of Wharton Road	SB	563	113	38	714	550	82	55	687	-26	-4%	1.00	✓	✓	✓
Bostock Road	North of Wharton Road	NB	880	124	41	1045	905	124	79	1108	63	6%	1.93	✓	✓	✓
A5018 Bostock Road	West of Road One	WB	595	97	31	723	582	94	61	737	14	2%	0.51	✓	✓	✓
A5018 Bostock Road	West of Road One	EB	955	117	31	1103	919	117	76	1112	9	1%	0.27	✓	✓	✓
A533	North of Bostock Road	SB	701	98	51	849	688	106	79	873	23	3%	0.79	✓	✓	✓
A533 Bostock Road	East of Road One	WB	114	22	14	151	116	22	19	158	7	5%	0.60	✓	✓	✓
Road One	South of Bostock Road	NB	179	77	32	287	178	13	20	211	-76	-26%	4.82	✓	✓	✓
A533 Bostock Road	East of Road One	EB	98	24	13	135	108	23	23	155	20	15%	1.65	✓	✓	✓
Bostock Road	East of Road One	WB	111	22	15	148	113	22	19	154	6	4%	0.50	✓	✓	✓
Road One	South of Bostock Road	SB	499	67	24	589	476	36	29	541	-48	-8%	2.02	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Road One	North of A54	NB	507	70	29	607	508	61	51	620	14	2%	0.56	✓	✓	✓
Road One	North of A54	SB	130	65	35	230	132	17	33	182	-49	-21%	3.38	✓	✓	✓
A54 Middlewich Road	East of Clive Lane	WB	369	63	35	467	341	63	52	456	-12	-3%	0.55	✓	✓	✓
Clive Lane	South of A54	NB	367	46	23	436	389	46	38	473	37	9%	1.76	✓	✓	✓
A54 Middlewich Road	West of Clive Lane	EB	564	70	31	665	566	93	56	715	50	7%	1.90	✓	✓	✓
Bostock Road	East of Road One	EB	93	23	13	129	95	23	23	141	12	9%	1.03	✓	✓	✓
London Road	North of A533	SB	295	22	5	322	297	27	12	337	15	5%	0.82	✓	✓	✓
A533 Bostock Road	South of London Road	NB	382	49	17	447	385	49	31	465	18	4%	0.83	✓	✓	✓
A533 Bostock Road	South of London Road	SB	378	41	17	436	378	50	35	462	26	6%	1.25	✓	✓	✓
A533 Bostock Road	North of A54	NB	285	39	15	339	283	39	27	349	9	3%	0.51	✓	✓	✓
A533 Bostock Road	North of A54	SB	279	43	19	341	272	43	32	347	6	2%	0.32	✓	✓	✓
A54 Chester Road	East of Bostock Road	WB	631	98	50	779	604	98	76	778	-1	0%	0.04	✓	✓	✓
A54 Middlewich Road	West of Bostock Road	EB	272	56	36	365	271	57	49	377	12	3%	0.62	✓	✓	✓
A54 Chester Road	East of Bostock Road	EB	550	99	55	705	543	100	81	724	19	3%	0.72	✓	✓	✓
Coalpit Lane	South of Chester Road	NB	25	3	1	28	25	0	0	25	-3	-12%	0.63	✓	✓	✓
Coalpit Lane	South of Chester Road	SB	6	2	0	7	6	0	0	6	-1	-15%	0.43	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A54 Middlewich Road	West of Bostock Road	WB	347	58	36	442	322	58	50	429	-12	-3%	0.59	✓	✓	✓
Middlewich Road	North of Beckett Avenue	WB	215	168	37	421	322	58	50	430	10	2%	0.46	✓	✓	✓
A54 Middlewich Road	East of Clive Lane	EB	281	61	36	378	269	57	49	374	-4	-1%	0.18	✓	✓	✓
Nantwich Road	East of Clivegreen Lane	WB	494	57	8	560	520	56	30	605	46	8%	1.90	✓	✓	✓
Nantwich Road	South of Clivegreen Lane	NB	787	105	32	924	787	104	66	957	33	4%	1.08	✓	✓	✓
Nantwich Road	East of Clivegreen Lane	EB	481	59	6	546	481	65	33	578	32	6%	1.34	✓	✓	✓
Nantwich Road	West of Brynlow Drive	SB	499	62	11	572	521	61	32	613	41	7%	1.67	✓	✓	✓
Nantwich Road	South of Clivegreen Lane	SB	667	86	30	784	644	80	54	778	-6	-1%	0.20	✓	✓	✓
School Lane	North of Lea Drive	WB	95	12	1	109	85	6	5	96	-13	-12%	1.29	✓	✓	✓
A530 Nantwich Road	South of Clivegreen Lane	NB	725	97	25	846	725	99	62	885	39	5%	1.32	✓	✓	✓
School Lane	North of Lea Drive	EB	122	13	1	136	25	6	3	33	-103	-76%	11.20	×	×	×
Middlewich Road	North of Beckett Avenue	EB	313	104	26	444	272	57	49	377	-67	-15%	3.29	✓	✓	✓
A54 Chester Road	West of Croxton Lane	NWB	632	96	47	775	604	96	76	776	1	0%	0.03	✓	✓	✓
A54 Chester Road	West of Croxton Lane	SEB	623	102	60	785	620	102	81	803	17	2%	0.61	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A530 Croxton Lane	North of A54	SB	388	59	10	458	395	47	20	463	5	1%	0.24	✓	✓	✓
A54 Chester Road	East of Croxton Lane	NWB	795	119	45	959	792	119	93	1004	45	5%	1.45	✓	✓	✓
A530 Croxton Lane	North of A54	NB	250	36	4	290	271	24	18	314	24	8%	1.36	✓	✓	✓
A530 King Street	North of Croxton Lane	SB	472	65	32	568	478	81	55	614	46	8%	1.88	✓	✓	✓
B5309 King Street	South of Croxton Lane	NB	442	63	37	542	404	61	54	519	-22	-4%	0.97	✓	✓	✓
A54 Chester Road	East of Croxton Lane	SEB	925	148	65	1137	922	146	101	1169	31	3%	0.92	✓	✓	✓
Nantwich Road	West of Brynlow Drive	NB	454	64	9	527	480	66	34	580	53	10%	2.27	✓	✓	✓
A54 St Michaels Way	West of Leadsmithy Street	EB	754	131	68	952	757	137	97	991	39	4%	1.25	✓	✓	✓
A54 Kinderton Street	East of Leadsmithy Street	WB	413	101	62	576	412	101	87	600	24	4%	0.99	✓	✓	✓
Leadsmithy Street	South of A54	NB	688	72	38	798	661	52	38	752	-47	-6%	1.67	✓	✓	✓
Leadsmithy Street	South of A54	SB	319	79	38	437	319	66	40	425	-12	-3%	0.57	✓	✓	✓
A54 Kinderton Street	East of Leadsmithy Street	EB	949	133	73	1155	911	134	109	1155	0	0%	0.01	✓	✓	✓
Holmes Chapel Road	North of Pochin Way	WB	387	86	69	542	386	86	79	551	9	2%	0.40	✓	✓	✓
Holmes Chapel Road	North of Pochin Way	EB	822	150	85	1056	775	117	113	1004	-52	-5%	1.61	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Centurion Way	North of Pochin Way	EB	404	43	53	500	404	43	56	503	3	1%	0.13	✓	✓	✓
Holmes Chapel Road	Northeast of Pochin Way	WB	433	92	97	623	430	91	110	631	9	1%	0.36	✓	✓	✓
Centurion Way	North of Pochin Way	WB	500	76	52	628	499	76	74	649	21	3%	0.84	✓	✓	✓
Holmes Chapel Road	northeast of Pochin Way	EB	599	114	113	826	589	113	124	826	0	0%	0.02	✓	✓	✓
Pochin Way	South of Centurion Wat	SB	188	29	16	233	240	13	18	271	38	16%	2.39	✓	✓	✓
B5309 Centurian Way	East of King Street	SB	202	36	11	249	202	36	29	267	18	7%	1.13	✓	✓	✓
B5309 Centurian Way	East of King Street	NB	306	64	39	408	306	37	45	388	-19	-5%	0.98	✓	✓	✓
B5309	South of King Street	EB	261	34	26	320	262	36	35	332	12	4%	0.68	✓	✓	✓
King Street	North of B5309	SB	227	38	25	290	228	38	36	302	12	4%	0.71	✓	✓	✓
B5309	South of King Street	WB	243	37	35	316	242	37	43	322	6	2%	0.35	✓	✓	✓
B5309 King Street	South of Croxton Lane	SB	261	39	25	325	247	39	36	322	-3	-1%	0.17	✓	✓	✓
Yatehouse Lane	East of King Street	WB	39	5	0	45	39	1	0	40	-4	-10%	0.69	✓	✓	✓
King Street	North of B5309	NB	398	59	35	492	373	62	54	489	-3	-1%	0.14	✓	✓	✓
Yatehouse Lane	East of King Street	EB	24	5	1	30	27	1	1	30	0	0%	0.01	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A54 St Michaels Way	West of Leadsmithy Street	WB	586	92	57	735	593	90	72	755	20	3%	0.74	✓	✓	✓
Clive Lane	South of A54	SB	169	26	22	216	178	28	27	232	16	7%	1.08	✓	✓	✓
A530 Nantwich Road	South of Clivegreen Lane	SB	571	73	23	667	642	76	51	769	102	15%	3.81	✓	×	✓
London Road	North of A533	NB	281	31	3	314	285	29	12	326	12	4%	0.66	✓	✓	✓
A533	North of Bostock Road	NB	730	120	53	903	731	104	82	917	13	1%	0.44	✓	✓	✓
A530 King Street	North of Croxton Lane	NB	632	89	45	765	627	85	64	776	10	1%	0.36	✓	✓	✓
B5309_King Street	King Street (S), Arm C Exit	SB	51	12	3	66	51	7	3	61	-5	-8%	0.67	✓	✓	✓
B5309_King Street	King Street (S), Arm C Approach	NB	244	28	2	273	216	29	13	258	-15	-6%	0.93	✓	✓	✓
A5018_B5356 Roundabout	Collingtree Avenue (N), Arm A Exit	NB	38	12	1	51	38	0	0	38	-13	-25%	1.91	✓	✓	✓
A5018_B5356 Roundabout	Collingtree Avenue (N), Arm A Approach	SB	140	19	1	160	140	19	8	167	7	4%	0.54	✓	✓	✓
A5018_B5356 Roundabout	B5355 Wharton Road (S), Arm C Exit	SB	178	36	10	224	152	15	9	176	-49	-22%	3.45	✓	✓	✓
A5018_B5356 Roundabout	B5355 Wharton Road (S), Arm C Approach	NB	253	40	9	302	254	40	20	314	12	4%	0.69	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A5018_B5356 Roundabout	A5018 Wharton Park Road (W), Arm D Exit	WB	479	83	30	591	470	83	53	606	15	2%	0.60	✓	✓	✓
A5018_B5356 Roundabout	A5018 Wharton Park Road (W), Arm D Approach	EB	619	84	29	731	621	81	58	759	28	4%	1.03	✓	✓	✓
A556 London Road	A556 (E), Arm B Exit	EB	1471	131	63	1664	1100	119	91	1309	-355	-21%	9.21	×	×	×
A556 London Road	A556 (E), Arm B Approach	WB	423	88	35	547	428	88	61	577	30	6%	1.28	✓	✓	✓
A556 London Road	A556 (W), Arm D Exit	WB	844	126	44	1013	708	112	78	897	-116	-11%	3.74	✓	✓	✓
A556 London Road	A556 (W), Arm D Approach	EB	1564	114	45	1723	992	76	53	1121	-602	-35%	15.98	×	×	×
A530 - Davenham Road - Crowder's Lane	A530 (N), Arm A Exit	NB	519	77	37	632	514	86	60	659	27	4%	1.06	✓	✓	✓
A530 - Davenham Road - Crowder's Lane	A530 (N), Arm A Approach	SB	457	84	45	586	461	82	51	595	9	2%	0.38	✓	✓	✓
A530 - Davenham Road - Crowder's Lane	A530 (S), Arm C Exit	SB	455	83	34	572	473	82	55	609	37	6%	1.50	✓	✓	✓
A530 - Davenham Road - Crowder's Lane	A530 (S), Arm C Approach	NB	611	94	39	744	605	85	65	755	11	1%	0.40	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Kingsmead - London Road	London Road (N), Arm A Approach	SB	409	34	7	450	658	55	29	742	292	65%	11.95	×	×	×
Kingsmead - London Road	A553 (E), Arm B Exit	EB	608	63	24	695	502	55	29	587	-109	-16%	4.29	✓	×	✓
Kingsmead - London Road	A553 (E), Arm B Approach	WB	875	114	54	1044	878	113	90	1080	37	4%	1.12	✓	✓	✓
A556 - A530 Roundabout	A556 (E), Arm B Exit	EB	1340	172	78	1589	1323	174	131	1628	38	2%	0.96	✓	✓	✓
A556 - A530 Roundabout	A556 (E), Arm B Approach	WB	1157	170	100	1427	1146	174	142	1462	35	2%	0.91	✓	✓	✓
A556 - A530 Roundabout	A556 (W), Arm D Exit	WB	1284	144	63	1491	788	144	111	1043	-448	-30%	12.59	×	×	×
A556 - B5082 Penny's Lane	B5082 Penny's Lane (S), Arm B Exit	SB	368	49	9	426	368	50	28	446	20	5%	0.95	✓	✓	✓
Station Road - Hall Lane	A559 Hall Lane (N), Arm A Exit	NB	272	56	27	354	0	0	0	0	-354	-100%	26.61	×	×	×
Station Road - Hall Lane	A559 Hall Lane (N), Arm A Approach	SB	392	64	32	487	0	0	0	0	-487	-100%	31.22	×	×	×
Station Road - Hall Lane	A559 Manchester Road (E), Arm B Exit	EB	433	71	29	533	433	53	45	531	-2	0%	0.10	✓	✓	✓
Station Road - Hall Lane	A559 Manchester Road (E), Arm B Approach	WB	329	48	30	408	329	48	47	424	16	4%	0.80	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Station Road - Hall Lane	A559 Manchester Road (W), Arm D Exit	WB	569	78	18	665	569	78	45	692	27	4%	1.03	✓	✓	✓
Station Road - Hall Lane	A559 Manchester Road (W), Arm D Approach	EB	492	89	16	597	666	89	50	805	208	35%	7.86	×	×	×
A559 - A556	A559 Manchester Road (E), Arm A Exit	EB	1239	159	73	1472	1428	170	127	1725	254	17%	6.34	×	×	×
A559 - A556	A559 Manchester Road (E), Arm A Approach	WB	1105	204	98	1407	1225	203	158	1586	178	13%	4.61	✓	✓	✓
Griffiths Road	Cottage Close (S) to A559 Manchester Road (N)	NB	238	43	14	296	238	43	19	300	4	1%	0.22	✓	✓	✓
Griffiths Road	A559 Manchester Road (N) to Cottage Close (S)	SB	310	47	18	375	226	38	17	281	-94	-25%	5.22	×	✓	✓
Chester Road	Birches Lane (S) to A556 Manchester Road (N)	NB	941	105	71	1116	995	130	108	1233	117	11%	3.43	✓	✓	✓
Chester Road	A556 Manchester Road (N) to Birches Lane (S)	SB	940	154	89	1183	943	154	130	1228	45	4%	1.30	✓	✓	✓
B5081 / Moss Lane / Drakelow Lane	B5081 (N) Exit (VEH)	NB	236	26	7	269	235	27	18	280	10	4%	0.63	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Centurion Way Exit (VEH)	EB	410	45	15	470	311	40	31	382	-88	-19%	4.26	✓	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Centurion Way Entry (VEH)	WB	374	90	55	519	343	54	61	458	-61	-12%	2.77	✓	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	White Park Close Exit (VEH)	SB	52	5	0	57	76	19	16	112	55	97%	5.98	×	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	White Park Close Entry (VEH)	NB	214	5	0	218	0	0	0	0	-218	-100%	20.90	×	×	×
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Pennymoor Drive Exit (VEH)	WB	18	1	0	19	0	0	0	0	-19	-100%	6.16	×	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Pennymoor Drive Entry (VEH)	EB	69	0	0	69	149	6	3	158	89	129%	8.34	×	✓	✓
Coal Pit Lane	Coal Pit Lane	SB	110	6	2	118	111	6	3	120	2	1%	0.15	✓	✓	✓
Coal Pit Lane	Coal Pit Lane	NB	104	9	3	117	106	10	4	120	3	3%	0.29	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A530_Clive Green Lane	Clive Green Lane (W), Arm C Exit	WB	453	53	23	529	477	55	42	573	45	8%	1.90	✓	✓	✓
A530_Clive Green Lane	Clive Green Lane (W), Arm C Approach	EB	286	40	19	345	296	40	32	368	23	7%	1.22	✓	✓	✓

Directions: NB = North-bound, EB = east-bound, SB = south-bound, WB = west-bound

Table 12: AP1 Winsford and Middlewich Model – PM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A54 Middlewich Road	West of Clive Lane	WB	784	75	18	877	732	73	32	837	-39	-4%	1.34	✓	✓	✓
Bostock Road	North of Wharton Road	SB	948	89	15	1052	962	83	45	1091	39	4%	1.20	✓	✓	✓
Bostock Road	North of Wharton Road	NB	623	57	15	695	628	48	27	703	8	1%	0.30	✓	✓	✓
A5018 Bostock Road	West of Road One	WB	929	86	24	1039	944	83	54	1081	43	4%	1.31	✓	✓	✓
A5018 Bostock Road	West of Road One	EB	622	63	15	700	645	63	35	743	43	6%	1.59	✓	✓	✓
A533	North of Bostock Road	SB	767	61	24	851	724	61	45	830	-21	-2%	0.71	✓	✓	✓
A533 Bostock Road	East of Road One	WB	98	13	10	120	98	4	9	112	-8	-7%	0.79	✓	✓	✓
Road One	South of Bostock Road	NB	597	45	19	661	598	44	28	670	8	1%	0.31	✓	✓	✓
A533 Bostock Road	East of Road One	EB	135	9	8	152	134	10	10	155	2	2%	0.20	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Bostock Road	East of Road One	WB	93	11	10	114	71	4	9	84	-30	-26%	3.01	✓	✓	✓
Road One	South of Bostock Road	SB	196	26	9	231	190	24	14	227	-3	-1%	0.21	✓	✓	✓
Road One	North of A54	NB	240	24	28	291	223	11	22	256	-35	-12%	2.13	✓	✓	✓
Road One	North of A54	SB	452	37	12	502	397	35	29	461	-41	-8%	1.86	✓	✓	✓
A54 Middlewich Road	East of Clive Lane	WB	330	40	16	387	333	40	21	393	7	2%	0.33	✓	✓	✓
Clive Lane	South of A54	NB	455	46	23	524	385	40	31	456	-68	-13%	3.07	✓	✓	✓
A54 Middlewich Road	West of Clive Lane	EB	427	44	21	492	429	44	20	493	1	0%	0.04	✓	✓	✓
Bostock Road	East of Road One	EB	133	10	8	151	124	10	10	144	-7	-5%	0.60	✓	✓	✓
London Road	North of A533	SB	358	17	2	378	339	17	7	363	-15	-4%	0.77	✓	✓	✓
A533 Bostock Road	South of London Road	NB	433	48	10	492	421	41	25	487	-4	-1%	0.20	✓	✓	✓
A533 Bostock Road	South of London Road	SB	468	27	10	506	462	27	17	506	1	0%	0.03	✓	✓	✓
A533 Bostock Road	North of A54	NB	282	42	9	333	268	33	22	322	-10	-3%	0.55	✓	✓	✓
A533 Bostock Road	North of A54	SB	278	21	10	309	290	21	15	326	17	5%	0.95	✓	✓	✓
A54 Chester Road	East of Bostock Road	WB	588	76	23	688	579	73	43	695	7	1%	0.27	✓	✓	✓
A54 Middlewich Road	West of Bostock Road	EB	263	30	22	315	298	43	31	372	57	18%	3.07	✓	✓	✓
A54 Chester Road	East of Bostock Road	EB	541	51	31	623	588	64	46	698	75	12%	2.93	✓	✓	✓
Coalpit Lane	South of Chester Road	NB	21	3	1	25	21	0	0	21	-4	-15%	0.80	✓	✓	✓
Coalpit Lane	South of Chester Road	SB	4	0	2	6	4	0	0	4	-2	-29%	0.75	✓	✓	✓
A54 Middlewich Road	West of Bostock Road	WB	307	35	15	357	312	40	21	372	16	4%	0.82	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Middlewich Road	North of Beckett Avenue	WB	179	153	17	348	334	42	22	398	50	14%	2.58	✓	✓	✓
A54 Middlewich Road	East of Clive Lane	EB	382	42	24	447	330	41	30	402	-46	-10%	2.22	✓	✓	✓
Nantwich Road	East of Clivegreen Lane	WB	450	45	3	498	437	32	16	485	-13	-3%	0.57	✓	✓	✓
Nantwich Road	South of Clivegreen Lane	NB	946	55	20	1022	934	80	49	1063	41	4%	1.26	✓	✓	✓
Nantwich Road	East of Clivegreen Lane	EB	555	48	6	609	546	39	19	605	-5	-1%	0.19	✓	✓	✓
Nantwich Road	West of Brynlow Drive	SB	456	24	4	483	437	32	17	486	3	1%	0.15	✓	✓	✓
Nantwich Road	South of Clivegreen Lane	SB	674	30	8	712	644	56	27	728	16	2%	0.58	✓	✓	✓
School Lane	North of Lea Drive	WB	90	14	2	105	31	3	2	36	-69	-66%	8.27	×	✓	✓
A530 Nantwich Road	South of Clivegreen Lane	NB	869	73	27	969	911	79	48	1038	69	7%	2.17	✓	✓	✓
School Lane	North of Lea Drive	EB	85	11	1	96	84	6	3	93	-4	-4%	0.37	✓	✓	✓
Middlewich Road	North of Beckett Avenue	EB	311	137	23	471	301	43	31	375	-96	-20%	4.66	✓	✓	✓
A54 Chester Road	West of Croxton Lane	NWB	588	67	14	669	584	76	44	704	35	5%	1.34	✓	✓	✓
A54 Chester Road	West of Croxton Lane	SEB	612	72	31	714	608	65	46	719	5	1%	0.18	✓	✓	✓
A530 Croxton Lane	North of A54	SB	448	51	5	503	477	39	19	535	32	6%	1.41	✓	✓	✓
A54 Chester Road	East of Croxton Lane	NWB	860	86	19	966	841	102	56	998	33	3%	1.04	✓	✓	✓
A530 Croxton Lane	North of A54	NB	352	28	6	386	342	32	14	388	2	1%	0.10	✓	✓	✓
A530 King Street	North of Croxton Lane	SB	632	48	20	701	653	64	42	759	58	8%	2.14	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
B5309 King Street	South of Croxton Lane	NB	603	56	43	702	619	54	45	717	15	2%	0.58	✓	✓	✓
A54 Chester Road	East of Croxton Lane	SEB	980	114	35	1128	1000	97	63	1160	32	3%	0.95	✓	✓	✓
Nantwich Road	West of Brynlow Drive	NB	550	33	7	590	546	40	19	605	15	3%	0.62	✓	✓	✓
A54 St Michaels Way	West of Leadsmithy Street	EB	691	53	32	776	695	53	43	791	15	2%	0.54	✓	✓	✓
A54 Kinderton Street	East of Leadsmithy Street	WB	656	72	22	750	606	70	46	722	-28	-4%	1.02	✓	✓	✓
Leadsmithy Street	South of A54	NB	566	52	16	634	599	49	22	670	36	6%	1.42	✓	✓	✓
Leadsmithy Street	South of A54	SB	553	48	20	622	543	48	31	621	0	0%	0.01	✓	✓	✓
A54 Kinderton Street	East of Leadsmithy Street	EB	619	55	31	705	644	59	42	745	41	6%	1.51	✓	✓	✓
Holmes Chapel Road	North of Pochin Way	WB	326	41	29	396	291	42	39	372	-24	-6%	1.23	✓	✓	✓
Holmes Chapel Road	North of Pochin Way	EB	592	70	37	699	594	71	50	715	16	2%	0.59	✓	✓	✓
Centurion Way	North of Pochin Way	EB	326	43	25	395	304	38	35	378	-17	-4%	0.85	✓	✓	✓
Holmes Chapel Road	Northeast of Pochin Way	WB	385	48	59	491	353	45	56	455	-37	-8%	1.69	✓	✓	✓
Centurion Way	North of Pochin Way	WB	474	43	18	536	494	38	38	570	34	6%	1.45	✓	✓	✓
Holmes Chapel Road	Northeast of Pochin Way	EB	639	83	59	782	647	84	79	809	27	3%	0.96	✓	✓	✓
Pochin Way	South of Centurion Wat	SB	36	7	22	66	59	7	3	69	4	6%	0.47	✓	✓	✓
B5309 Centurian Way	East of King Street	SB	244	22	14	281	243	22	24	289	8	3%	0.49	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
B5309 Centurian Way	East of King Street	NB	370	31	10	411	372	31	28	430	20	5%	0.95	✓	✓	✓
B5309	South of King Street	EB	216	26	21	263	213	22	24	259	-4	-1%	0.23	✓	✓	✓
King Street	North of B5309	SB	276	39	17	332	274	39	31	345	12	4%	0.67	✓	✓	✓
B5309	South of King Street	WB	393	38	16	447	417	31	35	484	36	8%	1.68	✓	✓	✓
B5309 King Street	South of Croxton Lane	SB	260	40	14	315	258	40	31	329	14	5%	0.79	✓	✓	✓
Yatehouse Lane	East of King Street	WB	110	10	1	120	110	0	0	111	-9	-8%	0.84	✓	✓	✓
King Street	North of B5309	NB	501	50	29	581	548	53	45	646	65	11%	2.61	✓	✓	✓
Yatehouse Lane	East of King Street	EB	40	4	1	44	23	1	0	23	-21	-47%	3.56	✓	✓	✓
A54 St Michaels Way	West of Leadsmithy Street	WB	741	74	18	833	689	63	38	790	-43	-5%	1.52	✓	✓	✓
Clive Lane	South of A54	SB	259	27	3	289	252	32	16	301	11	4%	0.65	✓	✓	✓
A530 Nantwich Road	South of Clivegreen Lane	SB	537	53	5	595	568	52	26	646	51	9%	2.05	✓	✓	✓
London Road	North of A533	NB	363	37	1	401	350	37	16	403	3	1%	0.14	✓	✓	✓
A533	North of Bostock Road	NB	797	54	20	871	797	55	40	892	21	2%	0.71	✓	✓	✓
A530 King Street	North of Croxton Lane	NB	783	60	51	895	773	66	50	889	-6	-1%	0.20	✓	✓	✓
B5309_King Street	King Street (S), Arm C Exit	SB	164	22	1	187	162	22	9	193	7	4%	0.50	✓	✓	✓
B5309_King Street	King Street (S), Arm C Approach	NB	163	24	2	189	232	27	12	270	82	43%	5.41	×	✓	✓
A5018_B5356 Roundabout	Collingtree Avenue (N), Arm A Exit	NB	128	19	0	147	128	1	1	130	-17	-12%	1.44	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A5018_B5356 Roundabout	Collingtree Avenue (N), Arm A Approach	SB	67	9	1	77	67	6	3	76	-1	-1%	0.06	✓	✓	✓
A5018_B5356 Roundabout	B5355 Wharton Road (S), Arm C Exit	SB	309	35	5	349	264	35	16	315	-34	-10%	1.89	✓	✓	✓
A5018_B5356 Roundabout	B5355 Wharton Road (S), Arm C Approach	NB	204	23	4	232	203	7	4	214	-17	-8%	1.17	✓	✓	✓
A5018_B5356 Roundabout	A5018 Wharton Park Road (W), Arm D Exit	WB	678	54	11	743	694	53	31	778	35	5%	1.26	✓	✓	✓
A5018_B5356 Roundabout	A5018 Wharton Park Road (W), Arm D Approach	EB	519	44	11	573	527	44	25	596	22	4%	0.93	✓	✓	✓
A556 London Road	A556 (E), Arm B Exit	EB	1052	98	30	1181	955	79	56	1091	-90	-8%	2.67	✓	✓	✓
A556 London Road	A556 (E), Arm B Approach	WB	1499	86	13	1598	1215	73	41	1328	-269	-17%	7.04	×	×	×
A556 London Road	A556 (W), Arm D Exit	WB	1557	88	17	1662	1498	87	48	1633	-29	-2%	0.71	✓	✓	✓
A556 London Road	A556 (W), Arm D Approach	EB	1005	109	18	1132	844	83	50	977	-154	-14%	4.76	✓	✓	✓
A530 - Davenham Road - Crowder's Lane	A530 (N), Arm A Exit	NB	678	75	29	782	667	63	46	775	-6	-1%	0.23	✓	✓	✓
A530 - Davenham Road - Crowder's Lane	A530 (N), Arm A Approach	SB	731	65	27	823	646	68	42	756	-67	-8%	2.40	✓	✓	✓
A530 - Davenham Road - Crowder's Lane	A530 (S), Arm C Exit	SB	696	65	25	785	668	64	42	775	-11	-1%	0.39	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A530 - Davenham Road - Crowder's Lane	A530 (S), Arm C Approach	NB	755	78	24	857	747	66	51	864	7	1%	0.22	✓	✓	✓
Kingsmead - London Road	London Road (N), Arm A Approach	SB	250	17	3	270	662	31	18	711	441	163%	19.92	×	×	×
Kingsmead - London Road	A553 (E), Arm B Exit	EB	513	40	5	558	506	40	23	569	11	2%	0.45	✓	✓	✓
Kingsmead - London Road	A553 (E), Arm B Approach	WB	944	83	17	1045	950	83	47	1080	35	3%	1.08	✓	✓	✓
A556 - A530 Roundabout	A556 (E), Arm B Exit	EB	1288	108	53	1449	1279	114	88	1481	32	2%	0.83	✓	✓	✓
A556 - A530 Roundabout	A556 (E), Arm B Approach	WB	1689	150	38	1877	1720	162	98	1980	104	6%	2.36	✓	✓	✓
A556 - A530 Roundabout	A556 (W), Arm D Exit	WB	1435	121	31	1587	1439	121	76	1636	49	3%	1.22	✓	✓	✓
A556 - B5082 Penny's Lane	B5082 Penny's Lane (S), Arm B Exit	SB	267	20	2	289	267	20	12	299	10	3%	0.57	✓	✓	✓
Station Road - Hall Lane	A559 Hall Lane (N), Arm A Exit	NB	431	48	10	489	0	0	0	0	-489	-100%	31.27	×	×	×
Station Road - Hall Lane	A559 Hall Lane (N), Arm A Approach	SB	308	33	8	349	0	0	0	0	-349	-100%	26.42	×	×	×
Station Road - Hall Lane	A559 Manchester Road (E), Arm B Exit	EB	348	37	10	396	305	37	23	365	-31	-8%	1.57	✓	✓	✓
Station Road - Hall Lane	A559 Manchester Road (E), Arm B Approach	WB	523	36	12	571	451	36	26	512	-59	-10%	2.54	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Station Road - Hall Lane	A559 Manchester Road (W), Arm D Exit	WB	709	57	9	775	758	57	30	844	70	9%	2.44	✓	✓	✓
Station Road - Hall Lane	A559 Manchester Road (W), Arm D Approach	EB	541	60	9	609	541	60	30	631	22	4%	0.86	✓	✓	✓
A559 - A556	A559 Manchester Road (E), Arm A Exit	EB	1115	105	52	1272	1375	129	93	1597	326	26%	8.60	×	×	×
A559 - A556	A559 Manchester Road (E), Arm A Approach	WB	1818	139	40	1998	1827	142	91	2059	62	3%	1.37	✓	✓	✓
Griffiths Road	Cottage Close (S) to A559 Manchester Road (N)	NB	254	17	12	283	254	19	8	282	-2	-1%	0.10	✓	✓	✓
Griffiths Road	A559 Manchester Road (N) to Cottage Close (S)	SB	413	19	13	445	324	24	10	358	-87	-20%	4.35	✓	✓	✓
Chester Road	Birches Lane (S) to A556 Manchester Road (N)	NB	895	77	52	1024	1057	94	79	1231	207	20%	6.16	×	×	×
Chester Road	A556 Manchester Road (N) to Birches Lane (S)	SB	1405	85	37	1527	1413	107	72	1593	66	4%	1.66	✓	✓	✓
B5081 / Moss Lane / Drakelow Lane	B5081 (N) Exit (VEH)	NB	67	5	3	75	129	11	7	147	73	97%	6.89	×	✓	✓
B5039 / Centurion Way / White Park	Centurion Way Exit (VEH)	EB	233	18	13	264	205	18	24	247	-17	-7%	1.09	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
Close / Pennymoor Drive Roundabout																
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Centurion Way Entry (VEH)	WB	514	38	11	563	533	34	30	596	34	6%	1.40	✓	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	White Park Close Exit (VEH)	SB	140	5	0	145	237	19	9	265	120	83%	8.42	×	×	×
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	White Park Close Entry (VEH)	NB	73	2	0	75	0	0	0	0	-75	-100%	12.23	×	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Pennymoor Drive Exit (VEH)	WB	48	3	0	51	0	0	0	0	-51	-100%	10.09	×	✓	✓
B5039 / Centurion Way / White Park Close / Pennymoor Drive Roundabout	Pennymoor Drive Entry (VEH)	EB	25	1	0	26	38	12	8	58	32	122%	4.91	✓	✓	✓
Coal Pit Lane	Coal Pit Lane	SB	143	6	0	148	144	6	3	152	4	2%	0.30	✓	✓	✓
Coal Pit Lane	Coal Pit Lane	NB	114	7	1	122	154	11	5	170	48	39%	3.98	✓	✓	✓
A530_Clive Green Lane	Clive Green Lane (W), Arm C Exit	WB	564	58	22	643	514	55	38	607	-36	-6%	1.46	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or Flow
A530_Clive Green Lane	Clive Green Lane (W), Arm C Approach	EB	339	42	3	383	334	39	19	392	8	2%	0.42	✓	✓	✓

Directions: NB = North-bound, EB = east-bound, SB = south-bound, WB = west-bound, NE = north-west, SE = south-east

Annex F: Model performance report – A500 Crewe Model

Contents

Tables

Figures

1 Introduction

1.1 Hybrid Bill

1.1.1 For the assessment of the Proposed Scheme at hybrid Bill (the original scheme), Mott MacDonald WSP Joint Venture (MWJV) used the A500 Crewe Model to develop forecasts of the Crewe area to assess the impact of the route of the original scheme at both the operational and construction stages.

1.1.2 The local authority, Cheshire East Council (CEC), released copies of the latest available A500 Crewe Model versions (as of June 2020) to High Speed Two (HS2) Ltd.

1.1.3 The A500 Crewe Model has subsequently been updated by HS2 Ltd's transport consultants, MWJV, to include localised improvements within the High Speed Rail (Crewe – Manchester) area of interest. This is described in the A500 Crewe Model hybrid Bill Model Performance Report.

1.1.4 For the purpose of assessment, the route of the original scheme is split into a number of geographical areas referred to as community areas. The A500 Crewe Model, updated for the hybrid Bill, has been utilised to provide an evidence base for the route of the Transport Assessment for the community area referred to as Hough to Walley's Green area (MA01).

1.1.5 Reference should be made to Figure 1 which shows the geographic coverage of strategic transport models that have been utilised for the Transport Assessment.

1.2 Additional Provision 1 Environmental Statement

1.2.1 Additional Provision (AP) amendments are changes to the scheme that include requirements for additional powers in the High Speed Rail (Crewe – Manchester) Bill.

1.2.2 Following the main Environmental Statement (ES), further model development has been undertaken by MWJV. The Baseline and Future Baseline models have been updated for the assessment of the AP1 revised scheme to reflect:

- use of some additional traffic count information, and refinement of network coding to improve model performance in key areas of interest and in response to stakeholder feedback;
- inclusion of recently consented, committed or completed transport schemes and development proposals that have come forward since the models used in the assessment reported in the main ES were developed;
- refinements to future baseline traffic demand to reflect changes to future growth patterns since the models used in the main ES were developed and the release of updated road traffic forecasts by the Department of Transport (DfT);

- the change in the future baseline forecast year from 2046 in the main ES to 2051 at Supplementary Environmental Statement 1 (SES1) and AP1 ES; and
- updates to value of time parameters to reflect the latest release of the DfT's Transport Analysis Guidance (TAG) data book.

1.3 Purpose of this report

1.3.1 This report provides documentation of the model performance review that has been carried out for the HS2 AP1 revised scheme A500 Crewe Model.

1.3.2 The purpose of this report is to provide evidence that this highway assignment model is suitable to support the Transport Assessment of the High Speed Rail (Crewe – Manchester) SES1 and AP1 ES.

1.4 Model framework

1.4.1 The A500 Crewe model framework is comprised of the following models:

- Variable Demand Model (DIADEM);
- Strategic Highway Assignment Model (SATURN); and
- Strategic Rail Assignment Model (VISUM).

1.4.2 For the Transport Assessment, only the strategic highway assignment model has been utilised by MWJV to provide an evidence base.

1.4.3 The A500 Crewe Strategic Highway Assignment Model has been developed within the SATURN model software platform (version: 11.4.06D).

1.4.4 The variable demand model focuses on forecasting overall travel demand with the strategic rail model dealing with rail assignment. Within this area, there is unlikely to be any impacts resulting from the route of the Proposed Scheme on modal shift or on local rail passenger movements. Accordingly, these models were not used and are therefore not described in this report.

1.4.5 The detailed modelled study area covers Crewe and surrounding areas. There is supporting network and zone system detail to provide a representation of the external area supply and demand. Reference should be made to Figure 2.

1.4.6 The original A500 Crewe Model is representative of 2017 base year transport conditions.

1.5 Model development

1.5.1 The A500 Crewe Model has been developed by transport consultants at CEC to provide an evidence base to support the business case for the A500 upgrade scheme between Meremoor Moss roundabout and M6 Junction 16 to dual carriageway standard.

1.6 Model description

1.6.1 The original A500 Crewe Strategic Highway Assignment Model has been developed with the following years:

- 2017 base year;
- 2021 future year; and
- 2036 horizon year.

1.6.2 The model is representative of the following time periods:

- AM peak hour - 08:00–09:00;
- average inter peak hour - 10:00–16:00; and
- PM peak hour - 17:00–18:00.

1.6.3 The model is comprised of the following demand user-classes:

- car commute;
- car employers business;
- car other;
- light goods vehicles (LGV); and
- other goods vehicles.

1.7 Model application objectives

1.7.1 For the assessment of the AP1 revised scheme, the A500 Crewe Strategic Highway Assignment Model provides:

- preliminary traffic data to inform scheme design;
- traffic data for the construction and operational phases of the AP1 revised scheme on which to base the assessment of significant effects for the SES1 and AP1 ES;
- changes in traffic flows, congestion and journey times to inform the transport assessment for the AP1 revised scheme; and
- changes in traffic flows between the base year and forecast scenarios for application to local models.

1.7.2 The A500 Crewe Model has been used primarily to assess the likely impacts of HS2 construction and operational traffic in order to provide an evidence base for the Transport Assessment for the AP1 revised scheme.

Figure 1: Strategic Transport Model coverage for the High Speed Rail (Crewe – Manchester) Transport Assessment

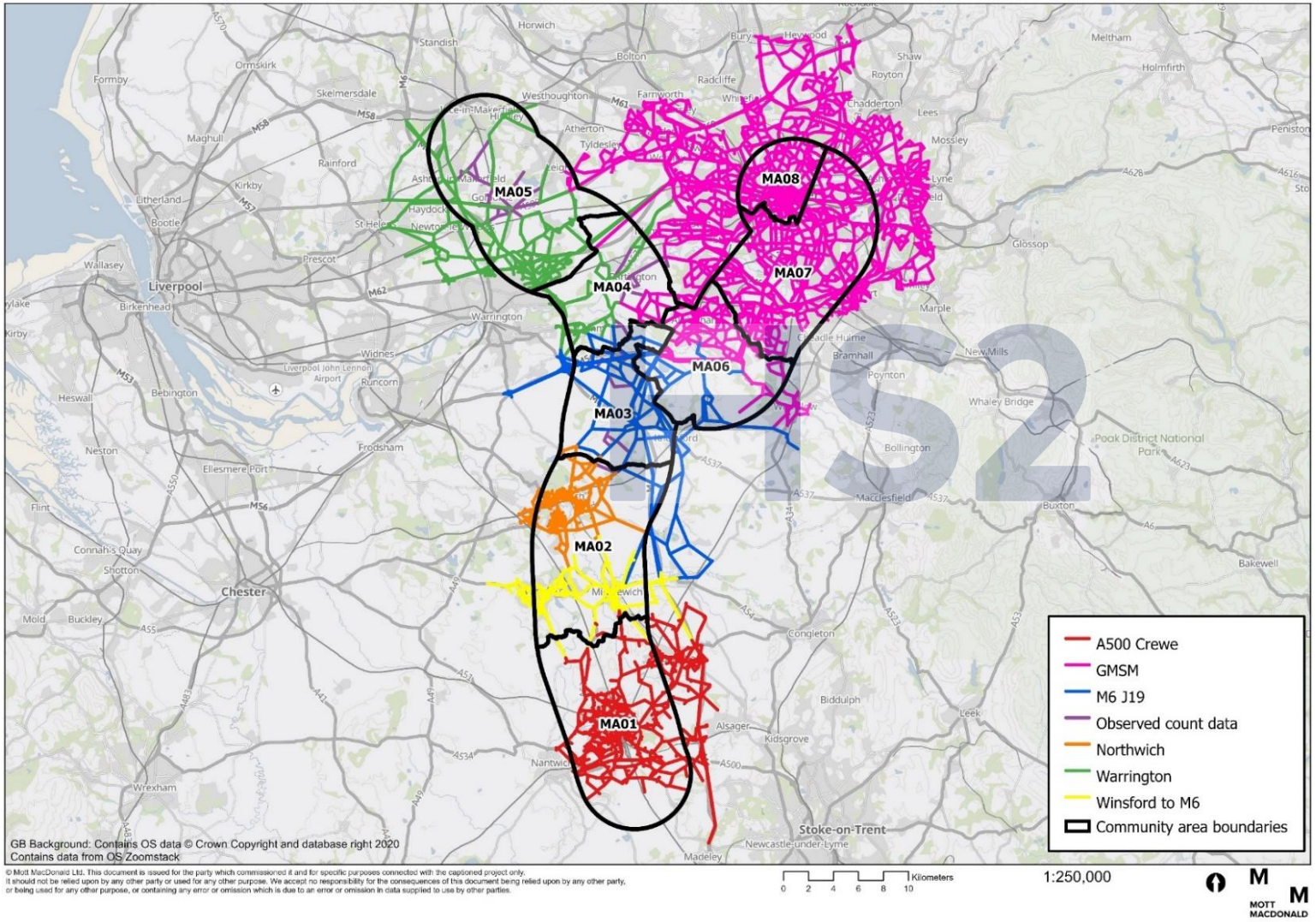


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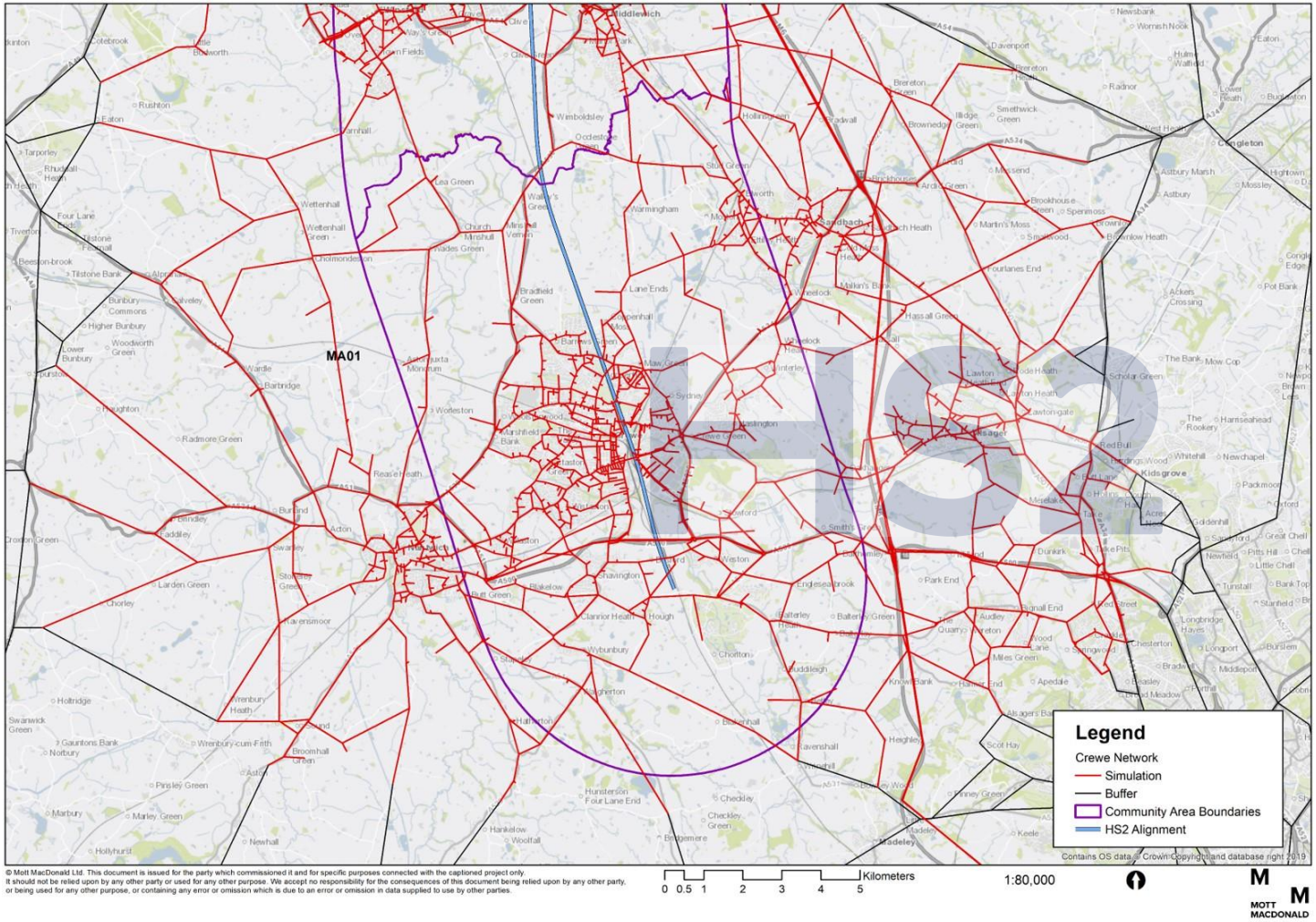
Figure 2: Model study area



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2 Guidance used

2.1 Introduction

2.1.1 This strategic highway model development makes reference to the following TAG as published by the Department for Transport (DfT): TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2 Highway model guidance

2.2.1 In relation to providing an assessment of model calibration and validation performance, reference has been made to Section 3.2 of TAG Unit M3.1 (Table 1 and Table 2).

2.2.2 The criteria for the assessment of model calibration and validation of traffic flows and journey time performance are presented in Table 1 below.

Table 1: DfT – TAG validation criteria

Criteria	Acceptability guideline
Assigned hourly flows	
Individual flows within +/-15% for flows 700-2,700 vph	>85% of cases
Individual flows within +/-100 vph for flows <700 vph	>85% of cases
Individual flows within +/-400 vph for flows >2,700 vph	>85% of cases
Screenline flows (normally >5 links) to be within 5%	All or nearly all screenlines
Geoffrey Havers (GEH) statistic	
Individual flows GEH <5	>85% of cases

Credit: Table 1 and Table 2 DfT TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2.3 The criteria for the assessment of highway model assignment convergence is presented in Table 2 below.

Table 2: Summary of convergence measures and base model acceptable values

Measures of convergence	Acceptability guideline
Delta and %GAP	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) <1%	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) <1%	Four consecutive iterations greater than 98%
Percentage change in total user costs of links with flow change (V) <1%	Four consecutive iterations less than 0.1% (SUE only)

Credit. Table 4 DfT TAG Unit M3.1 Highway Assignment Modelling (May 2020).

3 Data for model development

3.1 Overview

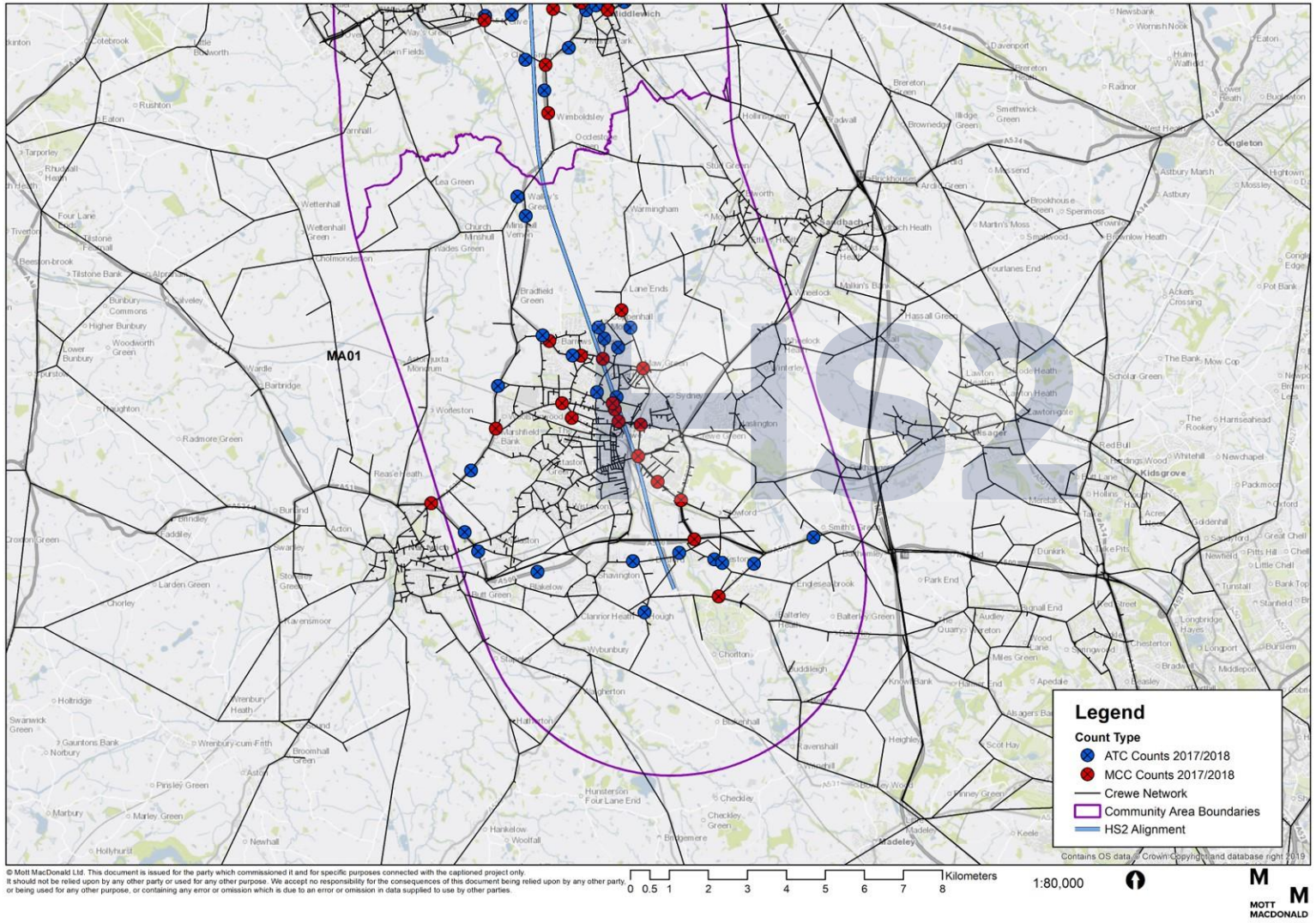
3.1.1 This section of the report presents details of traffic count data that has been collected for the purpose of calibrating the A500 Crewe Model study area. The same data set was used at hybrid Bill and also for the SES1 and AP1 ES for model calibration. The following section describes the traffic survey data commissioned to collect this data.

3.2 Traffic survey data commission

3.2.1 MWJV commissioned a programme of traffic count surveys in 2017/2018 to support the assessment of the original scheme.

3.2.2 Traffic count surveys have been used from different years and months to update the base year model. The traffic counts have been factored to June 2018 to develop a consistent dataset. Figure 3 shows the location of traffic surveys.

Figure 3: Location of traffic counts (MWJV survey commission)



4 Model development

4.1 Overview

4.1.1 For the SES1 and AP1 ES, a review of base year model traffic flows identified that there was scope to undertake some localised improvements to the traffic model in order to provide a more robust assessment in the AP1 revised scheme area of interest.

4.1.2 For both hybrid Bill and the SES1 and AP1 ES, the 2017 base year model has been updated to a 2018 (June) base year model by MWJV using traffic count survey data that was collected between November 2017 and March 2020 (prior to COVID-19). Traffic count data has been normalised to June 2018 traffic conditions using local count data.

4.1.3 This localised model update has focussed on the improvement to the validation of traffic flows at hybrid Bill and covering the AP1 revised scheme area of interest.

4.1.4 The model time periods represent the following peak hours, when the highest traffic volumes and most significant impacts are expected to occur:

- AM peak hour - 08:00–09:00; and
- PM peak hour - 17:00–18:00.

4.2 Transport supply

4.2.1 The original A500 Crewe Model future year networks (2025 and 2040) received from CEC already include the following schemes:

- the Crewe Green Roundabout scheme;
- the Sydney Road Bridge improvement scheme;
- A500 improvement to dual carriageway standard between Meremoor Moss roundabout and M6 Junction 16;
- North West Crewe Package of Schemes in Leighton; and
- Middlewich Eastern Bypass.

4.2.2 A review of the highway network detail and attributes has been completed for the model area that is included in the Hough to Walley's Green area (MA01).

4.2.3 The following network attributes have been reviewed and checked:

- links: distance, speeds, capacity, bus lanes, traffic regulation orders;
- junctions: type; turn saturation flows, capacity, and lane utilisation;
- traffic signal control: timings, phasing, and staging; and
- routes: minimum cost paths.

4.2.4 The review highlighted that there is a good level of detailed highway network representation within the route of the study area, and that this compared well with local datasets.

4.2.5 Although, the Crewe Green Roundabout improvement scheme was opened in autumn 2018, the base year model reflects 2018 traffic conditions prior to the opening of this scheme. This scheme has therefore been included in the future year forecast models.

4.2.6 The Smart Motorway Programme (SMP) roadworks on the M6 between junctions 16 and 19 were not included in the parent model provided by CEC. This scheme was included in the AP1 model network. For the AP1 Base model, the SMP scheme construction is represented by reducing capacity and reducing speeds to 50 mph to reflect this intervention.

4.2.7 The generalised cost values (PPM/PPK) for model assignment have also been updated to reflect the latest values from the DfT TAG databook (version: July 2020).

4.2.8 The model includes a sufficiently detailed level of network infrastructure to support Transport Assessment.

4.3 Transport demand

4.3.1 The original A500 Crewe Model includes a detailed representation of spatial demand. The model zone system contains 671 model zones and accounts for future land use development zones.

4.3.2 To account for the Crewe North Rolling Stock Depot, an additional zone was added to enable a more accurate representation of future demand, giving 672 modelled zones for the AP1 revised scheme.

4.3.3 At hybrid Bill, the demand matrices were adjusted from 2017 to 2018 by carrying out an interpolation between base and 2030 future year matrices. For both the hybrid Bill and the SES1 and AP1 ES, this interpolated 2018 matrix has then been subject to matrix estimation using the available 2018 count data; and a localised traffic flow calibration exercise has been carried out to improve the correlation between observed and modelled traffic flows within the local areas of interest.

4.3.4 The count data collected from the traffic survey data commission in 2017/2018 has been applied in matrix estimation in the same way at both hybrid Bill and the SES1 and AP1 ES.

5 Model performance

5.1 Overview

5.1.1 This section of the report focusses on the performance of the 2018 base model for the AP1 revised scheme as produced by MWJV against observed traffic flow data.

5.1.2 The prior trip matrix assignment is the model assignment before matrix estimation is applied. This uses an interpolated parent model matrix adjusted to the HS2 zone system with an updated network that corresponds to HS2 base year. The updated network also includes revisions identified following a network review.

5.1.3 Matrix estimation uses the prior matrix and updated network mentioned above and creates an updated matrix to match count data. The post trip matrix assignment is the model assignment using this updated matrix and the same updated network used in prior assignments.

5.1.4 It is the post matrix assignment that is taken forward and used in the Transport Assessment.

5.2 Traffic flow

5.2.1 Observed and modelled traffic flows have been compared for the count site locations within the Hough to Walley's Green area (MA01). In total, 138 individual link counts by direction have been compared.

5.2.2 Table 3 and Table 4 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the prior matrix assignment. The comparison shows that both time periods fall below the DfT TAG individual link count criteria of greater than 85% of comparisons achieving the flow or GEH criteria.

Table 3: AP1 A500 Crewe Model – individual link flow – total all vehicle – prior

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	138	62	45%	64	46%	69	50%
PM peak hour	138	70	51%	73	53%	76	55%

Table 4: AP1 A500 Crewe Model – individual link flow – car vehicle type – prior

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	138	70	51%	67	49%	72	52%
PM peak hour	138	79	57%	75	54%	82	59%

5.2.3 Figure 4 and Figure 5 show the locations of the link counts and the respective AM and PM peak hour model performance for the prior matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.4 Table 5 and Table 6 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the post matrix estimation assignment. The comparison shows that both time periods meet the DfT TAG individual link count criteria of greater than 85 percent of comparisons achieving flow and GEH criteria.

5.2.5 The results show an overall improvement on the results at hybrid Bill.

Table 5: AP1 A500 Crewe Model – individual link flow – total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	138	132	96%	132	96%	133	96%
PM peak hour	138	137	99%	137	99%	138	100%

Table 6: AP1 A500 Crewe Model – individual link flow – car vehicle type – post ME

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	138	133	96%	132	96%	133	96%
PM peak hour	138	137	99%	136	99%	137	99%

5.2.6 Figure 6 and Figure 7 show the locations of the link counts and the respective AM and PM peak hour model performance for the post matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.7 Reference should be made to Table 11 and Table 12, Appendix A, which presents supporting details of the individual link flow performance for AM and PM time periods, post matrix estimation.

Figure 4: AM peak hour – traffic flow performance – prior

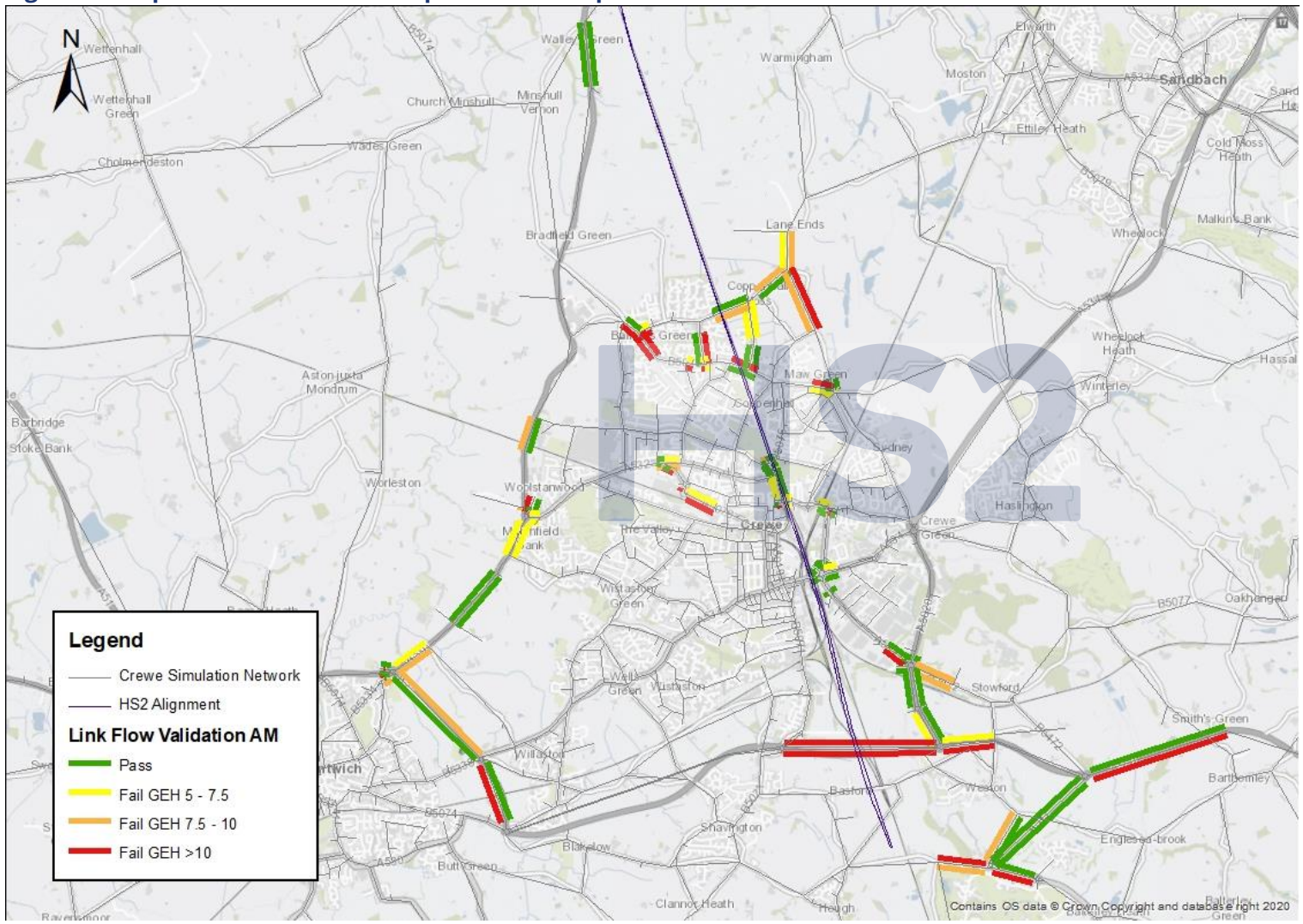


Figure 5: PM peak hour – traffic flow performance – prior

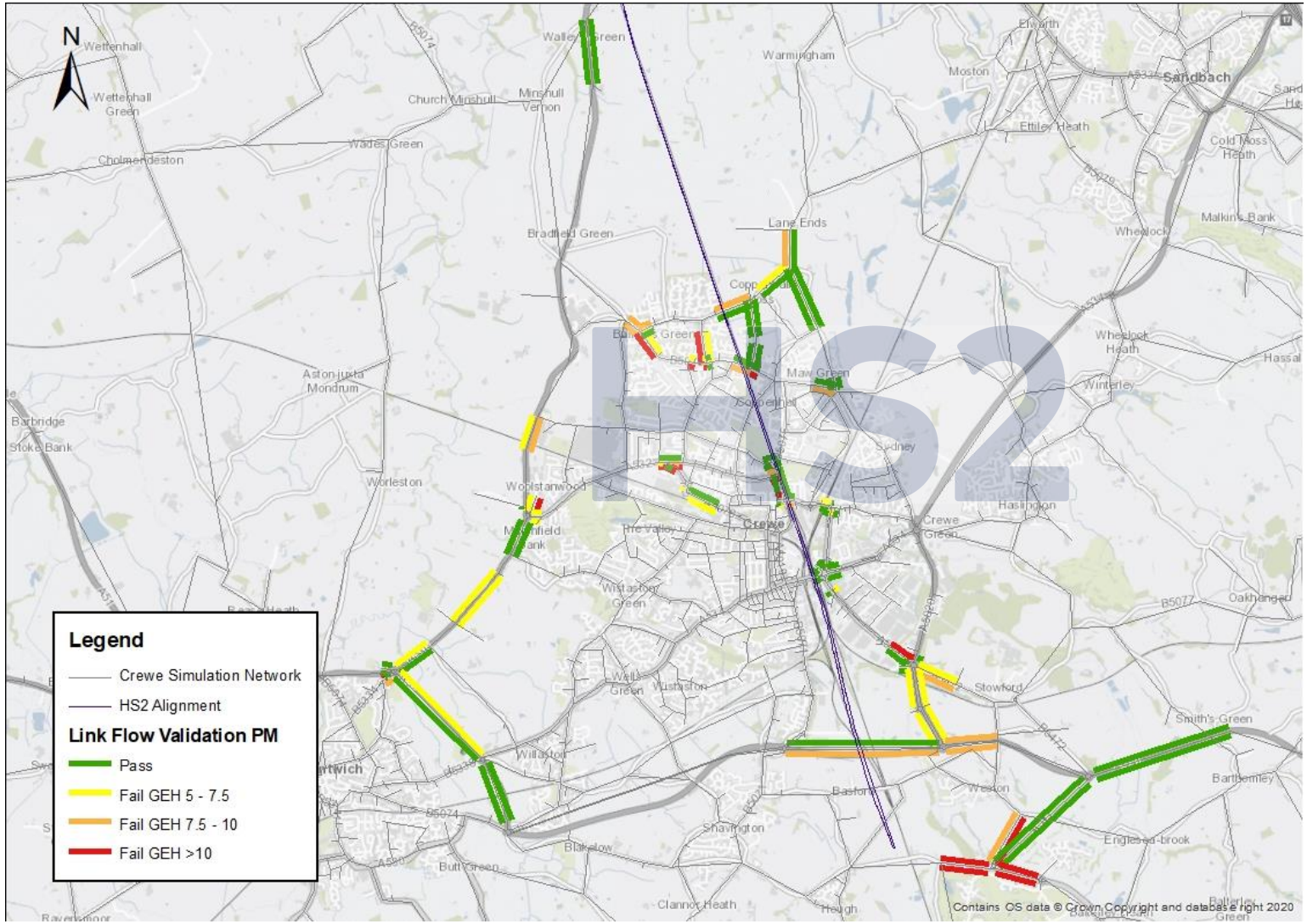


Figure 6: AM peak hour – traffic flow performance – post

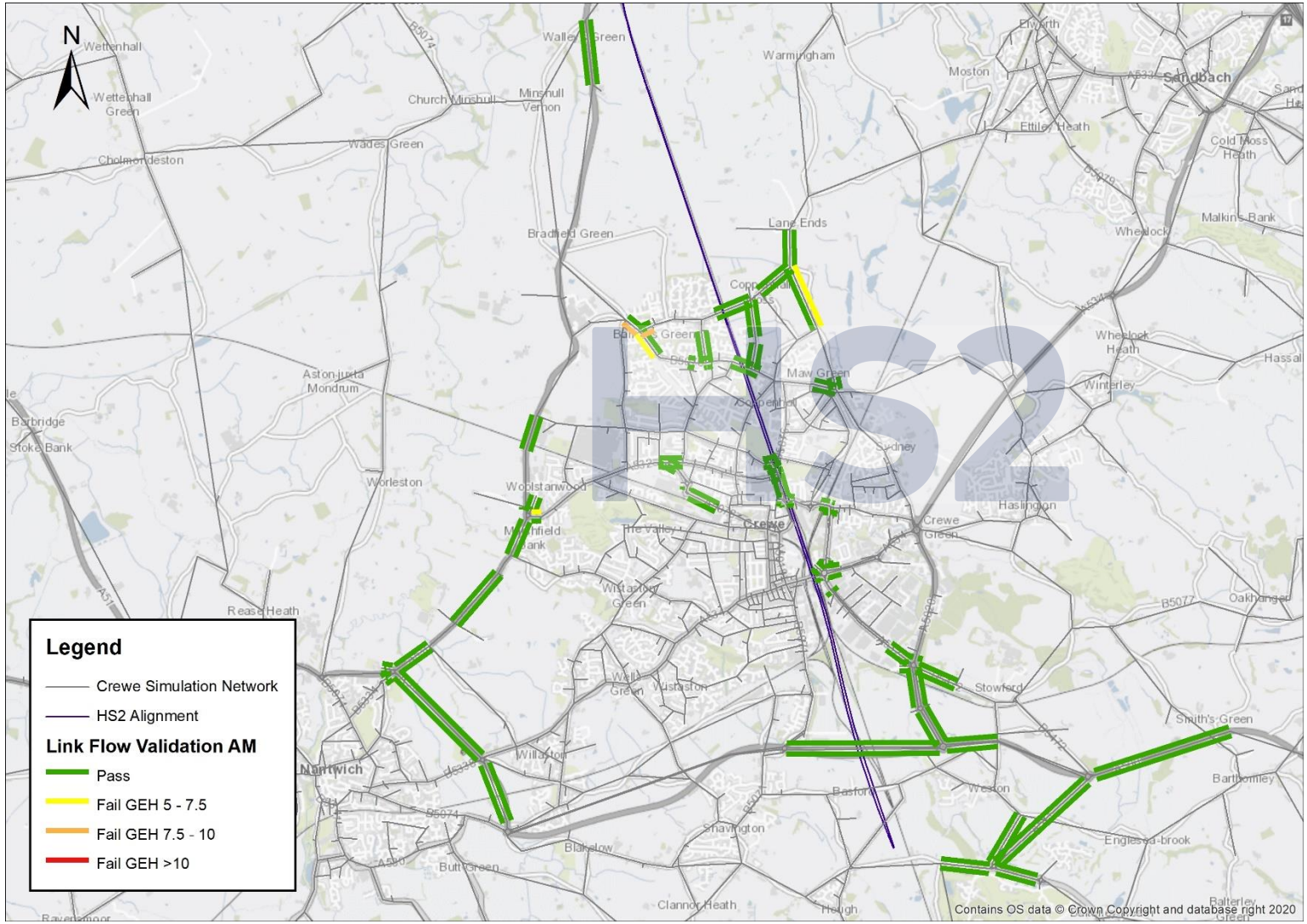
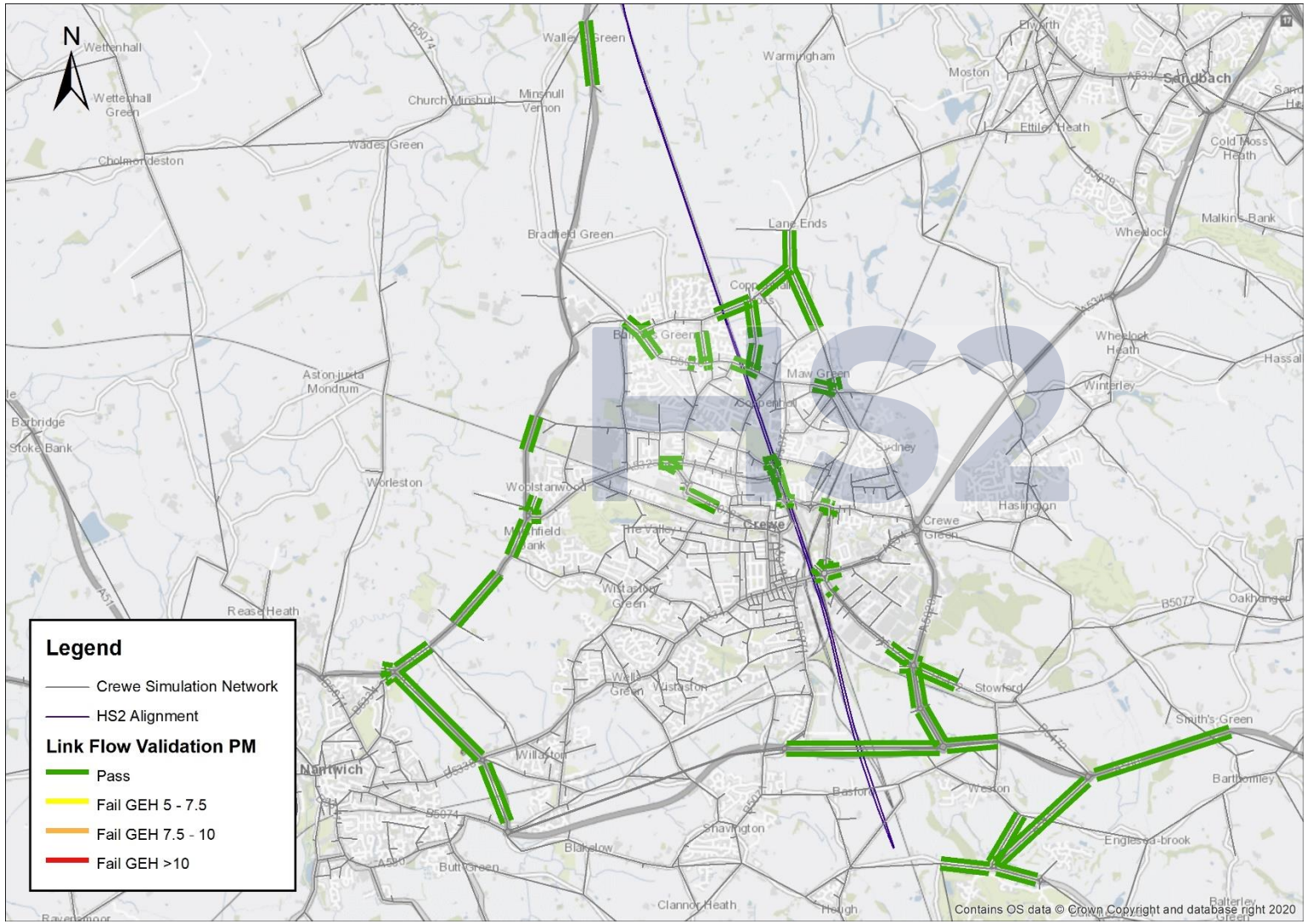


Figure 7: PM peak hour – traffic flow performance – post



6 Model convergence

6.1.1 Achieving a suitable level of model convergence is necessary to provide stable, consistent, and robust model results and to differentiate between real changes and those associated with differing degrees of convergence.

6.1.2 DfT TAG provides guidance on highway model convergence with recommendations on acceptable variations in link flows and costs between iterations helping to ensure the model is sufficiently stable.

6.1.3 Table 7 presents a summary of the 2018 base year highway model convergence statistics for the AP1 revised scheme by time period. Both models converge well in 50 loops or less.

Table 7: AP1 A500 Crewe Model 2018 baseline model convergence

Criteria	Loop	Target	AM	PM
Flow change	N-3	>98%	98.70	99.00
	N-2		98.70	99.10
	N-1		98.10	99.50
	N		98.90	99.70
Delays change	N-3	>98%	99.40	99.90
	N-2		99.40	99.80
	N-1		99.50	99.80
	N		99.70	99.80
Delta		<0.1%	0.0012/15	0.0003/6
% GAP		<0.1%	0.0068	0.0025

7 Summary and conclusions

7.1.1 For the assessment of the AP1 revised scheme, the A500 Crewe Model highway assignment 2017 base year, supplied by CEC, has been further developed for the SES1 and AP1 ES. This includes refinement of the network coding to improve model performance in key areas of interest and use of the same count data applied at hybrid Bill to a 2018 uplifted matrix during model calibration for matrix estimation.

7.1.2 Presented below is a summary of the individual link flow model performance for all modelled time periods for the SES1 and AP1 ES. The comparison shows that both time periods exceed the 85 percent threshold of individual links meeting either the DfT TAG flow range or GEH less than five criteria.

Table 8: AP1 A500 Crewe Model – individual link flow – total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	138	132	96%	132	96%	133	96%
PM peak hour	138	137	99%	137	99%	138	100%

7.1.3 Both the AM and PM models converge satisfactorily and in under 50 assignment loops.

7.1.4 In conclusion, the updated A500 Crewe Model provides a reliable forecasting base and forms a suitable tool for the assessment of HS2 construction and operational impacts within the High Speed Rail (Crewe – Manchester) area of interest.

8 List of acronyms

Table 9: List of acronyms

Acronym	Description
ATC	Automatic traffic count
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
ES	Environmental Statement
GEH	Geoffrey Havers (statistic)
HGV	Heavy Goods Vehicle
JTC	Junction turning count
LMVR	Local Model Validation Report
MCC	Manual Classified count
MPR	Model Performance Report
PPM	Pence Per Mile
PPK	Pence Per Kilometre
SMP	Smart Motorway Programme
TA	Transport Assessment

9 References

Department for Transport (2020), *TAG unit M1.2 Data Sources and Surveys.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m1-2-data-sources-and-surveys

Department for Transport (2020), *TAG unit M3.1 Highway Assignment Modelling.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m3-1-highway-assignment-modelling

10 Appendix A – Model performance

Individual link flow performance

Table 11: AP1 A500 Crewe Model – AM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Badger Avenue	West of Vernon Way	EB	362	27	4	394	284	27	4	315	-78	-20%	4.17	✓	✓	✓
A500	West of David Whitby Way	EB	1130	121	80	1339	1093	126	81	1300	-39	-3%	1.07	✓	✓	✓
Nantwich Bypass	South of Nantwich Bypass NB	NB	712	89	80	895	713	91	73	877	-18	-2%	0.62	✓	✓	✓
A530 Middlewich Road	South of Pyms Lane	SB	686	65	20	774	678	64	20	762	-12	-2%	0.44	✓	✓	✓
B5472 Weston Road	East of David Whitby Way	EB	323	66	32	423	355	92	25	472	50	12%	2.34	✓	✓	✓
A500	West of David Whitby Way	WB	782	217	91	1097	792	217	91	1100	3	0%	0.09	✓	✓	✓
Nantwich Bypass	South of Nantwich Bypass SB	SB	490	65	60	622	488	64	63	615	-7	-1%	0.28	✓	✓	✓
A530 Middlewich Road	South of Pyms Lane	NB	799	70	26	899	770	70	20	860	-39	-4%	1.3	✓	✓	✓
West Street	West of A532 West Street WB	WB	363	46	9	420	361	46	15	421	1	0%	0.05	✓	✓	✓
West Street	East of A532 West Street WB	WB	234	30	4	269	169	30	5	204	-65	-24%	4.21	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Dunwoody Way	North of Dunwoody way NB	WB	245	31	6	283	248	31	10	289	6	2%	0.34	✓	✓	✓
Bessemer Way	North of Bessemer Way SB	NB	47	0	0	47	47	2	1	50	3	7%	0.45	✓	✓	✓
West Street	West of A532 West Street EB	EB	539	61	7	610	530	54	12	596	-15	-2%	0.6	✓	✓	✓
Bessemer Way	North of Bessemer Way NB	SB	21	1	0	22	21	2	1	24	2	9%	0.42	✓	✓	✓
Dunwoody Way	North of Dunwoody Way SB	EB	396	39	4	440	337	39	9	384	-56	-13%	2.76	✓	✓	✓
West Street	East of A532 West Street EB	EB	285	37	4	327	276	30	4	309	-18	-5%	1	✓	✓	✓
Dunwoody Way	A5078 Dunwoody Way SB	SB	303	34	5	344	302	34	11	346	3	1%	0.15	✓	✓	✓
Dunwoody Way	A5078 Dunwoody Way NB	NB	245	37	9	291	251	37	14	302	10	4%	0.6	✓	✓	✓
Bradfield Road	East of Bradfield Road WB	WB	358	133	19	511	359	58	19	436	-76	-15%	3.49	✓	✓	✓
Bradfield Road	East of Bradfield Road EB	EB	222	121	12	356	225	47	13	286	-70	-20%	3.93	✓	✓	✓
Mablins Lane	South of Mablins Lane NB	NB	117	17	7	144	124	17	16	157	14	9%	1.1	✓	✓	✓
Bradfield Road	East of B5076 Bradfield Road EB	WB	406	49	26	492	415	52	34	501	9	2%	0.41	✓	✓	✓
Bradfield Road	West of B5076 Bradfield Road EB	EB	292	39	16	351	231	38	14	283	-68	-19%	3.83	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Mablins Lane	South of Mablins Lane SB	SB	145	14	3	164	209	24	12	245	80	49%	5.63	×	✓	✓
Dunwoody Way	East of A5078 Dunwoody Way WB	WB	245	38	9	293	251	37	11	299	6	2%	0.34	✓	✓	✓
Bradfield Road	East of B5076 Bradfield Road WB	EB	387	46	15	455	373	45	25	444	-12	-3%	0.56	✓	✓	✓
Dunwoody Way	East of A5078 Dunwoody Way EB	EB	301	35	6	343	302	34	8	344	1	0%	0.04	✓	✓	✓
Bradfield Road	West of Broughton Road	WB	461	57	17	541	478	57	23	559	18	3%	0.75	✓	✓	✓
Bradfield Road	East of Broughton Road	WB	466	62	18	553	483	62	26	571	18	3%	0.74	✓	✓	✓
Bradfield Road	West of Broughton Road	EB	446	57	13	520	417	57	18	492	-28	-5%	1.24	✓	✓	✓
Broughton Road	North of Bradfield Road	SB	121	16	2	140	120	16	3	138	-2	-1%	0.14	✓	✓	✓
Parkers Road	West of Broughton Road	EB	330	117	4	453	329	48	6	383	-70	-15%	3.42	✓	✓	✓
Badger Avenue	West of Vernon Way	WB	232	30	5	266	181	30	4	215	-52	-19%	3.34	✓	✓	✓
A532 West Street	West of Vernon Way	WB	248	32	4	284	246	32	4	281	-3	-1%	0.15	✓	✓	✓
Market Close	Market close NB	NB	3	1	0	3	3	7	0	10	7	237%	2.78	✓	✓	✓
Middlewich Street	North of Vernon Way NB	WB	525	52	4	583	439	50	2	491	-93	-16%	3.99	✓	✓	✓
Vernon Way	North of Vernon Way NB	NB	265	45	4	316	272	45	4	321	6	2%	0.33	✓	✓	✓
Vernon Way	North of Vernon Way	SB	631	57	6	697	533	56	7	596	-101	-14%	3.97	✓	×	✓
Vernon Way	South of Vernon Way	NB	282	44	5	332	274	44	4	322	-9	-3%	0.51	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Warmingham Road	South of Groby Rod	SB	375	35	6	419	377	33	6	416	-3	-1%	0.13	✓	✓	✓
Earle Street	West of Earles Street WB	WB	221	16	1	240	218	16	15	249	9	4%	0.57	✓	✓	✓
Middlewich Street	West of Middlewich Street NB	EB	289	37	2	329	279	38	0	316	-13	-4%	0.71	✓	✓	✓
Vernon Way	South of Vernon Way SB	SB	613	58	6	679	523	57	8	588	-91	-13%	3.63	✓	✓	✓
A532 Veron Way	South of West Street	NB	364	57	7	429	372	57	7	436	7	2%	0.34	✓	✓	✓
A532 West Street	West of Vernon Way	EB	211	29	5	246	235	31	5	272	26	10%	1.6	✓	✓	✓
Earle Street	West of Earles Street EB	EB	161	22	1	188	179	24	6	209	22	12%	1.55	✓	✓	✓
A532 Veron Way	South of West Street	SB	649	70	10	733	610	70	12	692	-41	-6%	1.55	✓	✓	✓
Vernon Way	South of Vernon Way NB	NB	470	53	4	528	470	53	4	528	-1	0%	0.02	✓	✓	✓
Earle Street	Earle Street WB	WB	654	85	10	750	631	85	22	739	-11	-2%	0.42	✓	✓	✓
Warmingham Road	North of Groby Road	SB	631	51	6	692	537	51	8	595	-97	-14%	3.81	✓	✓	✓
Warmingham Road	South of Groby Rod	NB	272	27	3	305	272	27	5	304	-1	0%	0.06	✓	✓	✓
Earle Street	Earle Street EB	EB	783	85	10	885	771	85	15	871	-14	-2%	0.47	✓	✓	✓
Tommy's Lane	South of Tommy's Lane NB	WB	82	21	2	105	82	21	2	105	0	0%	0.01	✓	✓	✓
A534 Nantwich Road	West of A532 Weston Road	EB	736	90	22	859	738	90	26	853	-6	-1%	0.2	✓	✓	✓
A532 Manchester Bridge	West of Macon Way	WB	650	96	11	758	639	96	23	759	1	0%	0.02	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Tommy's Lane	South of Tommy's Lane SB	EB	50	11	0	60	50	11	2	63	3	5%	0.4	✓	✓	✓
A532 Weston Road	South of A534 Nantwich Road	NB	571	107	24	707	557	107	25	690	-18	-2%	0.67	✓	✓	✓
A532 Macon Way	North of A534 Nantwich Road	SB	593	82	14	693	592	81	14	686	-6	-1%	0.25	✓	✓	✓
A532 Macon Way	North of A534 Nantwich Road	NB	469	75	12	557	466	75	12	553	-3	-1%	0.14	✓	✓	✓
A534 Crewe Road	East of A532 Weston Road	WB	417	75	24	527	425	75	27	526	-1	0%	0.03	✓	✓	✓
A532 Manchester Bridge	West of Macon Way	EB	925	114	14	1059	942	108	19	1069	9	1%	0.29	✓	✓	✓
A532 Macon Way	South of A532 Manchester Bridge	SB	649	84	10	746	603	78	14	695	-51	-7%	1.91	✓	✓	✓
A532 Macon Way	South of A532 Manchester Bridge	NB	319	83	11	413	316	83	12	411	-2	0%	0.09	✓	✓	✓
Hungerford Road	East of A532 Macon Way	WB	497	52	2	552	444	52	14	510	-42	-8%	1.83	✓	✓	✓
Groby Road	North of Sydney Road	NB	101	14	7	123	104	14	6	124	1	1%	0.08	✓	✓	✓
Hungerford Road	East of A532 Macon Way	EB	442	68	6	521	461	68	8	537	16	3%	0.68	✓	✓	✓
Remer Street	West of Groby Road	EB	307	40	10	359	304	41	9	354	-5	-1%	0.27	✓	✓	✓
Groby Road	North of Sydney Road	SB	240	22	8	272	238	22	7	267	-5	-2%	0.33	✓	✓	✓
Sydney Road	South of Groby Road	NB	450	47	18	520	458	47	20	525	6	1%	0.25	✓	✓	✓
Sydney Road	South of Groby Road	SB	520	59	16	599	519	60	16	596	-3	-1%	0.14	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Savoy Road	East of Savoy road WB	WB	114	11	18	143	114	0	10	124	-19	-13%	1.62	✓	✓	✓
Savoy Road	East of Savoy road EB	EB	15	6	16	36	15	6	14	35	-1	-3%	0.19	✓	✓	✓
A532 Weston Road	West of A5020 University Way	SB	277	71	54	403	274	71	55	400	-3	-1%	0.15	✓	✓	✓
A5020 David Whitby Way	South of A532	NB	643	66	38	747	634	64	38	736	-11	-2%	0.42	✓	✓	✓
A5020 University Way	North of Weston Road	SB	398	62	28	491	398	64	28	489	-1	0%	0.07	✓	✓	✓
A5020 University Way	North of Weston Road	NB	423	62	26	515	419	62	23	504	-11	-2%	0.49	✓	✓	✓
B5472 Weston Road	East of David Whitby Way	WB	892	90	45	1033	880	89	23	992	-41	-4%	1.29	✓	✓	✓
A5020 David Whitby Way	North of A500	SB	649	68	36	754	642	69	36	746	-8	-1%	0.28	✓	✓	✓
Parkers Road	West of Broughton Road	WB	286	132	8	428	313	43	4	360	-67	-16%	3.38	✓	✓	✓
A534 Nantwich Road	West of A532 Weston Road	WB	565	109	28	715	563	114	34	711	-4	-1%	0.17	✓	✓	✓
A534 Crewe Road	East of A532 Weston Road	EB	740	89	22	865	740	89	24	853	-12	-1%	0.41	✓	✓	✓
A532 Weston Road	South of A534 Nantwich Road	NB	511	71	21	604	511	64	22	596	-8	-1%	0.31	✓	✓	✓
Market Close	Market close NB	NB	3	1	0	4	1	4	0	5	2	49%	0.83	✓	✓	✓
Vernon Way	South of Vernon Way SB	SB	557	74	7	639	531	74	7	611	-28	-4%	1.12	✓	✓	✓
Remer Street	West of Groby Road	EB	371	35	13	423	376	36	15	427	5	1%	0.22	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Bradfield Road	East of Broughton Road	EB	510	68	13	596	479	68	19	566	-30	-5%	1.24	✓	✓	✓
Bradfield Road	West of B5076 Bradfield Road WB	WB	343	39	22	413	358	52	19	429	16	4%	0.77	✓	✓	✓
Broughton Road	North of Bradfield Road	NB	62	10	4	76	62	10	4	76	0	0%	0.02	✓	✓	✓
A532 Weston Road	West of A5020 University Way	NB	1157	107	67	1335	1094	89	63	1246	-90	-7%	2.5	✓	✓	✓
A530 Middlewich Road	South of Brookhouse Lane	NB	557	55	10	628	531	56	7	593	-35	-6%	1.41	✓	✓	✓
A530 Middlewich Road	South of Brookhouse Lane	SB	461	63	21	552	457	63	22	542	-10	-2%	0.41	✓	✓	✓
A530 Middlewich Road	South of Wistaston Green Road	NB	833	92	32	961	874	105	34	1014	52	5%	1.67	✓	✓	✓
A530 Middlewich Road	South of Wistaston Green Road	SB	701	98	31	832	699	97	34	830	-2	0%	0.07	✓	✓	✓
Warmingham Road	North of Groby Road	NB	287	33	5	327	289	45	8	343	16	5%	0.87	✓	✓	✓
A5020 David Whitby Way	South of A532	SB	207	50	37	294	220	50	36	306	12	4%	0.69	✓	✓	✓
Newcastle Road	North of Chorlton Lane	WB	293	75	10	381	293	75	9	377	-4	-1%	0.22	✓	✓	✓
A5020 David Whitby Way	North of A500	SB	210	53	38	301	210	53	37	300	-1	0%	0.07	✓	✓	✓
A500	East of David Whitby Way	WB	784	203	90	1083	823	199	90	1111	29	3%	0.87	✓	✓	✓
Newcastle Road	North of Chorlton Lane	EB	370	46	11	429	294	44	12	350	-79	-18%	4.02	✓	✓	✓
Main Road	South of Snape Lane	NB	174	39	7	221	174	39	8	221	0	0%	0.02	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A531	South of A500	SB	190	42	16	248	190	37	11	238	-10	-4%	0.63	✓	✓	✓
Newcastle Road	Between A531 roundabout and Abbey Park Way roundabout	WB	742	75	11	835	742	75	12	829	-7	-1%	0.23	✓	✓	✓
A500	East of David Whitby Way	EB	692	91	82	872	692	91	82	865	-7	-1%	0.23	✓	✓	✓
Main Road	South of Snape Lane	SB	362	29	7	402	388	29	9	426	25	6%	1.21	✓	✓	✓
Newcastle Road	Between A531 roundabout and Abbey Park Way roundabout	EB	440	65	12	522	440	65	13	519	-3	-1%	0.14	✓	✓	✓
A531	South of A500	NB	278	26	9	315	279	26	11	316	1	0%	0.05	✓	✓	✓
A500	East of B5472	WB	987	261	153	1407	992	261	102	1356	-51	-4%	1.37	✓	✓	✓
A500	East of B5472	EB	919	146	126	1195	918	146	128	1192	-3	0%	0.08	✓	✓	✓
Broughton Road	Bradfield Road (south) to Parkers Road (north)	NB	45	33	5	83	41	19	3	63	-20	-24%	2.38	✓	✓	✓
Broughton Road	Parkers Road (north) to Bradfield Road (south)	SB	67	49	3	120	66	28	2	96	-24	-20%	2.28	✓	✓	✓
A51 - A530	A51 Nantwich Bypass (south), Arm C Exit	SB	491	101	76	677	485	99	65	649	-28	-4%	1.07	✓	✓	✓
A51 - A531	A51 Nantwich Bypass (south), Arm C Approach	NB	677	124	68	877	681	127	62	870	-7	-1%	0.22	✓	✓	✓
Weston Road	Unnamed Road (south) to Weston Road Service Road (north)	NB	566	100	24	695	553	100	25	678	-17	-2%	0.65	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Weston Road	Weston Road Service Road (north) to Unnamed Road (south)	SB	324	59	12	397	324	64	17	404	8	2%	0.38	✓	✓	✓
Warmingham Road / Groby Road	Groby Road (east), Arm B Exit	EB	360	29	1	393	243	18	2	263	-130	-33%	7.18	×	×	×
Warmingham Road / Groby Road	Groby Road (east), Arm B Approach	WB	119	20	3	143	101	18	3	123	-20	-14%	1.74	✓	✓	✓
Marshfield Bank	Marshfield Bank NB	NB	354	49	10	413	353	49	4	406	-7	-2%	0.32	✓	✓	✓
Marshfield Bank	Marshfield Bank SB	SB	63	41	10	114	63	41	3	107	-7	-6%	0.64	✓	✓	✓
A530 Middlewich Road	North of A532 Coppenhall Lane	NB	806	87	38	935	778	84	26	888	-47	-5%	1.57	✓	✓	✓
A530 Middlewich Road	North of A532 Coppenhall Lane	SB	650	84	25	760	648	83	22	753	-7	-1%	0.27	✓	✓	✓
A530 Middlewich Road	North of Wistaston Green Road	SB	696	97	31	826	809	98	36	943	117	14%	3.93	✓	✓	✓
A530 Middlewich Road	North of Wistaston Green Road	NB	1017	112	39	1174	994	113	35	1142	-32	-3%	0.95	✓	✓	✓
Coppenhall Lane	West of A532 Coppenhall Lane WB	WB	536	55	15	608	526	54	19	599	-9	-1%	0.36	✓	✓	✓
Coppenhall Lane	West of A532 Coppenhall Lane EB	EB	410	59	10	483	292	59	14	364	-118	-25%	5.75	×	×	×
Middlewich Road	South of Nantwich Road SB	WB	727	98	24	849	635	97	26	759	-91	-11%	3.2	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Middlewich Road	South of Nantwich Road NB	EB	810	103	40	958	748	99	37	884	-74	-8%	2.43	✓	✓	✓
Middlewich Road	North of B5334 NB	EB	507	82	9	600	502	83	12	598	-2	0%	0.1	✓	✓	✓
Middlewich Road	North of B5334 SB	WB	518	90	7	616	470	91	15	576	-40	-6%	1.64	✓	✓	✓
A51	South of Nantwich Tennis Club	EB	640	107	81	839	670	108	81	859	20	2%	0.68	✓	✓	✓
A51	South of Nantwich Tennis Club	WB	628	115	60	810	647	117	60	824	14	2%	0.5	✓	✓	✓
Unnamed Road	Near to Alvaston Business Park	EB	13	4	1	17	13	4	0	17	0	3%	0.1	✓	✓	✓
Unnamed Road	Near to Alvaston Business Park	WB	117	6	0	122	117	6	2	125	2	2%	0.22	✓	✓	✓
Parkers Road	East of Bradfield Road	WB	560	44	10	618	358	38	17	412	-206	-33%	9.06	×	×	×
Bradfield Road	South of Parkers Lane	NB	529	65	12	612	408	63	15	485	-127	-21%	5.41	×	×	×
Bradfield Road	South of Parkers Lane	SB	337	47	11	399	266	37	12	315	-84	-21%	4.47	✓	✓	✓
Bradfield Road - Parkers Road	B5076 Bradfield Road (north-west), Arm C Exit	NW	987	98	19	1114	735	99	31	865	-249	-22%	7.92	×	×	×
Bradfield Road - Parkers Road	B5076 Bradfield Road (north-west), Arm C Approach	SE	483	66	22	578	480	65	33	579	0	0%	0.02	✓	✓	✓
Parkers Road	East of Bradfield Road	EB	248	30	14	295	241	30	21	291	-4	-1%	0.25	✓	✓	✓

Directions: NB = North-bound, EB = east-bound, SB = south-bound, WB = west-bound, NW = north-west, SE = south-east

Table 12: AP1 A500 Crewe Model – PM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Badger Avenue	West of Vernon Way	EB	342	25	1	368	342	25	0	367	-1	0%	0.06	✓	✓	✓
A500	West of David Whitby Way	EB	933	126	62	1128	939	126	59	1124	-4	0%	0.11	✓	✓	✓
Nantwich Bypass	South of Nantwich Bypass NB	NB	784	59	39	886	788	57	39	884	-2	0%	0.05	✓	✓	✓
A530 Middlewich Road	South of Pyms Lane	SB	817	58	12	887	763	58	5	825	-62	-7%	2.11	✓	✓	✓
B5472 Weston Road	East of David Whitby Way	EB	941	68	9	1019	931	68	6	1005	-14	-1%	0.44	✓	✓	✓
A500	West of David Whitby Way	WB	1403	118	52	1574	1396	126	52	1574	0	0%	0.00	✓	✓	✓
Nantwich Bypass	South of Nantwich Bypass SB	SB	713	72	44	843	712	72	44	828	-14	-2%	0.49	✓	✓	✓
A530 Middlewich Road	South of Pyms Lane	NB	575	37	9	622	571	37	9	617	-6	-1%	0.23	✓	✓	✓
West Street	West of A532 West Street WB	WB	608	52	3	666	610	52	13	675	9	1%	0.34	✓	✓	✓
West Street	East of A532 West Street WB	WB	287	29	1	317	233	29	3	265	-51	-16%	3.02	✓	✓	✓
Dunwoody Way	North of Dunwoody Way NB	WB	580	38	2	624	582	38	9	629	6	1%	0.22	✓	✓	✓
Bessemer Way	North of Bessemer Way SB	NB	22	2	0	24	27	2	1	30	6	27%	1.22	✓	✓	✓
West Street	West of A532 West Street EB	EB	554	37	4	598	604	37	14	655	57	10%	2.28	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Bessemer Way	North of Bessemer Way NB	SB	31	3	0	34	31	3	0	34	0	0%	0.02	✓	✓	✓
Dunwoody Way	North of Dunwoody Way SB	EB	420	28	2	453	408	28	9	445	-8	-2%	0.38	✓	✓	✓
West Street	East of A532 West Street EB	EB	384	23	2	409	397	23	5	425	17	4%	0.81	✓	✓	✓
Dunwoody Way	A5078 Dunwoody Way SB	SB	349	22	1	372	338	22	8	368	-4	-1%	0.23	✓	✓	✓
Dunwoody Way	A5078 Dunwoody Way NB	NB	480	23	1	505	484	24	8	516	11	2%	0.49	✓	✓	✓
Bradfield Road	East of Bradfield Road WB	WB	293	121	10	425	327	31	6	364	-61	-14%	3.08	✓	✓	✓
Bradfield Road	East of Bradfield Road EB	EB	346	161	10	519	383	47	10	440	-79	-15%	3.62	✓	✓	✓
Mablins Lane	South of Mablins Lane NB	NB	201	16	1	219	204	16	6	226	7	3%	0.46	✓	✓	✓
Bradfield Road	East of B5076 Bradfield Road EB	WB	528	38	4	579	530	38	11	579	0	0%	0.02	✓	✓	✓
Bradfield Road	West of B5076 Bradfield Road EB	EB	438	42	8	493	397	41	10	449	-45	-9%	2.06	✓	✓	✓
Mablins Lane	South of Mablins Lane SB	SB	136	7	2	146	136	10	9	155	10	7%	0.78	✓	✓	✓
Dunwoody Way	East of A5078 Dunwoody Way WB	WB	482	24	1	507	484	24	3	511	4	1%	0.18	✓	✓	✓
Bradfield Road	East of B5076 Bradfield Road WB	EB	532	48	9	596	526	47	19	592	-4	-1%	0.18	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Dunwoody Way	East of A5078 Dunwoody Way EB	EB	341	22	1	365	338	22	3	363	-2	-1%	0.13	✓	✓	✓
Bradfield Road	West of Broughton Road	WB	613	45	3	664	612	45	3	660	-4	-1%	0.16	✓	✓	✓
Bradfield Road	East of Broughton Road	WB	655	50	3	711	655	50	4	708	-3	0%	0.11	✓	✓	✓
Bradfield Road	West of Broughton Road	EB	547	31	7	586	541	31	10	582	-5	-1%	0.20	✓	✓	✓
Broughton Road	North of Bradfield Road	SB	67	7	1	77	67	7	1	74	-3	-4%	0.35	✓	✓	✓
Parkers Road	West of Broughton Road	EB	347	114	6	468	350	33	6	388	-80	-17%	3.85	✓	✓	✓
Badger Avenue	West of Vernon Way	WB	361	24	1	386	349	23	1	373	-13	-3%	0.65	✓	✓	✓
A532 West Street	West of Vernon Way	WB	301	25	3	331	256	24	3	283	-48	-14%	2.73	✓	✓	✓
Market Close	Market close SB	SB	8	0	0	8	5	8	0	13	5	71%	1.68	✓	✓	✓
Middlewich Street	North of Vernon Way NB	WB	368	34	0	404	341	29	15	386	-19	-5%	0.94	✓	✓	✓
Vernon Way	North of Vernon Way NB	NB	613	39	1	652	606	37	13	656	4	1%	0.16	✓	✓	✓
Vernon Way	North of Vernon Way SB	SB	393	33	1	429	380	28	15	424	-5	-1%	0.24	✓	✓	✓
Vernon Way	South of Vernon Way NB	NB	600	35	2	637	597	35	14	646	9	1%	0.36	✓	✓	✓
Warmingham Road	South of Groby Rod	SB	266	29	2	298	251	29	4	284	-15	-5%	0.86	✓	✓	✓
Earle Street	West of Earles Street WB	WB	215	14	1	230	219	14	27	260	30	13%	1.93	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Middlewich Street	West of Middlewich Street NB	EB	571	41	1	613	564	41	12	618	5	1%	0.19	✓	✓	✓
Vernon Way	South of Vernon Way SB	SB	404	33	1	439	387	28	16	431	-8	-2%	0.39	✓	✓	✓
A532 Veron Way	South of West Street	NB	673	44	3	720	678	43	16	737	16	2%	0.60	✓	✓	✓
A532 West Street	West of Vernon Way	EB	386	27	3	416	347	27	3	377	-39	-9%	1.96	✓	✓	✓
Earle Street	West of Earles Street EB	EB	240	15	1	257	242	15	18	275	17	7%	1.06	✓	✓	✓
A532 Veron Way	South of West Street	SB	555	44	3	602	558	40	18	616	14	2%	0.56	✓	✓	✓
Vernon Way	South of Vernon Way NB	NB	695	43	1	739	695	43	1	739	0	0%	0.00	✓	✓	✓
Earle Street	Earle Street WB	WB	893	56	3	952	890	56	14	960	8	1%	0.26	✓	✓	✓
Warmingham Road	North of Groby Road	SB	372	39	2	416	371	44	4	418	2	0%	0.10	✓	✓	✓
Warmingham Road	South of Groby Rod	NB	321	14	0	339	324	14	7	345	7	2%	0.36	✓	✓	✓
Earle Street	Earle Street EB	EB	860	61	3	926	858	61	8	927	1	0%	0.04	✓	✓	✓
Tommy's Lane	South of Tommy's Lane NB	WB	79	6	0	84	79	6	0	85	1	1%	0.08	✓	✓	✓
A534 Nantwich Road	West of A532 Weston Road	EB	672	47	6	732	669	47	13	729	-3	0%	0.11	✓	✓	✓
A532 Manchester Bridge	West of Macon Way	WB	1006	63	3	1072	1003	63	14	1081	9	1%	0.27	✓	✓	✓
Tommy's Lane	South of Tommy's Lane SB	EB	71	6	1	78	71	3	0	74	-3	-4%	0.40	✓	✓	✓
A532 Weston Road	South of A534 Nantwich Road	NB	627	38	6	672	631	40	8	680	8	1%	0.30	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A532 Macon Way	North of A534 Nantwich Road	SB	576	38	3	617	575	42	5	623	7	1%	0.26	✓	✓	✓
A532 Macon Way	North of A534 Nantwich Road	NB	668	38	4	709	666	36	4	706	-4	-1%	0.14	✓	✓	✓
A534 Crewe Road	East of A532 Weston Road	WB	567	31	9	609	570	31	13	614	5	1%	0.19	✓	✓	✓
A532 Manchester Bridge	West of Macon Way	EB	894	66	4	966	968	69	9	1045	79	8%	2.50	✓	✓	✓
A532 Macon Way	South of A532 Manchester Bridge	SB	466	39	3	508	465	42	6	513	4	1%	0.20	✓	✓	✓
A532 Macon Way	South of A532 Manchester Bridge	NB	795	37	3	835	721	37	3	761	-74	-9%	2.62	✓	✓	✓
Hungerford Road	East of A532 Macon Way	WB	499	50	1	550	499	50	12	561	11	2%	0.48	✓	✓	✓
Groby Road	North of Sydney Road	NB	168	12	0	180	191	14	1	206	25	14%	1.83	✓	✓	✓
Hungerford Road	East of A532 Macon Way	EB	717	51	1	771	720	51	3	774	3	0%	0.11	✓	✓	✓
Remer Street	West of Groby Road	EB	420	34	7	462	420	34	7	462	0	0%	0.00	✓	✓	✓
Groby Road	North of Sydney Road	SB	181	13	0	194	180	14	0	195	1	0%	0.05	✓	✓	✓
Sydney Road	South of Groby Road	NB	495	45	2	545	512	45	17	574	29	5%	1.23	✓	✓	✓
Sydney Road	South of Groby Road	SB	583	47	7	637	581	47	7	635	-2	0%	0.06	✓	✓	✓
Savoy Road	East of Savoy road WB	WB	12	1	5	18	12	0	4	16	-1	-6%	0.27	✓	✓	✓
Savoy Road	East of Savoy road EB	EB	118	5	4	127	118	5	2	125	-2	-2%	0.17	✓	✓	✓
A532 Weston Road	West of A5020 University Way	SB	1208	85	21	1316	1201	74	21	1296	-20	-1%	0.54	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A5020 David Whitby Way	South of A532	NB	279	36	29	349	280	36	29	346	-3	-1%	0.17	✓	✓	✓
A5020 University Way	North of Weston Road	SB	579	55	11	647	569	55	11	634	-12	-2%	0.48	✓	✓	✓
A5020 University Way	North of Weston Road	NB	445	47	10	503	446	47	9	502	-1	0%	0.05	✓	✓	✓
B5472 Weston Road	East of David Whitby Way	WB	401	41	27	470	401	43	7	451	-19	-4%	0.90	✓	✓	✓
A5020 David Whitby Way	North of A500	SB	284	28	32	348	285	28	32	345	-2	-1%	0.12	✓	✓	✓
Parkers Road	West of Broughton Road	WB	219	108	5	333	219	43	4	266	-67	-20%	3.87	✓	✓	✓
A534 Nantwich Road	West of A532 Weston Road	WB	743	46	6	798	756	59	15	830	32	4%	1.11	✓	✓	✓
A534 Crewe Road	East of A532 Weston Road	EB	431	27	3	467	428	27	7	462	-5	-1%	0.25	✓	✓	✓
A532 Weston Road	South of A534 Nantwich Road	NB	592	43	12	649	588	36	14	638	-11	-2%	0.42	✓	✓	✓
Market Close	Market Close NB	NB	4	0	0	4	0	6	0	6	2	59%	1.04	✓	✓	✓
Vernon Way	South of Vernon Way SB	SB	628	40	1	668	629	36	0	666	-2	0%	0.08	✓	✓	✓
Remer Street	West of Groby Road	EB	340	32	2	376	340	32	17	389	13	3%	0.65	✓	✓	✓
Bradfield Road	East of Broughton Road	EB	576	33	8	621	570	33	10	613	-8	-1%	0.30	✓	✓	✓
Bradfield Road	West of B5076 Bradfield Road WB	WB	376	26	4	411	333	26	6	365	-46	-11%	2.33	✓	✓	✓
Broughton Road	North of Bradfield Road	NB	80	10	0	90	80	10	1	91	1	1%	0.11	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A532 Weston Road	West of A5020 University Way	NB	321	42	51	417	322	35	32	388	-28	-7%	1.42	✓	✓	✓
A530 Middlewich Road	South of Brookhouse Lane	NB	649	44	3	702	644	44	8	695	-7	-1%	0.27	✓	✓	✓
A530 Middlewich Road	South of Brookhouse Lane	SB	493	33	2	533	493	33	5	531	-2	0%	0.09	✓	✓	✓
A530 Middlewich Road	South of Wistaston Green Road	NB	618	54	10	684	732	52	15	800	116	17%	4.24	✓	×	✓
A530 Middlewich Road	South of Wistaston Green Road	SB	585	32	2	620	629	36	8	673	53	9%	2.09	✓	✓	✓
Warmingham Road	North of Groby Road	NB	476	26	0	505	474	26	7	507	2	0%	0.09	✓	✓	✓
A5020 David Whitby Way	South of A532	SB	868	64	18	952	859	64	18	940	-12	-1%	0.38	✓	✓	✓
Newcastle Road	North of Chorlton Lane	WB	386	31	0	417	386	31	3	420	3	1%	0.13	✓	✓	✓
A5020 David Whitby Way	North of A500	SB	879	64	18	963	845	64	18	926	-37	-4%	1.21	✓	✓	✓
A500	East of David Whitby Way	WB	848	85	66	1000	852	69	68	988	-11	-1%	0.36	✓	✓	✓
Newcastle Road	North of Chorlton Lane	EB	318	33	2	355	318	33	1	352	-2	-1%	0.12	✓	✓	✓
Main Road	South of Snape Lane	NB	371	25	1	399	370	25	3	399	-1	0%	0.03	✓	✓	✓
A531	South of A500	SB	270	24	3	299	372	24	3	398	99	33%	5.31	×	✓	✓
Newcastle Road	Between A531 roundabout and Abbey Park Way roundabout	WB	445	27	1	475	445	27	5	477	2	0%	0.11	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A500	East of David Whitby Way	EB	973	130	61	1170	954	105	61	1120	-50	-4%	1.48	✓	✓	✓
Main Road	South of Snape Lane	SB	172	14	1	189	172	14	4	190	2	1%	0.12	✓	✓	✓
Newcastle Road	Between A531 roundabout and Abbey Park Way roundabout	EB	775	51	2	832	776	47	4	827	-5	-1%	0.18	✓	✓	✓
A531	South of A500	NB	171	17	2	192	171	17	1	188	-3	-2%	0.25	✓	✓	✓
A500	East of B5472	WB	1213	106	79	1398	1218	106	71	1395	-3	0%	0.09	✓	✓	✓
A500	East of B5472	EB	1116	147	61	1330	1155	147	61	1363	33	2%	0.89	✓	✓	✓
Broughton Road	Bradfield Road (south) to Parkers Road (north)	NB	54	27	2	85	54	16	2	71	-14	-16%	1.57	✓	✓	✓
Broughton Road	Parkers Road (north) to Bradfield Road (south)	SB	41	39	3	84	41	10	0	52	-32	-38%	3.89	✓	✓	✓
A51 - A530	A51 Nantwich Bypass (south), Arm C Exit	SB	701	90	35	829	703	90	35	828	-1	0%	0.02	✓	✓	✓
A51 - A531	A51 Nantwich Bypass (south), Arm C Approach	NB	682	76	42	801	681	74	42	797	-4	0%	0.13	✓	✓	✓
Weston Road	Unnamed Road (south) to Weston Road Service Road (north)	NB	485	32	6	525	489	37	9	535	10	2%	0.45	✓	✓	✓
Weston Road	Weston Road Service Road (north) to Unnamed Road (south)	SB	608	35	10	656	604	36	12	652	-3	-1%	0.13	✓	✓	✓
Warmingham Road / Groby Road	Groby Road (east), Arm B Exit	EB	212	19	0	234	174	15	0	189	-45	-19%	3.06	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Warmingham Road / Groby Road	Groby Road (east), Arm B Approach	WB	262	21	0	282	204	12	0	216	-66	-23%	4.17	✓	✓	✓
Marshfield Bank	Marshfield Bank NB	NB	86	12	4	101	86	12	3	101	0	0%	0.01	✓	✓	✓
Marshfield Bank	Marshfield Bank SB	SB	351	11	2	364	351	11	1	363	-1	0%	0.05	✓	✓	✓
A530 Middlewich Road	North of A532 Coppenhall Lane	NB	567	39	9	616	564	39	9	611	-4	-1%	0.17	✓	✓	✓
A530 Middlewich Road	North of A532 Coppenhall Lane	SB	821	49	5	875	819	49	5	873	-2	0%	0.07	✓	✓	✓
A530 Middlewich Road	North of Wistaston Green Road	SB	1055	57	4	1118	1053	57	9	1118	0	0%	0.00	✓	✓	✓
A530 Middlewich Road	North of Wistaston Green Road	NB	669	58	11	740	668	56	16	740	0	0%	0.01	✓	✓	✓
Coppenhall Lane	West of A532 Coppenhall Lane WB	WB	378	22	1	403	378	23	6	407	5	1%	0.23	✓	✓	✓
Coppenhall Lane	West of A532 Coppenhall Lane EB	EB	510	33	3	547	512	33	8	553	6	1%	0.26	✓	✓	✓
Middlewich Road	South of Nantwich Road SB	WB	646	38	4	690	643	38	9	689	-1	0%	0.04	✓	✓	✓
Middlewich Road	South of Nantwich Road NB	EB	770	68	11	850	739	62	16	817	-33	-4%	1.15	✓	✓	✓
Middlewich Road	North of B5334 NB	EB	632	52	3	689	634	52	8	694	5	1%	0.18	✓	✓	✓
Middlewich Road	North of B5334 SB	WB	617	40	2	660	617	40	7	664	3	1%	0.13	✓	✓	✓
A51	South of Nantwich Tennis Club	EB	760	100	39	901	760	100	39	899	-3	0%	0.10	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A51	South of Nantwich Tennis Club	WB	712	74	39	826	713	74	39	826	0	0%	0.00	✓	✓	✓
Unnamed Road	Near to Alvaston Business Park	EB	109	8	1	117	109	8	0	117	0	0%	0.01	✓	✓	✓
Unnamed Road	Near to Alvaston Business Park	WB	30	3	1	34	30	3	0	33	0	-1%	0.04	✓	✓	✓
Parkers Road	East of Bradfield Road	WB	226	22	1	250	226	22	8	256	6	2%	0.38	✓	✓	✓
Bradfield Road	South of Parkers Lane	NB	437	28	2	472	433	28	5	465	-7	-1%	0.32	✓	✓	✓
Bradfield Road	South of Parkers Lane	SB	514	36	3	558	511	36	6	553	-5	-1%	0.21	✓	✓	✓
Bradfield Road - Parkers Road	B5076 Bradfield Road (north-west), Arm C Exit	NW	569	38	3	615	565	38	13	616	1	0%	0.03	✓	✓	✓
Bradfield Road - Parkers Road	B5076 Bradfield Road (north-west), Arm C Approach	SE	918	62	4	992	916	62	17	995	3	0%	0.09	✓	✓	✓
Parkers Road	East of Bradfield Road	EB	498	38	2	542	499	38	11	548	6	1%	0.27	✓	✓	✓

Directions: NB = North-bound, EB = east-bound, SB = south-bound, WB = west-bound, NE = north-west, SE = south-east

Annex G: Model performance report – Northwich Traffic Model

Contents

Tables

Figures

1 Introduction

1.1 Hybrid Bill

1.1.1 For the assessment of the Proposed Scheme at hybrid Bill (the original scheme), Mott MacDonald WSP Joint Venture (MWJV) used the Northwich Traffic Model to develop forecasts of the Northwich area to assess the impact of the original scheme at both the operational and construction stages.

1.1.2 The local authority, Cheshire West and Chester Council (CWAC) released copies of the latest available Northwich Traffic Model versions (as of January 2019) to High Speed Two (HS2) Ltd.

1.1.3 The Northwich Traffic Model has subsequently been updated by HS2 Ltd's transport consultants, MWJV, to include localised improvements within the High Speed Rail (Crewe – Manchester) area of interest. This is described in the Northwich Traffic Model hybrid Bill Model Performance Report.

1.1.4 For the purpose of assessment, the route of the original scheme is split into a number of geographical areas referred to as community areas. The Northwich Traffic Model, updated for hybrid Bill, has been utilised to provide an evidence base for the Transport Assessment for the community area Wimboldsley to Lostock Gralam (MA02). Reference should be made to Figure 1 which shows the geographic coverage of strategic transport models that have been utilised for the Transport Assessment.

1.2 Additional Provision 1 Environmental Statement

1.2.1 Additional Provision (AP) amendments are changes to the scheme that include requirements for additional powers in the High Speed Rail (Crewe – Manchester) Bill.

1.2.2 Following the main Environmental Statement (ES), further model development has been undertaken by MWJV. The Baseline and Future Baseline models have been updated for the assessment of the AP1 revised scheme to reflect:

- use of some additional traffic count information and refinement of network coding to improve model performance in key areas of interest and in response to stakeholder feedback;
- inclusion of recently consented, committed or completed transport schemes and development proposals that have come forward since the models used in the assessment reported in the main ES were developed;
- refinements to future baseline traffic demand to reflect changes to future growth patterns since the models used in the main ES were developed and the release of updated road traffic forecasts by the Department of Transport (DfT);

- the change in the future baseline forecast year from 2046 in the main ES to 2051 for the Supplementary Environmenal Statement 1 (SES1) and AP1 ES; and
- updates to value of time parameters to reflect the latest release of the DfT's Transport Analysis Guidance (TAG) data book.

1.3 Purpose of this report

1.3.1 This report provides documentation of the model performance review that has been carried out for the HS2 AP1 revised scheme Northwich Traffic Model.

1.3.2 The purpose of this report is to provide evidence that this highway assignment model is suitable to support the Transport Assessment of the High Speed Rail (Crewe – Manchester) SES1 and AP1 ES.

1.4 Model framework

1.4.1 The Northwich Traffic Model is a local highway model that has been developed within a SATURN model software platform (version 11.3.12u).

1.4.2 The detailed modelled study area covers Northwich and surrounding areas. There is supporting network and zone system detail to provide a representation of the external area supply and demand. Reference should be made to Figure 2.

1.4.3 The Northwich Traffic Model is representative of 2016 base year transport conditions.

1.5 Model development

1.5.1 The Northwich Traffic Model has been developed by CWAC's appointed transport consultants to support the Northwich Transport Strategy.

1.6 Model description

1.6.1 The original Northwich Traffic Model has been developed for the following years:

- 2016 base year; and
- 2030 future year.

1.6.2 The model is representative of the following time periods:

- AM peak hour - 08:00–09:00;
- average inter peak hour - 10:00–16:00; and
- PM peak hour - 17:00–18:00.

1.6.3 The model is comprised of the following demand user-classes:

- car commute;

- car other;
- car employers business;
- light goods vehicles; and
- other goods vehicles.

1.7 Model application objectives

1.7.1 For the assessment of the AP1 revised scheme, the A500 Crewe Strategic Highway Assignment Model provides:

- preliminary traffic data to inform scheme design;
- traffic data for the construction and operational phases of the AP1 revised scheme on which to base the assessment of significant effects for the SES1 and AP1 ES;
- changes in traffic flows, congestion and journey times to inform the Transport Assessment for the AP1 revised scheme; and
- changes in traffic flows between the base year and forecast scenarios for application to local models.

1.7.2 The Northwich Traffic Model has been used primarily to assess the likely impacts of HS2 construction and operational traffic in order to provide an evidence base for the Transport Assessment for the AP1 revised scheme.

Figure 1: Strategic Transport Model coverage for the High Speed Rail (Crewe – Manchester) Transport Assessment

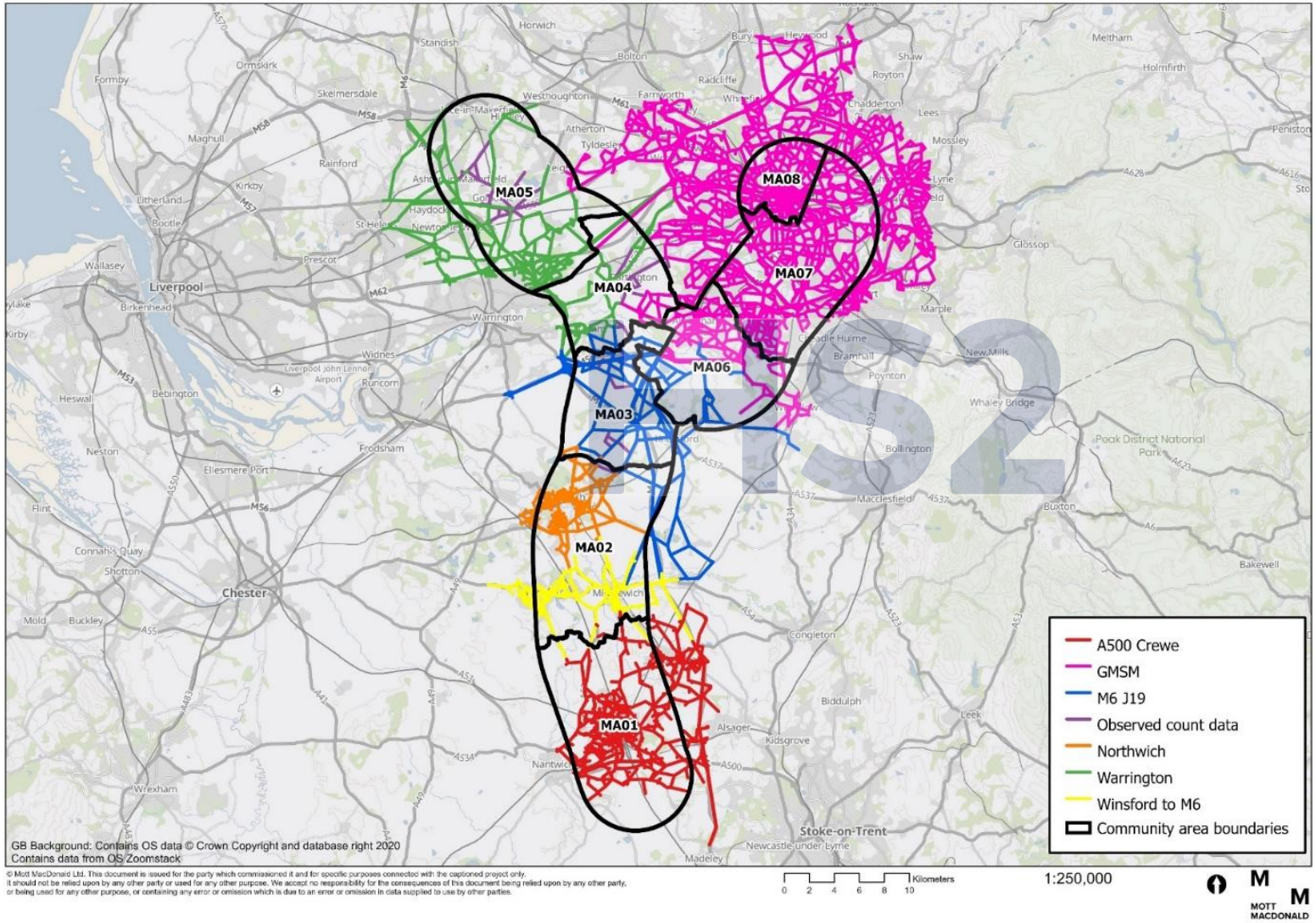
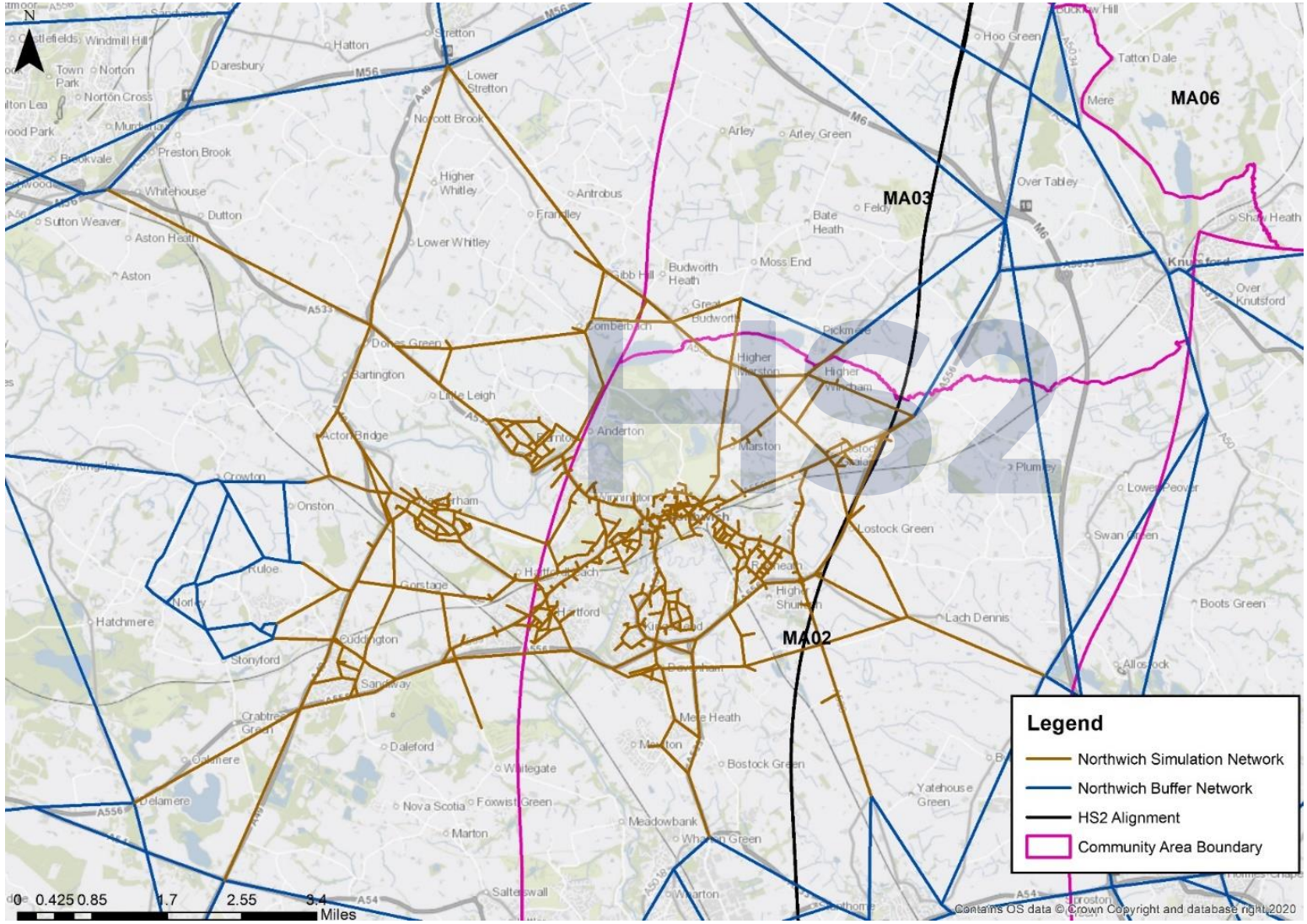


Figure 2: Model study area



2 Guidance used

2.1 Introduction

2.1.1 This strategic highway model development makes reference to the following TAG as published by the Department for Transport (DfT): TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2 Highway model guidance

2.2.1 In relation to providing an assessment of model calibration and validation performance, reference has been made to Section 3.2 of TAG Unit M3.1 (Table 1 and Table 2).

2.2.2 The criteria for the assessment of model calibration and validation of traffic flows and journey time performance are presented in Table 1 below.

Table 1: DfT – TAG validation criteria

Criteria	Acceptability guideline
Assigned hourly flows	
Individual flows within +/-15% for flows 700-2,700vph	>85% of cases
Individual flows within +/-100 vph for flows <700vph	>85% of cases
Individual flows within +/-400 vph for flows >2,700vph	>85% of cases
Screenline flows (normally >5 links) to be within 5%	All or nearly all screenlines
Geoffrey Havers (GEH) statistic	
Individual flows GEH <5	>85% of cases

Credit: Table 1 and Table 2 DfT TAG Unit M3.1 Highway Assignment Modelling (May 2020).

2.2.3 The criteria for the assessment of highway model assignment convergence is presented in Table 2 below.

Table 2: Summary of convergence measures and base model acceptable values

Measures of convergence	Acceptability guideline
Delta and %GAP	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) <1%	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) <1%	Four consecutive iterations greater than 98%
Percentage change in total user costs of links with flow change (V) <1%	Four consecutive iterations less than 0.1% (SUE only)

Credit. Table 4 DfT TAG Unit M3.1 Highway Assignment Modelling (May 2020).

3 Data for model development

3.1 Overview

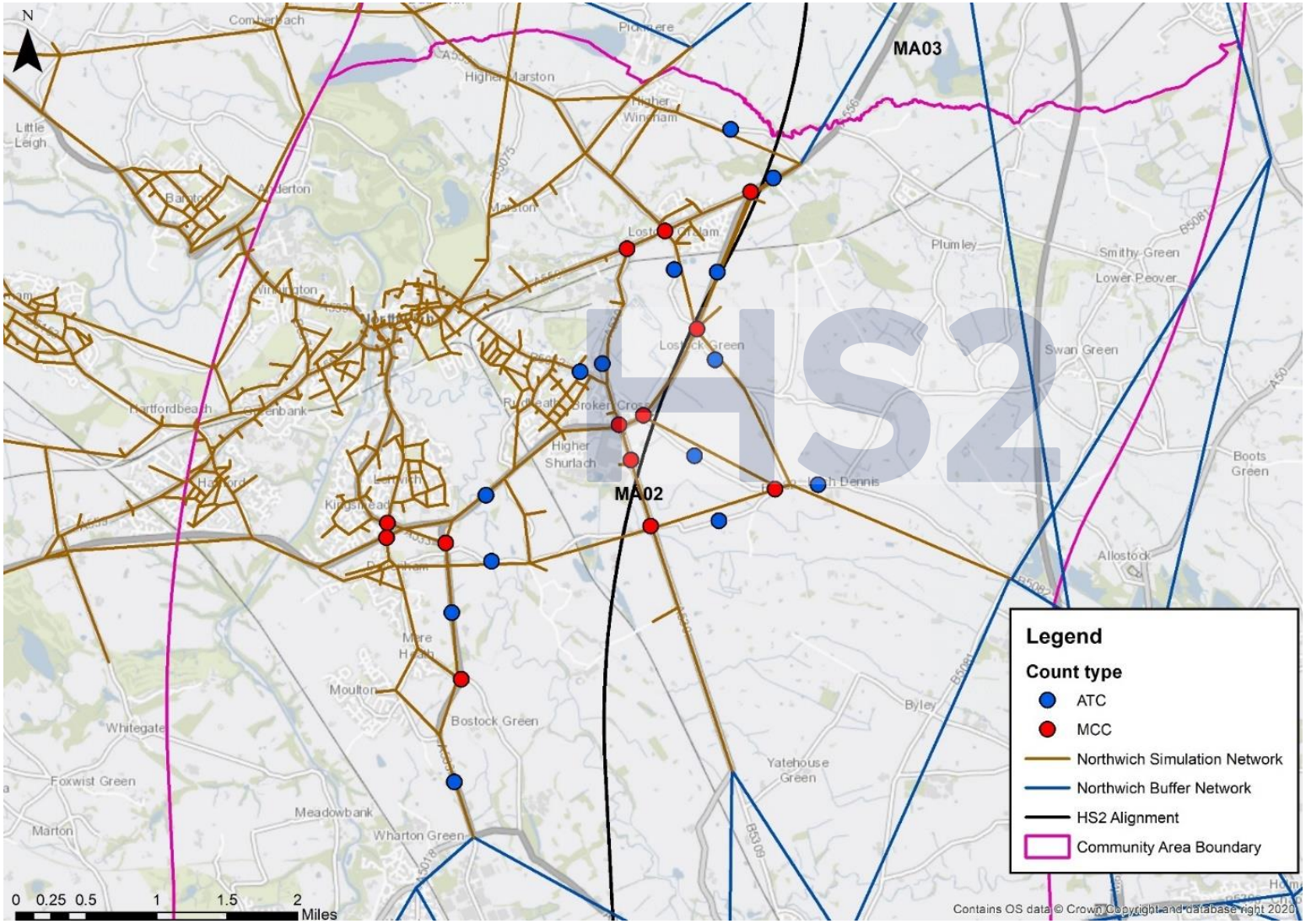
3.1.1 This section of the report presents details of traffic count data that has been collected for the purpose of calibrating the Northwich Traffic Model study area. The same data set was used at hybrid Bill and also for the SES1 and AP1 ES for model calibration. The following section describes the traffic survey data commissioned to collect this data.

3.2 Traffic survey data commission

3.2.1 MWJV commissioned a programme of traffic count surveys in 2017/2018 to support the assessment of the original scheme.

3.2.2 Traffic count surveys have been used from different years and months to update the base year model. The traffic counts have been factored to June 2018 to develop a consistent dataset. Figure 3 shows the location of traffic surveys.

Figure 3: Location of traffic counts (MWJV survey commission)



4 Model development

4.1 Overview

4.1.1 For the SES1 and AP1 ES, a review of base year model traffic flows identified that there was scope to undertake some localised improvements to the traffic model in order to provide a more robust assessment in the AP1 revised scheme area of interest.

4.1.2 For both hybrid Bill and the SES1 and AP1 ES, the 2016 base year model has been updated to a 2018 (June) base year model by MWJV using local growth factors and the traffic count survey data that was collected between November 2017 and March 2020 (prior to COVID-19). Traffic count data has been normalised to June 2018 traffic conditions using local count data.

4.1.3 This localised model update has focussed on the improvement to the validation of traffic flows at hybrid Bill and covering the AP1 revised scheme area of interest.

4.1.4 The model time periods represent the following peak hours, when the highest traffic volumes and most significant impacts are expected to occur:

- AM peak hour - 08:00–09:00; and
- PM peak hour - 17:00–18:00.

4.2 Transport supply

4.2.1 A review of highway network detail and attributes has been completed for the model area that is included in the Wimboldsley to Lostock Gralam area (MA02).

4.2.2 The following network attributes have been reviewed and checked:

- links: distance, speeds, capacity, bus lanes, traffic regulation orders;
- junctions: type; turn saturation flows, capacity, and lane utilisation;
- traffic signal control: timings, phasing, and staging; and
- routes: minimum cost paths.

4.2.3 The review highlighted that there is a good level of detailed highway network representation within the study area, and that this compared well with local datasets.

4.2.4 A network coding change was applied to the Gadbrook Roundabout, refining the network to improve representation in the model for the SES1 and AP1 ES.

4.2.5 The generalised cost values (PPM/PPK) for model assignment have also been updated to reflect the latest values from the DfT TAG databook (version: July 2020).

4.2.6 The model includes a sufficiently detailed level of network infrastructure to support the Transport Assessment.

4.3 Transport demand

4.3.1 The original Northwich Traffic Model includes a detailed representation of spatial demand. The model zone system contains 220 model zones and accounts for future land-use development zones.

4.3.2 At hybrid Bill, the demand matrices were adjusted from 2016 to 2018 by carrying out an interpolation between base and 2030 future year matrices. These uplifted matrices were then applied directly in model assignment without matrix estimation.

4.3.3 For the SES1 and AP1 ES, this interpolated 2018 matrix has been subject to matrix estimation using the available 2018 count data; and a localised traffic flow calibration exercise has been carried out to improve the correlation between observed and modelled traffic flows within the local area of interest.

5 Model performance

5.1 Overview

5.1.1 This section of the report focusses on the performance of the 2018 base model as produced by MWJV against observed traffic flow data.

5.1.2 The prior trip matrix assignment is the model assignment before matrix estimation is applied. This uses an interpolated parent model matrix adjusted to the HS2 zone system with an updated network that corresponds to HS2 base year. The updated network also includes revisions identified following a network review.

5.1.3 Matrix estimation uses the prior matrix and updated network mentioned above and creates an updated matrix to match count data. The post trip matrix assignment is the model assignment using this updated matrix and the same updated network used in prior assignments.

5.1.4 It is the post matrix assignment that is taken forward and used in the Transport Assessment.

5.2 Traffic flow

5.2.1 Observed and modelled traffic flows have been compared for the count site locations within the Wimboldsley to Lostock Gralam area (MA02). In total, 78 individual link counts by direction have been compared.

5.2.2 Table 3 and Table 4 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the prior matrix assignment. The comparison shows that both time periods fall below the DfT TAG individual link count criteria of greater than 85% of comparisons achieving the flow or GEH criteria.

Table 3: AP1 Northwich Traffic Model – Individual link flow – total all vehicle – prior

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	78	51	65%	45	58%	52	67%
PM peak hour	78	57	73%	53	68%	57	73%

Table 4: AP1 Northwich Traffic Model – Individual link flow – car vehicle type – prior

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	78	53	68%	48	62%	53	68%
PM peak hour	78	57	73%	52	67%	58	74%

5.2.3 Figure 4 and Figure 5 show the locations of the link counts and the respective AM and PM peak hour model performance for the prior matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.4 Table 5 and Table 6 present a summary comparison of individual link flows for all vehicles and by the car vehicle type for the post matrix estimation assignment. The comparison shows that both time periods meet the DfT TAG individual link count criteria of greater than 85 percent of comparisons achieving flow and GEH criteria.

5.2.5 The results show an overall improvement on the results at hybrid Bill.

Table 5: AP1 Northwich Traffic Model – Individual link flow – total all vehicle – post matrix estimation

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG Flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	78	75	96%	69	88%	75	96%
PM peak hour	78	70	90%	68	87%	72	92%

Table 6: AP1 Northwich Traffic Model – Individual link flow – car vehicle type – post matrix estimation

Time period	Car flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	78	73	94%	72	92%	75	96%
PM peak hour	78	71	91%	72	92%	74	95%

5.2.6 Figure 6 and Figure 7 show the locations of the link counts and the respective AM and PM peak hour model performance for the post matrix assignment. These show links passing TAG flow or GEH criteria as green bands. Links failing the TAG flow or GEH criteria are shown as yellow, orange or red bands, according to GEH value.

5.2.7 Reference should be made to Table 10 and Table 11, Appendix A, which presents supporting details of the individual link flow performance for AM and PM time periods, post matrix estimation.

Figure 4: AM peak hour – traffic flow performance – prior

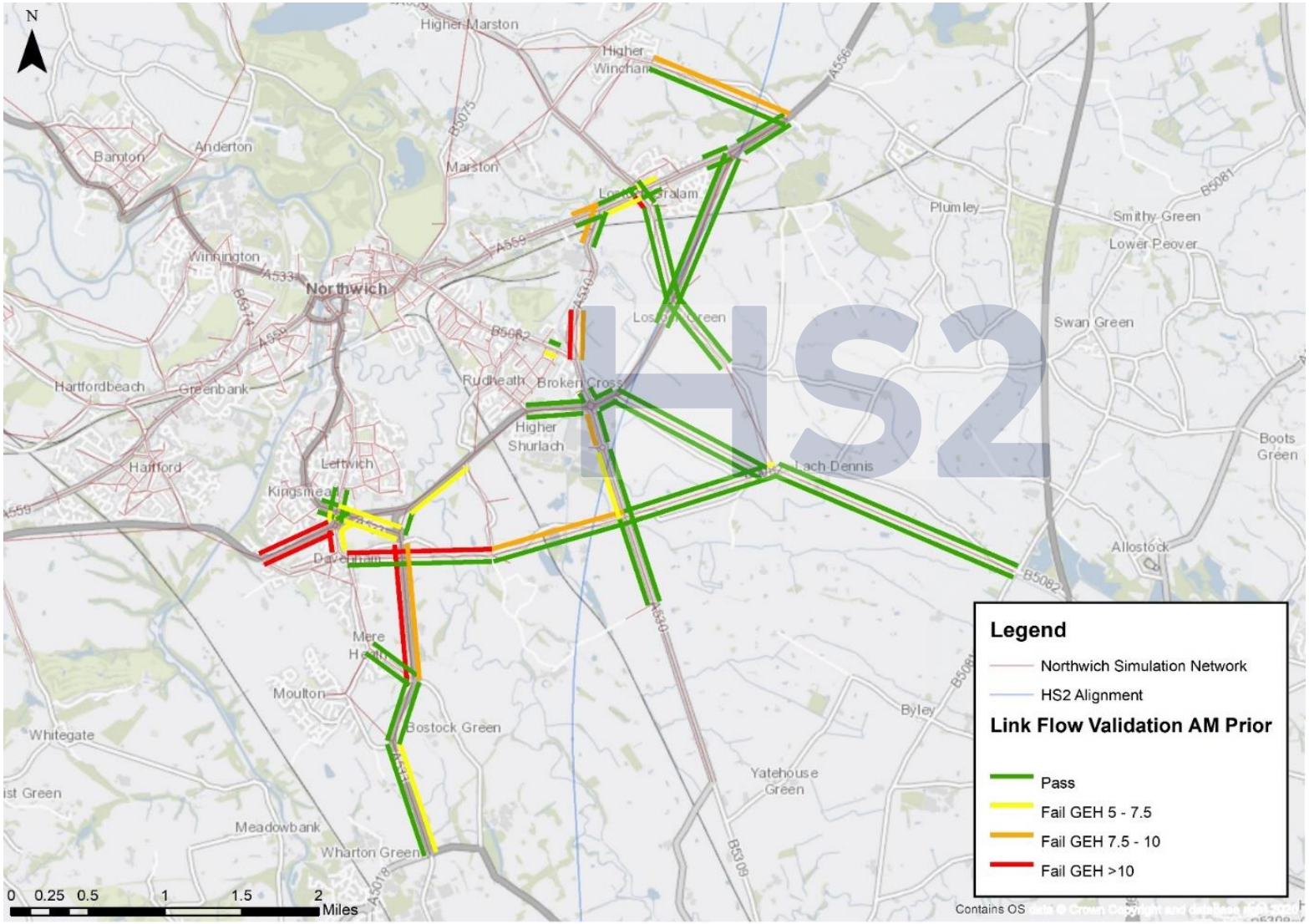


Figure 5: PM peak hour – traffic flow performance – prior

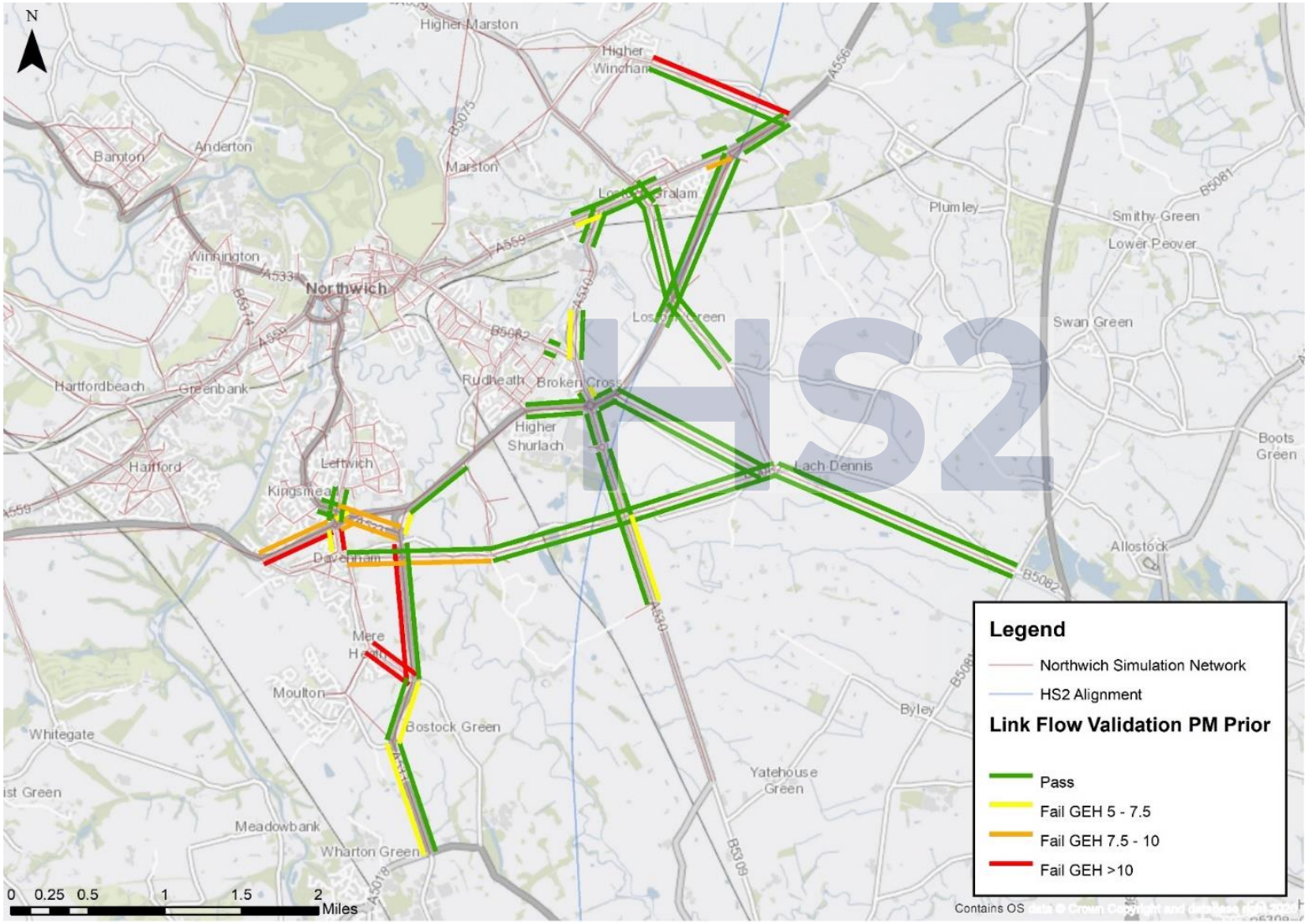


Figure 6: AM peak hour – traffic flow performance – post

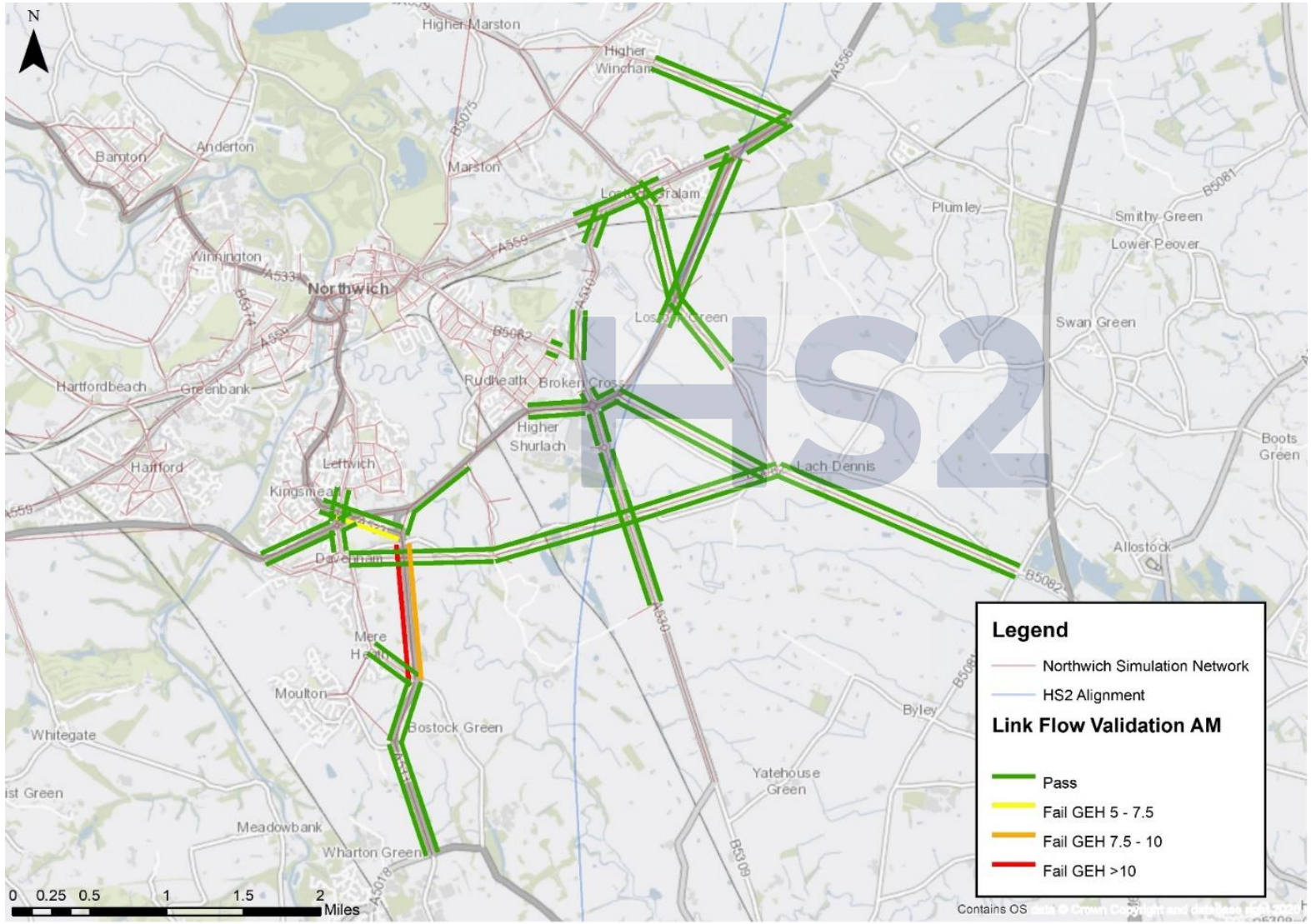
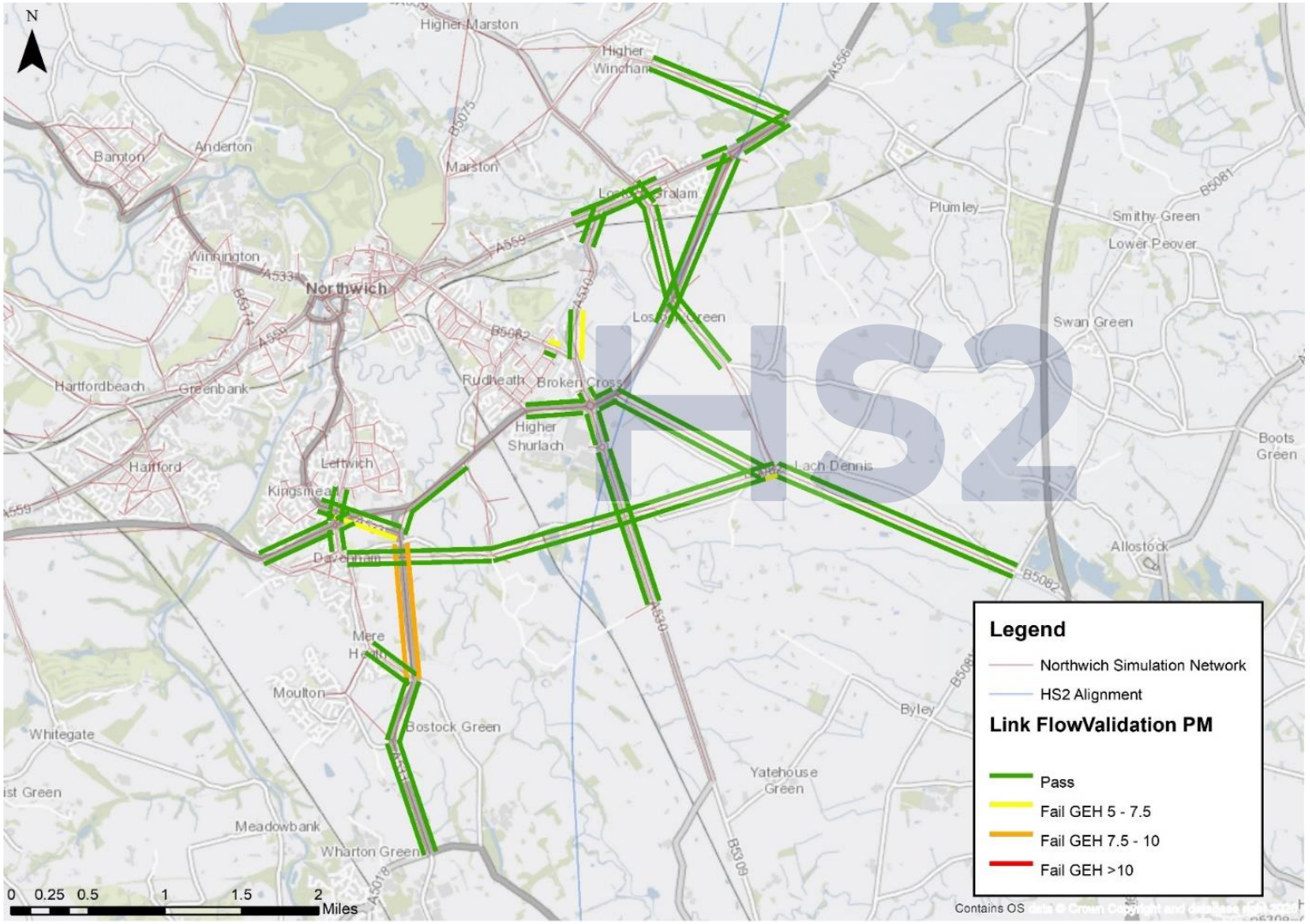


Figure 7: PM peak hour – traffic flow performance – post



6 Model convergence

6.1.1 Achieving a suitable level of model convergence is necessary to provide stable, consistent, and robust model results and to differentiate between real changes and those associated with differing degrees of convergence.

6.1.2 DfT TAG provides guidance on highway model convergence with recommendations on acceptable variations in link flows and costs between iterations helping to ensure the model is sufficiently stable.

6.1.3 Table 7 presents a summary of the 2018 base year highway model convergence statistics for the AP1 revised scheme by time period. Both models converge well in 50 loops or less.

Table 7: AP1 Northwich Traffic Model 2018 baseline model convergence

Criteria	Loop	Target	AM	PM
Flow change	N-3	>98%	98.50	99.50
	N-2		98.70	99.60
	N-1		98.90	99.60
	N		98.70	99.70
Delays change	N-3	>98%	99.70	99.70
	N-2		99.70	99.60
	N-1		99.90	99.60
	N		99.80	99.70
Delta		<0.1%	0.0012/15	0.0012/15
% GAP		<0.1%	0.0068	0.0068

7 Summary and conclusions

7.1.1 For the assessment of the AP1 revised scheme, the Northwich Traffic Model 2016 base year local highway model as supplied by CWAC has been further developed for the SES1 and AP1 ES. This includes refinement of the network coding to improve model performance in key areas of interest, and use of the count data applied to a 2018 uplifted matrix during model calibration for matrix estimation.

7.1.2 Presented below is a summary of the individual link flow model performance for all modelled time periods for the SES1 and AP1 ES. The comparison shows that both time periods exceed the 85 percent threshold of individual links meeting either the DfT TAG flow range or GEH less than five criteria.

Table 8: AP1 Northwich Traffic Model – individual link flow – total all vehicle – post ME

Time period	Total flow comparison (vehicles)						
	Number of sites	TAG flow criteria		TAG GEH criteria		TAG flow or GEH criteria	
		Number of counts	Percentage	Number of counts	Percentage	Number of counts	Percentage
AM peak hour	78	75	96%	69	88%	75	96%
PM peak hour	78	70	90%	68	87%	72	92%

7.1.3 Both the AM and PM models converge satisfactorily and in under 50 assignment loops.

7.1.4 In conclusion, the updated Northwich Traffic Model provides a reliable forecasting base and forms a suitable tool for the assessment of HS2 construction and operational impacts within the High Speed Rail (Crewe – Manchester) area of interest.

8 List of acronyms

Table 9: List of acronyms

Acronym	Description
ATC	Automatic traffic count
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
ES	Environmental Statement
GEH	Geoffrey Havers (statistic)
HGV	Heavy Goods Vehicle
JTC	Junction turning count
LMVR	Local Model Validation Report
MCC	Manual Classified count
MPR	Model Performance Report
PPM	Pence Per Minute
PPK	Pence Per Kilometre
TA	Transport Assessment

9 References

Department for Transport (2020), *TAG unit M1.2 Data Sources and Surveys.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m1-2-data-sources-and-surveys.

Department for Transport (2020), *TAG unit M3.1 Highway Assignment Modelling.* Public Transport Assignment. Available online at: https://www.gov.uk/government/publications/webtag-tag-unit-m3-1-highway-assignment-modelling.

10 Appendix A – Model performance

Individual link flow performance

Table 11: AP1 Northwich Traffic Model – AM peak hour – individual link flows

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A533	between Bostock Road and Jack Lane	NB	712	117	52	881	828	118	25	971	89	10%	2.94	✓	✓	✓
A559 Manchester Road	between Station Road and Lodge Lane	EB	423	69	29	521	389	69	13	472	-49	-9%	2.20	✓	✓	✓
A559 Manchester Road	between Cheshire Business Park and A556	EB	478	75	33	586	482	75	14	570	-16	-3%	0.65	✓	✓	✓
A556	between Birches Lane and A559 Manchester Road	EB	918	102	69	1089	934	101	27	1061	-28	-3%	0.85	✓	✓	✓
A559 Hall Lane	between A559 Manchester Road and Townshend Road	NB	265	55	26	346	261	56	6	322	-23	-7%	1.26	✓	✓	✓
A559 Manchester Road	between A530 Griffiths Road and Station Road	EB	480	87	16	583	477	87	17	581	-1	0%	0.06	✓	✓	✓
A559 Hall Lane	between Townshend Road and A559 Manchester Road	SB	383	62	31	476	386	60	2	449	-27	-6%	1.25	✓	✓	✓
A559 Manchester Road	between Lodge Lane and Station Road	WB	322	47	30	398	255	45	13	313	-85	-21%	4.51	✓	✓	✓
Station Road	between School Lane and A559 Manchester Road	NB	140	18	2	159	87	13	2	103	-56	-35%	4.90	✓	✓	✓
A530 King Street	between A556 and Cookes Lane	NB	329	62	17	408	329	73	14	415	8	2%	0.39	✓	✓	✓

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A559 Manchester Road	between Stanley Grove and A530 Griffiths Road	EB	423	76	5	504	419	76	17	511	8	2%	0.35	✓	✓	✓
A559 Manchester Road	between Station Road and A530 Griffiths Road	WB	555	77	18	649	556	80	16	652	3	0%	0.10	✓	✓	✓
A530 Griffiths Road	between A530 Griffiths Road and A559	NB	199	45	5	249	201	45	0	246	-3	-1%	0.16	✓	✓	✓
A530 King Street	between Morrisons and Crowders Lane	SB	415	82	34	530	427	83	15	525	-5	-1%	0.23	✓	✓	✓
Crowder's Lane	between A530 and Penny's Lane	WB	40	27	4	72	20	1	0	22	-50	-70%	7.35	×	✓	✓
A530 King Street	between Whatcroft Hall Lane and Crowder's Lane	NB	619	88	43	750	559	88	16	662	-87	-12%	3.29	✓	✓	✓
Davenham Road	between Shurlach Lane and A530 King Street	EB	156	20	1	176	128	22	0	150	-26	-15%	2.07	✓	✓	✓
A530 Griffiths Road	between A530 Griffiths Road and B5082 Middlewich Road	SB	302	46	18	366	329	52	3	384	18	5%	0.91	✓	✓	✓
A533 Kingsmead	between London Road and Regency Way	WB	955	79	25	1059	955	96	12	1063	4	0%	0.11	✓	✓	✓
A533 Kingsmead	between Regency Way and London Road	EB	961	75	17	1053	954	86	9	1049	-4	0%	0.14	✓	✓	✓
London Road	between Dunham Road and A533	SB	399	33	7	439	399	33	7	439	0	0%	0.01	✓	✓	✓
A533 Kingsmead	between A533 and London Road	WB	854	112	54	1020	774	83	3	859	-161	-16%	5.24	×	×	×

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
London Road	between Davenham Road Roundabout and A533 Kingsmead	NB	1012	81	34	1126	1018	46	16	1080	-45	-4%	1.36	✓	✓	✓
A556	between Davenham Road Roundabout and A556	EB	1769	135	64	1968	1788	137	27	1952	-15	-1%	0.34	✓	✓	✓
A556 Slip Road	between A556 and A533 Kingsmead	SB	222	69	28	319	260	50	17	327	9	3%	0.49	✓	✓	✓
A533 Kingsmead	between London Road and A533	EB	594	62	24	680	534	44	3	581	-99	-15%	3.94	✓	✓	✓
A556	between Shurlach Lane and A533 Exit	WB	663	132	72	867	673	138	31	842	-25	-3%	0.84	✓	✓	✓
A533	between Peckmill Roundabout and A533 Kingsmead	NB	856	112	48	1016	633	71	0	704	-312	-31%	10.64	×	×	×
A556	between Davenham Road Roundabout and Hartford Road	WB	824	123	43	989	819	123	19	962	-27	-3%	0.86	✓	✓	✓
B5082 Penny's Lane	between Crowder's Lane and A556	WB	168	66	12	246	268	43	6	318	72	29%	4.28	✓	✓	✓
A556	between A530 King Street and B5082 Penny's Lane	EB	1319	161	76	1555	1350	172	32	1554	-1	0%	0.04	✓	✓	✓
A556	between A530 King Street and Gadbrook Rd	WB	1253	141	62	1455	1270	141	34	1446	-9	-1%	0.24	✓	✓	✓
Lostock Green	between Lostock Hollow and Birches Lane	SB	8	5	1	14	0	0	0	0	-14	-100%	5.35	×	✓	✓
A556	between A559 Manchester Road and Birches Lane	WB	917	150	87	1154	917	151	40	1108	-46	-4%	1.37	✓	✓	✓

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Birches Lane	between Hangman's Lane and A556	NB	8	17	3	27	0	0	0	0	-27	-100%	7.36	×	✓	✓
A556	between Truck Stop and Birches Lane	EB	997	119	67	1182	1042	122	29	1193	11	1%	0.32	✓	✓	✓
B5569 Chester Road	between A556 and Linnards Lane	EB	1311	0	189	1500	1137	118	39	1294	-206	-14%	5.51	×	✓	✓
Linnards Lane	between Keats Lane and B5569 Chester Road	EB	73	0	5	78	75	23	14	112	34	44%	3.51	✓	✓	✓
B5082 Middlewich Road	between West Avenue and East Avenue	EB	315	0	23	338	321	56	13	390	52	15%	2.73	✓	✓	✓
B5082 Middlewich Road	between East Avenue and West Avenue	WB	306	0	20	326	300	38	8	347	21	6%	1.13	✓	✓	✓
B5082 Penny's Lane	between Crowder's Lane and Birches Lane	EB	498	69	11	578	416	70	3	488	-89	-15%	3.87	✓	✓	✓
London Road	between A533 and Dunham Road	NB	375	32	5	412	374	32	7	414	2	0%	0.09	✓	✓	✓
London Road	between A556 and Green Lane	SB	338	42	11	391	308	41	8	357	-33	-8%	1.71	✓	✓	✓
Lostock Green	between Birches Lane and Lostock Hollow	NB	120	38	2	160	108	21	2	132	-28	-18%	2.34	✓	✓	✓
Station Road	between A559 Manchester Road and School Lane	SB	81	14	1	95	0	0	0	0	-95	-100%	13.78	×	✓	✓
A556	between Birches Lane and Truck Stop	WB	845	140	100	1084	850	126	37	1013	-71	-7%	2.18	✓	✓	✓
B5082 Penny's Lane	between Birches Lane and Crowder's Lane	WB	337	44	17	398	289	44	7	339	-58	-15%	3.03	✓	✓	✓

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Crowder's Lane	between A530 and Penny's Lane	EB	129	51	3	183	108	20	0	128	-55	-30%	4.42	✓	✓	✓
B5082 Penny's Lane	between A556 and Crowder's Lane	EB	245	99	7	351	308	50	3	361	10	3%	0.52	✓	✓	✓
Davenham Road	between A530 King Street and Shurlach Lane	WB	108	22	2	132	55	22	0	77	-55	-42%	5.38	×	✓	✓
Shipbrook Rd	between Shurlach Lane and London Road	WB	24	0	2	26	22	16	0	38	12	46%	2.10	✓	✓	✓
Birches Lane	between A556 and Hangman's Lane	SB	50	42	7	98	67	25	3	95	-3	-3%	0.33	✓	✓	✓
Shipbrook Rd	between London Road and Shurlach Lane	EB	96	0	4	100	128	22	0	150	50	50%	4.47	✓	✓	✓
London Road	between A533 and Jack Lane	NB	269	44	4	317	179	44	21	245	-72	-23%	4.29	✓	✓	✓
A533	between London Road and Jack Lane	SB	753	103	44	900	791	102	22	914	14	2%	0.47	✓	✓	✓
A533	between Jack Lane and Jack Lane	SB	684	96	50	829	818	102	25	945	116	14%	3.90	✓	✓	✓
A533	between Jack Lane and London Road	NB	804	114	48	966	800	115	21	936	-30	-3%	0.96	✓	✓	✓
London Road	between Jack Lane and A533	SB	180	19	6	204	150	20	4	174	-30	-15%	2.22	✓	✓	✓
A533	between A533 Kingsmead and London Road	SB	832	118	50	1000	653	82	18	753	-247	-25%	8.35	×	×	×
A559 Mancheste Rd	between A530 Griffiths Road and Stanley Grove	WB	362	66	10	437	365	66	16	447	10	2%	0.49	✓	✓	✓
A530 Griffiths Road	between A559 and A530 Griffiths Road	SB	341	48	7	396	333	48	0	381	-15	-4%	0.76	✓	✓	✓

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A530 Griffiths Road	between B5082 Middlewich Road and A530 Griffiths Road	NB	233	42	14	289	192	42	6	240	-49	-17%	2.99	✓	✓	✓
A530 King Street	between A556 and Morrisons	SB	477	83	55	614	454	84	16	554	-60	-10%	2.48	✓	✓	✓
A530 King Street	between Crowder's Lane and Morrisons	NB	512	83	36	630	522	68	16	607	-23	-4%	0.94	✓	✓	✓
B5569 Chester Road	between Linnards Lane and A556	WB	950	0	204	1154	954	120	51	1124	-30	-3%	0.88	✓	✓	✓
A556	between A556 and Davenham Road Roundabout	WB	413	86	35	534	413	88	14	515	-19	-3%	0.81	✓	✓	✓
London Road	between A533 Kingsmead and Davenham Road Roundabout	SB	1294	120	58	1472	1281	76	13	1370	-102	-7%	2.71	✓	✓	✓
London Road	between Green Lane and Davenham Road Roundabout	NB	709	62	14	785	723	73	23	819	34	4%	1.21	✓	✓	✓
A556	between Hartford Road and Davenham Road Roundabout	EB	1526	112	45	1682	1516	111	20	1647	-35	-2%	0.85	✓	✓	✓
A556	between Gadbrook Road and A530 King Street	EB	1102	121	59	1281	1136	123	25	1284	3	0%	0.08	✓	✓	✓
A530 King Street	between Morrisons and A556	NB	501	67	36	604	521	68	15	605	1	0%	0.05	✓	✓	✓
A556	between A530 King Street and B5082 Pennys Lane	WB	1128	169	107	1403	1118	169	44	1331	-72	-5%	1.95	✓	✓	✓
A530 King Street	between Cookes Lane and A556	SB	622	108	28	757	629	108	12	749	-8	-1%	0.29	✓	✓	✓

Road name	Location	Direction	Observed flow (Vehicles)				Modelled flow (vehicles)				Total Flow Comparison					
			Cars	LGV	HGV	Total	Cars	LGV	HGV	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A559 Manchester Road	between A556 and Cheshire Business Park	WB	363	52	30	444	321	52	12	386	-57	-13%	2.81	✓	✓	✓
A530 King Street	between Crowder's Lane and Whatccroft Hall Lane	SB	463	64	31	558	449	84	15	547	-10	-2%	0.43	✓	✓	✓
Linnards Lane	between B5569 Chester Road and Keats Lane	WB	32	0	2	33	31	11	4	46	13	39%	2.06	✓	✓	✓
Holmes Chapel Road	between Common Lane and Highfield Farm	EB	488	0	34	522	483	94	6	583	61	12%	2.59	✓	✓	✓
Holmes Chapel Road	between Highfield Farm and Common Lane	WB	285	0	69	354	289	44	7	339	-15	-4%	0.78	✓	✓	✓

Directions: NB = North-bound, EB = east-bound, SB = south-bound, WB = west-bound

Table 12: AP1 Northwich Traffic Model – PM peak hour – individual link flows

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A533	between Bostock Road and Jack Lane	NB	777	53	20	850	860	69	14	943	94	11%	3.13	✓	✓	✓
A559 Manchester Road	between Station Road and Lodge Lane	EB	340	37	10	386	339	37	5	381	-5	-1%	0.25	✓	✓	✓
A559 Manchester Road	between Cheshire Business Park and A556	EB	396	29	8	432	466	27	4	497	65	15%	3.04	✓	✓	✓
A556	between Birches Lane and A559 Manchester Road	EB	873	75	51	999	878	69	19	967	-32	-3%	1.04	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A559 Hall Lane	between A559 Manchester Road and Townshend Road	NB	421	47	10	477	399	48	3	450	-27	-6%	1.26	✓	✓	✓
A559 Manchester Road	between A530 Griffiths Road and Station Road	EB	528	59	9	595	542	59	6	607	12	2%	0.49	✓	✓	✓
A559 Hall Lane	between Townshend Road and A559 Manchester Road	SB	301	33	8	341	290	38	1	329	-11	-3%	0.63	✓	✓	✓
A559 Manchester Road	between Lodge Lane and Station Road	WB	511	35	12	558	436	36	5	477	-80	-14%	3.53	✓	✓	✓
Station Road	between School Lane and A559 Manchester Road	NB	152	18	1	170	148	14	2	163	-6	-4%	0.49	✓	✓	✓
A530 King Street	between A556 and Cookes Lane	NB	602	71	9	682	605	70	8	682	1	0%	0.04	✓	✓	✓
A559 Manchester Road	between Stanley Grove and A530 Griffiths Road	EB	526	45	5	576	477	48	6	531	-45	-8%	1.89	✓	✓	✓
A559 Manchester Road	between Station Road and A530 Griffiths Road	WB	692	56	9	756	677	61	7	745	-11	-1%	0.41	✓	✓	✓
A530 Griffiths Road	between A530 Griffiths Road and A559	NB	256	30	4	290	263	31	0	293	4	1%	0.22	✓	✓	✓
A530 King Street	between Morrisons and Crowders Lane	SB	700	59	24	783	698	51	9	758	-25	-3%	0.92	✓	✓	✓
Crowder's Lane	between A530 and Penny's Lane	WB	66	63	3	132	107	8	0	115	-17	-13%	1.56	✓	✓	✓
A530 King Street	between Whatcroft Hall Lane and Crowder's Lane	NB	765	59	50	874	764	74	15	853	-21	-2%	0.71	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Davenham Road	between Shurlach Lane and A530 King Street	EB	9	7	0	15	16	7	0	23	8	54%	1.86	✓	✓	✓
A530 Griffiths Road	between A530 Griffiths Road and B5082 Middlewich Road	SB	404	18	13	434	277	25	5	307	-128	-29%	6.63	×	×	×
A533 Kingsmead	between London Road and Regency Way	WB	1054	60	5	1119	1023	70	3	1096	-23	-2%	0.68	✓	✓	✓
A533 Kingsmead	between Regency Way and London Road	EB	745	47	5	797	826	61	1	888	91	11%	3.14	✓	✓	✓
London Road	between Dunham Road and A533	SB	244	17	4	265	239	27	8	274	9	3%	0.52	✓	✓	✓
A533 Kingsmead	between A533 and London Road	WB	922	81	17	1020	805	49	2	856	-164	-16%	5.35	×	×	×
London Road	between Davenham Road Roundabout and A533 Kingsmead	NB	1012	67	6	1085	974	55	7	1037	-48	-4%	1.47	✓	✓	✓
A556	between Davenham Road Roundabout and A556	EB	900	111	27	1037	913	112	16	1041	4	0%	0.13	✓	✓	✓
A556 Slip Road	between A556 and A533 Kingsmead	SB	571	47	17	635	463	57	8	528	-106	-17%	4.40	✓	×	✓
A533 Kingsmead	between London Road and A533	EB	501	39	5	545	445	25	2	473	-72	-13%	3.21	✓	✓	✓
A556	between Shurlach Lane and A533 Exit	WB	1967	136	35	2138	1895	137	14	2045	-92	-4%	2.02	✓	✓	✓
A533	between Peckmill Roundabout and A533 Kingsmead	NB	900	65	20	986	719	42	0	761	-224	-23%	7.58	×	×	×

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A556	between Davenham Road Roundabout and Hartford Road	WB	1519	86	17	1622	1507	82	5	1594	-27	-2%	0.68	✓	✓	✓
B5082 Penny's Lane	between Crowder's Lane and A556	WB	113	47	4	163	210	37	2	249	86	53%	5.98	×	✓	✓
A556	between A530 King Street and B5082 Penny's Lane	EB	1244	102	50	1396	1245	109	22	1376	-20	-1%	0.52	✓	✓	✓
A556	between A530 King Street and Gadbrook Rd	WB	1400	118	31	1549	1449	109	13	1572	23	2%	0.59	✓	✓	✓
Lostock Green	between Lostock Hollow and Birches Lane	SB	5	2	1	8	0	0	0	0	-8	-100%	3.88	✓	✓	✓
A556	between A559 Manchester Road and Birches Lane	WB	1371	83	37	1490	1387	105	15	1508	17	1%	0.45	✓	✓	✓
Birches Lane	between Hangman's Lane and A556	NB	36	54	5	95	28	0	0	28	-66	-70%	8.45	×	✓	✓
A556	between Truck Stop and Birches Lane	EB	1016	68	50	1133	1034	92	21	1148	15	1%	0.43	✓	✓	✓
B5569 Chester Road	between A556 and Linnards Lane	EB	1103	0	97	1200	1013	77	23	1114	-86	-7%	2.53	✓	✓	✓
Linnards Lane	between Keats Lane and B5569 Chester Road	EB	36	0	2	37	69	31	3	104	67	179%	7.93	×	✓	✓
B5082 Middlewich Road	between West Avenue and East Avenue	EB	326	0	17	343	406	36	6	447	104	30%	5.25	×	×	×
B5082 Middlewich Road	between East Avenue and West Avenue	WB	399	0	12	411	408	52	3	462	51	13%	2.46	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
B5082 Penny's Lane	between Crowder's Lane and Birches Lane	EB	298	19	3	319	232	18	1	251	-68	-21%	4.03	✓	✓	✓
London Road	between A533 and Dunham Road	NB	324	32	3	359	317	34	6	356	-3	-1%	0.14	✓	✓	✓
London Road	between A556 and Green Lane	SB	420	35	5	460	414	33	5	452	-7	-2%	0.34	✓	✓	✓
Lostock Green	between Birches Lane and Lostock Hollow	NB	134	49	4	187	156	23	2	181	-6	-3%	0.42	✓	✓	✓
Station Road	between A559 Manchester Road and School Lane	SB	39	4	1	43	0	0	0	0	-43	-100%	9.27	×	✓	✓
A556	between Birches Lane and Truck Stop	WB	1351	102	34	1487	1365	98	14	1478	-9	-1%	0.24	✓	✓	✓
B5082 Penny's Lane	between Birches Lane and Crowder's Lane	WB	456	27	3	485	316	46	2	364	-121	-25%	5.88	×	×	×
Crowder's Lane	between A530 and Penny's Lane	EB	33	9	2	45	21	1	0	23	-22	-50%	3.83	✓	✓	✓
B5082 Penny's Lane	between A556 and Crowder's Lane	EB	165	65	3	233	211	17	1	228	-5	-2%	0.33	✓	✓	✓
Davenham Road	between A530 King Street and Shurlach Lane	WB	194	11	0	205	200	13	0	212	8	4%	0.54	✓	✓	✓
Shipbrook Road	between Shurlach Lane and London Road	WB	142	0	6	148	192	11	0	204	56	38%	4.21	✓	✓	✓
Birches Lane	between A556 and Hangman's Lane	SB	37	31	2	70	50	7	1	58	-12	-17%	1.49	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Shipbrook Road	between London Road and Shurlach Lane	EB	16	0	1	17	12	6	0	18	1	7%	0.27	✓	✓	✓
London Road	between A533 and Jack Lane	NB	258	29	3	289	230	31	10	271	-18	-6%	1.08	✓	✓	✓
A533	between London Road and Jack Lane	SB	856	80	25	961	835	79	10	924	-36	-4%	1.17	✓	✓	✓
A533	between Jack Lane and Jack Lane	SB	748	59	23	831	866	79	13	959	128	15%	4.28	✓	×	✓
A533	between Jack Lane and London Road	NB	822	68	29	918	822	69	9	900	-18	-2%	0.61	✓	✓	✓
London Road	between Jack Lane and A533	SB	126	15	2	143	142	8	2	151	9	6%	0.73	✓	✓	✓
A533	between A533 Kingsmead and London Road	SB	1058	79	23	1161	819	77	9	905	-255	-22%	7.94	×	×	×
A559 Mancheste Rd	between A530 Griffiths Road and Stanley Grove	WB	583	48	7	638	580	48	7	635	-3	0%	0.11	✓	✓	✓
A530 Griffiths Road	between A559 and A530 Griffiths Road	SB	358	32	3	393	295	33	0	328	-64	-16%	3.39	✓	✓	✓
A530 Griffiths Road	between B5082 Middlewich Road and A530 Griffiths Road	NB	248	17	12	276	261	23	5	289	12	5%	0.74	✓	✓	✓
A530 King Street	between A556 and Morrisons	SB	726	69	30	824	696	51	9	755	-69	-8%	2.46	✓	✓	✓
A530 King Street	between Crowder's Lane and Morrisons	NB	656	71	23	750	665	72	15	752	3	0%	0.10	✓	✓	✓
B5569 Chester Road	between Linnards Lane and A556	WB	1570	0	145	1716	1588	130	19	1737	21	1%	0.51	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
A556	between A556 and Davenham Road Roundabout	WB	1463	84	13	1559	1431	80	5	1517	-42	-3%	1.07	✓	✓	✓
London Road	between A533 Kingsmead and Davenham Road Roundabout	SB	1054	80	19	1152	1059	63	7	1129	-22	-2%	0.67	✓	✓	✓
London Road	between Green Lane and Davenham Road Roundabout	NB	354	29	5	387	327	32	14	373	-14	-4%	0.71	✓	✓	✓
A556	between Hartford Road and Davenham Road Roundabout	EB	981	106	18	1105	987	109	8	1104	0	0%	0.01	✓	✓	✓
A556	between Gadbrook Rd and A530 King Street	EB	1155	81	33	1268	1147	80	13	1240	-28	-2%	0.78	✓	✓	✓
A530 King Street	between Morrisons and A556	NB	668	75	35	777	675	73	15	762	-14	-2%	0.51	✓	✓	✓
A556	between A530 King Street and B5082 Pennys Lane	WB	1669	140	35	1843	1569	135	16	1720	-123	-7%	2.90	✓	✓	✓
A530 King Street	between Cookes Lane and A556	SB	547	59	16	622	597	55	8	661	39	6%	1.54	✓	✓	✓
A559 Manchester Road	between A556 and Cheshire Business Park	WB	541	44	10	594	533	43	4	580	-14	-2%	0.56	✓	✓	✓
A530 King Street	between Crowder's Lane and Whatccroft Hall Lane	SB	617	46	20	683	699	54	9	761	78	11%	2.90	✓	✓	✓

Road name	Location	Direction	Observed flow (vehicles)				Modelled flow (vehicles)				Total flow comparison					
			Cars	LGVs	HGVs	Total	Cars	LGVs	HGVs	Total	Dif	% Dif	GEH	GEH <5	Flow	GEH or flow
Linnards Lane	between B5569 Chester Road and Keats Lane	WB	65	0	3	68	64	8	2	75	7	10%	0.82	✓	✓	✓
Holmes Chapel Road	between Common Lane and Highfield Farm	EB	343	0	24	367	282	25	2	309	-58	-16%	3.16	✓	✓	✓
Holmes Chapel Road	between Highfield Farm and Common Lane	WB	369	0	53	422	345	46	2	392	-30	-7%	1.48	✓	✓	✓

Directions: NB = North-bound, EB = east-bound, SB = south-bound, WB = west-bound

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