

## Base Modelling Report

MG0123 – A49 Corridor VISSIM, Warrington

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10 January 2020

# DOCUMENT CONTROL ISSUE SHEET

## Project & Document Details

Project Name	A49 Corridor, Warrington
Project Number	MG0123
Document Title	Base Modelling Report
Document Reference	Version 2

## Document History

Issue	Status	Reason for Issue	Issued to
1	Pre-approval	Auditor approval	Fiona Bennet (Highgate Transportation)

## Issue Control

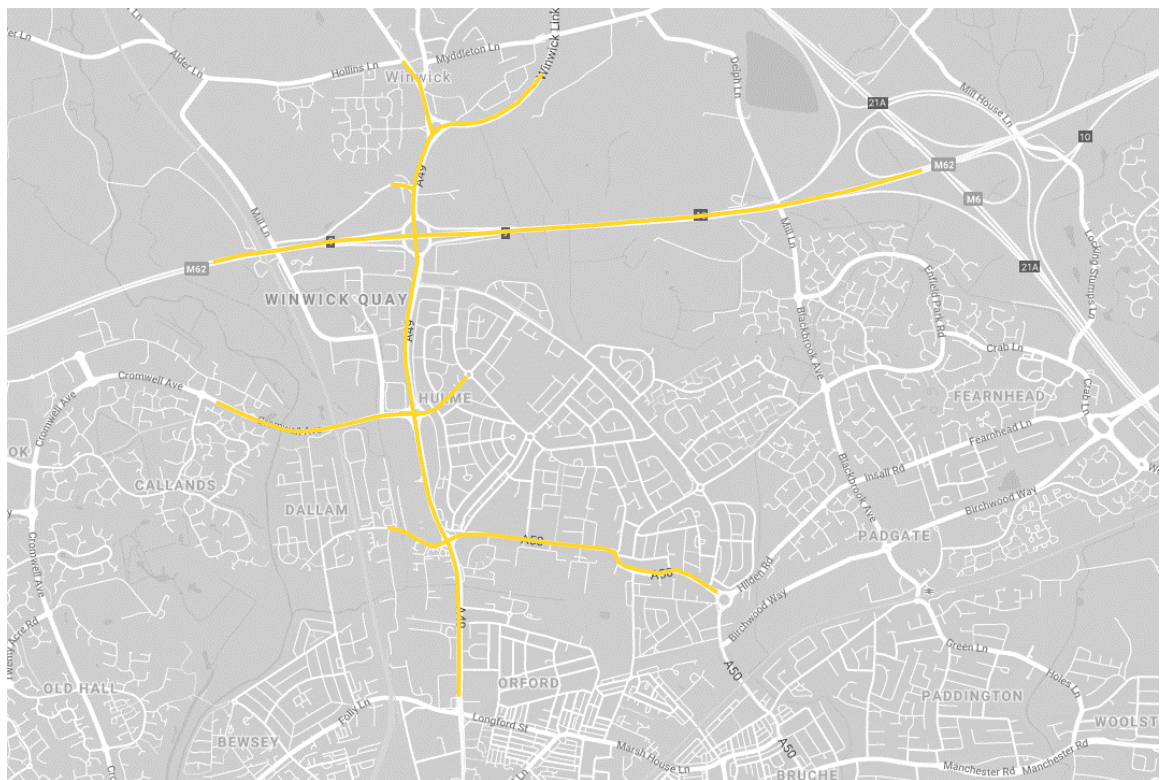
Issue	Date	Author	Contributors	Authorisation	
				Approved	Date
1	10/01/2020	Luke Best		Carl Moreno	10/01/2020
2	22/02/2020	Luke Best		Carl Moreno	22/02/2020

<b>1. INTRODUCTION .....</b>	<b>1</b>
1.1 BACKGROUND .....	1
<i>Figure 1.1: Area of Interest .....</i>	<i>1</i>
1.2 REPORT PURPOSE .....	1
1.4 REPORT STRUCTURE .....	2
<b>2 BASE MODEL DEVELOPMENT .....</b>	<b>3</b>
2.1 PREVIOUS MODELLING .....	3
<i>Figure 2.1: Previous Model Extents .....</i>	<i>3</i>
2.2 CHANGES TO PREVIOUS MODELLING .....	3
Table 2.1: AM Summary Data – Volume Comparison Per Movement .....	4
Table 2.2: PM Summary Data – Volume Comparison Per Movement .....	4
Table 2.3: AM Summary Data – Travel Time Route Volumes & Times.....	4
Table 2.4: PM Summary Data – Travel Time Route Volumes & Times.....	4
2.3 CHANGES TO NETWORK EXTENTS.....	5
Table 2.5: AM Summary Data – Volume Comparison Per Movement .....	5
Table 2.6: PM Summary Data – Volume Comparison Per Movement.....	5
Table 2.7: AM Summary Data – Travel Time Route Volumes & Time .....	5
Table 2.8: PM Summary Data – Travel Time Route Volumes & Time .....	6
2.4 UPDATING OF MODELLED YEAR .....	7
<i>Figure 2.2: April 2019 Manual Classified Count Sites .....</i>	<i>7</i>
<i>Figure 2.3: April 2019 Historical TomTom Data Travel Time Route (North &amp; South).....</i>	<i>8</i>
Table 2.9: Summary Data – Volume Comparison Per Movement.....	8
Table 2.10: Summary Data – Average Volume Comparison Per Movement .....	9
2.5 TRAFFIC SIGNALS.....	9
2.6 MODEL ASSIGNMENT.....	10
2.7 DRIVING BEHAVIOUR PARAMETERS .....	10
2.8 MODEL SPECIFICATION.....	10
<b>3 MODEL CALIBRATION .....</b>	<b>11</b>
3.1 TRAFFIC FLOW SOURCES .....	11
<i>Figure 3.1: Available 2019 Traffic data .....</i>	<i>12</i>
<i>Figure 3.2: Available HATRIS Traffic Data .....</i>	<i>12</i>
3.2 CHANGES IN FLOWS 2015 – 2019.....	13
3.3 TRAFFIC COMPOSITIONS.....	13
Table 3.1: Traffic Composition Summary.....	13
3.4 FLOW CALIBRATION.....	13
Table 3.2: Flow Calibration Summary.....	13
3.5 SIGNAL RECALIBRATION .....	14
3.6 CALIBRATION SUMMARY .....	14
<b>4 MODEL VALIDATION.....</b>	<b>15</b>
4.1 JOURNEY TIME VALIDATION .....	15
<i>Figure 4.1: Journey Time Validation Route Sections.....</i>	<i>15</i>
4.2 LINK VALIDATION.....	16
Table 4.1: Link Validation Summary .....	16
4.3 VALIDATION SUMMARY .....	17
Table 4.2: AM Journey Time Validation Summary.....	18
Table 4.3: PM Journey Time Validation Summary.....	19
<b>5 SUMMARY &amp; RECOMMENDATIONS .....</b>	<b>20</b>

# 1. INTRODUCTION

## 1.1 Background

1.1.1 BestMore Consulting Ltd (now Modelling Group Ltd) has been commissioned by Highgate Transportation to develop a microsimulation model of the A49 corridor for the area to the north of Warrington, surrounding the M62 junction 9. The aim of this model is to provide a robust platform on which the proposed development (Peel Hall) can be tested and impact upon the highway network assessed.



**FIGURE 1.1: AREA OF INTEREST**

## 1.2 Report Purpose

1.2.1 The following report summarises the methodology used to build and test the model, as well as the results obtained to determine the suitability of the model. For use in proposed option testing.

## 1.4 Report Structure

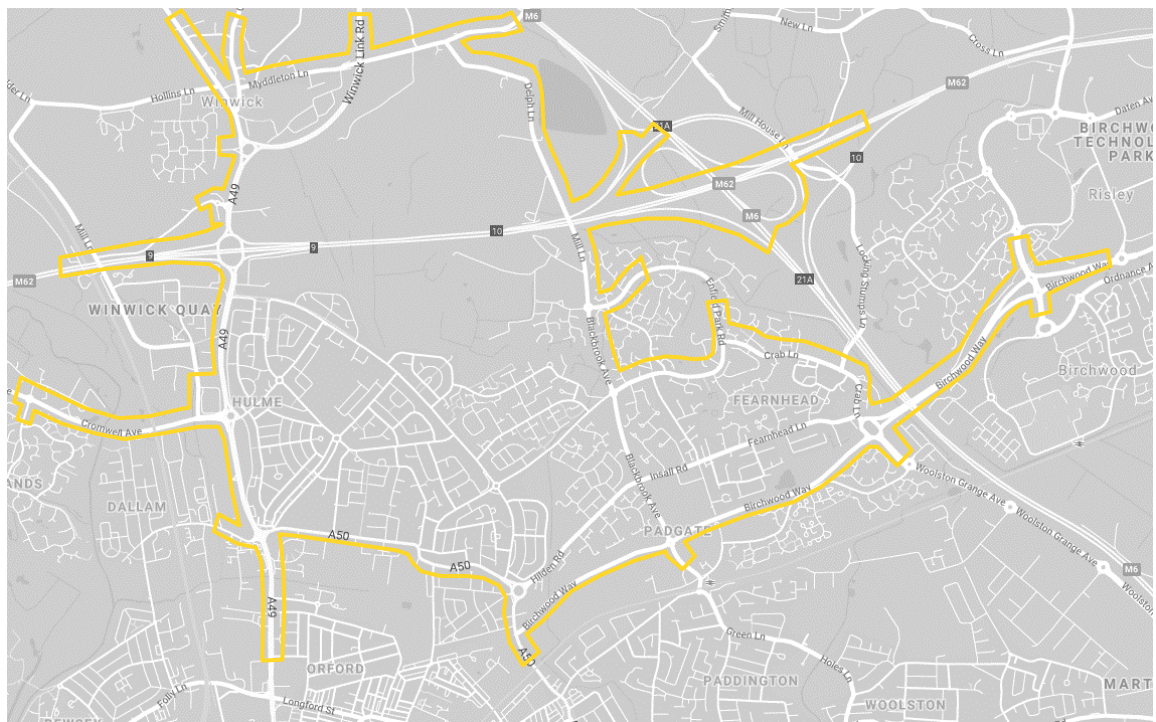
The report is structured as follows:

- Section 2: Base Model Development including details on the software used, the model extents alteration process, duration and any changes made to software parameters in line with best-practice recommendations;
- Section 3: Base Model Calibration including the comparison of previous model with newly cordoned model, as well as observed and modelled turning flows;
- Section 4: Model Validation including the comparison of observed and modelled journey times; and
- Section 5: Summary and Recommendations including a summary of the model development process and the overall suitability for future use.

## 2 BASE MODEL DEVELOPMENT

### 2.1 Previous Modelling

2.1.1 In 2017, a microsimulation model was developed by AECOM of the area surrounded by the A49 corridor to the west and the M6 to the east. The model was validated to 2015 conditions and data and included all of the main junctions and roads within the area defined in Figure 2.1. This model has been provided as a starting point for the revised model extents and model update.



**FIGURE 2.1: PREVIOUS MODEL EXTENTS**

### 2.2 Changes to Previous Modelling

2.2.1 As the previous modelling had been carried out in an outdated version (08.00-04) of the software, it was decided to firstly update the network to the latest fully stable and tested version of the software (11.00-12). As a result of this, testing was required to ensure that key model performance indicators were comparable to the original model.

2.2.2 Tables 2.1 and 2.2 shows a comparison between turning volumes at each junction:

AM PEAK	Nodes – Average volume comparison per movement/ time period							
	VEHS (ALL)		VEHS (Car)		VEHS (LGV)		VEHS (HGV)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
TOTAL	2112		2112		2112		2112	
GEH <=3	2106	99.7%	2106	99.7%	2108	99.8%	2112	100.0%
GEH <=5	2109	99.9%	2109	99.9%	2112	100.0%	2112	100.0%
GEH <=10	2112	100.0%	2112	100.0%	2112	100.0%	2112	100.0%

**TABLE 2.1: AM SUMMARY DATA – VOLUME COMPARISON PER MOVEMENT**

PM PEAK	Nodes – Average volume comparison per movement/ time period							
	VEHS (ALL)		VEHS (Car)		VEHS (LGV)		VEHS (HGV)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
TOTAL	2112		2112		2112		2112	
GEH <=3	2107	99.8%	2107	99.8%	2112	100.0%	2112	100.0%
GEH <=5	2109	99.9%	2109	99.9%	2112	100.0%	2112	100.0%
GEH <=10	2112	100.0%	2112	100.0%	2112	100.0%	2112	100.0%

**TABLE 2.2: PM SUMMARY DATA – VOLUME COMPARISON PER MOVEMENT**

2.2.3 As can be seen, volumes of all vehicle types, at all junctions remained directly comparable. Analysis of journey time data was also carried out – a summary of the results is shown below in Tables 2.3 and 2.4:

AM PEAK – Travel Time Route Volumes						AM Peak – Travel Times			
GEH			Percentage Difference			Percentage Difference		Actual Difference	
Measure	Count	%	Measure	Count	%	Measure	%	Measure	%
TOTAL	99		TOTAL	99		<b>99</b> TOTAL		<b>99</b> TOTAL	
GEH <=3	99	100%	GEH <=3	97	98%	<b>79</b> <>5%	80%	<b>79</b> <>5%	86%
GEH <=5	99	100%	GEH <=5	99	100%	<b>85</b> <>10%	86%	<b>85</b> <>10%	92%
GEH <=10	99	100%	GEH <=10	99	100%	<b>86</b> <>15%	87%	<b>86</b> <>15%	96%

**TABLE 2.3: AM SUMMARY DATA – TRAVEL TIME ROUTE VOLUMES & TIMES**

PM PEAK – Travel Time Route Volumes						PM Peak – Travel Times			
GEH			Percentage Difference			Percentage Difference		Actual Difference	
Measure	Count	%	Measure	Count	%	Measure	%	Measure	%
TOTAL	99		TOTAL	99		<b>99</b> TOTAL		<b>99</b> TOTAL	
GEH <=3	99	100%	GEH <=3	85	86%	<b>82</b> <>5%	83%	<b>79</b> <>5%	96%
GEH <=5	99	100%	GEH <=5	93	94%	<b>92</b> <>10%	93%	<b>85</b> <>10%	100%
GEH <=10	99	100%	GEH <=10	99	100%	<b>96</b> <>15%	97%	<b>86</b> <>15%	100%

**TABLE 2.4: PM SUMMARY DATA – TRAVEL TIME ROUTE VOLUMES & TIMES**

2.2.4 Although there is some variation, likely as a result of revisions made default vehicle size and performance parameters, along with changes to the random seed algorithms, performance is still comparable.

## 2.3 Changes to Network Extents

2.3.1 As there was only a need for testing of effects to the operation of the A49 corridor itself, it was decided that it would be more efficient to cordon the network, as shown in Figure 1.1. In order to ensure that the traffic assignment remained the same, effectively frozen, the model was firstly transformed from a dynamic assignment model to a static assignment model. As there was to be no route choice in the newly cordoned area, this approach would still leave a perfectly functional model for the proposed testing.

2.3.2 In the same manner as previously, a comparison of key model performance indicators was carried out to ensure that turning volumes, route volumes and travel times were acceptably similar after the process of conversion to static assignment and cordoning of network extents and the subsequent adjustment to all vehicle routing had been completed.

2.3.3 Tables 2.5 and 2.6 show a comparison between turning volumes at each junction:

AM PEAK	Nodes – Average volume comparison per movement/ time period							
	VEHS (ALL)		VEHS (Car)		VEHS (LGV)		VEHS (HGV)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
TOTAL	642		642		642		642	
GEH <=3	627	97.7%	627	97.7%	640	97.7%	642	100.0%
GEH <=5	638	99.4%	638	99.4%	642	100.0%	642	100.0%
GEH <=10	642	100.0%	642	100.0%	642	100.0%	642	100.0%

**TABLE 2.5: AM SUMMARY DATA – VOLUME COMPARISON PER MOVEMENT**

PM PEAK	Nodes – Average volume comparison per movement/ time period							
	VEHS (ALL)		VEHS (Car)		VEHS (LGV)		VEHS (HGV)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
TOTAL	642		642		642		642	
GEH <=3	584	91.0%	582	90.7%	637	99.2%	637	99.2%
GEH <=5	614	95.6%	614	95.6%	642	100.0%	642	100.0%
GEH <=10	640	99.7%	640	99.7%	642	100.0%	642	100.0%

**TABLE 2.6: PM SUMMARY DATA – VOLUME COMPARISON PER MOVEMENT**

2.3.4 As can be seen, volumes of all vehicle types, at all junctions in the newly cordoned area remained almost directly comparable. Analysis of journey time data was also carried out – a summary of results is shown in Tables 2.7 and 2.8:

AM PEAK – Travel Time Route Volumes						AM Peak – Travel Times			
GEH			Percentage Difference			Percentage Difference		Actual Difference	
Measure	Count	%	Measure	Count	%	Measure	%	Measure	%
TOTAL	54		TOTAL	54		<b>54</b> TOTAL		<b>54</b> TOTAL	
GEH <=3	51	94%	GEH <=3	51	94%	<b>47</b> <>5%	87%	<b>52</b> <>5%	96%
GEH <=5	54	100%	GEH <=5	53	98%	<b>47</b> <>10%	87%	<b>52</b> <>10%	96%
GEH <=10	54	100%	GEH <=10	53	98%	<b>50</b> <>15%	93%	<b>52</b> <>15%	96%

**TABLE 2.7: AM SUMMARY DATA – TRAVEL TIME ROUTE VOLUMES & TIME**



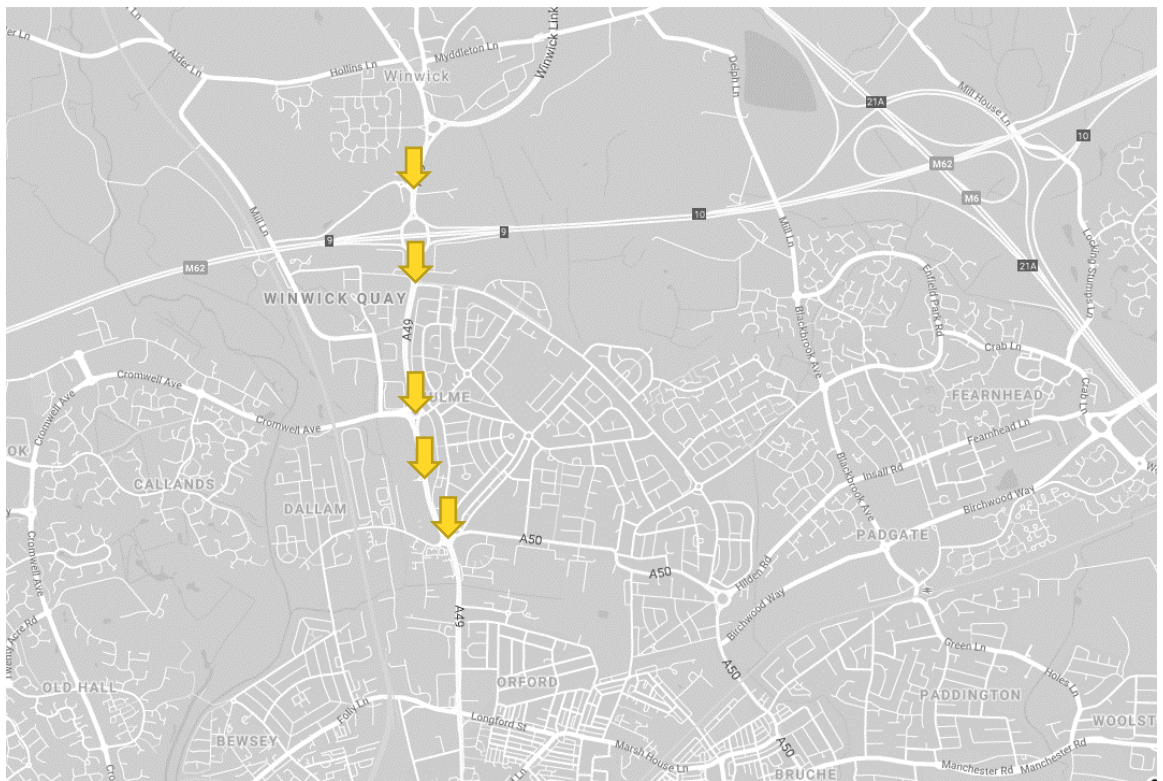
**TABLE 2.8: PM SUMMARY DATA – TRAVEL TIME ROUTE VOLUMES & TIME**

PM PEAK – Travel Time Route Volumes						PM Peak – Travel Times			
GEH			Percentage Difference			Percentage Difference		Actual Difference	
Measure	Count	%	Measure	Count	%	Measure	%	Measure	%
TOTAL	54		TOTAL	54		<b>54</b> TOTAL		<b>54</b> TOTAL	
GEH <=3	34	63%	GEH <=3	37	69%	<b>39</b> <>5%	72%	<b>44</b> <>5%	81%
GEH <=5	46	85%	GEH <=5	43	80%	<b>43</b> <>10%	80%	<b>52</b> <>10%	96%
GEH <=10	53	98%	GEH <=10	50	93%	<b>49</b> <>15%	91%	<b>53</b> <>15%	98%

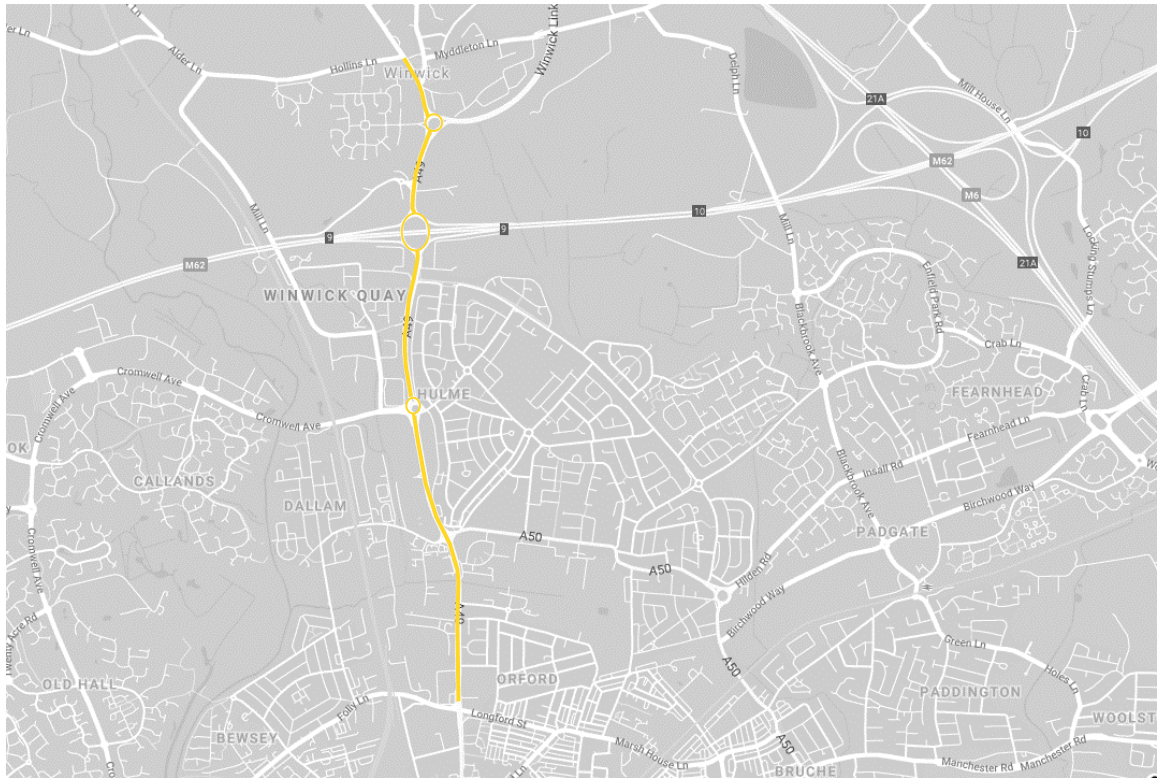
## 2.4 Updating of Modelled Year

2.4.1 As a result of the original inherited AECOM model having a base year of 2015, it was decided that testing needed to be carried out against an up to date dataset in order to ensure that the model was representative of current onsite conditions, and therefore a suitably robust platform for testing of proposed scenarios.

2.4.2 Manual Classified Count data had already been collected in April 2019 for the locations shown in Figure 2.2. To complement this, historical travel time data was also collated for the corridor (Streetwise - TomTom data) for neutral days (Tuesday, Wednesday & Thursday) for the month of April 2019 – shown in Figure 2.3.



**FIGURE 2.2: APRIL 2019 MANUAL CLASSIFIED COUNT SITES**



**FIGURE 2.3: APRIL 2019 HISTORICAL TOMTOM DATA TRAVEL TIME ROUTE (NORTH & SOUTH)**

- 2.4.3 However, when initial results were run, it was clear that the models did not validate well to 2019 data, meaning that there had clearly been some changes in local conditions, flow profiles and route choice in the area.
- 2.4.4 Tables 2.9 and 2.10 show the summary turning count validation data for the AM and PM peak models respectively. Further details can be found in Appendix A, but it was clear that some additional refining of the models would be needed in order to ensure that they were broadly representative of current conditions.

<b>AM PEAK (08:00-09:00) TURNING COUNT VALIDATION</b>	
Total number of counts considered	40
VISSIM model counts with GEH <=3	14
% of VISSIM counts with GEH <=3	<b>35.5%</b>
VISSIM model counts with GEH <=5	20
% of VISSIM counts with GEH <=5	<b>50.0%</b>
VISSIM model counts with GEH <=10	31
% of VISSIM counts with GEH <=10	<b>77.5%</b>
VISSIM model counts meeting WebTAG Unit 3.1 criteria	28
% of VISSIM model counts meeting WebTAG Unit 3.1 criteria	<b>70.0%</b>

**TABLE 2.9: SUMMARY DATA – VOLUME COMPARISON PER MOVEMENT**

PM PEAK (17:00-18:00) TURNING COUNT VALIDATION	
Total number of counts considered	40
VISSIM model counts with GEH <=3	13
% of VISSIM counts with GEH <=3	<b>32.5%</b>
VISSIM model counts with GEH <=5	21
% of VISSIM counts with GEH <=5	<b>52.5%</b>
VISSIM model counts with GEH <=10	30
% of VISSIM counts with GEH <=10	<b>75.0%</b>
VISSIM model counts meeting WebTAG Unit 3.1 criteria	25
% of VISSIM model counts meeting WebTAG Unit 3.1 criteria	<b>62.5%</b>

**TABLE 2.10: SUMMARY DATA – AVERAGE VOLUME COMPARISON PER MOVEMENT**

## 2.5 Traffic Signals

2.5.1 The modelled network includes the following signal-controlled junctions:

- Site 1156 – Winwick Link
- Site 1150 – Delph Lane (B&Q)
- Site 1146 – M62 J9 South
- Site 1147 – M62 J9 North
- Site 1083 – Winwick Road/ Cromwell Avenue
- Site 1204 – Calver Road
- Site 1216 – J9 Retail Park
- Site 1077 – Long Lane

2.5.2 As the existing signal controllers in the model were set-up as fixed time controllers, this same set-up has been carried through to the updated models. Warrington UTMC has provided some updated controller specification and average stage and cycle time captures, which has been used to modify the signal controllers where necessary to aid in achieving validation.

## 2.6 Model Assignment

2.6.1 The network modelled has no real route choice as the focus is on the A49 corridor. As a result, and as a result of the methodology to freeze the previous 2015 assignment volumes into the model during the cordoning exercise, the model has been setup using static routing assignment.

2.6.2 During the process to convert the original model from dynamic assignment to static assignment, an option to remove any routes with less than 0.02 relative volume and/or less than 2 absolute minimum volume was selected in an attempt to minimise the subsequent total amount of static routes to work with. Otherwise though, all routes are as per the original models.

## 2.7 Driving Behaviour Parameters

2.7.1 No changes were made to any of the driving behaviour parameters as per the original 2015 AECOM model set-up.

## 2.8 Model Specification

VISSIM Version – 11.00-12.

Base Year – 2019.

Model Time Periods

- Weekday AM – 07:00-08:00 (warm-up), 08:00-09:00 (peak period), 09:00-09:30 (cool-down).
- Weekday PM – 16:00-17:00 (warm-up), 17:00-18:00 (peak period), 18:00-18:30 (cool-down).
- Vehicle Types
  - Cars
  - LGVs
  - HGVs
  - PT Buses (static routes)

2.8.1 Results have been output with a model simulation resolution of 5-time steps / second, as per the original modelling. Random seeds were set at 5 with an increase per run of 5, as per the original models (meaning seeds 5,10, 15, 20 etc were used).

## 3 MODEL CALIBRATION

This section summarises the calibration process undertaken and identifies sources of traffic flow data used to check and refine the flow profiles within the VISSIM model.

### 3.1 Traffic Flow Sources

3.1.1 Manual classified count (MCC) surveys were undertaken on Wednesday 3rd April 2019 at the locations highlighted in Figure 3.1. These include:

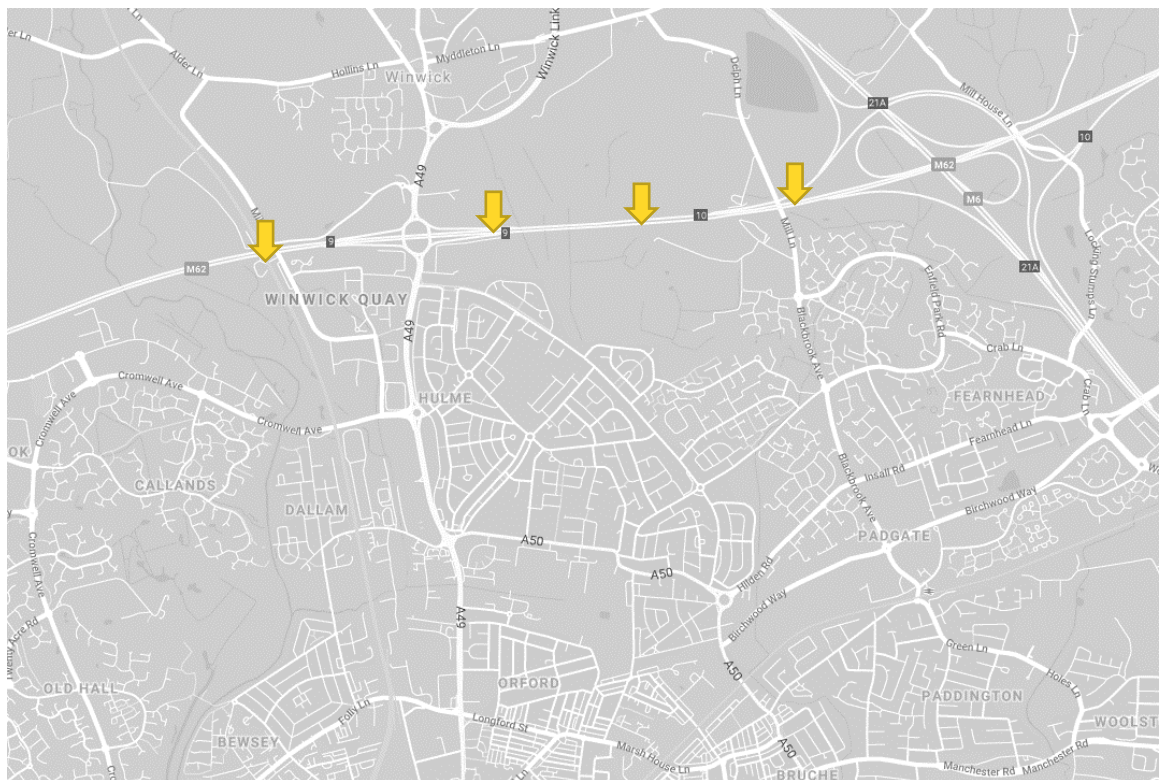
- A49/ Delph Lane
- A49/ Woburn Road
- A49/ Cromwell Avenue/ Sandy Lane
- A49/ Junction Nine Retail Park
- A49/ Hawleys Lane/ Long Lane

3.1.2 Link counts (April 2019) from the Hatris Database for were checked for the sections of motorway included in the model, taken from the following site locations (see Figure 3.2):

- M62 Westbound Mainline (M62/1260B) – west of junction 9
- M62 Eastbound Mainline (M62/1260A) – west of junction 9
- M62 Westbound Mainline (M62/1270B) – east of junction 9
- M62 Eastbound Mainline (M62/1269A) – east of junction 9
- M62 Westbound Mainline (M62/1275B) – east of junction 9
- M62 Eastbound Mainline (M62/1274A) – east of junction 9
- Link from M62 Eastbound to M6 (M6/7073K)



**FIGURE 3.1: AVAILABLE 2019 TRAFFIC DATA**



**FIGURE 3.2: AVAILABLE HATRS TRAFFIC DATA**

## 3.2 Changes in Flows 2015 – 2019

- 3.2.1 Initially, it was found that at these locations traffic flows had changed, in some places considerably, between 2015 and 2019 with differences for individual movements up to 400-500 vehicles/ hour.
- 3.2.2 As the base model needs to be used to test in current and future years, and therefore needs to be shown to robustly represent current conditions a decision had to be made regarding how to manage this difference in flow, as described in the options below:
1. Scale up the 2015 model flow globally in an attempt to match the link counts provided, which would essentially increase either the flow or levels of congestion, or both, throughout the whole model; or
  2. Limit any scaling of traffic to specific movements and key routes, in an attempt to, as far as possible, keep all other movements / proportions consistent with those in the 2015 model.
- 3.2.3 Option 2 above was considered the best way forward as it had the least impact on the distribution of flows around the cordoned network. This option was taken forward as current 2019 data is not available for all junctions modelled in the network. This creates the possibility of updating the model without the need for a full rebuild and validation exercise.

## 3.3 Traffic Compositions

As with the original models, three traffic compositions were used in the model: Cars, LGVs and HGVs. As Cars made up the vast majority of the overall volume in both peaks, tweaks to volumes and routing were primarily focussed here when carrying out the recalibration and validation exercise.

Vehicle Type	AM % Distribution	PM % Distribution
Car	83.7%	91.7%
LGV	8.4%	4.2%
HGV	7.9%	4.1%

TABLE 3.1: TRAFFIC COMPOSITION SUMMARY

## 3.4 Flow Calibration

The process of flow calibration has involved multiple iterations of minor adjustments to both the vehicle inputs and static routing proportions at key locations and on key routes. The calculated GEH statistic for the observed and modelled flows was considered for each of the junction turning counts in accordance with the criteria stated in WebTAG Unit 3.1. To consider day to day variation in driver behaviour, the models were run, and results averaged over ten random seeds, as per the original model specification. Table 3.2 summarises the flow calibration results.

	AM Peak	PM Peak
Criteria	08:00-09:00	17:00-18:00
85% of VISSIM counts with GEH <=3	82.5%	80.0%
85% of VISSIM counts with GEH <=5	100.0%	92.5%
100% of VISSIM counts with GEH <=10	100.0%	100.0%
85% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100.0%	100.0%

TABLE 3.2: FLOW CALIBRATION SUMMARY



3.4.1 For transparency, completeness and robustness, these results also include a comparison against the TfL criteria for key links, using a GEH value of 3 or under. Although it has not been possible to achieve the ideal 85% count, the results still show that a strong flow calibration result has been achieved. A full breakdown of model calibration results can be found in Appendix A.

## 3.5 Signal Recalibration

3.5.1 Another element which was suspected to have likely changed on the ground since the 2015 model construction and validation was the traffic signal set-up and timing configuration. Subsequently, traffic signal specifications and drawings were obtained from Warrington UTMC for the following junctions:

- Site 1156 Winwick Link
- Site 1150 Delph Lane (B&Q)
- Site 1146 M62 J9 South
- Site 1147 M62 J9 North
- Site 1083 Cromwell Avenue / Winwick Road
- Site 1204 Calver Road
- Site 1216 J9 Retail Park
- Site 1077 Long Lane

3.5.2 Additionally, a capture of 1 weeks' worth of phase, stage and cycle timing data was carried out for each of the following nodes (with the exception of those highlighted):

- Site 1156 Winwick Link
- Site 1150 Delph Lane (B&Q)
- Site 1146 M62 J9 South – No comms to site
- Site 1147 M62 J9 North – No comms to site
- Site 1083 Cromwell Avenue / Winwick Road
- Site 1204 Calver Road
- Site 1216 J9 Retail Park - Unavailable due to roadworks
- Site 1077 Long Lane

3.5.3 The signal data showed that although some locations were running with exactly the same setup and timings as found in the 2015 model, most key signal controllers required timings to be recalibrated in line with current operation.

## 3.6 Calibration Summary

3.6.1 Overall, based on the flow comparison results highlighted in section 3.2, a good fit between observed and modelled traffic flows has been achieved.

## 4 MODEL VALIDATION

This section summarises the goodness of fit between modelled and observed outputs, independently collected.

### 4.1 Journey Time Validation

- 4.1.1 The journey time validation has been carried out using TomTom data collected for the network. This was chosen as it provides a high sample rate dataset which improves the overall robustness of the validation comparison. The data is provided in small link sections, so these were combined into more reasonable lengths from junction to junction in the network, which assisted the calibration of the model. The journey time data is averaged over April 2019, for Tuesdays, Wednesdays and Thursdays. The Easter break period was considered, and the date range removed from the travel time dataset (Easter holidays in Warrington were 6<sup>th</sup> April 2019 – 22<sup>nd</sup> April 2019\*)

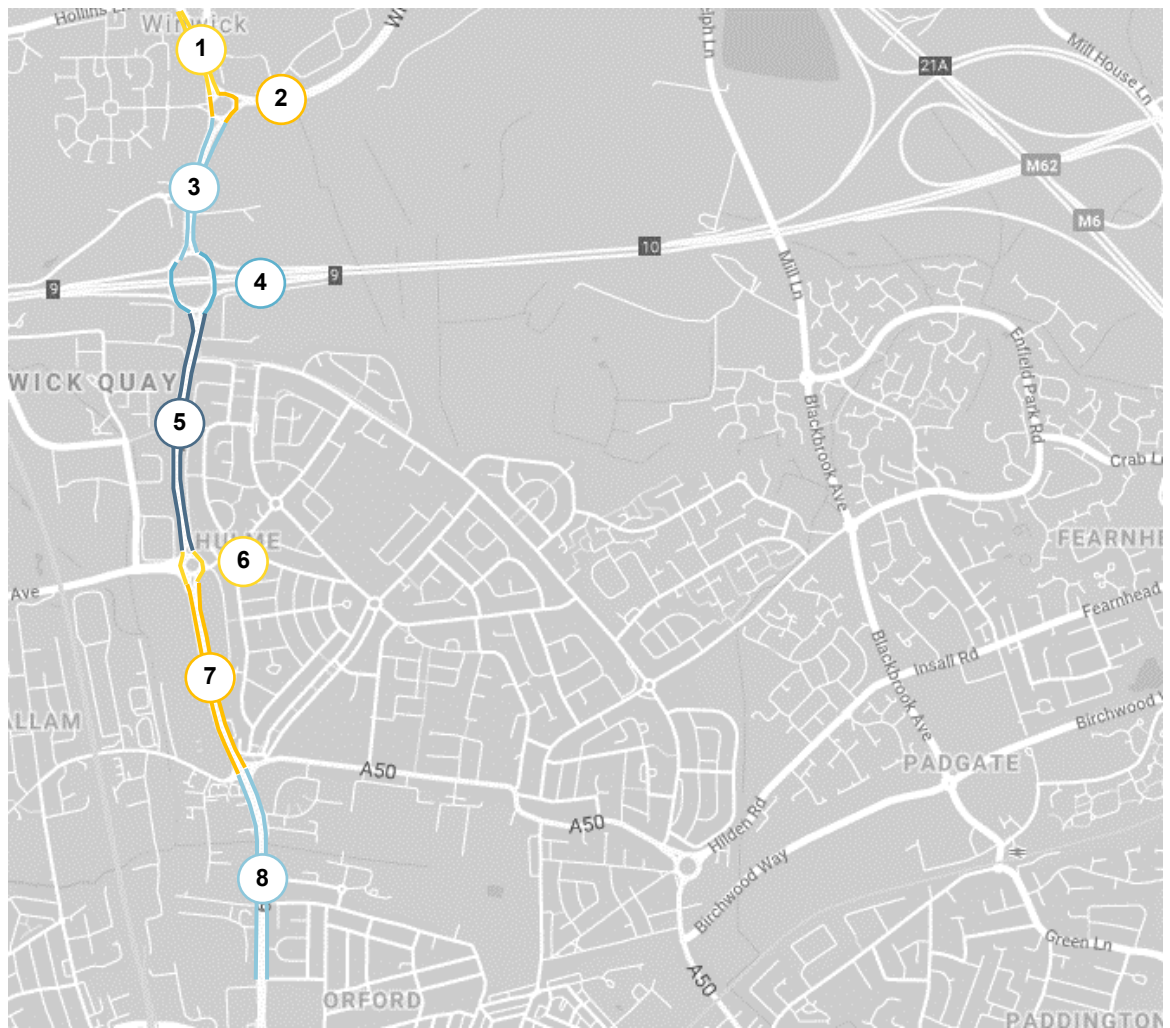


FIGURE 4.1: JOURNEY TIME VALIDATION ROUTE SECTIONS

\*2019 Warrington term dates taken from [www.familiesonline.co.uk](http://www.familiesonline.co.uk) – click link for details

- 4.1.2 In accordance with WebTAG Unit 3.1 criteria, which recommends that the difference between observed and modelled journey times should be within 15% (or 1 minute if higher) for at least 85% of the routes evaluated (although that criteria is ideally designed for route sections over 3km in length). Tables 4.1 and 4.2 (on the following pages) shows that 24/32 route sections (75%) are within 15% and all route sections are within 60 seconds of the observed.
- 4.1.3 Route sections 2 and 6 are both very short in length, meaning that the percentage difference actually represents a very low actual difference, in seconds. If those sections were not considered, 23/28 route sections (82.14%) would be within 15%.
- 4.1.4 The total route validation (i.e. for the entire length when all route sections are combined) for the AM & PM peaks, for north and southbound traffic is within 15%.
- 4.1.5 In the PM peak, route section 4 southbound is slightly over 15% (20%) difference. This is as a result of performance differences resulting from modelling MOVA signals as fixed time modelled controllers. However, this still represents a relatively small average difference of 6 seconds.
- 4.1.6 Further details can be found in Appendix B.

## 4.2 Link Validation

- 4.2.1 The modelled flows have been compared to the motorway flows from the HATRIS Database not used in the flow calibration process. Together these provide an independent dataset to determine the robustness of the model.

	AM Peak	PM Peak
Criteria	08:00-09:00	17:00-18:00
85% of VISSIM counts with GEH <=3	42.9%	85.7%
85% of VISSIM counts with GEH <=5	85.7%	100.0%
100% of VISSIM counts with GEH <=10	100.0%	100.0%
85% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100.0%	100.0%

**TABLE 4.1: LINK VALIDATION SUMMARY**

- 4.2.2 The results in Table 4.3 show that overall, for each of the peak hours modelled, the GEH is less than five for at least 85% of cases. Furthermore, WebTAG Unit 3.1 flow criteria is also met.
- 4.2.3 Appendix C shows the Link Validation in more detail.

## 4.3 Validation Summary

- 4.3.1 Overall, based on the journey time and link validation results above, a good fit between observed and modelled results has been achieved. Each complete A49 route validates well within the 15% criteria, with 68.75% of route sections (87.5% if very short sections are ignored) journey times compared within 15% of the observed and at least 85% of flows compared have a GEH < 5 in the AM peak. In the PM peak, each complete A49 journey time route also validates well within the 15% criteria, with 81.25% of route sections (91.25% if very short sections are ignored) journey times compared within 15% of the observed and at least 85% of flows compared have a GEH < 5.
- 4.3.2 Based on the fact that this model has been created from a hybrid of different data sources, considering all audit comments received regarding current levels of queuing and delay within the network (typical data drawn from current Big Data sources such as Google Traffic), it is felt that large amounts of time have been spend attempting to make the best of bridging the gaps between different sources. Spending further time making minute tweaks to traffic volume and routing data is therefore not believed to be likely to bring any real further benefit, particularly considering that all future year testing will use altered traffic flows anyway. The model is therefore considered to be fit for purpose.

**TABLE 4.2: AM JOURNEY TIME VALIDATION SUMMARY**

Section	Direction	Description From - To	Observed		Modelled			AM Peak 08:00 - 09:00 Validation - Northbound				
			Dist.	Avg	Min	Avg	Max	Actual Diff.	% Diff.	Within 15%	Within 60 seconds	Validates
1	NB	Winwick Link Rd - Hollins Ln	384m	75	67	72	79	-7	-9%	✓	✓	✓
2	NB	Roundabout	43m	6	6	7	8	1	22%	✗	✓	✓
3	NB	M62 Junction 9 - Winwick Link Rd	447m	81	79	86	104	7	9%	✓	✓	✓
4	NB	M62 Junction 9	254m	36	35	36	40	1	3%	✓	✓	✓
5	NB	Cromwell Ave - M62 Junction 9	810m	68	73	74	75	6	9%	✓	✓	✓
6	NB	Roundabout	63m	5	7	7	8	2	41%	✗	✓	✓
7	NB	Hawleys Ln - Cromwell Ave	645m	94	75	87	95	-2	-3%	✓	✓	✓
8	NB	Ireland St - Hawleys Ln	720m	104	91	92	93	1	1%	✓	✓	✓
<b>TOTAL</b>	<b>NB</b>	<b>Ireland St - Hollins Ln</b>	<b>3364m</b>	<b>468</b>	<b>449</b>	<b>462</b>	<b>490</b>	<b>10</b>	<b>2%</b>	✓	✓	✓
Section	Direction	Description From - To	Observed		Modelled			AM Peak 08:00 - 09:00 Validation - Southbound				
			Dist.	Avg	Min	Avg	Max	Actual Diff.	% Diff.	Within 15%	Within 60 seconds	Validates
1	SB	Hollins Ln - Winwick Link Rd	356m	64	59	64	68	16	24%	✗	✓	✓
2	SB	Roundabout	110m	21	19	20	21	1	6%	✓	✓	✓
3	SB	Winwick Link Rd - M62 Junction 9	492m	115	110	114	118	3	2%	✓	✓	✓
4	SB	M62 Junction 9	232m	42	36	37	38	-3	-7%	✓	✓	✓
5	SB	M62 Junction 9 - Sandy Ln	811m	158	150	171	210	21	14%	✓	✓	✓
6	SB	Roundabout	68m	11	10	11	12	4	39%	✗	✓	✓
7	SB	Sandy Ln - Long Ln	650m	144	139	159	184	27	19%	✗	✓	✓
8	SB	Long Ln - Ireland St	725m	82	72	73	74	-11	-13%	✓	✓	✓
<b>TOTAL</b>	<b>SB</b>	<b>Hollins Ln - Ireland St</b>	<b>3444m</b>	<b>637</b>	<b>615</b>	<b>648</b>	<b>713</b>	<b>58</b>	<b>9%</b>	✓	✓	✓
									<b>68.8%</b>	<b>100%</b>	<b>100%</b>	

**TABLE 4.3: PM JOURNEY TIME VALIDATION SUMMARY**

Section	Direction	Description From - To	Observed		Modelled			AM Peak 08:00 - 09:00 Validation - Northbound				
			Dist.	Avg.	Min.	Avg.	Max.	Actual Diff.	% Diff.	Within 15%	Within 60 seconds	Validates
1	NB	Winwick Link Rd - Hollins Ln	384m	84	76	79	84	-9	-10%	✓	✓	✓
2	NB	Roundabout	43m	5	7	8	8	2	46%	✗	✓	✓
3	NB	M62 Junction 9 - Winwick Link Rd	447m	105	85	94	102	-5	-5%	✓	✓	✓
4	NB	M62 Junction 9	254m	40	38	42	43	4	11%	✓	✓	✓
5	NB	Cromwell Ave - M62 Junction 9	810m	86	79	81	84	-5	-6%	✓	✓	✓
6	NB	Roundabout	63m	6	6	6	6	0	-2%	✓	✓	✓
7	NB	Hawleys Ln - Cromwell Ave	645m	137	116	124	133	1	1%	✓	✓	✓
8	NB	Ireland St - Hawleys Ln	720m	251	264	283	293	11	4%	✓	✓	✓
<b>TOTAL</b>	<b>NB</b>	<b>Ireland St - Hollins Ln</b>	<b>3364m</b>	<b>716</b>	<b>707</b>	<b>717</b>	<b>726</b>	<b>-1</b>	<b>0%</b>	✓	✓	✓
Section	Direction	Description From - To	Observed		Modelled			AM Peak 08:00 - 09:00 Validation - Southbound				
			Dist.	Avg.	Min.	Avg.	Max.	Actual Diff.	% Diff.	Within 15%	Within 60 seconds	Validates
1	SB	Hollins Ln - Winwick Link Rd	356m	64	58	60	64	1	2%	✓	✓	✓
2	SB	Roundabout	110m	17	15	16	17	2	12%	✓	✓	✓
3	SB	Winwick Link Rd - M62 Junction 9	492m	114	91	101	110	-12	-10%	✓	✓	✓
4	SB	M62 Junction 9	232m	30	49	52	55	6	20%	✗	✓	✓
5	SB	M62 Junction 9 - Sandy Ln	811m	94	79	94	100	2	2%	✓	✓	✓
6	SB	Roundabout	68m	15	8	8	8	-8	-49%	✗	✓	✓
7	SB	Sandy Ln - Long Ln	650m	97	86	91	97	-2	-2%	✓	✓	✓
8	SB	Long Ln - Ireland St	725m	75	70	70	71	-4	-6%	✓	✓	✓
<b>TOTAL</b>	<b>SB</b>	<b>Hollins Ln - Ireland St</b>	<b>3444m</b>	<b>507</b>	<b>476</b>	<b>493</b>	<b>506</b>	<b>-14</b>	<b>-3%</b>	✓	✓	✓
									<b>81.3%</b>	<b>100%</b>	<b>100%</b>	



## 5 SUMMARY & RECOMMENDATIONS

- 5.1.1 In summary, the results demonstrate a suitable fit between modelled and observed flows with an accurate distribution of traffic around the network, representative of a typical weekday in April 2019. Considering journey times, almost 85% of modelled sections routes are within 15% of the observed and all are within 60 seconds of the observed, and both full routes are within 15%. As such, the base models are considered an appropriate starting point to test future changes in traffic patterns.





# **APPENDIX A:**

## **TURNING COUNT CALIBRATION RESULTS**



### AM Peak (08:00-09:00) Summary

Total number of counts considered	40
VISSIM model counts with GEH <3	33
% of VISSIM counts with GEH <3	<b>82.50%</b>
VISSIM model counts with GEH <5	40
% of VISSIM counts with GEH <5	<b>100.00%</b>
VISSIM model counts with GEH <10	40
% of VISSIM counts with GEH <10	<b>100.00%</b>
VISSIM model counts meeting Webster TAG Unit 3.1 criteria	40
% of VISSIM counts meeting Webster TAG Unit 3.1 flow criteria	<b>100.00%</b>

Junction/ Movement		Vehicle Flow		Difference		GEH Criteria Met			Flow Criteria Met			
Junction	Approach	Observed	Modelled	Actual	%	Critical	GEH	Pass	FLOW	<700	700 - 2700	>2700
A49 Newton Road/ Delph Lane	A49 NB	1266	1223	-43	-3%	N	1.22	✓	✓			
	A49 NB to Delp Ln	179	189	10	6%	N	0.74	✓	✓			
	A49 SB	1699	1646	-53	-3%	N	1.30	✓	✓			
	A49 SB to Delph Ln	64	44	-20	-31%	N	2.72	✓	✓			
	Delph Ln to A49 NB	87	49	-38	-44%	N	4.61	✓	✓			
Delph Ln to A49 SB	192	145	-47	-24%	N	3.62	✓	✓				
A49 Winwick Road @ Poplars Avenue	A49 NB to Woburn Rd	16	19	3	19%	N	0.72	✓	✓			
	A49 NB	1220	1236	16	1%	N	0.46	✓	✓			
	A49 SB	1650	1783	133	8%	N	3.21	✓	✓			
A49 Winwick Road/ A574 Cromwell Avenue/ Sandy Lane West	A49 SB to Sandy Ln	154	147	-7	-5%	N	0.57	✓	✓			
	A49 SB	1277	1314	37	3%	N	1.03	✓	✓			
	A49 SB to Cromwell Ave	243	266	23	9%	N	1.44	✓	✓			
	Cromwell Ave to A49 NB	250	230	-20	-8%	N	1.29	✓	✓			
	Cromwell Ave to Sandy Ln	314	288	-26	-8%	N	1.50	✓	✓			
	Cromwell Ave to A49 SB	645	616	-29	-4%	N	1.15	✓	✓			
	Cromwell Ave to Cromwell Ave (U-turn)	55	44	-11	-20%	N	1.56	✓	✓			
	A49 NB	776	778	2	0%	N	0.07	✓	✓			
	A49 NB to Sandy Ln	71	91	20	28%	N	2.22	✓	✓			
	A49 NB to Cromwell Ave	424	426	2	0%	N	0.10	✓	✓			
	Sandy Ln to A49 NB	210	234	24	11%	N	1.61	✓	✓			
Sandy Ln to Sandy Ln (U-turn)	0	0	0	-	N	0.00	✓	✓				
Sandy Ln to A49 SB	81	68	-13	-16%	N	1.51	✓	✓				
Sandy Ln to Cromwell Ave	203	177	-26	-13%	N	1.89	✓	✓				
A49 Winwick Road @ Junction NINE Retail Park	A49 SB	1888	1812	-76	-4%	N	1.77	✓	✓			
	A49 SB to Junction NINE Retail	115	155	40	35%	N	3.44	✓	✓			
	A49 NB	1199	1206	7	1%	N	0.20	✓	✓			
	Junction NINE Retail to A49 SB	16	19	3	19%	N	0.72	✓	✓			
Junction NINE Retail to A49 NB	72	77	5	7%	N	0.58	✓	✓				
A49 Winwick Road/ Hawleys Lane/ A50 Long Lane	A49 SB to Hawleys Lane	199	202	3	2%	N	0.21	✓	✓			
	A49 SB to Long Lane	258	233	-25	-10%	N	1.60	✓	✓			
	A49 SB	1447	1411	-36	-2%	N	0.95	✓	✓			
	A49 NB to Hawleys Lane	77	43	-34	-44%	N	4.39	✓	✓			
	A49 NB to Long Lane	236	187	-49	-21%	N	3.37	✓	✓			
	A49 NB	805	820	15	2%	N	0.53	✓	✓			
	Long Lane to A49 SB	390	345	-45	-12%	N	2.35	✓	✓			
	Long Lane to Hawleys Lane	134	98	-36	-27%	N	3.34	✓	✓			
	Long Lane to A49 NB	239	233	-6	-3%	N	0.39	✓	✓			
	Hawleys Lane to Long Lane	113	90	-23	-20%	N	2.28	✓	✓			
	Hawleys Lane to A49 SB	58	53	-5	-9%	N	0.67	✓	✓			
Hawleys Lane to A49 NB	174	167	-7	-4%	N	0.54	✓	✓				

### PM Peak (17:00-18:00) Summary

Total number of counts considered	40
VISSIM model counts with GEH <3	32
% of VISSIM counts with GEH <3	<b>80.00%</b>
VISSIM model counts with GEH <5	37
% of VISSIM counts with GEH <5	<b>92.50%</b>
VISSIM model counts with GEH <10	40
% of VISSIM counts with GEH <10	<b>100.00%</b>
VISSIM model counts meeting WebTAG Unit 3.1 criteria	40
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	<b>100.00%</b>

Junction/ Movement		Vehicle Flow		Difference		GEH Criteria Met			Flow Criteria Met			
Junction	Approach	Observed	Modelled	Actual	%	Critical	GEH	Pass	FLOW	<700	700 - 2700	>2700
A49 Newton Road/ Delph Lane	A49 NB	1739	1684	-55	-3%	N	1.33	✓	✓			
	A49 NB to Delp Ln	203	198	-5	-2%	N	0.35	✓	✓			
	A49 SB	1273	1193	-80	-6%	N	2.28	✓	✓			
	A49 SB to Delph Ln	111	89	-22	-20%	N	2.20	✓	✓			
	Delph Ln to A49 NB	195	175	-20	-10%	N	1.47	✓	✓			
	Delph Ln to A49 SB	169	193	24	14%	N	1.78	✓	✓			
A49 Winwick Road @ Poplars Avenue	A49 NB to Woburn Rd	23	11	-12	-52%	N	2.91	✓	✓			
	A49 NB	2008	1929	-79	-4%	N	1.78	✓	✓			
	A49 SB	1345	1365	20	1%	N	0.54	✓	✓			
A49 Winwick Road/ A574 Cromwell Avenue/ Sandy Lane West	A49 SB to Sandy Ln	233	168	-65	-28%	N	4.59	✓	✓			
	A49 SB	822	884	62	8%	N	2.12	✓	✓			
	A49 SB to Cromwell Ave	306	303	-3	-1%	N	0.17	✓	✓			
	Cromwell Ave to A49 NB	403	391	-12	-3%	N	0.60	✓	✓			
	Cromwell Ave to Sandy Ln	259	226	-33	-13%	N	2.12	✓	✓			
	Cromwell Ave to A49 SB	517	497	-20	-4%	N	0.89	✓	✓			
	Cromwell Ave to Cromwell Ave (U-turn)	96	81	-15	-16%	N	1.59	✓	✓			
	A49 NB	1423	1381	-42	-3%	N	1.12	✓	✓			
	A49 NB to Sandy Ln	104	89	-15	-14%	N	1.53	✓	✓			
	A49 NB to Cromwell Ave	657	672	15	2%	N	0.58	✓	✓			
	Sandy Ln to A49 NB	205	151	-54	-26%	N	4.05	✓	✓			
	Sandy Ln to Sandy Ln (U-turn)	0	0	0	-	N	0.00	✓	✓			
	Sandy Ln to A49 SB	103	103	0	0%	N	0.00	✓	✓			
Sandy Ln to Cromwell Ave	260	183	-77	-30%	N	5.17	✗	✓				
A49 Winwick Road @ Junction NINE Retail Park	A49 SB	1309	1354	45	3%	N	1.23	✓	✓			
	A49 SB to Junction NINE Retail	133	138	5	4%	N	0.43	✓	✓			
	A49 NB	1923	1956	33	2%	N	0.75	✓	✓			
	Junction NINE Retail to A49 SB	103	71	-32	-31%	N	3.43	✓	✓			
	Junction NINE Retail to A49 NB	261	201	-60	-23%	N	3.95	✓	✓			
A49 Winwick Road/ Hawleys Lane/ A50 Long Lane	A49 SB to Hawleys Lane	189	175	-14	-7%	N	1.04	✓	✓			
	A49 SB to Long Lane	319	368	49	15%	N	2.64	✓	✓			
	A49 SB	904	871	-33	-4%	N	1.11	✓	✓			
	A49 NB to Hawleys Lane	70	46	-24	-34%	N	3.15	✓	✓			
	A49 NB to Long Lane	215	147	-68	-32%	N	5.05	✗	✓			
	A49 NB	1357	1387	30	2%	N	0.81	✓	✓			
	Long Lane to A49 SB	246	205	-41	-17%	N	2.73	✓	✓			
	Long Lane to Hawleys Lane	158	99	-59	-37%	N	5.20	✗	✓			
	Long Lane to A49 NB	298	279	-19	-6%	N	1.12	✓	✓			
	Hawleys Lane to Long Lane	134	127	-7	-5%	N	0.61	✓	✓			
	Hawleys Lane to A49 SB	65	80	15	23%	N	1.76	✓	✓			
Hawleys Lane to A49 NB	353	409	56	16%	N	2.87	✓	✓				

# **APPENDIX B:**

## **JOURNEY TIME VALIDATION RESULTS**









# **APPENDIX C:**

## **HATRIS MOTORWAY COUNT VALIDATION RESULTS**

		OBSERVED - AM HATRS					
		07:00-08:00		08:00-09:00		09:00-09:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	4844	53.5	4413	55	1979	58
WB_M62_WestOfJ9	14	4661	62	4337	59.3	2124	61
EB_M62_J9	15	3577	38	3150	44.8	1418	58
WB_M62_J9	16	3395	65.8	3278	62	1589	65
EB_M62_EastOfJ9	17	4291	34.8	3697	39	1676	57
WB_M62_EastOfJ9	18	3908	64.8	3940	62.5	1890	63
EB_M62-M6link	19	2065	43.8	2207	43.8	955	44

		OBSERVED - PM HATRS					
		16:00-17:00		17:00-18:00		18:00-18:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	5205	59.8	4826	61	2137	59
WB_M62_WestOfJ9	14	5658	51.8	5935	61.5	2713	62
EB_M62_J9	15	4219	59.3	3879	60	1618	60
WB_M62_J9	16	4569	53.5	4720	64	2253	64
EB_M62_EastOfJ9	17	5120	58	4748	58	1951	59
WB_M62_EastOfJ9	18	5410	52.8	5574	63	2610	63
EB_M62-M6link	19	2614	47.8	2286	54.8	979	55

		DIFFERENCE - AM ACTUAL					
		07:00-08:00		08:00-09:00		09:00-09:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	-270	5.72	-121	4.69	-89	2.7
WB_M62_WestOfJ9	14	-19	-2.6	25	1.1	-27	-0.1
EB_M62_J9	15	294	19.4	257	-0.3	156	2.3
WB_M62_J9	16	584	-5.4	119	-0.6	108	-3.3
EB_M62_EastOfJ9	17	-271	6.39	423	-0.5	120	0
WB_M62_EastOfJ9	18	680	-7.1	208	-4.1	113	-4.2
EB_M62-M6link	19	-108	2.4	-220	2.1	-130	13

		DIFFERENCE - PM ACTUAL					
		16:00-17:00		17:00-18:00		18:00-18:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	29	-1.4	-37	-2	-45	1.6
WB_M62_WestOfJ9	14	-92	6.2	-36	-4.5	-208	-2.2
EB_M62_J9	15	173	-1.9	113	-1.6	59	0.7
WB_M62_J9	16	206	6.3	161	-4.5	-244	-2.7
EB_M62_EastOfJ9	17	-310	-6.4	-250	-5.1	-15	-3.6
WB_M62_EastOfJ9	18	-63	3.2	-35	-7.7	-272	-4.8
EB_M62-M6link	19	-147	-0.4	36	-2.5	29	0.6

		MODELLED - AM VISSIM					
		07:00-08:00		08:00-09:00		09:00-09:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	4574	59.2	4292	59.7	1890	61
WB_M62_WestOfJ9	14	4642	59.4	4362	60.4	2097	61
EB_M62_J9	15	3871	57.4	3407	44.4	1574	60
WB_M62_J9	16	3979	60.4	3397	61.4	1697	61
EB_M62_EastOfJ9	17	4020	41.1	4120	38.5	1796	57
WB_M62_EastOfJ9	18	4588	57.7	4148	58.4	2003	59
EB_M62-M6link	19	1957	46.2	1987	45.9	825	56

		MODELLED - PM VISSIM					
		16:00-17:00		17:00-18:00		18:00-18:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	5234	58.4	4789	59	2092	61
WB_M62_WestOfJ9	14	5566	57.9	5899	57	2505	60
EB_M62_J9	15	4392	57.4	3992	58.4	1677	61
WB_M62_J9	16	4775	59.8	4881	59.5	2009	61
EB_M62_EastOfJ9	17	4810	51.6	4498	52.9	1936	55
WB_M62_EastOfJ9	18	5347	55.9	5539	55.3	2338	58
EB_M62-M6link	19	2467	47.3	2322	52.3	1008	56

		DIFFERENCE - AM PERCENTAGE					
		07:00-08:00		08:00-09:00		09:00-09:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	-6%	11%	-3%	9%	-4%	5%
WB_M62_WestOfJ9	14	0%	-4%	1%	2%	-1%	0%
EB_M62_J9	15	8%	51%	8%	-1%	11%	4%
WB_M62_J9	16	17%	-8%	4%	-1%	7%	-5%
EB_M62_EastOfJ9	17	-6%	18%	11%	-1%	7%	0%
WB_M62_EastOfJ9	18	17%	-11%	5%	-7%	6%	-7%
EB_M62-M6link	19	-5%	5%	-10%	5%	-14%	29%

		DIFFERENCE - PM PERCENTAGE					
		16:00-17:00		17:00-18:00		18:00-18:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	1%	-2%	-1%	-3%	-2%	3%
WB_M62_WestOfJ9	14	-2%	12%	-1%	-7%	-8%	-4%
EB_M62_J9	15	4%	-3%	3%	-3%	4%	1%
WB_M62_J9	16	5%	12%	3%	-7%	-11%	-4%
EB_M62_EastOfJ9	17	-6%	-11%	-5%	-9%	-1%	-6%
WB_M62_EastOfJ9	18	-1%	6%	-1%	-12%	-10%	-8%
EB_M62-M6link	19	-6%	-1%	2%	-4%	3%	1%

		DIFFERENCE - AM GEH (VOLUME)					
		07:00-08:00		08:00-09:00		09:00-09:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	3.93	11%	1.83	9%	2.02	5%
WB_M62_WestOfJ9	14	0.28	-4%	0.38	2%	0.59	0%
EB_M62_J9	15	4.82	51%	4.49	-1%	4.03	4%
WB_M62_J9	16	9.62	-8%	2.06	-1%	2.66	-5%
EB_M62_EastOfJ9	17	4.20	18%	6.77	-1%	2.88	0%
WB_M62_EastOfJ9	18	10.43	-11%	3.27	-7%	2.56	-7%
EB_M62-M6link	19	2.41	5%	4.80	5%	4.36	29%

		DIFFERENCE - PM GEH (VOLUME)					
		16:00-17:00		17:00-18:00		18:00-18:30	
#		#Veh	Mph	#Veh	Mph	#Veh	Mph
EB_M62_WestOfJ9	13	0.40	-2%	0.53	-3%	0.98	3%
WB_M62_WestOfJ9	14	1.23	12%	0.47	-7%	4.07	-4%
EB_M62_J9	15	2.64	-3%	1.80	-3%	1.45	1%
WB_M62_J9	16	3.01	12%	2.32	-7%	5.29	-4%
EB_M62_EastOfJ9	17	4.40	-11%	3.68	-9%	0.34	-6%
WB_M62_EastOfJ9	18	0.86	6%	0.47	-12%	5.47	-8%
EB_M62-M6link	19	2.92	-1%	0.75	-4%	0.92	1%

