IS05

Epsom and Ewell Local Plan Strategic Transport Model Assessment Report

Technical Annex

October 2024

Transport Studies

SURREY COUNTY COUNCIL

Amendment List

Issue/ Revision	Date	Officers	Reviewed by	Comment
1	15/10/24	JL, AH, GJ, PM	GJ, WB	

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Contents

Introduction

Regulation 19 Appraisal

Epsom and Ewell Borough Council are in the process of determining their Local Plan site allocations for their Regulation 19 consultation. As part of the evidence base for this consultation, an assessment of the transport impacts of the site allocations is required. This document details the technical aspects of the modelling undertaken for this assessment and forms an annex to the main report, *Epsom and Ewell Local Plan Strategic Transport Model Assessment: Results and Analysis,* which focuses on the outcomes of the modelling.

Surrey's transport model SINTRAM74 has been used for the assessment as well as a cordoned Local Model of Epsom and Ewell and its immediate surroundings. A future year of 2040 has been assessed, to tie in with the end of the Local Plan period.

Organisation of this Report

This Technical Annex will detail the model development, validation and forecasting methodology.

Within this, Chapter 2 describes the development of the Base year (2019) model from which forecasts can be subsequently projected. The chapter introduces the two-level modelling system that is applied.

Chapter 3 sets out the model validation of both flows and journey times.

The final chapter describes the forecasting process. This is based on forecasting travel demand using modelling components for trip productions and attractions (trip ends), and the patterns of travel (trip distribution). The impact of travel demand on the transport network is modelled using network assignment procedures. The chapter also explains how the demand for travel, using the higher-level, multi-modal SINTRAM74 modelling, is converted to forecasts of traffic demand used to provide forecasts of peak-hour traffic conditions on the Epsom and Ewell highway network in 2040.

The Appendix contains several figures and tables that are referenced in the main text.

The figures and tables in this report are designed for viewing in print and at standard scales, but they have a resolution that enables them to be viewed on-screen with a reasonable level of zoom to facilitate reading and discerning details.

Base Model Development

Model and Scope

The modelling is focused on a local highway model that covers the borough of Epsom and Ewell and a hinterland. The hinterland incorporates areas of Elmbridge and London Borough of Kingston upon Thames to the west, Mole Valley to the south, Reigate and Banstead to the east, and London Borough of Sutton to the north.

This local model is derived from Surrey County Council's (SCC) regional, multi-modal transport model, version SINTRAM74_1b_v81. It is used in this application to provide initial ('prior') base year highway travel information for the local model in the form of origin-destination (OD) trip matrices, as well as to forecast changes. The prior OD matrices from SINTRAM74 are refined as part of the validation process reported later in this document.

The modelling system, all of which is implemented in OmniTRANS modelling software, may thus be understood as having two levels, with SINTRAM74 to forecast demand, and the local Epsom and Ewell model to provide assessments of the highway conditions for different potential developments.

Further Model Documentation

The validation of the SINTRAM74 model provides an important background and a further basis of assurance for the Epsom and Ewell modelling. Its validation and technical reports listed below are relevant and available from Surrey CC on request.

SINTRAM74 reports include:

- *SINTRAM74 Model Development, Validation and Assessment* which describes development of the model, associated validation and its assessment as a forecasting model.
- *SINTRAM74 Model Technical Report* which describes the principal modelling characteristics of SINTRAM74.

Base Year

The model base year is 2019. This reflects the base year of SINTRAM.

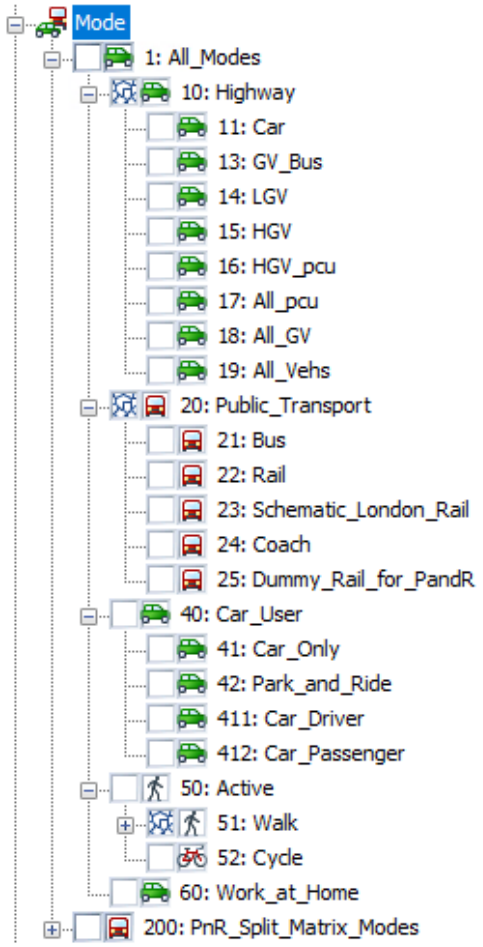
Modes of Transport

The modelling of demand in SINTRAM74 is multi-modal, with the main modes of:

- Highway
- Public Transport (PT) and
- Active.

As shown in Figure 1, these categories include an extensive number of sub-modes.

Figure 1 Travel Modes for Demand Modelling



For both the SINTRAM74 and Local Model cases, primary highway vehicle types are car; light goods vehicles (LGV); and heavy goods vehicles (HGV). Additionally, bus vehicles are included in the highway traffic, as are the car components of Park and Ride trips[1].

For highway assignment modelling, all the vehicle types are considered in terms of passenger car units (PCUs). Most vehicles on the road have a PCU value of 1.0, i.e., 'vehicles' and 'PCUs' are the same, but HGVs have a PCU value of 2.0 and buses of 2.5, reflecting their relatively greater impact on network capacity.

Time Periods

The starting point for the calculation of travel demand is an average 24-hours for a working day in a 'neutral' month (avoiding significant holiday periods and more extreme winter weather). This enables total daily trip rates by trip purpose to be assumed constant over the forecasting period.

For most demand modelling though, trips are allocated to the four time-periods of AM (0700 – 1000), Inter-Peak (1000 – 1600), PM (1600 – 1900), and Off-Peak/night-time (1900 – 0700).

The demand modelling focuses on the 12 daytime hours covered by AM, Inter-Peak (IP), and PM, but return-trips include consideration of Off-Peak (OP) travel.

The SINTRAM74 highway modelling uses 'peak hour' factors to represent heightened levels of congestion within the AM and PM peak periods, respectively taken as occurring for the peak

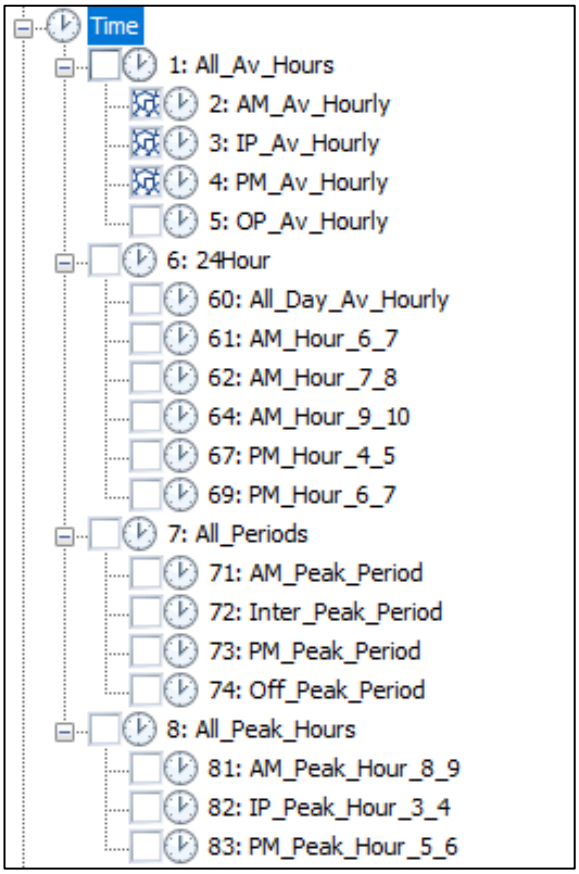
[1] Park and ride trips include connectivity between car and rail as well as traditional car and bus.

hours 0800 – 0900 and 1700 – 1800. For the Local Model AM and PM peak hours, trips are further adjusted with reference to values of local peak-hour traffic counts.

An average hourly Inter-Peak highway network assignment is generated in the Local Modelling but is not subject to specific validation or reporting.

The set of time periods used at various points in the modelling is shown in Figure 2.

Figure 2 Time Periods used in Modelling

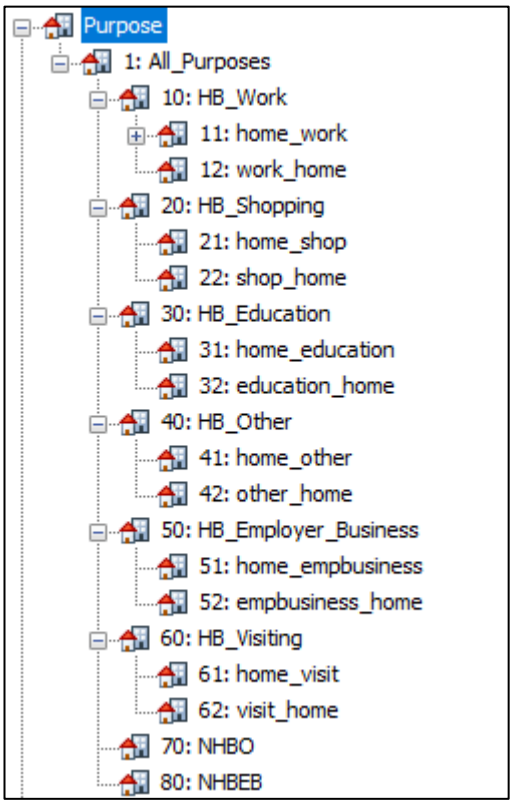


Demand Types

For demand modelling, trips are initially considered as ‘tours’ and identified as ‘Production-Attraction’ (‘PA’) trips. Tours apply to home-based (HB) trips, with an outbound trip from the home implying (in nearly all cases) a return trip later in the day. Non-home based (NHB) trips do not imply return trips. For network assignment modelling, and, importantly, for local modelling, trips are considered as ‘Origin-Destination’ (‘OD’) movements for a particular time period, that is, OD trip tables (matrices) include both outbound and (returning) inbound home-based trips, as well as any NHB trips arising in the particular time period.

The set of trip purposes used in demand modelling is shown in Figure 3.

Figure 3 Trip Purposes used in Demand Modelling



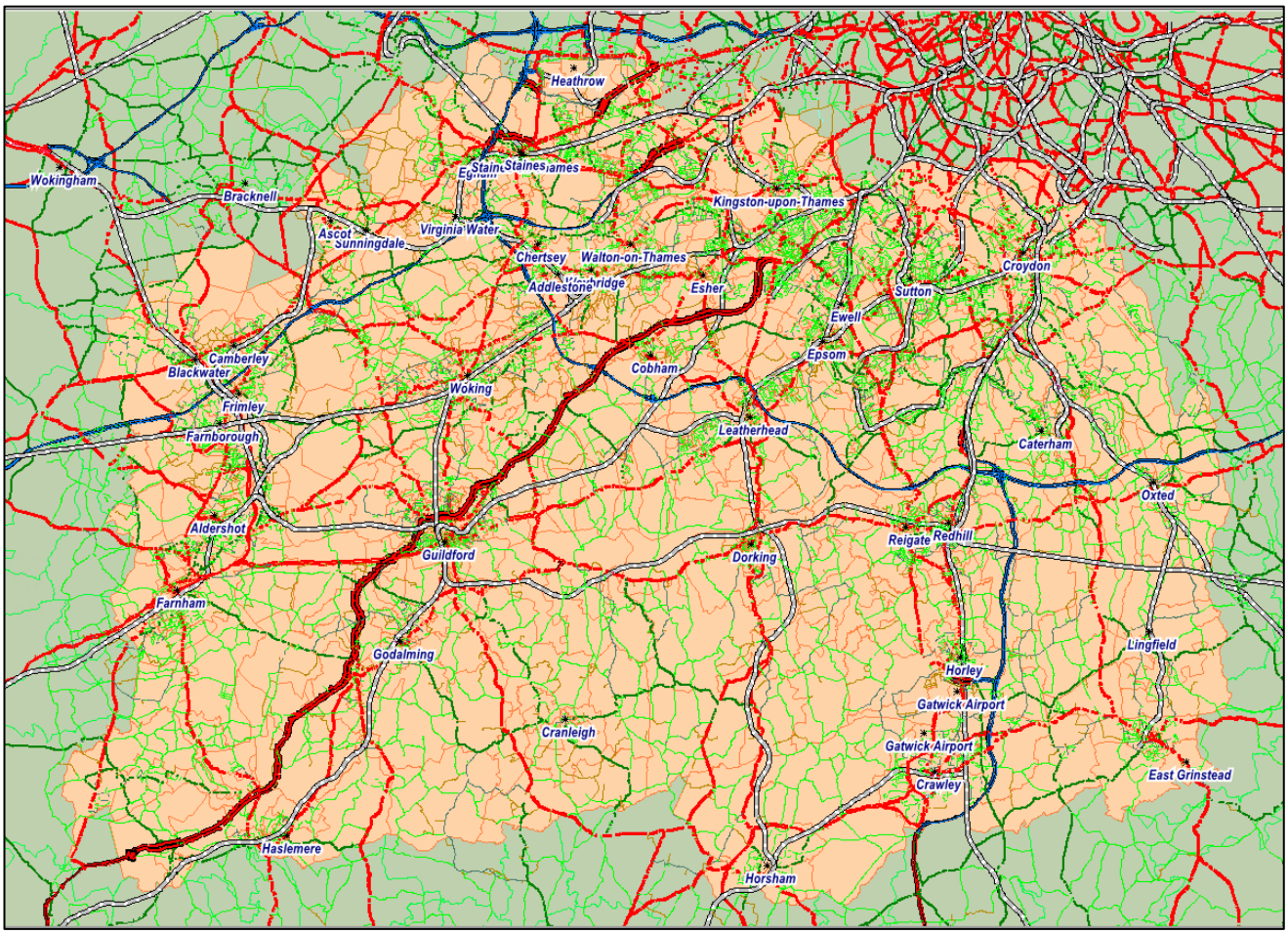
Travel demand is further categorised in the demand modelling according to the availability of a car for travel.

For the Local Model, all person car trips are considered as all purposes combined but, obviously, the pattern of trips reflects the underlying trip purposes used in the demand modelling.

Study Area

Figure 4 shows a part of the SINTRAM74 transport network. An ‘Inner Study Area’ (ISA), where the modelling is most detailed, is shown with a light orange background. The ISA includes Surrey and some adjacent areas.

Figure 4 SINTRAM74 Inner Study Area



The Local Model is defined by a cordon around the Borough of Epsom and Ewell and some adjacent areas in the SINTRAM74 model, as shown in Figure 5 below, to produce the Local Model shown in Figure 6 following.

Epsom and Ewell is situated between the A3 north of junction 10 and the M25. These roads are the responsibility of National Highways, but neither of these roads travel through the Borough.

Figure 5 Extraction of Epsom and Ewell Network for the Local Model

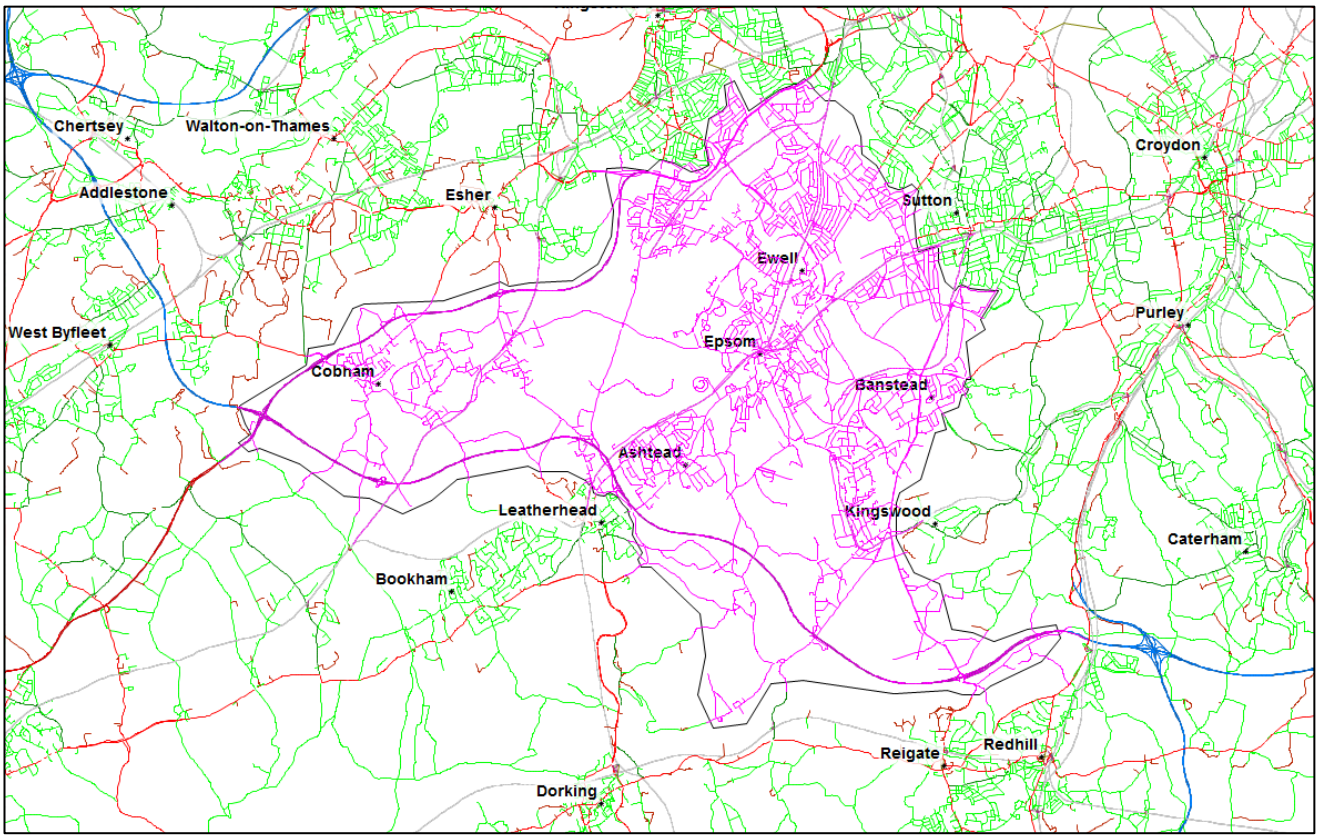
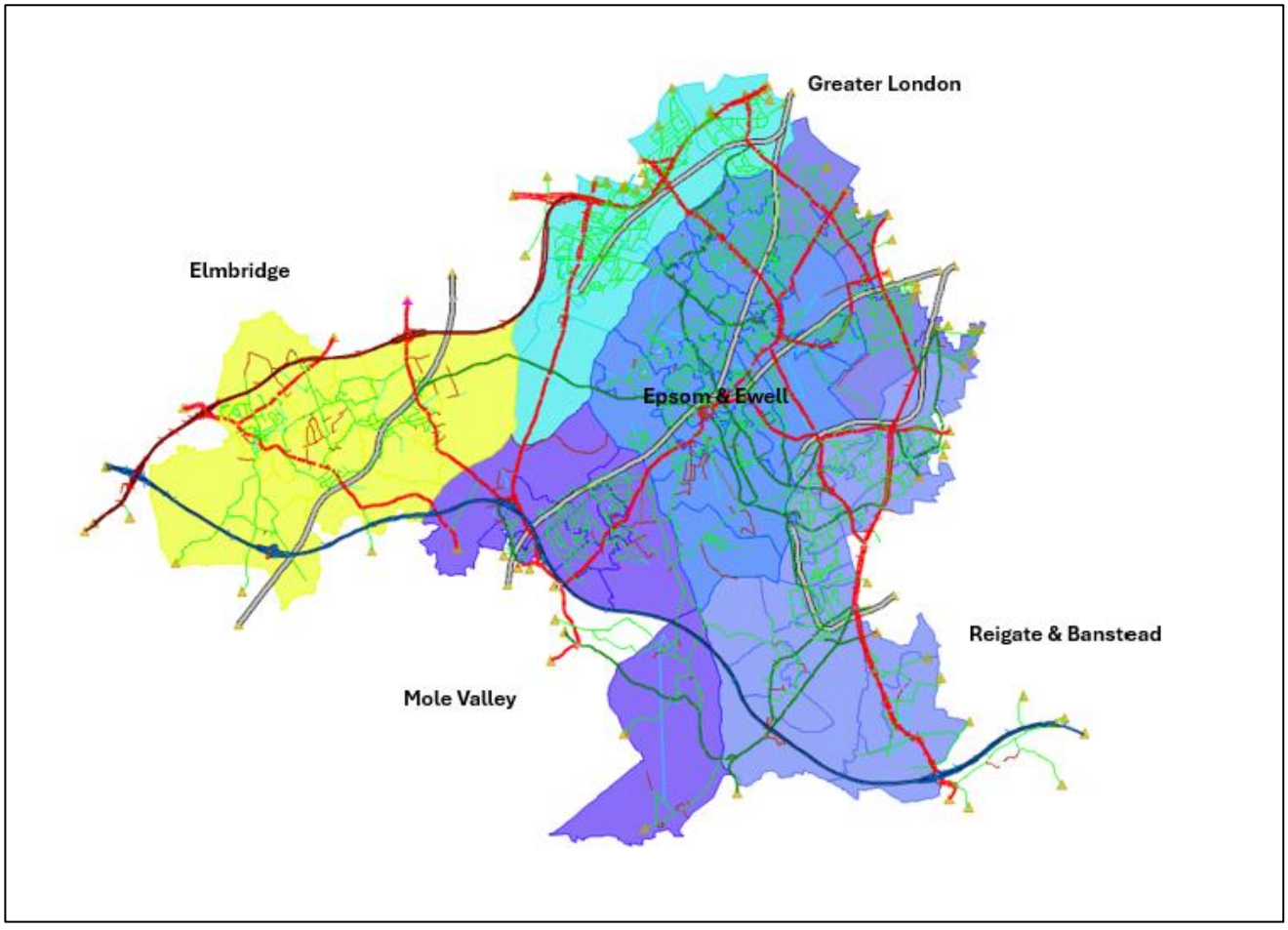


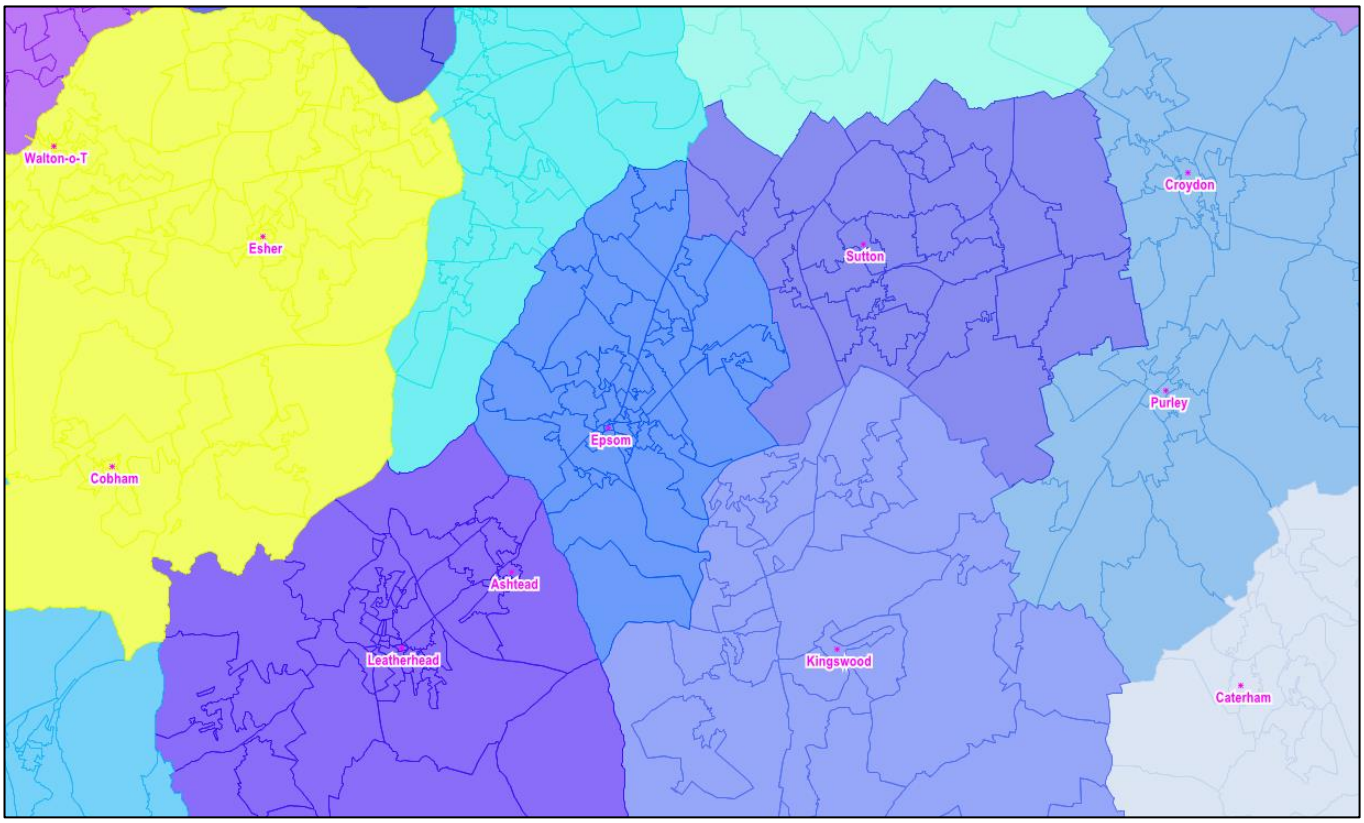
Figure 6 Local Model Network Showing Epsom and Ewell Borough and Surrounding Areas



Zoning

The Local Model has 242 zones defined. Of these, 87 correspond to the cordon crossing points, shown as triangles in Figure 6 above. Figure 7 below shows example details of the zoning in Epsom and Ewell and the surrounding area.

Figure 7 Model Zones in and around Epsom and Ewell Borough



Network Review

To ensure that the model network reflects the layout on street, a review of the SINTRAM network in Epsom and Ewell and its immediate surroundings was carried out. This involved checking numerous parameters including speed limits, road class, number of lanes, junction layouts and priorities, one-way streets and banned turns. Checks were made against a variety of information sources including SCC's Street Gazetteer data and aerial mapping.

Junction Modelling

The network modelling includes explicit modelling of junctions. This is naturally more prominent in urban areas. Further attention is given to the modelling of delays when merging onto motorways where delays are experienced on the link downstream of the merge.

The design of a junction determines the volume of vehicles able to pass through the junction in a defined period of time, and the maximum volume is the saturation flow (pcu/hour). OmniTRANS uses basic saturation flows for each movement per junction type, differentiated by type of movement e.g., left or right turning, straight ahead etc. The software decreases the saturation flow automatically accounting for effects like the number of lanes, shared lanes, give way, blocking probabilities, signal settings, etc.

Signal junctions are coded within the model as having 'automated' signal timings. This means cycle times and green times are not explicitly coded to match observed settings. The model calculates an optimal time and green times for the given junction layout and turning flows. Using the automated signal settings ensures that when forecasting is undertaken signal timings are appropriate as they adapt to match the future traffic flows. This reflects what would occur on street whereby signal timings would be revalidated in response to changing flow conditions.

Assignment

The local highway assignment modelling is provided by the OtTraffic component of OmniTRANS, which provides multi-user class (MUC) equilibrium assignment.

The MUC assignment models the combined effects of cars, LGVs, and HGVs on congestion, while supporting different routeing characteristics for each class.

Congestion effects on links are modelled via speed-flow curves as specified in 'Appendix D of Transport Appraisal Guidance (TAG) TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk)., and which take account road types, widths, and localities (urban, rural, etc.).

Delays at junctions are modelled via relationships based on 'time-dependent queueing theory'. These are described further in the OmniTRANS support document *Junction Modelling*.

Additionally, SCC's consultants have implemented a custom 'cost function' for modelling merging delays at motorway junctions. This is based on TRL research evidence documented in Appendix D.9 of TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk)..

Routes through the network are calculated in terms of 'generalised time' (units of minutes). The coefficients for the expressions used to calculate generalised time are the same as reported for SINTRAM74_1a and are taken from the November 2023 TAG Databook (v1.21) for values of time (VoT) and vehicle operating costs (VOC) applicable to each of Cars, LGVs, and HGVs.

The base assignments are run through an iterative process which is halted when it meets the convergence criteria sent out in Table 4 of TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk).

Model Validation

Introduction

The validation reported here focuses on the local highway model that covers Epsom and Ewell and a hinterland incorporating parts of adjacent authorities.

As described previously, this local model is derived from Surrey County Council's regional, multi-modal transport model, version SINTRAM74, which is used to provide initial ('prior') base year highway travel information for the local model in the form of origin-destination (OD) trip matrices, and later could be used to forecast changes in the demand for travel, in for example 2040, the Local Plan forecast year. The prior OD matrices from SINTRAM74 are refined as part of the validation process reported in this section.

This chapter focuses on the local model base year (2019) highway validation, considering the comparison of modelled traffic flows with observations at count and along screenlines and, similarly, comparisons of journey times along a set of sixteen journey time routes defined for the purpose. Changes to the matrix due to Matrix Estimation (ME) have also been considered alongside this.

Assessment Objectives

The primary objective of the local model validation is to provide assurance that the model's replication of observed base year traffic flows and congestion levels is sufficient, also to give confidence in any potential forecast highway network modelling for using this model.

Validation Criteria

Validation simply compares modelled and observed data. The standard criteria for assessing highway network models are provided by the Department for Transport's TAG guidance, notably, TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk).

The validation of a highway assignment model includes comparisons of the following:

- Assigned flows and counts totalled for each screenline or cordon, as a check on the quality of the trip matrices.
- Assigned flows and counts on individual links as a check on the quality of the assignment.
- Modelled and observed journey times along routes, as a check on the quality of the network and the assignment.

For trip matrix validation within traffic assignments, the measure which should be used is the percentage differences between modelled flows and counts. Comparisons at a screenline level provide information on the quality of the trip matrices.

For link flow validation the measures used are the absolute and percentage differences between modelled flows and observed counts as well as the GEH statistic. The GEH statistic is a form of the chi-squared statistic that incorporates bot relative and absolute errors, and is defined as follows:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

where: GEH is the GEH statistic

M is the modelled flow

C is the observed flow

For journey time validation the measure used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference.

The TAG acceptability guidelines for each of these measures are summarised in Table 1 below.

Table 1 Validation Acceptability Guidelines

Validation Criteria	Acceptability Guideline
Differences between screenline modelled flows and counts should be less than 5% of the counts	All or nearly all screenlines
Individual flows within 100vph of counts for flows less than 700vph	> 85% of cases
Individual flows within 15% of counts for flows from 700 to 2,700vph	
Individual flows within 400vph of counts for flows more than 2,700vph	
GEH < 5 for individual flows	
Modelled journey times within 15% (or 1 minute, if higher)	

Note TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk) states that the validation of a highway assignment model should not only be about achieving the flow validation criteria. This is so that matrix estimation is not relied upon too much and some models where flow validation is not quite met are still fit for purpose. The limits set out in relation to matrix estimation changes are listed in TAG unit M3-1 Table 5 (copied below in Table 2) and should be respected as a priority over validation standards in Tables 1, 2 and 3 (summarised in this report in Table 1 above).

Table 2 Significance of Matrix Estimation changes

Measure	Significance Criteria
Matrix zonal cell values	Slope within 0.98-1.02 Intercept near 0 R^2 in excess of 0.95
Matrix zonal trip ends	Slope within 0.99-1.01 Intercept near 0 R^2 in excess of 0.98
Trip length distributions	Means within 5% Standard deviations within 5%
Sector to sector level matrices	Difference within 5%

Methodology for Comparing Counts and Flow

The local model observed traffic counts are taken from the set used in SINTRAM74 modelling, of which there were circa 3,500 one-way counts. These counts were taken in the period 2016 to 2020 and normalised to 2019.

Flows should not change too much unless the counts are situated next to major land use change in the interim. Change in flow from year to year is also highly dependent on capacity. For example, a link at capacity is unlikely to have flow increase if demand exceeds or equals supply, but a link with spare capacity is more subject to growth. Nevertheless, if the road is a minor road, it is likely that other count data will not exist in that location.

Of the 3,553 counts in SINTRAM74, 303 relate to the local model highway network. As described below, flow validation is based on 266 counts from across the subarea.

This total large number of counts, and their distribution on the highway network, is due to the wide sources of traffic count data that have contributed to the set. These include counts produced by DfT, National Highways, Surrey CC, as well as counts commissioned for individual concerns. The count data has also been observed by different means, both instrumented and manual, and across widely varying numbers of days. These differences are encoded via 'confidence level' factors[2] that are used in matrix estimation.

These different forms and sources of collection also vary in how, and the extent to which, traffic is classified by the vehicle types used in the modelling of car, LGV, and HGV.

Motorway and Trunk Road Mainline Counts

Simple inspection of the count data on the M25 and A3, reveals a number of inconsistencies that cannot be resolved by any feasible set of modelled flows. For these roads, the peak hour counts are less than the experienced levels of congestion imply. The reason for this is readily accounted by the extensive queueing present at the start of the modelled periods, where long stretches of 4 and 3-lane motorway and trunk road can store up to 2,000 vehicles in a 2km stretch. Peak hour queueing occurs, of course, elsewhere in the network, but the discrepancies between counted flows and travel demand are most significant for these roads.

To address these discrepancies, National Highways and DfT counts were compared on the M25 and A3. The higher count was selected for use in each case and a further uplift factor of 10%

[2] Confidence levels vary between 0.0 ('no confidence') and 1.0 ('full confidence'). The range applied in practice varies from 0.6 to 0.9, largely depending on the data collection type and numbers of repeated observations.

applied to reflect the ‘peak hour adjustment’, resulting in ‘assessed’ counts in these locations. This 10% uplift is considered to be a reasonable proxy for any ‘missed demand’ during the congested peaks.

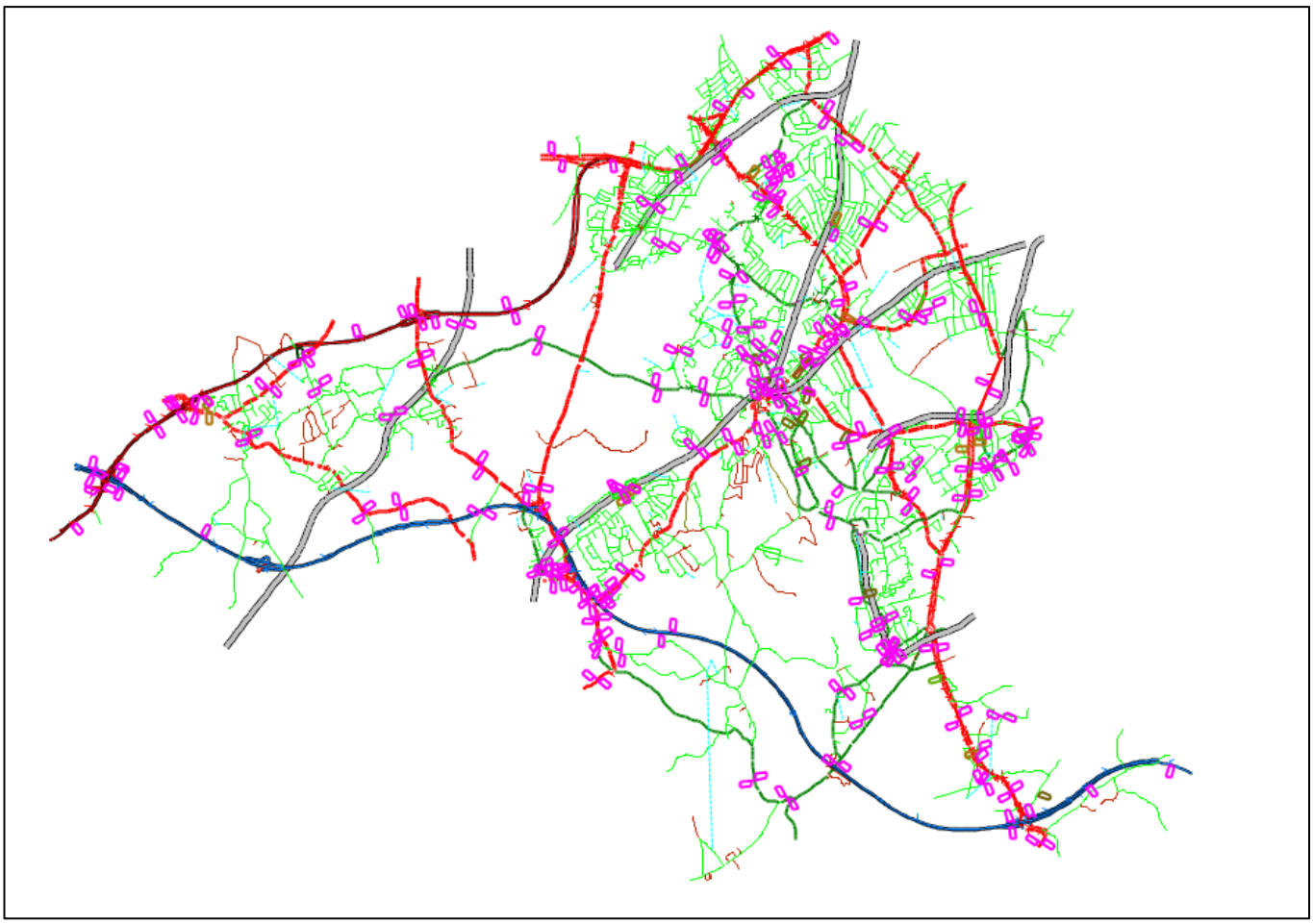
Count Selection

Although not a concern for much of Epsom and Ewell, there is a sufficient density of counts that inconsistencies between adjacent and nearby counts manifest. In some cases, these discrepancies may reasonably be associated with queueing effects reducing the apparent demand (as per motorways but on a smaller scale), but in other cases the reasons are not clear.

Sets of counts have therefore been defined respectively for matrix estimation and for flow validation. These sets are selected in terms of ‘reliable’ counts for which 275 counts are used for matrix estimation. As shown in Figure 8, these count sites are indicated by the pink rectangles.

These counts vary from the year 2016 – 2020 and so have been normalised using Surrey’s annual traffic growth to estimate a growth factor so they all correspond to the base year of 2019. Note that all 2020 counts took place prior to the Covid-19 lockdowns.

Figure 8 Matrix Estimation Count Sites



TAG Unit M3 specifies the use of another set of counts for validation purposes that are not used in matrix estimation. This is problematic for several reasons: if the ‘validation’ counts differ from the ‘estimation’ counts then they should be included in the estimation set if the differences imply

additional information that should not unreasonably be withheld from the estimation. If the differences arise because of observation errors, then they are not fair validation tests.

For these reasons, the assessment of model flows is confined to the 283 counts that have passed the quality threshold of 'reasonably self-consistent'. The full set of 303 counts is retained in the model so that variances with modelled values can be inspected.

The number of 283 counts is still large for the size of the Epsom and Ewell network, so any broad level of agreement, coupled with the established provenance of the prior OD matrices, provides strong assurance that the model reflects base year travel patterns.

Development of SINTRAM74 Base Matrices

The starting point for the Local Model base matrices is provided by the base matrices in the SINTRAM74 model, with 2019 being the base year in both cases.

The zones in the SINTRAM74 model are categorised as: *(Inner) Study Area*: zones 1 – 1325; *Hinterland*: zones 1326 – 1553; and *External*: zones 1554 – 1595.

A set of zones are classified as 'Dummy' zones and used for representing developments on major 'greenfield' sites[3]; these bring the total number of zones in the SINTRAM74 model to 1615.

Figure 9 shows the Study Area and Hinterland zones in the context of the South-East of England. As is clearly shown, the Hinterland zones (green boundaries) are much larger than the Study Area zones.

[3] 'Greenfield' should be interpreted here as (largely) vacant sites subject to significant land use change, thus including 'brownfield' sites.

Figure 9 Study Area, Hinterland, and External Zone Areas

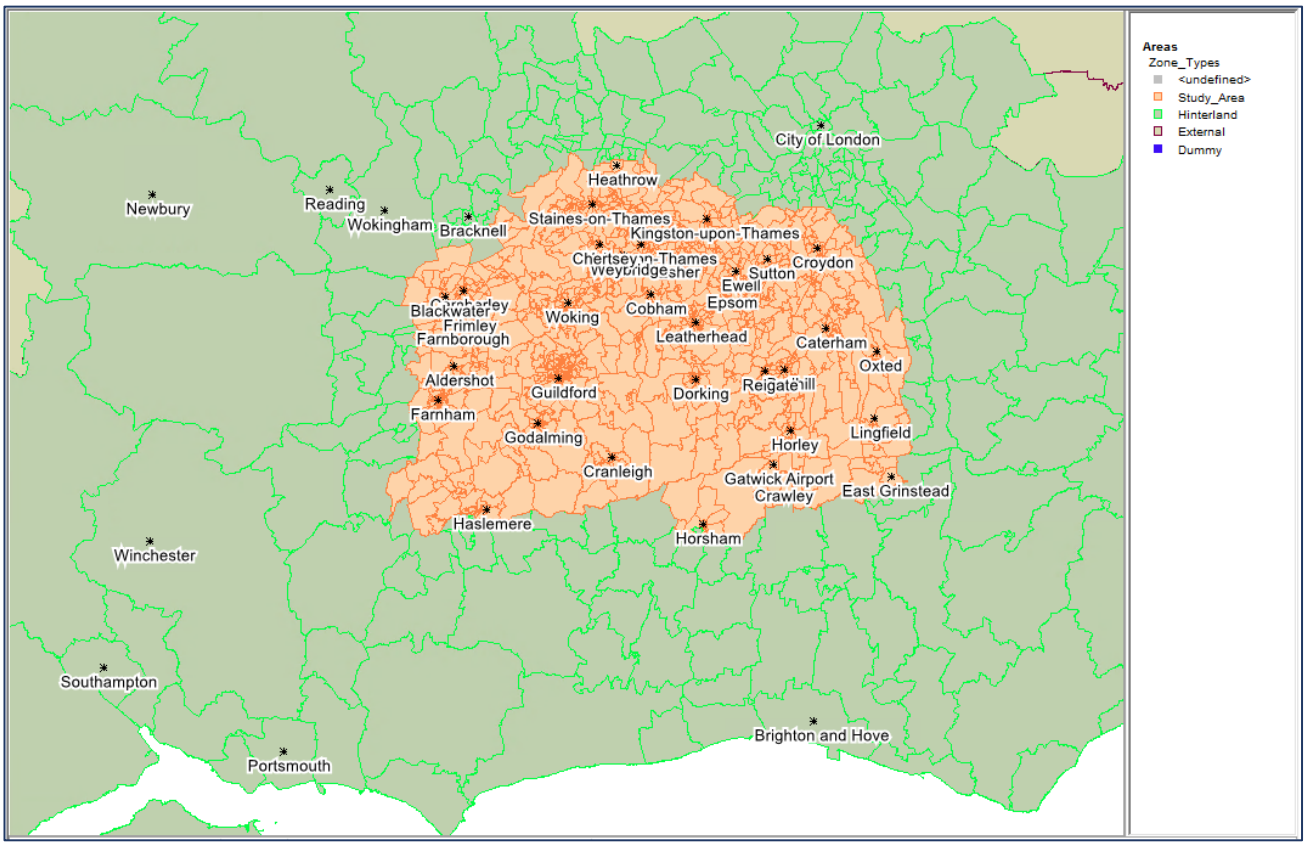
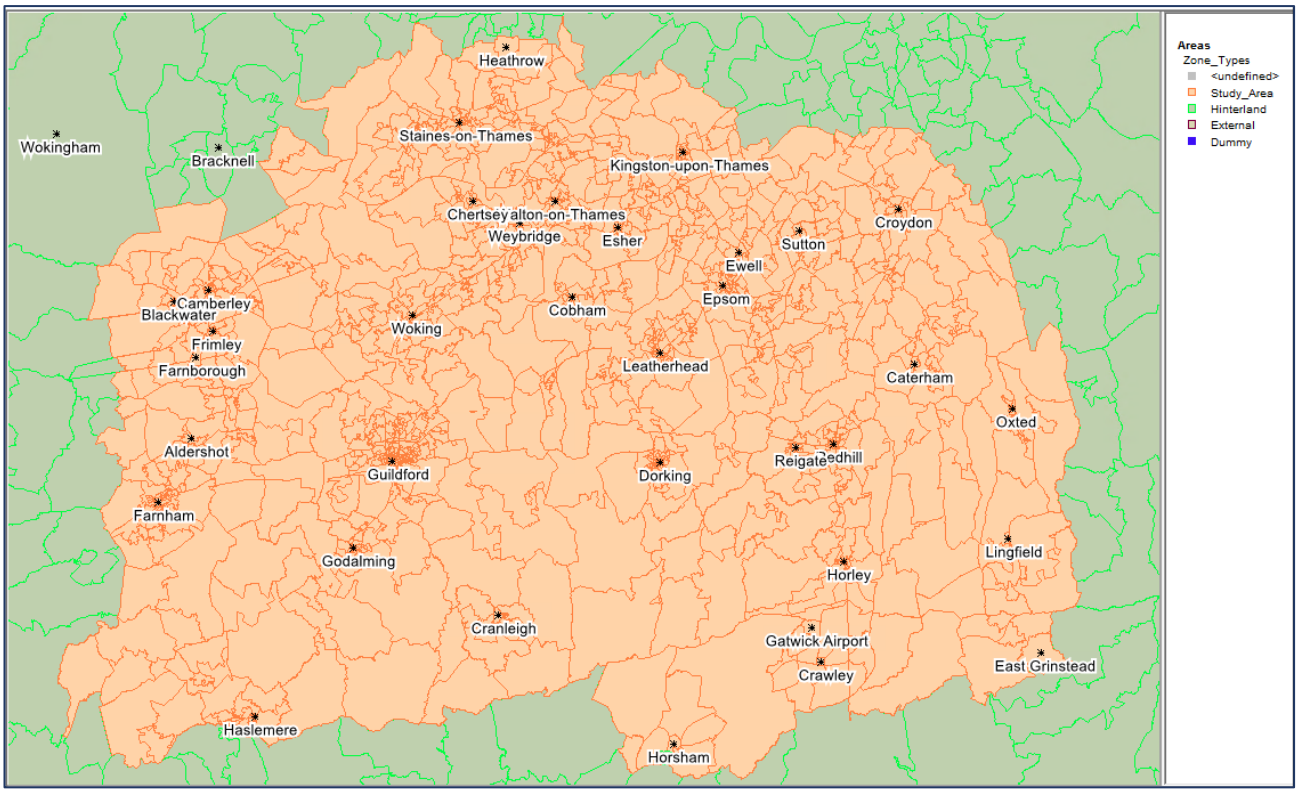


Figure 10 below shows a more detailed view of the SINTRAM74 zoning in the Study Area.

Figure 10 Detail of Study Area Zoning



The development of the SINTRAM74 base matrices involved a complex and comprehensive process, reported in *SINTRAM74 Model Development, Validation and Assessment*. The following sources of data were used:

- Mobile phone network data which provided us with a huge sample of where people are travelling to and from, for a selection of purposes (e.g., to work), split into rail, road and rail-based park and ride trips.
- Teletrac Navman journey time (all vehicles) and origin and destination data for LGV and HGV from GPS tracked vehicles.
- National Highways South-East Regional Transport Model (SERTM) estimation of trips travelling through Surrey.
- The National Travel Survey which provides a good source of information of trip length by mode of travel and purpose.
- The Office of Road and Rail (ORR) Origin and Destination data for rail trips.
- The Office for National Statistics (ONS) Mid-Year population estimates.
- The Nomis Business Register and Employment Survey (BRES).
- 3,500 vehicle counts, sourced from neighbouring authorities, Department for Transport, National Highways, and our own records.

Development of Local Model Base Trip Matrices

In accordance with best practice the changes resulting from matrix estimation are monitored and assessed to ensure that the prior matrix is not being excessively distorted. This section describes the trip matrices before and after matrix estimation using the following analyses:

- Matrix totals by user/vehicle class
- Statistical analysis of change in trip ends
- Statistical analysis of change in trip length distributions.

Criteria for the assessment of matrix estimation changes are set out in TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk)Table 5 which is re-produced for reference in Table 2.

The Local Model base trip matrices use traffic count data and matrix estimation provided by OmniTRANS to update prior OD matrices generated from SINTRAM74.

The location of the 275 traffic counts used in the estimation is indicated above in Figure 8, which shows the sites as pink rectangular symbols.

The major assurance for the quality of the local matrices is provided by their provenance as extracts of SINTRAM74 matrices. In general, the Local Model matrix estimation alters the matrices, but only to a relatively limited extent, so that travel patterns are not markedly altered. This is illustrated in Figure 11 to Figure 14, which display origin (blue) and destination (green) trip ends for the base prior (darker) and the final matrix estimation ('ME', lighter) cases[4].

[4] Some zones are shown with no trip ends. These correspond to future 'Greenfield' sites which, correctly, do not have base year trips.

Figure 11 and Figure 12 compare the prior and matrix estimation car trip ends for the entire Local Model for the AM and PM peak hours respectively. Close-up views of Epsom and Ewell are provided in Figure 13 and Figure 14. Note that different scales are used for the close-up plots for clarity.

There is very little change overall, with more change occurring at the cordon edge, specifically on the external zones at either end of the M25 and A3. This coincides with these corridors carrying some of the greatest volume of trips in the model. There is no clear trend in terms of increase or decrease in car trip ends arising from matrix estimation with the effect being specific to each zone.

Figure 11 Prior versus ME Car Trip Ends for the AM Peak Hour (0800 – 0900), Local Model

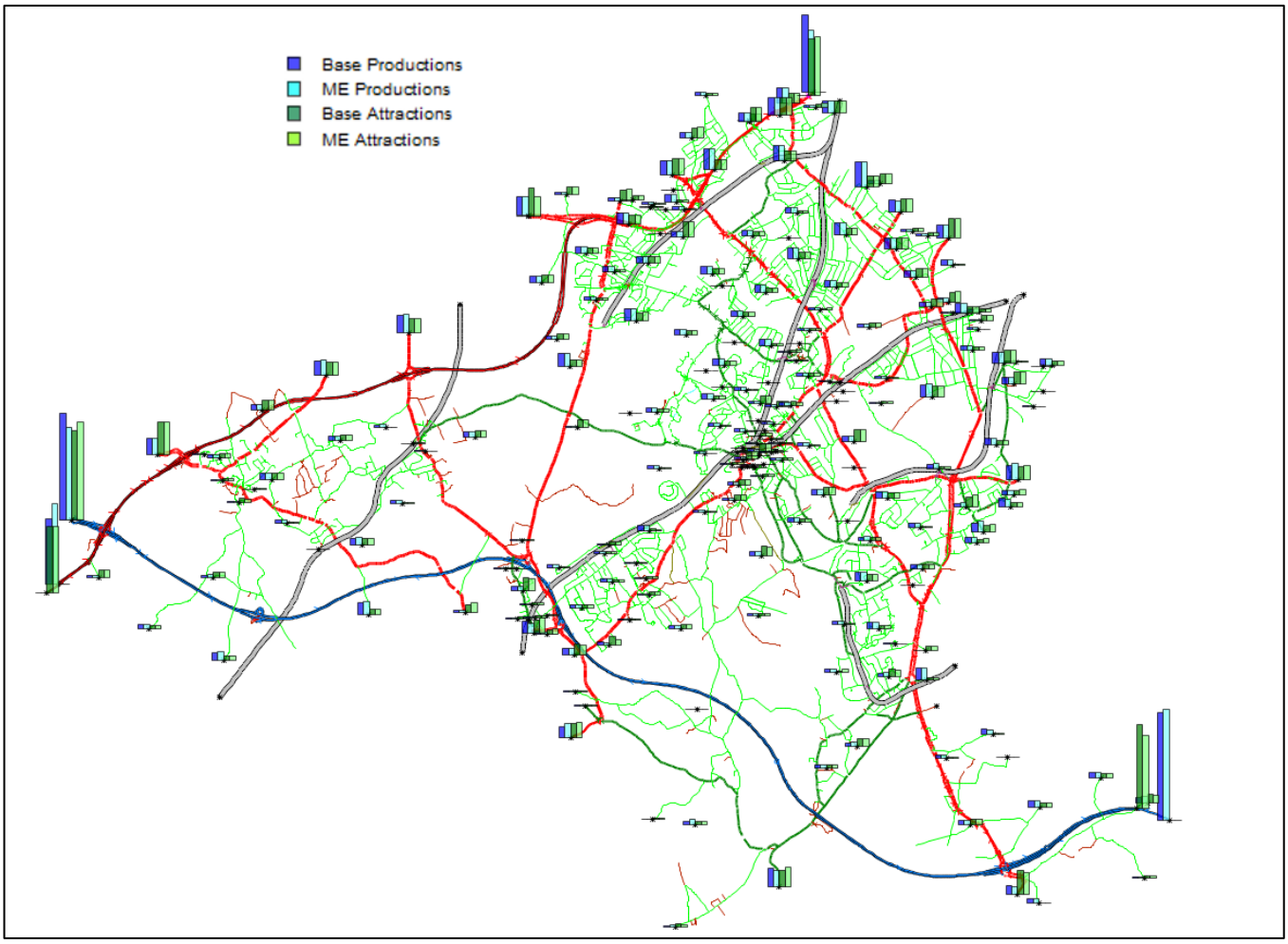


Figure 12 Prior versus ME Car Trip Ends for the PM Peak Hour (1700 – 1800), Local Model

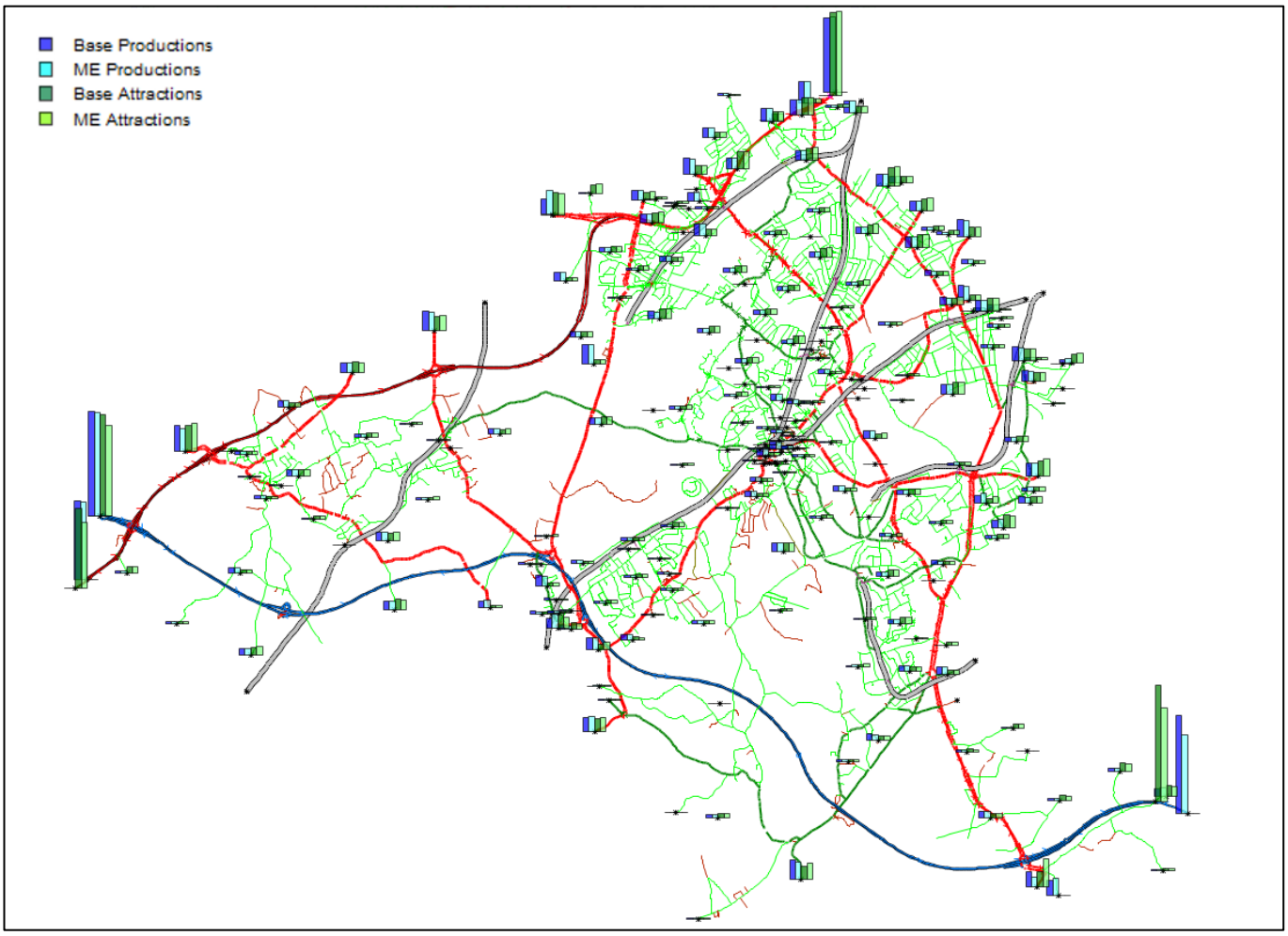


Figure 13 Prior versus ME Car Trip Ends for the AM Peak Hour (0800 – 0900), Epsom and Ewell Borough

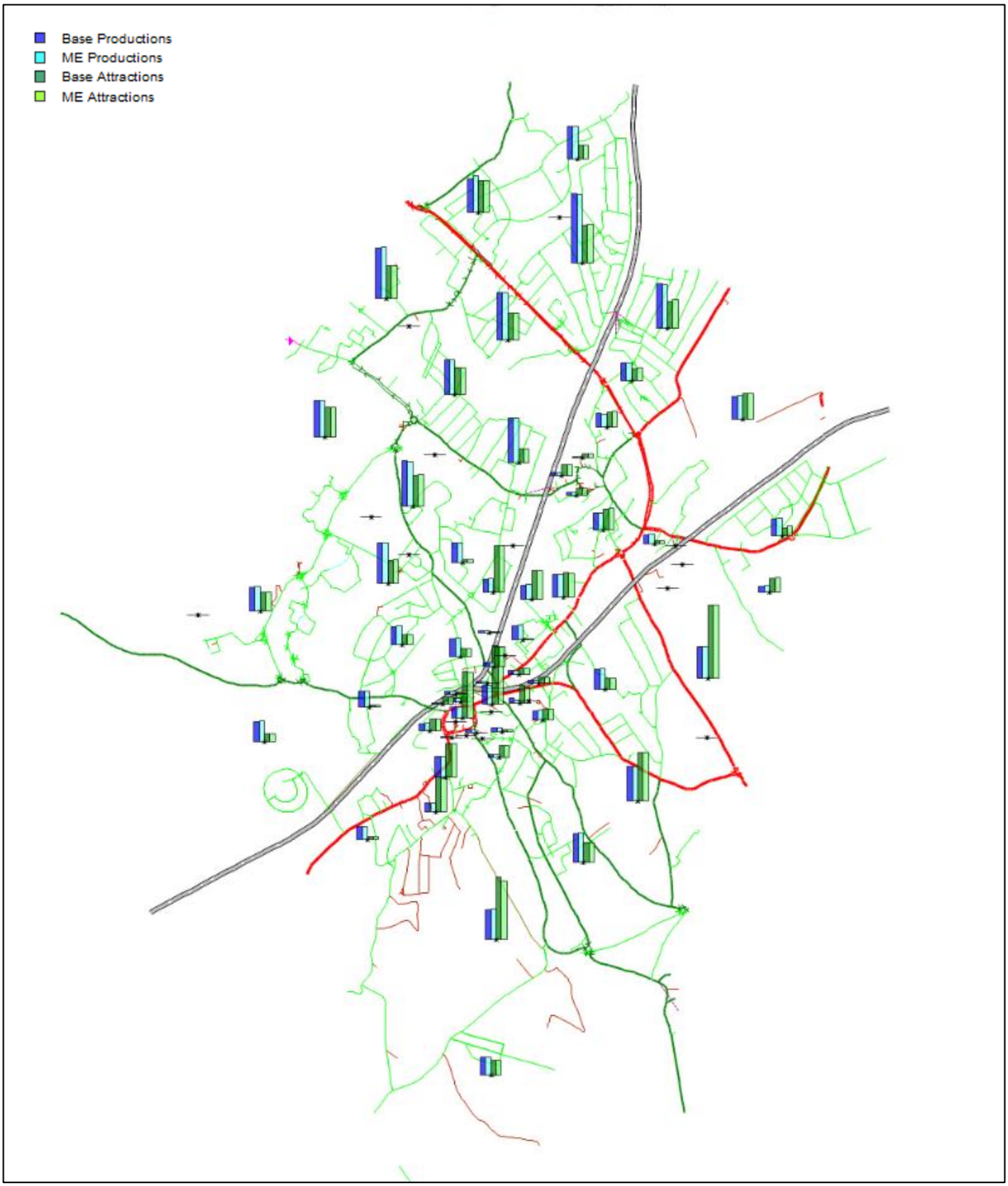
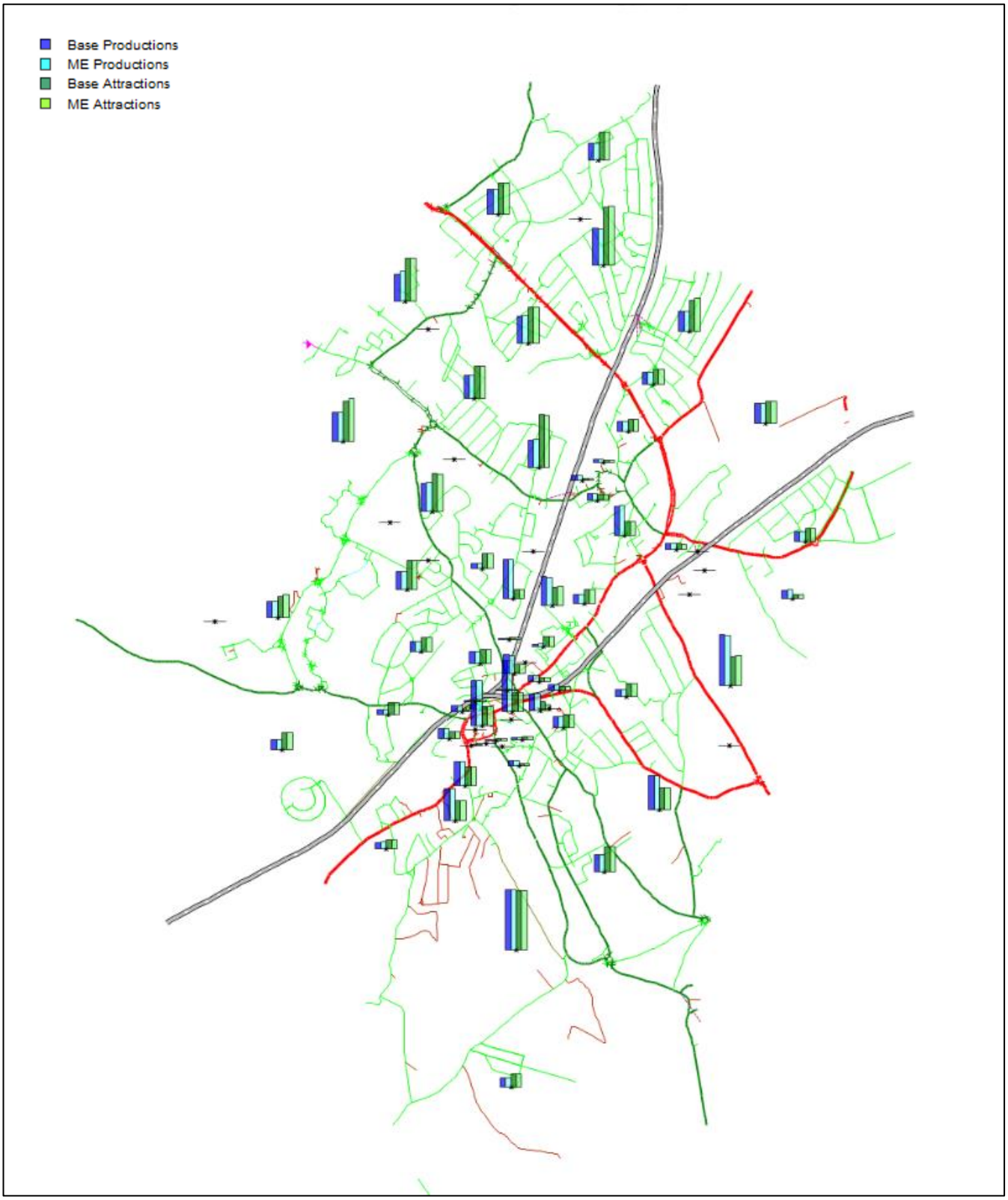


Figure 14 Prior versus ME Car Trip Ends for the PM Peak Hour (1700 – 1800), Epsom and Ewell Borough



Consideration of the trip matrix totals, presented in Table 3 below, shows the total volume of trips changing by a nominal amount of 2% in the AM and 0.04% in the PM case. Table 3 gives values for the prior matrices (as generated by SINTRAM74) and the final matrix estimated matrices.

Table 3 Prior and ME Final Matrix Totals

Matrix Type	Cars	LGV	HGV	All Vehicles	% of Original Total
AM Peak Hour (0800 - 0900)					
Prior Matrix	65,798	6,970	2,438	75,205	100%
ME Matrix	65,926	8,137	2,729	76,792	102%
PM Peak Hour (1700 - 1800)					
Prior Matrix	66,288	5,973	1,378	73,639	100%
ME Matrix	65,241	6,946	1,483	73,669	100%

The primary purpose of matrix estimation is to refine prior matrices, and such refinements should be sufficiently small that they are not regarded as significant. The limits set out in relation to matrix estimation changes listed in Table 2 (TAG unit M3-1 Table 5) and have been discussed below.

Matrix zonal cell values have been presented below with the prior matrix against the post ME matrix as can be seen in Figure 15 and Figure 16.

In the AM, the intercept is close to zero and the slope is just outside the 0.98 to 1.02 range at 1.0224, although the R^2 is below 0.95. In the PM the slope is outside the 0.98 to 1.02 range at 0.9311, the intercept is slightly further away from 0 than the AM, and the R^2 is below the threshold at 0.8432.

Figure 15 Car AM Matrix Cell Zonal Values

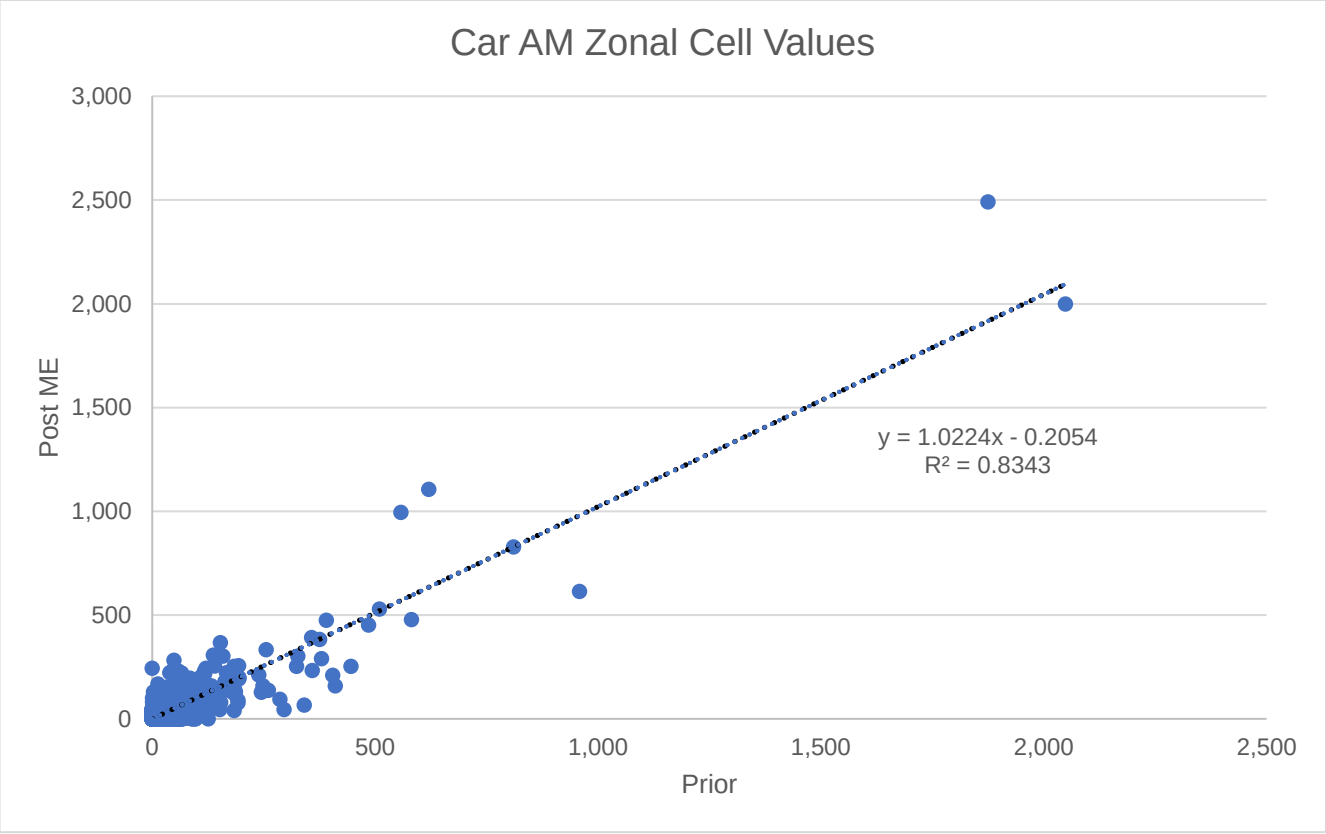
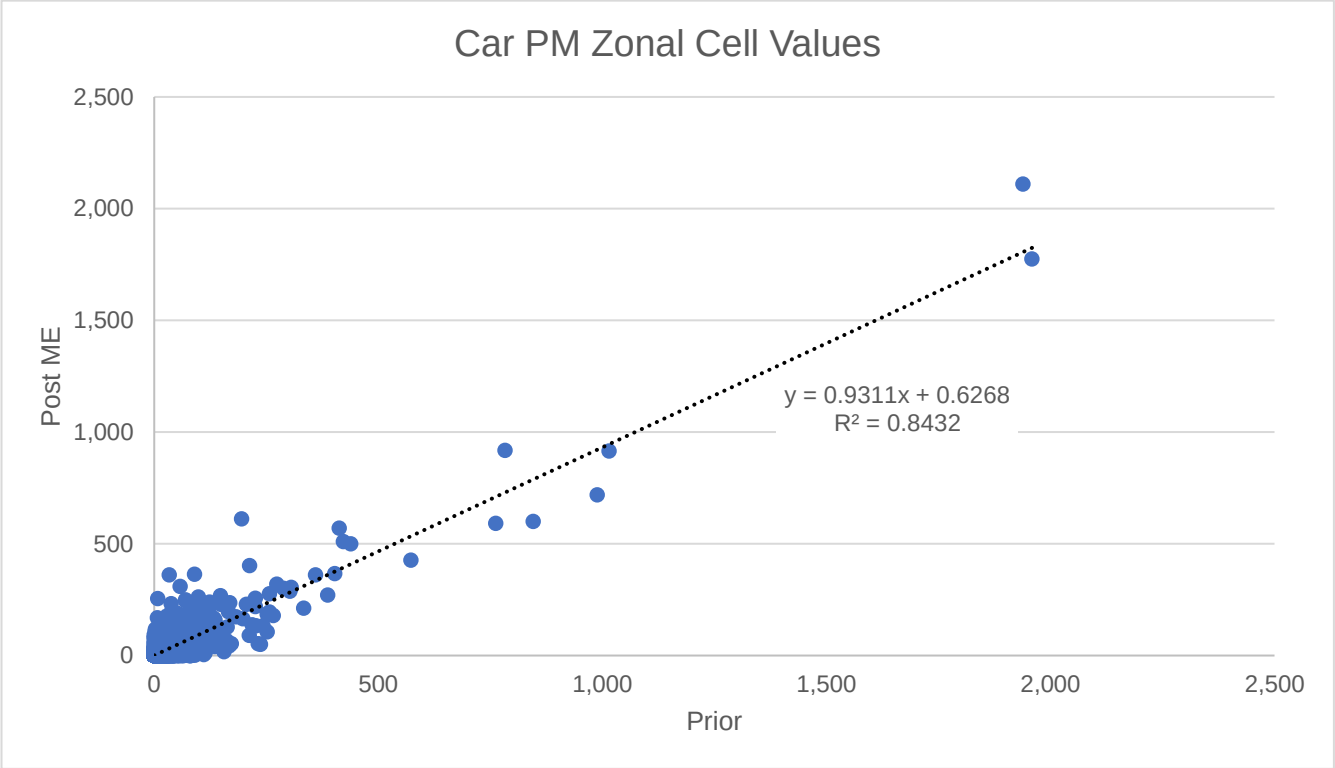


Figure 16 Car PM Matrix Cell Zonal Values



Matrix zonal trip ends have been presented below with the prior matrix against the post ME matrix as can be seen in Figure 17 and Figure 18.

In the AM, the slope is just below the range 0.99 to 1.01 at 0.9797, the intercept fairly close to 0 for the size of this model, and the R^2 is greater than 0.98. In the PM the slope is outside the range of 0.99 and 1.01, the intercept is slightly further from 0 than the AM, and the R^2 is greater than 0.98.

Figure 17 Car AM Matrix Zonal Trip Ends

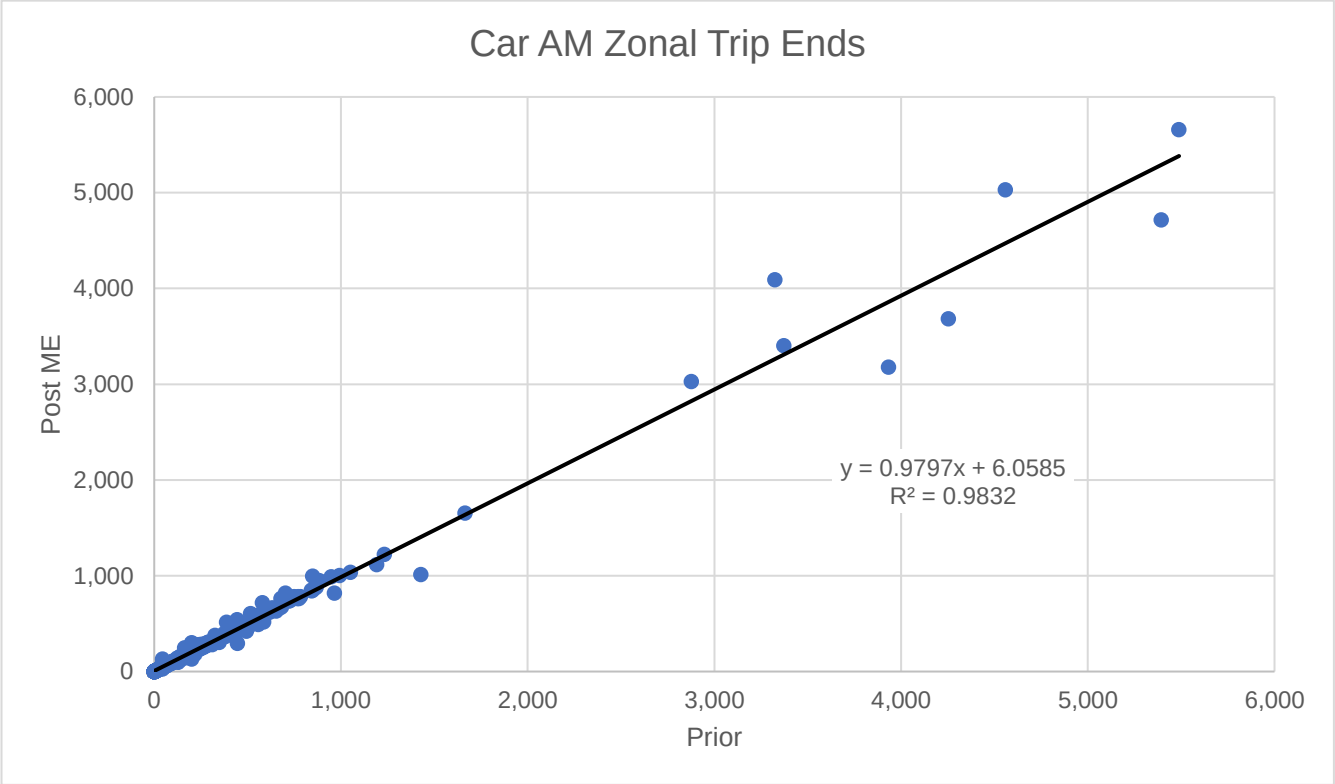
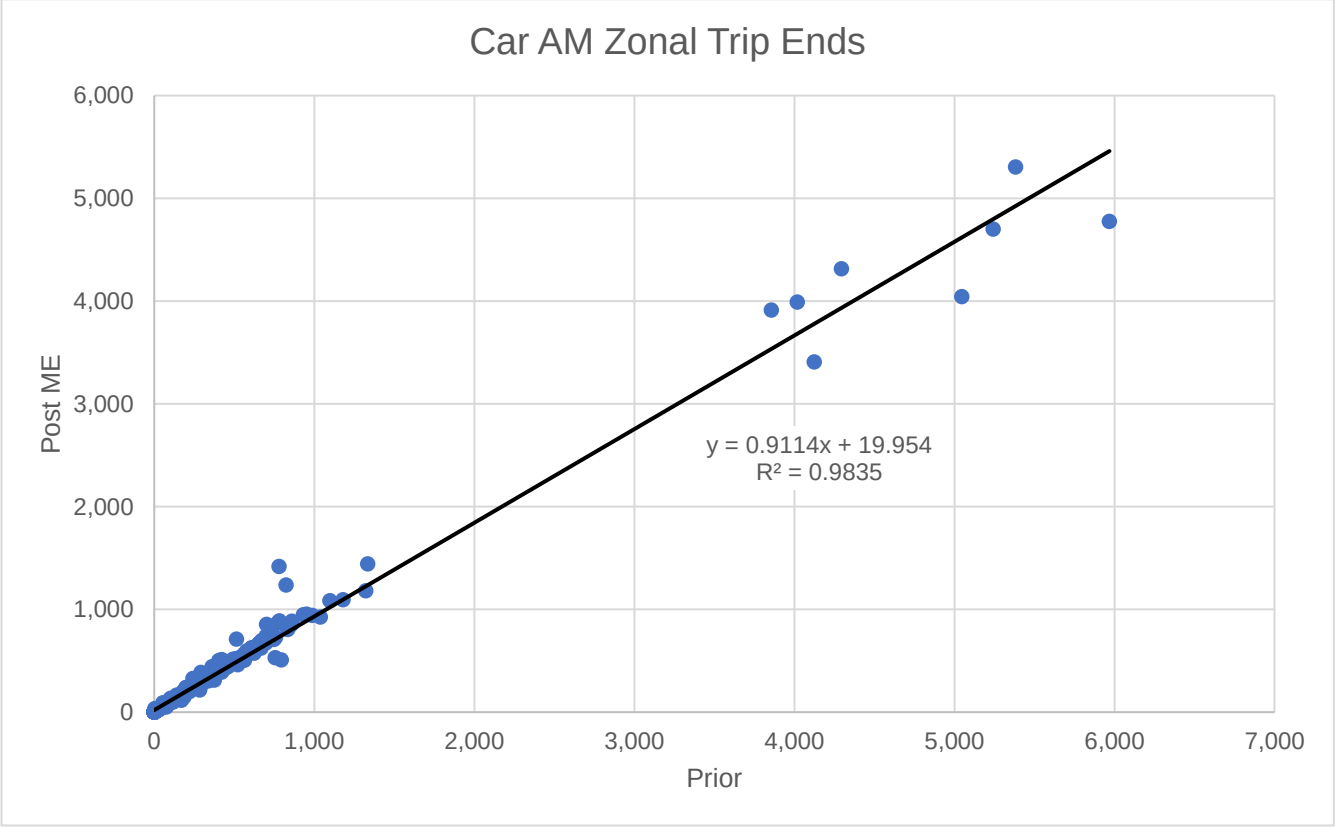


Figure 18 Car PM Matrix Zonal Trip Ends



The means and standard deviations of the Trip Length Distributions for Car are presented in Table 4 for the AM and PM. External to external trips have been excluded since these distort the results.

Table 4 Car Prior versus Post ME Trip Length Distributions in kilometres

	AM		PM	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
2019 Prior	6.69	6.00	6.84	5.88
2019 Post ME	5.95	4.95	6.34	5.34
Difference	-0.74	-1.05	-0.50	-0.54
% Change	12%	21%	8%	10%

It can be seen that although the percentage change is in excess of the TAG criteria of 5% for both mean and standard deviation in the AM and PM, the absolute differences are low, particularly considering that the zoning in the model is not that spatially fine, Figure 19 and Figure 20 graphically illustrate the trip length distributions.

Figure 19 Car AM Prior versus Post ME Trip Length Distributions

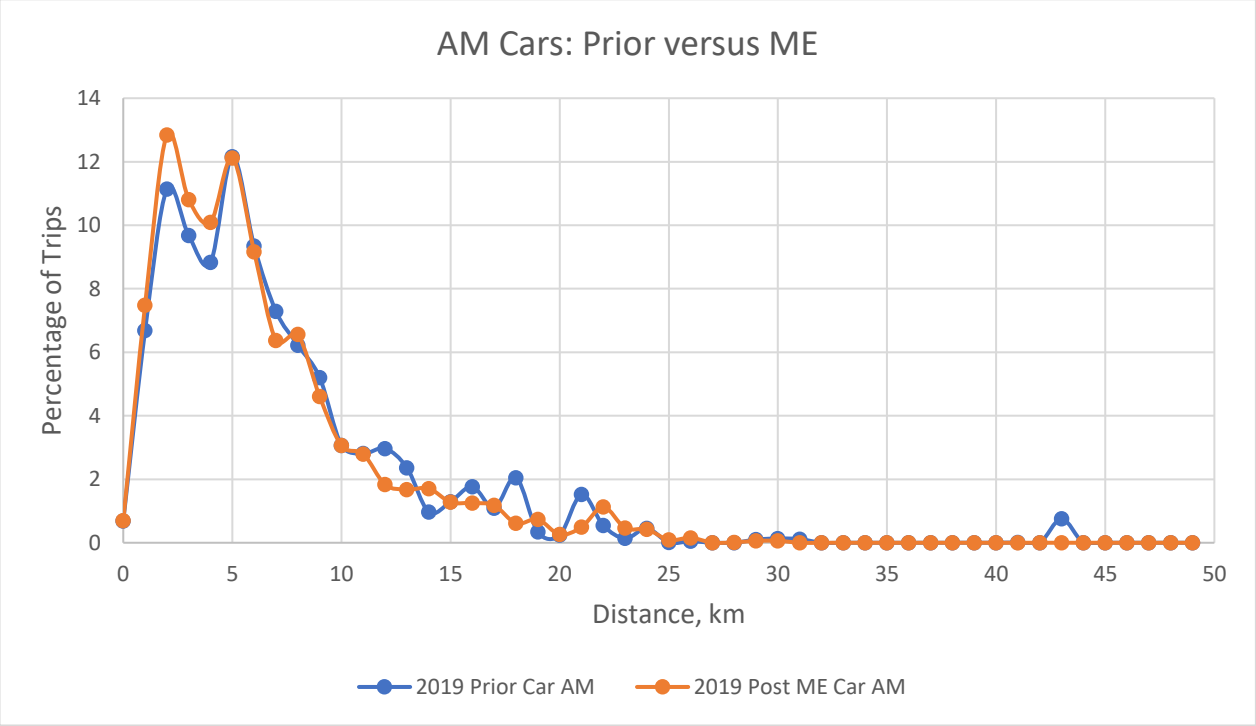
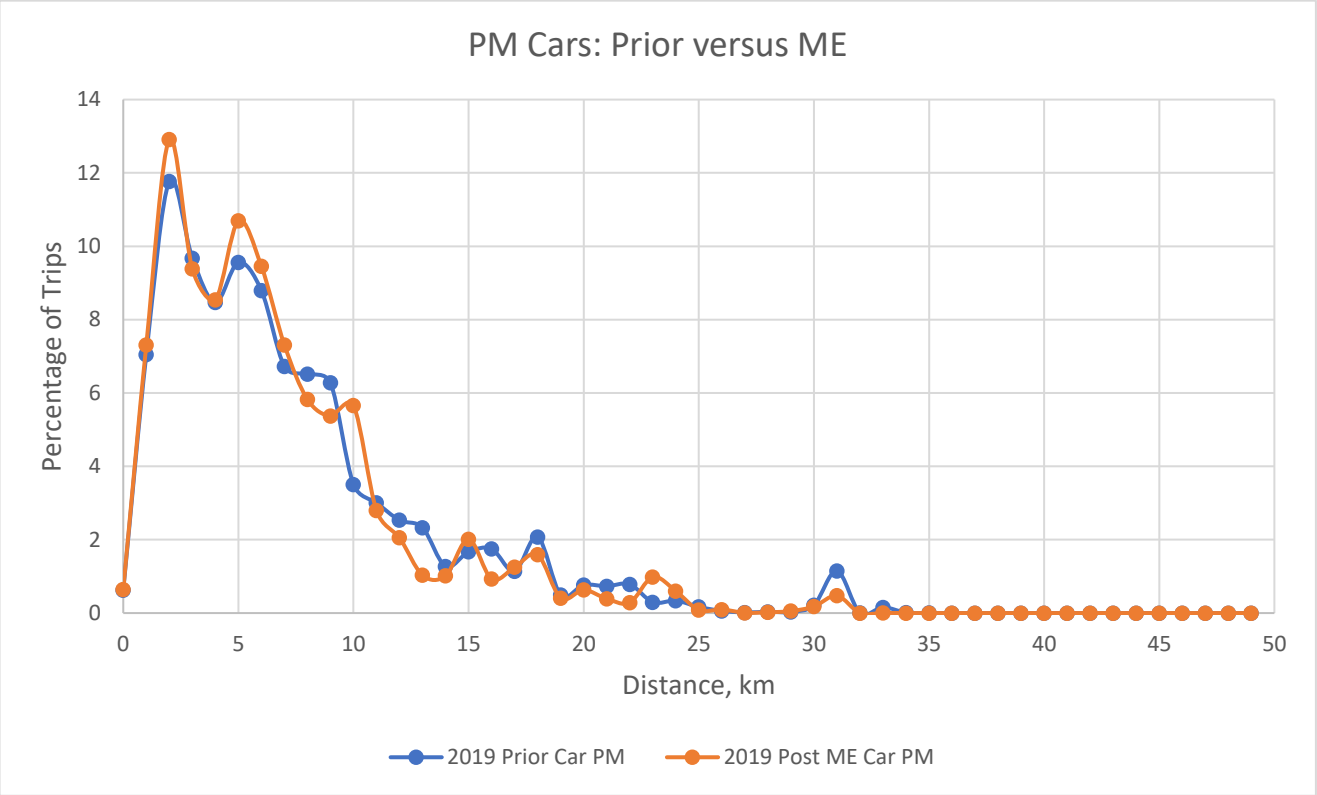


Figure 20 Car AM Prior versus Post ME Trip Length Distributions



The evaluation of changes between prior and post matrix estimation matrices shows some changes that are above TAG guidance levels. A balance has been struck between achieving sufficient count validation in key areas whilst not undermining the trip distribution.

Screenline and Link Flow Validation

Figure 21 below shows the location, in pink, of the 266 one-way count sites, which have been used for validation.

Figure 21 Location of All Validation Counts Sites

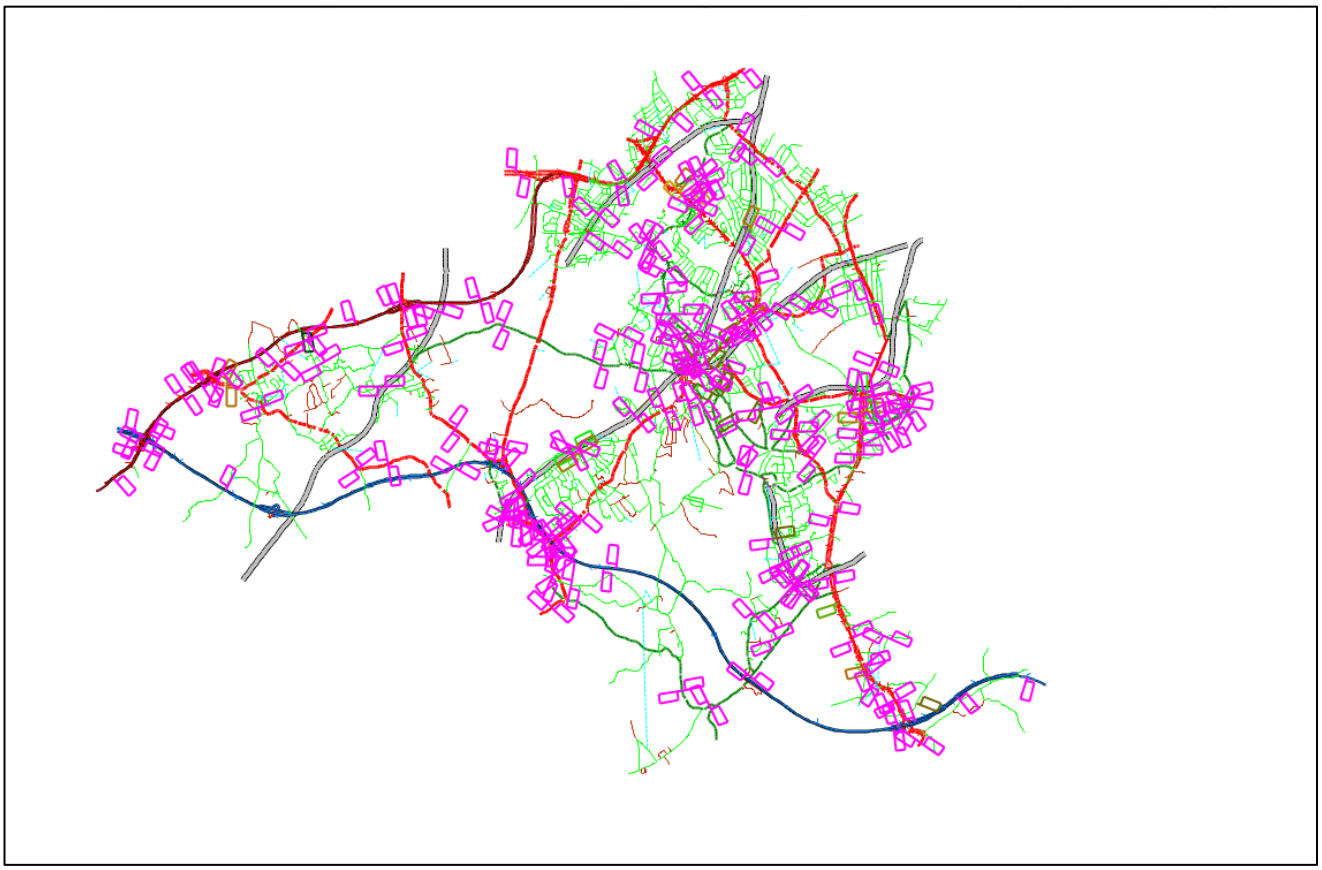


Figure 22 and Table 5 show the screenline assessed in the Epsom and Ewell Local Model for validation. It represents and entry/exit cordon covering most main roads serving the Epsom and Ewell.

Figure 22 Location of Screenline Surrounding Epsom and Ewell

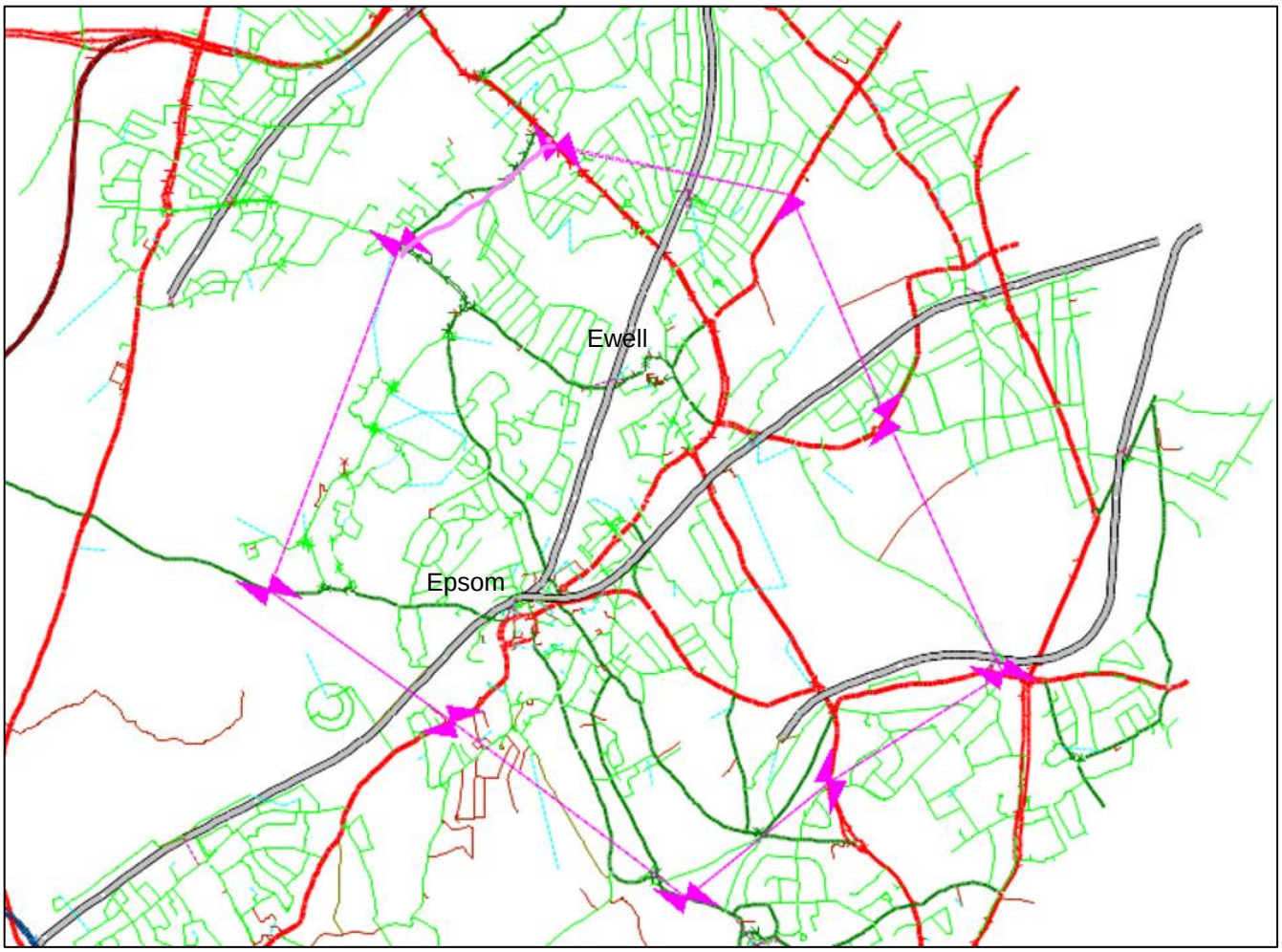


Table 5 Epsom and Ewell Urban Area Screenline Flow Validation Results for the Local Model

	AM Peak (0800 - 0900)		PM Peak (1700 - 1800)	
	Entering	**Exiting**	**Entering**	**Exiting**
Observed Counts				
Car	5,326	5,398	6,086	5,941
LGV	613	555	548	525
HGV	215	155	132	63
TOTAL	**6,154**	**6,108**	**6,766**	**6,529**
Modelled Flows				
Car	5,889	5,549	5,791	5,835
LGV	646	592	530	476
HGV	180	168	83	59
TOTAL	**6,715**	**6,309**	**6,404**	**6,370**
Absolute Difference				
Car	563	151	-295	-106
LGV	33	37	-18	-49
HGV	-35	13	-49	-4
TOTAL	**561**	**201**	**-362**	**-159**
% Difference				
Car	10%	3%	-5%	-2%
LGV	5%	7%	-3%	-8%
HGV	-18%	8%	-25%	-3%
TOTAL	**9%**	**3%**	**-6%**	**-3%**

The screenline is generally close to within the +/-5% criteria. Looking at the vehicle total, entering the Epsom and Ewell urban area is more than 5% different compared to observed during both the AM and PM peak at 9 and -6% respectively. However, the number of vehicles exiting meets the criteria. In the AM peak there is an increase in model flow measured along the screenline compared with observed, and a reduction in the PM peak.

Table 6 presents the summary of the link flow validation of both the weekday AM and PM peak hours in terms of the Department for Transport's acceptability guidelines.

In the AM peak hour 79% of observed movements met the GEH criteria and 81% met the flow criteria. In the PM peak hour 83% of observed movements met the GEH criteria and 85% met the flow criteria.

In both the AM and PM peak hours, the GEH statistics are close to meeting the TAG desired acceptance level of 85%, however the PM period performs better overall regarding the TAG desired acceptance level.

Where there are discrepancies between observed and modelled flow, these are often attributable to discrepancies between adjacent counts which is to be expected in a large dataset where counts were undertaken on different days, via different methods. The discrepancies are such that it is not mathematically possible to match both observed counts. For example, during the AM peak the count on the A3 southbound just north of the Painshill roundabout is 2,643. Downstream, on the off-slip onto Painshill roundabout is 1016, while the mainline flow is 2,846. Together, these total 3,862, 1219 higher than the upstream flow, but they should be near equal. It is therefore impossible for the model to accurately assign flows for all counts here, as vehicles cannot disappear.

As previously stated, the validation of a highway assignment model should not only be about achieving the flow validation criteria. This is so that matrix estimation is not relied upon too much and some models where flow validation is not quite met are still fit for purpose.

Table 6 Link Flow Validation Results for the Local Model

	Total Counts	Met GEH		Met Flow		>10	Avg. GEH
AM Peak Hour (0800 – 0900)	266	211	79%	216	81%	8	3.37
PM Peak Hour (1700 – 1800)	258	215	83%	219	85%	6	3.11

Figure 23 and Figure 24 show the modelled flows plotted against the observed with best-fit regression line and correlation coefficient (R^2), for each model time period. This aids in visualising the goodness of fit. The R^2 values presented indicate that overall, the model reflects observed traffic flows well.

Figure 23 Comparison Plot of Modelled Against Observed Link Flows with Best-Fit Regression Line and Correlation Coefficient (R^2) for the weekday AM Peak Hour (0800 – 0900)

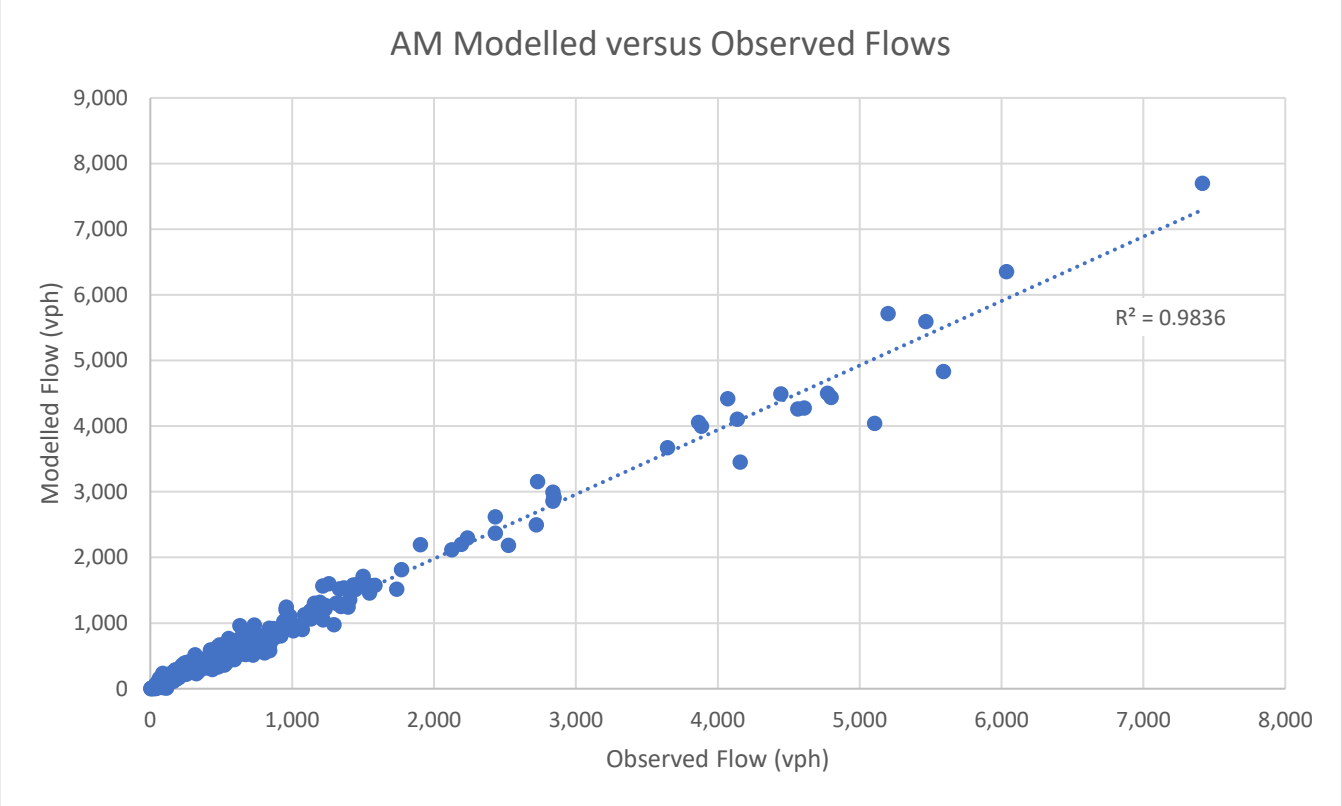
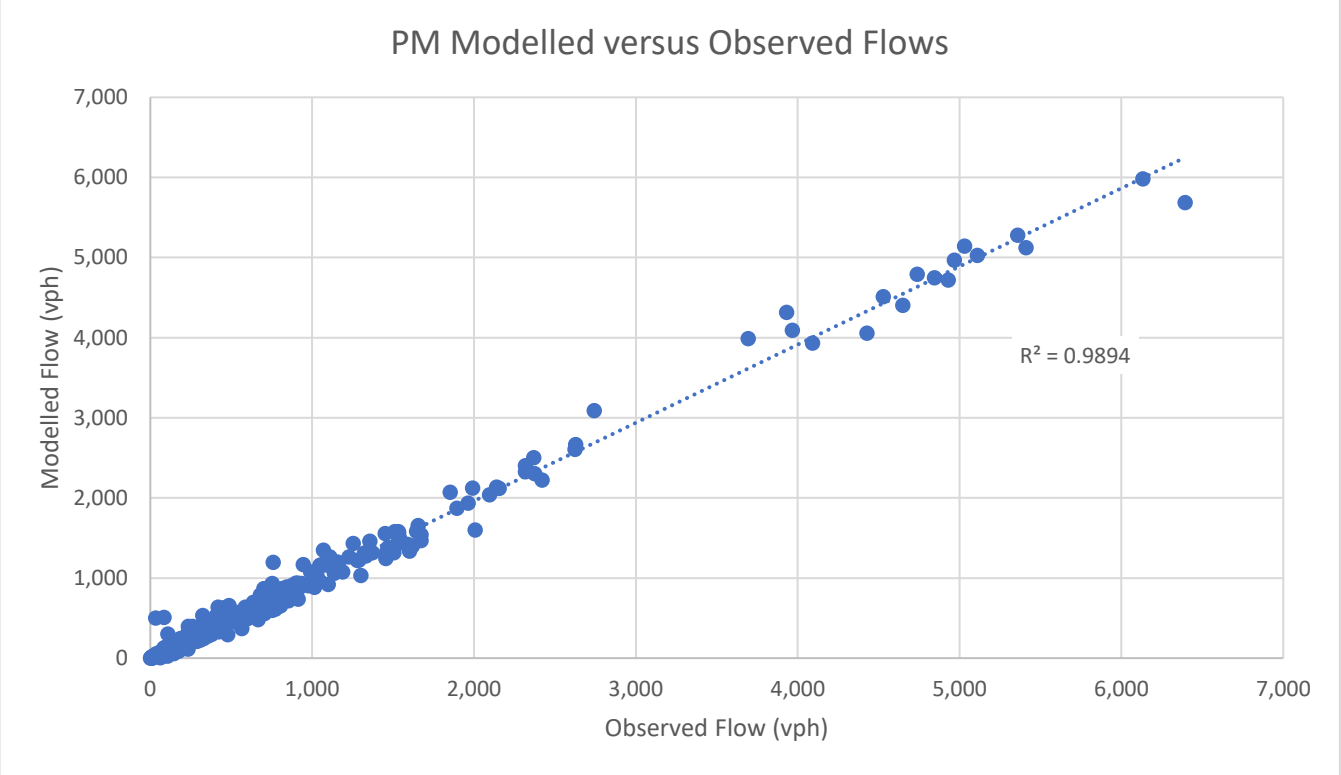


Figure 24 Comparison Plot of Modelled Against Observed Link Flows with Best-Fit Regression Line and Correlation Coefficient (R^2) for the weekday PM Peak Hour (1700 – 1800)



The cumulative frequency of GEH, for the AM and PM peak hours respectively, is presented in Figure 25 and Figure 26. In the AM peak hour 80% of the counts have a GEH of less than 6, whilst for the PM peak the figure is 87%.

Figure 25 Variation of GEH for the AM Peak hour (0800 – 0900)

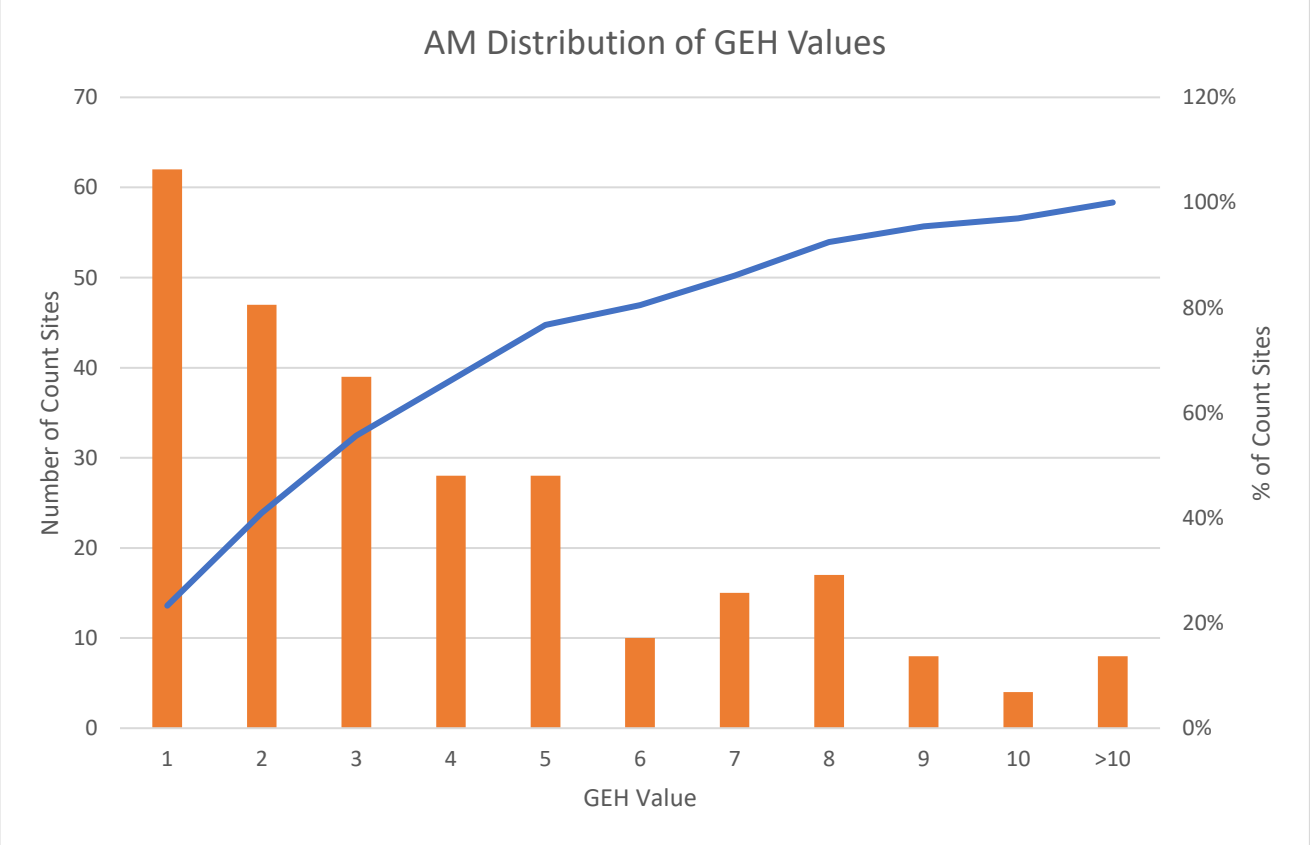


Figure 26 Variation of GEH for the PM Peak hour (1700 – 1800)

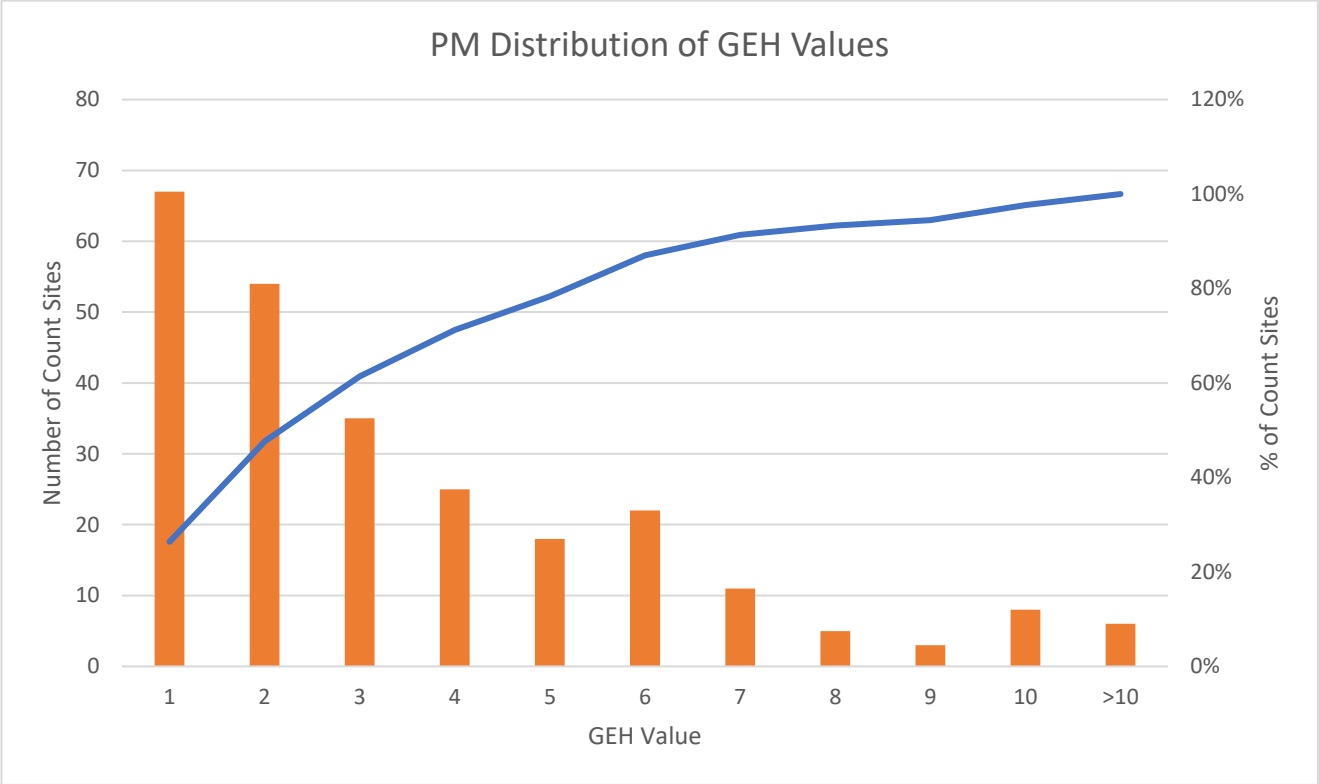
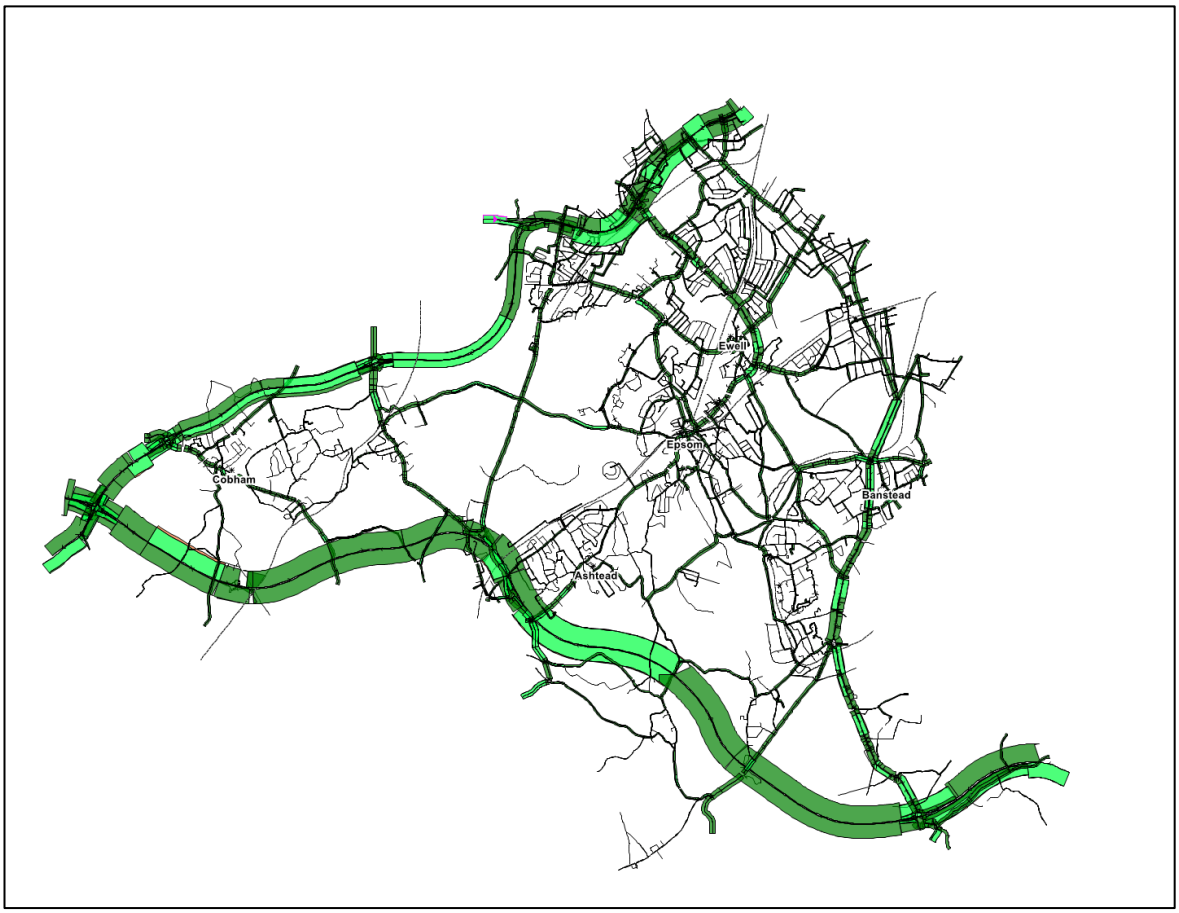


Figure 27 and Figure 28 display observed versus model flow bandwidths for the entire Local Model. The bandwidths are proportional to the level of flow. A bandwidth, coloured light green, indicates that an observed count is present on the link. Where the green bands have an orange edge, the model flow is less than the observed flow. Where the green bands show a dark green edge, the model flow is greater than the observed flow. Note that the scales for the overview and close up view of Epsom and Ewell differ to provide clarity.

Figure 27 Local Model Link Flow versus Count Bandwidth for the AM Peak Hour (0800 – 0900) with all roads showing above and a close up of Epsom and Ewell below

Figure 28 Local Model Link Flow versus Count Bandwidth for the PM Peak Hour (1700 – 1800) with all roads showing above and a close up of Epsom and Ewell below



A full comparison of observed and modelled flow for the selected counts is provided in the Appendix.

Journey Time Validation

Eight journey time routes have been defined for the purposes of assessing modelled journey times, as shown in Figure 29, and listed in Table 7 and Table 8**.** This implies sixteen one-way journey time routes for two time periods, which equals thirty-two result sets.

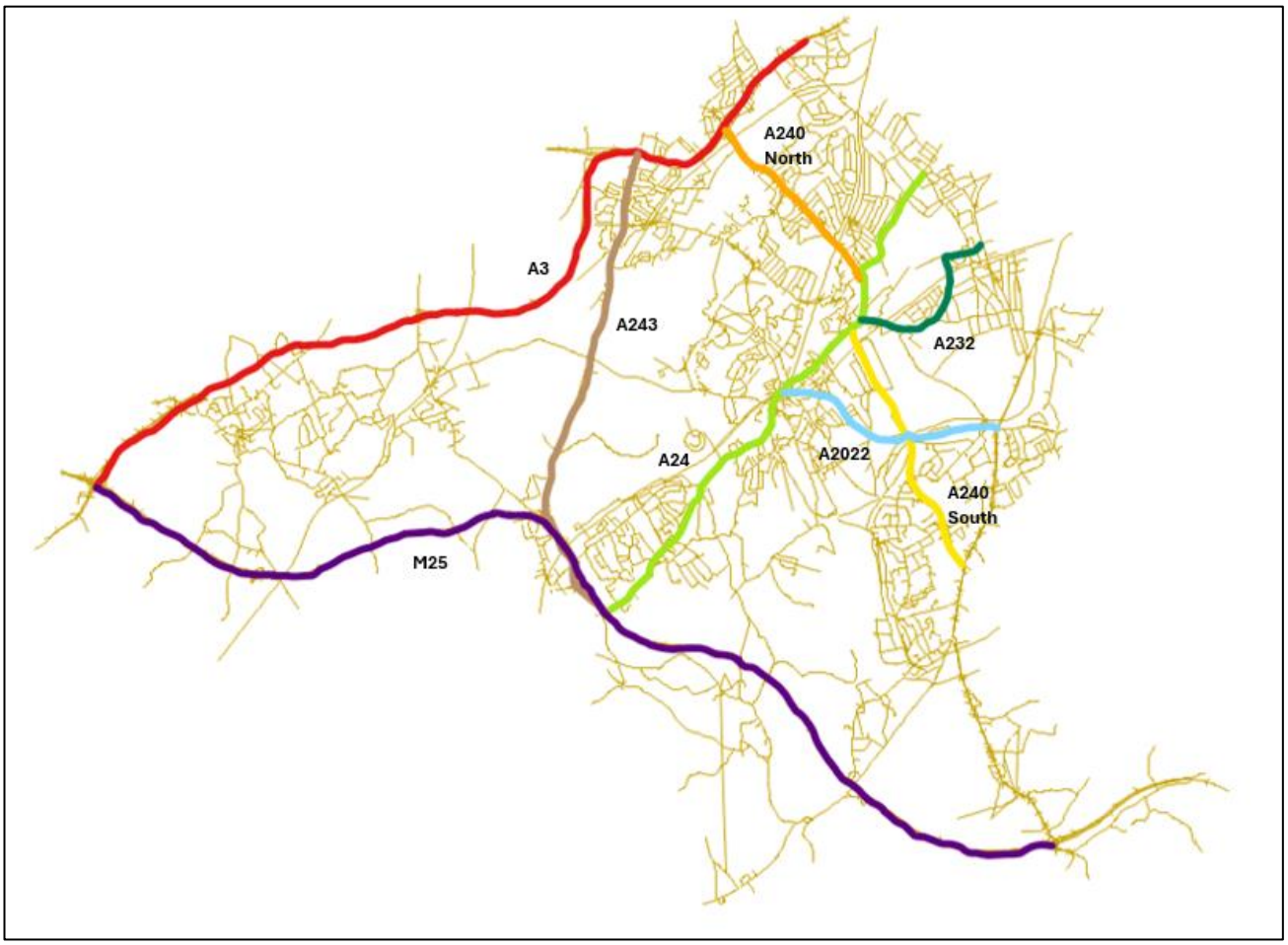
The journey time data was acquired from Highways Analyst, developed by Basemap. Highways Analyst uses congestion data supplied by Teletrac-Navman plc that is mapped to the Ordnance Survey (OS) Integrated Transport Network (ITN) in order to calculate journey time by ITN link. The Teletrac-Navman data is obtained from GPS-equipped vehicles traversing the highway, which provides high volume GPS-based samples. In contrast to the traffic count data, it is statistically precise at capture and does not have associated self-consistency problems.

Tuesday to Thursday weekday data (excluding school holidays) was extracted for the academic year. This was used to calibrate and verify model values of delay, speed, and travel times.

The captured data is converted to the modelled road network algorithmically and involves some melding where ITN and model networks are not the same (typically because some junction geometry detail is omitted for modelling reasons). Modelled junction delays are included in the upstream link to which they apply. It can be less clear from the GPS data to which links junction delays are associated (given ambiguities in determining the extent of junctions, and their entry and exit delays). This results in a few caveats for individual link times, but overall journey times still match with Teletrac-Navman and, generally, the journey time data is regarded as precise and accurate, especially when taken over a contiguous set of links.

The journey time routes are between 3 and 26 km in length, with most falling between 3 and 14km. The observed journey times vary between approximately 7 and 33 minutes.

Figure 29 Locations of Journey Time Routes



Evaluation of modelled and observed journey times provides a good indication of how well the model is replicating delay, especially as the observed data is extensive both in terms of area coverage and the sample size.

Table 7 and Table 8 compare the observed journey time routes with those extracted from the model. Graphs are presented in the Appendix which compare observed and modelled travel times across the length of each of the analysed routes.

With reference to the criteria set out in Table 1, the model successfully validates in both time periods. As can be seen in both tables, modelled journey times, whilst meeting the necessary criteria, are being slightly underestimated in most cases.

It should be noted that although modelled journey times reflect observed journey times closely overall, there are some parts of the network where there is disparity. For example, modelled delay southbound on the A243 in the AM peak hour approaching the junction with Rushett Lane is notably higher than observed delay. There is also higher modelled delay than observed southbound on the A240 in the vicinity of Nescot during the AM peak hour, resulting in higher modelled journey times for the majority of the route.

In summary the model is successfully validating in terms of journey times with all routes meeting the specified journey time criteria, in both AM and PM peak hours.

Table 7 Journey Time Comparisons for the AM Peak Hour (0800 – 0900)

Route	Length (km)	Observed Time (mins)	Modelled Time (mins)	Difference	% Difference	Met Criteria? ✓/✗
A240 South Southbound	4.95	8.83	9.45	0.6	7.1%	✓
A240 South Northbound	4.95	9.31	9.39	0.1	0.9%	✓
A243 Northbound	9.29	22.16	19.75	-2.4	-10.9%	✓
A243 Southbound	9.20	16.06	17.50	1.4	8.9%	✓
A2022 Eastbound	4.40	9.79	9.17	-0.6	-6.3%	✓
A2022 Westbound	4.40	9.89	9.01	-0.9	-8.9%	✓
A3 Northbound	19.44	16.22	16.16	-0.1	-0.4%	✓
A3 Southbound	19.82	14.88	13.21	-1.7	-11.2%	✓
A24 Northbound	13.72	31.68	30.62	-1.1	-3.3%	✓
A24 Southbound	13.61	32.60	30.84	-1.8	-5.4%	✓
A232 Eastbound	3.41	7.77	7.92	0.2	2.0%	✓
A232 Eastbound	3.44	9.56	8.69	-0.9	-9.1%	✓
A240 North Northbound	3.69	12.24	11.68	-0.6	-4.6%	✓
A240North Southbound	3.68	7.39	6.50	-0.9	-12.1%	✓
M25 Eastbound	24.59	15.16	14.14	-1.0	-6.7%	✓
M25 Westbound	25.25	22.23	19.09	-3.1	-14.1%	✓
Total number of routes met criteria			16			
% of routes met criteria			100%			
Within DfT acceptability guidelines?			Yes			

Table 8 Journey Time Comparison for the PM Peak Hour (1700 – 1800)

Route	Length (km)	Observed Time (mins)	Modelled Time (mins)	Difference	% Difference	Met Criteria? ✓/✗
A240 South Southbound	4.95	10.60	9.73	-0.9	-8.2%	✓
A240 South Northbound	4.95	8.40	8.78	0.4	4.5%	✓
A243 Northbound	9.29	20.16	18.62	-1.5	-7.6%	✓
A243 Southbound	9.20	17.06	15.08	-2.0	-11.6%	✓
A2022 Eastbound	4.40	12.46	11.06	-1.4	-11.2%	✓
A2022 Westbound	4.40	9.34	9.47	0.1	1.5%	✓
A3 Northbound	19.44	16.87	16.15	-0.7	-4.2%	✓
A3 Southbound	19.82	14.62	15.96	1.3	9.1%	✓
A24 Northbound	13.72	32.37	31.06	-1.3	-4.0%	✓
A24 Southbound	13.61	29.92	27.92	-2.0	-6.7%	✓
A232 Eastbound	3.41	7.74	8.18	0.4	5.6%	✓
A232 Eastbound	3.44	8.69	7.78	-0.9	-10.5%	✓
A240 North Northbound	3.69	7.92	8.90	1.0	12.5%	✓
A240North Southbound	3.68	8.78	9.04	0.3	3.0%	✓
M25 Eastbound	24.59	17.60	15.22	-2.4	-13.6%	✓
M25 Westbound	25.25	16.03	15.99	0.0	-0.3%	✓
Total number of routes met criteria						16
% of routes met criteria						100%
Within DfT acceptability guidelines?						Yes

Network Validation Adjustments

The validation of the network's flows and journey times mainly involved attention to the trip matrices, as described previously.

In just a few instances where specific issues arose, link times have been adjusted in light of observed data. These changes are included in the results presented in above.

The main changes related to specific parts of the network where the modelling was not reflecting all the factors. The adjustments were applied to replicate:

- Delay at pedestrian crossings, which are not explicitly modelled
- Delay approaching A3 junctions
- Motorway queueing and
- Queue propagation at key junctions including:
    - Banstead crossroads
    - Junction with A243 and Rushett Lane
    - M25 Junction 9

Validation Summary

Although the post matrix estimation matrices do not meet the TAG criteria in terms of level of change from the prior matrices, the differences are not considered to be significant and the model validates well across geography, road types and time periods.

The assessment with respect to observed flows is less assured due to the variability of the large count dataset, as well as limitations in the standard count comparison metrics. A broad view across the study area, though, does not indicate any systematic problems. For reference, the flow validation summary table is repeated below in Table 9.

Table 9 Flow validation summary table.

	Total Counts	Met GEH		Met Flow		>10	Avg. GEH
AM Peak Hour (0800-0900)	266	211	79%	216	81%	8	3.37
PM Peak Hour (1700-1800)	258	215	83%	219	85%	6	3.11

The journey time comparisons provide more assurance because of the statistical strength of the observed data, and to which the model's results match well in both time periods.

Details are also open for further inspection via spreadsheets providing additional technical documentation, on request.

Assessment of Suitability

This sub-area model has been validated in preparation for the review of Epsom and Ewell's Local Plan spatial strategy. The validation criteria set out in previous sections are a guide and the larger and more complex the model the more difficult it is to meet all the criteria. TAG unit M3-1 highway assignment modelling - GOV.UK (www.gov.uk) states in paragraph 3.2.2 that "the achievement of the validation guidelines… does not guarantee that a model is 'fit for purpose' and likewise a failure to meet the specified validation standards does not mean that a model is not 'fit for purpose". It is therefore up to the modeller to determine whether a model is suitable for its intended purpose. The development of this model sought to strike a balance between flow validation, journey time validation and minimising matrix changes in order to produce a suitable tool for evaluating the impact of the Epsom and Ewell's Local Plan.

The Local Plan Assessment will adjust the matrices to reflect the trips generated by committed and proposed development in Epsom and Ewell. Trip distribution for new zones will be informed by suitable existing adjacent zones. Outputs of the assessment will include changes in traffic volumes and speeds, journey times, junction delay, and level of service associated with the additional development related demand. The model has good flow validation and journey times rendering it suitable for assessing these changes. Taking the overall model performance into account, despite not all acceptability criteria being met, it is considered that the model is suitable for the purposes of the Epsom and Ewell Local Plan assessment.

Limitations and Caveats of this Strategic Model

When choosing a model to use, it is important to recognise that all models have limitations, including strategic models such as SINTRAM and its associated Local Models. Strategic models cannot represent accurately every individual journey made by every mode and route. They are also not precise in the way they replicate specific individual behaviour and the interaction between individuals. There are many factors that impact people's travel behaviour and the day-to-day variation in congestion which are random and impossible to predict.

The model is strategic in nature and has good validation at this level, but local junction validation may be required if the model outputs are to be used in detailed junction assessments.

The strategic nature of this model and its findings do not in any way reduce the need for individual developments to have detailed, local transport assessments carried out which may identify additional specific impacts on the network (e.g., junction congestion) that require mitigation.

Understanding the limitations of a model is key to making the best use of it and taking advantage of its strengths. The reasonable expectation from this model is that it can estimate the likely route choice of transport users, and the resulting average levels of congestion.

Outputs are provided in good faith and the user accepts full responsibility to satisfy themselves of the accuracy, reliability, and completeness of the information.

The results from this model are only one element of a much wider evidence base needed to be considered in the development of further policy documents.

It is advised that whenever a model is used for a new project, it should be reviewed and refined to ensure that it is fit for purpose for the purposes of that project.

Model Forecasting

Forecast Year

The model forecast year is 2040.

Forecast Scenarios

For this Regulation 19 assessment, the following two scenarios have been created:

- 2040 Do-Minimum. This includes completions and commitments within the borough since 2019, significant recent completions and commitments outside of the borough, and natural traffic growth..
- 2040 Do-Something. This is a copy of the 2040 Do-Minimum scenario **plus** Local Plan development sites and windfalls.

To understand the impacts of the Local Plan sites, the Do-Something scenario is compared with the Do-Minimum.

For all scenarios, natural demographic and employment changes, as determined by the Department for Transport's (DfT) National Trip End Model (NTEM) have been included for the whole of Great Britain. In line with the DfT's Transport Appraisal Guidance, adjustments have been made to the NTEM data to reflect the locality and composition of the committed and non-committed development sites which comprise the scenarios.

External to Epsom and Ewell Borough, the following sites have been explicitly included in the assessment. These are large nearby sites which are committed and/or are identified in neighbouring Local Plans and have the potential to have an impact on travel in Epsom and Ewell Borough and are included in both scenarios.

- Development land and site at A1 Hook Rise South, Surbiton (London Borough of Kingston upon Thames)
- Cambridge Road Estate redevelopment site, Kingston Upon Thames (London Borough of Kingston upon Thames)
- 229-255 and 277-279 Kingston Road, New Malden (London Borough of Kingston upon Thames)
- Eden Street and St James Road redevelopment (London Borough of Kingston upon Thames)
- Former SCC County Hall, Kingston upon Thames (London Borough of Kingston upon Thames)
- Site of former De Burgh School, Tadworth (Reigate and Banstead Borough)
- Kingswood House, Kingswood (Reigate and Banstead Borough)
- Royal Marsden Hospital, Sutton (London Borough of Sutton)
- Elm Grove Estate, Sutton (London Borough of Sutton)
- B&Q, Sutton (London Borough of Sutton)
- Headley Court, Headley (Mole Valley District)

- Land South of Ermyn Way, Ashtead (Mole Valley District)
- Ermyn House, Ashtead (Mole Valley District)

The gross and net totals of dwellings and jobs by scenario is provided in Table 10. The net is the difference between the existing site numbers and the proposed.

Table 10 Gross and Net Totals of Dwellings and Jobs between 2020 and 2040

	Dwellings		Jobs	
	Gross	**Net**	**Gross**	**Net**
Do-Minimum (no Local Plan)	7,547	6,588	23,928	14,426
Do-Something (Local Plan)	11,893	10,865	25,652	14,886
Difference	*4,346*	*4,277*	*1,724*	*460*

Development Sites and Pro-Forma

Information regarding the composition of both commercial and residential development sites to be considered in this appraisal was provided by Epsom and Ewell Borough Council in the form of the County Council's pro-forma.

Each development site listed in the pro-forma was matched to the model zone system using provided grid references and Geographic Information System (GIS)..

Figure 30 and Figure 31 presents geographically the net increase in residents and jobs respectively for the Local Plan sites for the Do-Something scenario for Epsom and Ewell Borough. Note that sites which have already received planning permission are not included within these figures, and net reductions are not shown.

Table 11 lists all the proposed sites with net increase in dwellings and jobs. Windfalls make up 922 dwellings and together with the allocation sites are included in the Do-Something scenario only.

Figure 30 Location of Epsom and Ewell Local Plan Residential Sites with Values showing the Net Increase in Dwellings

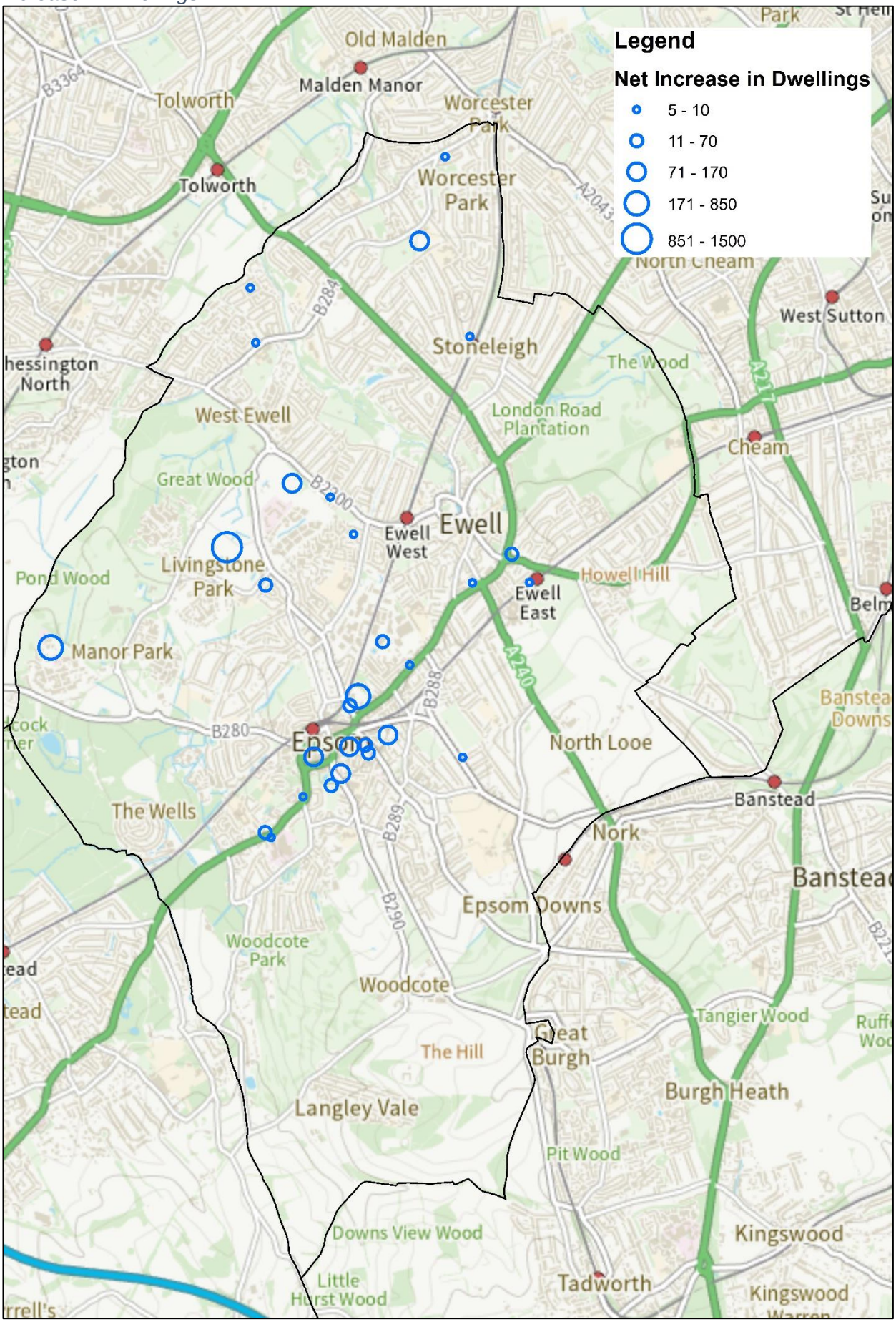


Figure 31 Location of Epsom and Ewell Local Plan Commercial Sites with Values showing the Net Increase in Jobs

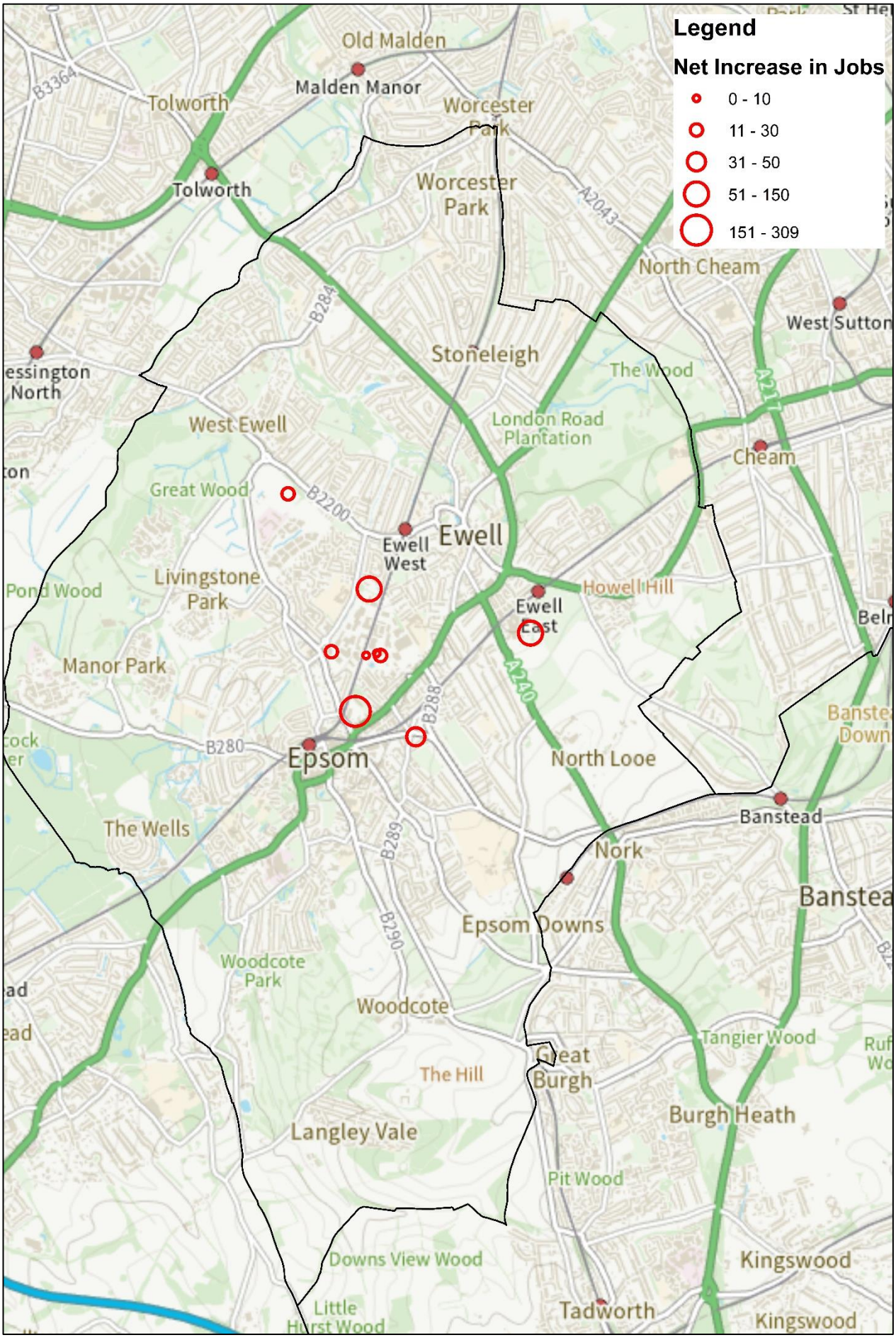


Table 11 Local Plan Site Allocations and Windfalls

Site	Net Increase in Dwellings	Net Increase in Jobs
Hook Road Car Park and SGN Site	800	309
Town Hall	75	-171
Hope Lodge	25	0
Depot Road & Upper High Street Car Parks	100	0
The Ashley Centre and Global House	100	0
Land at West Park Hospital plus community hospital	200	0
Horton Farm	1,500	0
Land at Chantilly Way	30	0
Hook Road Arena	100	30
Swail House	100	0
Finachem House, 2-4 Ashley Road	21	0
Land at Kiln Lane (Site 3) (corner of Kiln Lane & Conifer Park)	40	23
Hatch Furlong Nursery	30	-3
Land rear of Rowe Hall, Salisbury Road	93	0
20 Hook Road, Solis House	25	0
Gibraltar Crescent	0	128
Blenheim House, 1 Blenheim Road	0	11
Wilsons - Longmead / Kiln Lane (Site 1) (square site-Conifer Park)	0	2
Wilsons - Longmead / Kiln Lane (Site 2) (triangular site -Conifer Park)	0	10
Former Dairy Crest Site, 4 Alexandra Road	0	50
Nescot, Reigate Road	0	150
7 Station Approach, Stoneleigh	10	-7
35 Alexandra Road	8	0
Epsom Lodge, 1 Burgh Heath Road	-2	0
Garages at Somerset Close & Westmorland Close	6	0
46 The Avenue, Worcester Park	7	0
26 Reigate Road	5	0
Etwelle House, Station Road	10	-9
Crane Court/Rowden Rd (Garage)	6	0
140-142 Ruxley Lane West Ewell Surrey	7	0
Corner of Kiln Lane & East Street [101B East Street]	5	-2
Richards Field Car Park	7	0
64 South Street, Epsom	6	-8
22-24 Dorking Road	18	0
63 Dorking Road	8	-21
Epsom Clinic, Church Street	15	-32
SITE ALLOCATION TOTAL	3,355	460
Windfalls	922	0
ALLOCATIONS PLUS WINDFALLS TOTAL	**4,277**	**460**

The total amount of housing included in the Local Plan housing trajectory, which was tested in the Transport Assessment is 5,693 units between 2020 and 2040. In addition to the site allocations listed above, this figure includes (a) committed development either completed since 2019 or sites with extant planning permission, expected to be delivered within the Local Plan period (included in the Do-Minimum scenario) and (b) a small sites (windfall) allowance totalling 922 dwellings included in the Do-Something option only.

Forecasting Approach

SINTRAM74, is a regional, multi-modal model, with a base year of 2019. The modes included are highway (car, LGV and HGV), public transport (bus and rail) and active, with park and ride (both bus-based around Guildford and related to the main rail stations) also being represented. For the purposes of Local Plan related assessments, it is used both in its wider format, the master model, and its local subarea mode.

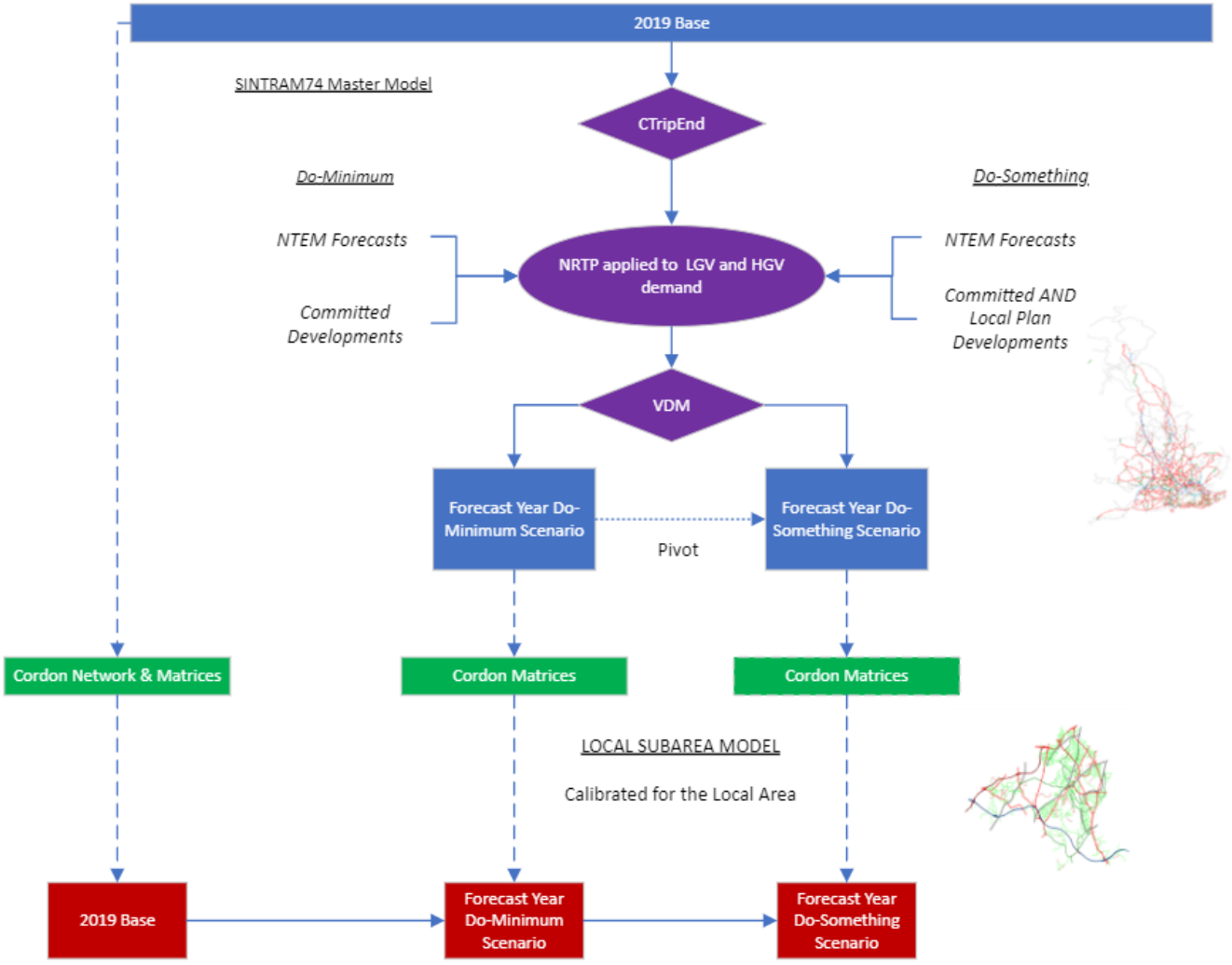
The forecasting approach incorporated the following network (supply) and growth (demand) alterations:

- Committed changes to the highway and public transport networks
- Background growth both outside and within the sub-area model
- Growth arising from committed developments within the local planning authority area
- Growth arising from proposed local plan related developments, including windfall developments

Figure 32 provides an overview of the relationship between the two models, the forecasting method and scenario generation, which are described in detail in the following sections.

The method is the same as that previously agreed by National Highways for Guildford Borough Council's Local Plan assessment work.

Figure 32 Overview of Forecasting Approach



Covid-19 Adjustment

No Covid-19 adjustment was applied in this method. A Covid adjustment method, as per Appendix B of TAG unit M4 forecasting and uncertainty - GOV.UK (www.gov.uk), is currently being developed for SINTRAM but is not yet available for use in this assessment. Overall demand in 2023 has been shown to be 9% less than 2019 in both Epsom and Ewell and Surrey as a whole. In the context of this assessment, the analysis is based on a comparison between scenarios with and without Local Plan focussing on differences rather than absolute flows and delays. The impacts can be considered worst case as a result of the underlying demand being higher than is likely to be the case in 2040.

2040 Do-Minimum Scenario

Background Growth and Committed Developments

In order to establish the future year Do-Minimum, against which the Do-Something scenario is compared, background growth both inside and outside the study area was established.

There are two factors influencing the demand for car travel being modelled which are:

- General demographic and economic trends, as per DfT's National Trip End Model (NTEM) forecasts, and

- Committed developments in housing and employment.

Growth outside the study area was forecast using the Department for Transport's (DfT) CTripEnd version 8.0. This is part of the National Trip End Model (NTEM) and sits behind TEMPro. CTripEnd 8.0 provides the same information as TEMPro 8.1, but in greater detail. The core TEMPro scenario was used as a starting point to create the planning assumptions for the evaluation.

Consequently, growth outside the borough was derived from and reflects TEMPro, but the exception to this is the large development sites close to the borough boundary listed on page 44. These were treated the same as those within the study area described below.

Within the study area, increased trips arise from background growth (for example, increases in car ownership, etc.) and development sites that has either been built since the base year (2019) or is committed. The former was obtained from data contained within CTripEnd whereas the latter was informed by planning data comprising estimations of the net increase in population, dwellings and jobs from the proforma provided by the Epsom and Ewell Borough and fed into CTripEnd.

Vehicle Trip Generation

As described above, Local Model trip ends (zonal trip productions and attractions) were initially derived from SINTRAM74 modelling, which uses local population and employment data at a detailed level for the Do-Minimum scenario.

Trip productions were calculated from daily trip rates for different trip purposes from the DfT's National Trip End Model (NTEM) CTripEnd v8.0 system, as opposed to applying TRICS derived trip rates. Trip attractions for different purposes were allocated to zones based on different types of employment levels per zone.

CTripEnd is based on a coarser zoning system than the 1615 zones used in SINTRAM74. However, it allows the introduction of finer zones, as is done for SINTRAM74 in general but also for local area models.

Since the forecasts for population and employment are provided from the two sources of the DfT's CTripEnd software, which represents general forecasts, and from data supplied by Epsom and Ewell Borough on built and committed development, provision is included in the calculations to avoid issues of 'double-counting' arising from the use of the two data sources, subject to some constraints.

Overall growth in the borough is balanced such that if the committed developments in the Do-Minimum scenario are less than CTripEnd, these are balanced to meet CTripEnd at a borough level. Information supplied by the borough on the committed sites informs the location of this growth as the supplied data is at a finer local level than CTripEnd. If the committed developments exceed CTripEnd, balancing does not occur, and the higher total reflected by the data supplied by the planning authority is maintained. In this way, the overall growth level for the Do-Minimum scenario in the borough reflects the DfT future year forecasts as a minimum. In the case of Epsom and Ewell's assessment the Do-Minimum planning data outweighed CTripEnd's estimates of population and higher education jobs and thus these elements were not balanced and left to exceed to reflect the planning data.

Vehicle Trip Distribution

The trip ends were used in the SINTRAM74 modelling to construct ‘latent’ (or ‘unconstrained’) demand PA trip matrices and their zonal trip ends. This corresponds to the demand for travel implied by economic and land use data applying to the forecast scenario, but not considering congestion on the transport networks, which can inhibit demand. Calculating the effects of congestion on demand relative to the latent demand represents the ‘variable demand’ element. This involved a number of ‘demand-supply’ iterations in the modelling process.

The PA (production-attraction) matrices in the demand modelling reflect all-day home-based (HB) ‘tours’, that is, implying outbound from the home and inbound returning to the home, plus non-home based (NHB) trips. These PA matrices were converted to OD (origin-destination) trip matrices for three time-periods representing the weekday AM peak, inter-peak, and PM peak. These were used for highway assignment (congestion) modelling in SINTRAM74, but also provided the forecast ‘prior’ car matrices for the Local Model.

Once the latent demand matrices were established, as outlined above, SINTRAM74 takes account of congestion through ‘variable demand modelling’ (VDM). This follows the form of modelling recommended in TAG unit M2-1 variable demand modelling - GOV.UK (www.gov.uk).

A central component of the methodology is provided by ‘(hierarchical incremental) choice modelling’, which models traveller choices for travel.

The choice modelling is driven by the costs of different options. In the modelling, these are expressed as generalised time (minutes) where financial costs (e.g., fares, fuel, and parking costs) are converted to time units using values of time applicable to the relevant segments of demand, such as different trip purposes, as provided in the TAG data book - GOV.UK (www.gov.uk).

The sensitivity of choices to cost differences is modelled using initial values taken from TAG Data Book parameters. These have been adjusted as part of the SINTRAM74 forecasting validation process, in particular, through the TAG ‘Realism’ sensitivity tests.

The choice modelling is confined to destination and mode choices, with a supplementary level applying to parking destination choice for cars. Mode choice includes Park and Ride as a choice for car users. Home-based work (commuting) and education trips are ‘doubly-constrained’ to match employment and education zonal trip attractions.

The sensitivity of travel choices to changes in costs is limited to trips with one or both ends in the SINTRAM74 Inner Study Area. Mode, time period, and destination characteristics of other (‘external-to-external’) trips are based on growth factoring (‘Furnessing’) base year/reference trips to trip ends derived from CTripEnd.

Once the trip matrices have been forecast via VDM modelling, they were converted to car matrices for the Local Model.

The prior and post matrix estimation matrices from model validation described on page 20 enable the derivation of a set of production and attraction adjustment factors for each zone that reflects the changes between the Local Model prior, base matrices and the equivalent estimated matrices. These adjustment factors were then applied to the future year matrices using a Furness factoring process to reflect the changes determined by the additional local validation step.

Goods Vehicles

Goods vehicle trip matrices were forecast using growth factors by for LGVs and HGVs derived from National Road Transport Projections 2022 workbook. The growth factors distinguish between the regions of the South East and London, as well as the rest of the country.

Treatment of Goods Vehicles in Dummy Zones

Where new developments are contained within new 'dummy' zones, used in the case of large developments where existing zone accesses would not be appropriate, the process above would not allow for LGV and HGV trips to and from these zones as there are no existing goods vehicle trips within the zone. Consequently, when the matrices are taken into the sub-area model TRICS has been used to determine trip rates and average mode split by location type, and goods vehicle trips added to the sub-area scenario matrices accordingly. Where the percentage split between flats and houses is unknown, the trip rates for "mixed private housing" has been used.

Summary of Changes in Forecast Demand

The modelling process, as described above, converts the land use forecasts into travel demand forecast. There are four main steps in this process:

- Calculate latent demand in SINTRAM74 which reflects land use changes.
- Take account of highway congestion on demand for car travel in SINTRAM74 through VDM modelling.
- Convert forecast vehicle OD matrices to Local Sub-area Model OD vehicle matrices.
- Apply base-year Local Subarea Model re-validation adjustments to Local Model OD forecasts.

The changes mean that there is more than one set of forecasts. It is the results of the last step that are most pertinent, but it can be informative to understand the results of the earlier steps when seeking to interpret the results.

The matrix totals applying in the Local Subarea Model forecasts were modified from Latent Demand values on account of highway congestion and Local Subarea Model validation changes.

Table 12 shows the average growth rates by trip purpose from 2019 to 2040. It may be noted that education trips, which predominate in the peak hours, especially the AM peak, have lower growth rates than other purposes.

Table 12 Average Growth Rates 2019 to 2040

Trip Purposes	Mean Production Growth	Mean Attraction Growth
Home based education	0.95	0.98
Home based employers' business	1.04	1.08
Home based other	1.05	1.07
Home based shop	1.05	1.08
Home based visiting	1.02	1.02
Home based work	1.03	1.06
NHBEB	1.08	1.07
NHBO	1.06	1.06

The matrix totals applied in the Local Subarea Model forecasts were modified from Latent Demand values on account of highway congestion and Local Subarea Model validation changes.

Forecast Network

All forecast networks are a copy of the base coupled with completed or committed highway schemes of strategic importance since the base year of 2019. Of most relevance are the inclusion of the M25 Junction 10 and A3 Wisley Interchange (which includes Ockham and Painshill)[5], A3 Tolworth roundabout[6] and the proposals for Ewell Village[7]. The schemes were inserted into the model prior to forecasting so that demand is responsive to these changes in supply.

Local Subarea Model Assignment

Assignment for the Do-Minimum is as described on page 13 for the base year. The assignments are run through an iterative process which is halted when the variation in results meets requirements as set out in TAG (Unit M3.1, Section C.2.8).

2040 Do-Something Scenario

The future year Do-Something scenario makes use of the same process as the Do-Minimum. Thus, VDM was applied in deriving the future year Do-Something scenario matrices and goods vehicles were added to dummy zones using trip rates generated from TRICS.

Development Sites and Pro-Forma

Similar to the future year Do-Minimum scenario, information regarding the composition of both commercial and residential development sites to be considered in the appraisal was provided by Epsom and Ewell Borough Council in the form of Surrey County Council's pro-forma. Each development site listed in the pro-forma was matched to the SINTRAM74 model zone system using the grid references provided and Geographic Information System (GIS).

Windfall sites were provided by ward and distributed to model zones based on their 2019 Office for National Statistics (ONS) mid-year population.

Forecast Network

The forecast network is the same as the Do-Minimum scenario. It is assumed that there will be no issue with access to and egress from the allocation sites and that exact access arrangements will be addressed as part of the planning application process for each site at a later date.

Local Model Assignment

The forecast matrices were assigned to the local model network in the same way and using the same convergence criteria as the Do-Minimum scenario.

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[5] M25 junction 10 project profile - National Highways

[6] Proposed changes to the (A3) Tolworth Road - Kingston Road junction | Access our older consultations | Have Your Say Transport for London (tfl.gov.uk), TfL completes major work to improve travel through Tolworth - Transport for London

[7] Have Your Say Today - Ewell Village - Commonplace

Appendix

AM Peak Hour (0800 – 0900) Link Flow Validation Count Comparison

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
2	2: Pseudo_S72_B290_ATC_Ashley Road_N-S	253	329	76	30%	4.45
23	23: Pseudo_S72_B284_MCTC_Hook Road_N-S	434	431	-3	-1%	0.12
25	25: Pseudo_S72_A24_MCTC_East Street_W-E	782	741	-41	-5%	1.48
31	31: Pseudo_S72_A2022_MCC_College Road_W-E	284	341	57	20%	3.22
36	36: Pseudo_S72_B280_ATC_Christchurch Rd_E-W	395	314	-81	-20%	4.29
37	37: Pseudo_S72_A2022_MCTC_Upper High St_W-E	167	139	-28	-17%	2.27
56	56: Pseudo_S72_B2220_MCTC_Chequers Ln_E-W	155	195	40	26%	2.99
57	57: Pseudo_S72_D2462_MCTC_Worple Road_W-E	407	363	-44	-11%	2.26
61	61: Pseudo_S72_B288_MCTC_Windmill Lane_W-E	359	311	-48	-14%	2.65
67	67: Pseudo_S72_B290_MCTC_Epsom Ln N_S-N	534	558	24	5%	1.03
74	74: Pseudo_S72_B284_ATC_Hook Road_S-N	525	573	48	9%	2.05
78	78: Pseudo_S72_B280_ATC_Christchurch Rd_W-E	495	456	-39	-8%	1.79
85	85: Pseudo_S72_D2280_MCTC_Manor Gr Rd_W-E	228	254	26	11%	1.67
89	89: Pseudo_S72_D2345_MCTC_Pound Lane_N-S	398	465	67	17%	3.21
92	92: Pseudo_S72_B284_ATC_Burgh Heath Rd_S-N	464	460	-4	-1%	0.17
95	95: Pseudo_S72_D2462_MCTC_Worple Road_E-W	742	708	-34	-5%	1.25
100	100: Pseudo_S72_C195_MCTC_Waterloo Rd_S-N	288	310	22	8%	1.28
113	113: Pseudo_S72_C196_ATC_Horton Lane_S-N	362	359	-3	-1%	0.15
133	133: Pseudo_S72_B284_ATC_Hook Road_N-S	546	535	-11	-2%	0.49
134	134: Pseudo_S72_D2116_MCTC_Depot Road_E-W	30	29	-1	-3%	0.17
140	140: Pseudo_S72_D2124_MCC_Dirdene Gdns_W-E	12	2	-10	-79%	3.55
143	143: Pseudo_S72_D2116_MCTC_Depot Road_W-E	137	131	-6	-4%	0.48
153	153: Pseudo_S72_D2462_MCTC_Worple Rd_E-W	224	246	22	10%	1.47
158	158: Pseudo_S72_B2220_MCTC_Chequers Ln_W-E	136	142	6	4%	0.48
162	162: Pseudo_S72_D2267_ATC_Chantilly Way_W-E	206	235	29	14%	1.93
170	170: Pseudo_S72_A307_MCTC_Fairmile Lane_S-N	535	518	-17	-3%	0.76
183	183: MCC_D6855_Littleheath Lane_S-N	67	79	12	18%	1.43
184	184: MCC_D6855_Littleheath Lane_N-S	89	232	143	161%	11.28
267	267: ATC_A240_Kingston Road_S-N	1260	1598	338	27%	8.93
268	268: ATC_A240_Kingston Road_N-S	1558	1566	8	1%	0.21
285	285: ATC_A217_Brighton Road_S-N	1448	1511	63	4%	1.63
286	286: ATC_A217_Brighton Road_S-N	1217	1561	344	28%	9.24
288	288: ATC_A217_Brighton Road_S-N	1430	1576	146	10%	3.77
289	289: ATC_A217_Brighton Road_S-N	1502	1709	207	14%	5.18
290	290: ATC_A217_Brighton Road_N-S	1395	1242	-153	-11%	4.21
291	291: ATC_A217_Brighton Road_N-S	1233	1212	-21	-2%	0.59

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
292	292: ATC_A217_Brighton Road_N-S	1170	1111	-59	-5%	1.75
293	293: ATC_A217_Brighton Road_N-S	985	1103	118	12%	3.66
318	318: ATC_A232_Cheam Road_S-N	505	597	92	18%	3.93
319	319: ATC_A232_Cheam Road_N-S	307	388	81	26%	4.35
343	343: MCC_A245_Portsmouth Road_W-E	1185	1094	-91	-8%	2.70
344	344: MCC_A245_Portsmouth Road_E-W	866	915	49	6%	1.66
347	347: MCTC_D2507_Barnett Wood Ln_N-S	425	586	161	38%	7.17
348	348: MCTC_D2507_Barnett Wood Ln_S-N	197	233	36	18%	2.48
405	405: ATC_A217_Brighton Road_S-N	1585	1573	-12	-1%	0.30
406	406: ATC_A217_Brighton Road_N-S	1088	1124	36	3%	1.09
407	407: ATC_A244_Oxshott Road_S-N	467	534	67	14%	2.99
408	408: ATC_A244_Oxshott Road_N-S	549	568	19	4%	0.82
417	417: ATC_A217_Reigate Hill_N-S	1311	1299	-12	-1%	0.34
418	418: ATC_A217_Reigate Hill_S-N	457	474	17	4%	0.78
421	421: ATC_A217_Brighton Road_N-S	958	1204	246	26%	7.48
422	422: ATC_A217_Brighton Road_S-N	1464	1591	127	9%	3.24
429	429: ATC_A245_Stoke Road_N-S	571	537	-34	-6%	1.42
430	430: ATC_A245_Stoke Road_S-N	950	954	4	0%	0.14
431	431: ATC_A217_Brighton Road_S-N	1904	2191	287	15%	6.34
432	432: ATC_A217_Brighton Road_N-S	1771	1812	41	2%	0.97
433	433: ATC_A217_Brighton Road_S-N	1196	1317	121	10%	3.41
434	434: ATC_A217_Brighton Road_N-S	947	943	-4	0%	0.12
435	435: ATC_A240_Reigate Road_S-N	490	664	174	35%	7.23
436	436: ATC_A240_Reigate Road_N-S	570	500	-70	-12%	3.02
437	437: ATC_A243_Kingston Road_S-N	835	748	-87	-10%	3.11
438	438: ATC_A243_Kingston Road_N-S	818	781	-37	-5%	1.32
441	441: ATC_A243_Leatherhead_N-S	1228	1239	11	1%	0.30
450	450: ATC_A309_Kingston By Pass_E-W	1125	1135	10	1%	0.28
461	461: ATC_A309_Kingston By Pass_W-E	1149	1156	7	1%	0.20
462	462: ATC_B280_Fair Oak Lane_W-E	441	590	149	34%	6.54
463	463: ATC_B280_Fair Oak Lane_E-W	399	443	44	11%	2.15
464	464: ATC_B280_Christ Church Road_E-W	524	358	-166	-32%	7.90
465	465: ATC_B280_Christ Church Road_W-E	466	469	3	1%	0.16
513	513: HE ATC_M25_AC J9 - J8_N-S	5106	4039	-1067	-21%	15.77
514	514: HE ATC_M25_CW J8 - J9_S-N	6037	6349	312	5%	3.96
515	515: HE ATC_M25_CW J9 - J10_S-N	5467	5593	126	2%	1.69
517	517: HE ATC_M25__W-E	725	589	-136	-19%	5.29
523	523: HE ATC_M25__W-E	1329	1302	-27	-2%	0.74
524	524: HE ATC_M25__S-N	960	1243	283	30%	8.54
535	535: HE ATC_M25__S-N	572	487	-85	-15%	3.68
540	540: HE ATC_M25__E-W	476	636	160	34%	6.80
541	541: HE ATC_M25_CW J7 - J8_E-W	7417	7699	282	4%	3.24

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
544	544: HE ATC_M25__W-E	1219	1047	-172	-14%	5.11
545	545: HE ATC_M25__E-W	1406	1354	-52	-4%	1.39
631	631: HE ATC_M25__W-E	724	510	-214	-30%	8.64
632	632: HE ATC_M25_AC J10 - Services_W-E	5592	4832	-760	-14%	10.53
687	687: ATC_A24_Ewell Bypass_S-N	1366	1535	169	12%	4.43
688	688: ATC_A24_Ewell Bypass_N-S	1538	1578	40	3%	1.01
689	689: ATC_A24_Leatherhead Rd_S-N	673	522	-151	-22%	6.17
690	690: ATC_A24_Leatherhead Rd_N-S	594	439	-155	-26%	6.80
715	715: ATC_A24_Dorking Rd_E-W	674	664	-10	-1%	0.38
716	716: ATC_A24_Dorking Rd_W-E	596	653	57	10%	2.28
718	718: ATC_A24_Epsom Road_N-S	891	811	-80	-9%	2.73
719	719: ATC_A24_Epsom Road_S-N	722	725	3	0%	0.13
766	766: HE ATC_M25__E-W	2237	2295	58	3%	1.23
767	767: HE ATC_M25__W-E	2125	2116	-9	0%	0.19
771	771: HE ATC_A3__N-S	2432	2616	184	8%	3.66
772	772: HE ATC_A3__N-S	302	377	75	25%	4.05
773	773: HE ATC_A3__N-S	1016	966	-50	-5%	1.59
774	774: HE ATC_A3__S-N	2845	2917	72	3%	1.34
775	775: HE ATC_A3__S-N	1131	1189	58	5%	1.69
778	778: HE ATC_A3__N-S	2433	2366	-67	-3%	1.37
779	779: HE ATC_A3__N-S	2846	2900	54	2%	1.01
780	780: ATC_A309__E-W	642	664	22	3%	0.88
781	781: HE ATC_A3__N-S	734	968	234	32%	8.01
782	782: HE ATC_A3__S-N	2840	2857	17	1%	0.32
784	784: HE ATC_A3__S-N	2730	3151	421	15%	7.76
787	787: HE ATC_A3__S-N	2722	2496	-226	-8%	4.42
795	795: HE ATC_A3__N-S	3885	3997	112	3%	1.79
799	799: HE ATC_A3__N-S	1158	1302	144	12%	4.10
970	970: MCTC_A2022_Winkworth Rd_E-W	478	512	34	7%	1.54
971	971: MCTC_A2022_Winkworth Rd_W-E	592	547	-45	-8%	1.86
972	972: MCTC_B2217_Bolters Ln_S-N	412	322	-90	-22%	4.70
973	973: MCTC_B2217_Bolters Ln_N-S	377	320	-57	-15%	3.04
982	982: MCTC_B284_Ruxley Ln_N-S	507	568	61	12%	2.64
983	983: MCTC_B284_Ruxley Ln_S-N	513	480	-33	-6%	1.49
984	984: MCTC_B284_Chessington Rd (Ewell)_W-E	838	761	-77	-9%	2.72
985	985: MCTC_B284_Chessington Rd (Ewell)_E-W	921	801	-120	-13%	4.08
986	986: MCTC_C164_Chessington Rd_W-E	643	701	58	9%	2.25
987	987: MCTC_C164_Chessington Rd_E-W	720	830	110	15%	3.95
1155	1155: MCTC_C55_Headley Road_W-E	258	400	142	55%	7.85
1156	1156: MCTC_C55_Headley Road_E-W	438	290	-148	-34%	7.76
1157	1157: MCTC_D2519_Overdale_E-W	88	51	-37	-42%	4.47
1158	1158: MCTC_D2519_Overdale_W-E	55	55	-0	0%	0.01

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
1161	1161: MCTC_D2568_Woodfield Rd_W-E	76	55	-21	-28%	2.61
1162	1162: MCTC_D2568_Woodfield Rd_E-W	46	51	5	10%	0.68
1179	1179: MCTC_B284_Ruxley Ln_S-N	798	670	-128	-16%	4.74
1180	1180: MCTC_B284_Ruxley Ln_N-S	607	736	129	21%	4.97
1181	1181: MCTC_A240_Kingston Rd (west)_W-E	1335	1519	184	14%	4.86
1360	1360: MCTC_B290_Station Approach_N-S	479	330	-149	-31%	7.42
1361	1361: MCTC_B290_Station Approach_S-N	326	226	-100	-31%	6.01
1362	1362: MCTC_B2220_Tadworth St (from A217)_E-W	153	244	91	60%	6.47
1363	1363: MCTC_B2220_Tadworth St (from A217)_W-E	223	352	129	58%	7.62
1364	1364: MCTC_D1116_High Street_S-N	117	180	63	54%	5.17
1365	1365: MCTC_D1116_High Street_N-S	115	7	-108	-94%	13.88
1366	1366: MCTC_B2220_Tadworth St_W-E	230	348	118	51%	6.95
1367	1367: MCTC_B2220_Tadworth St_E-W	316	517	201	64%	9.86
1470	1470: MCTC_D2099_Cromwell Rd (from B284)_N-S	96	113	17	18%	1.70
1471	1471: MCTC_D2099_Cromwell Rd (from B284)_S-N	203	269	66	33%	4.31
1472	1472: MCTC_D2020_Grafton Rd (from A2043)_E-W	204	170	-34	-17%	2.51
1473	1473: MCTC_D2020_Grafton Rd (from A2043)_W-E	79	50	-29	-36%	3.55
1474	1474: MCTC_D2099_Cromwell Rd (from A240)_S-N	102	129	27	26%	2.49
1475	1475: MCTC_D2099_Cromwell Rd (from A240)_N-S	67	82	15	22%	1.70
1476	1476: MCTC_D2020_Grafton Rd (from A240)_W-E	45	3	-42	-93%	8.57
1477	1477: MCTC_D2020_Grafton Rd (from A240)_E-W	98	14	-84	-86%	11.32
1649	1649: MCTC_C55_Headley Rd_E-W	41	43	2	5%	0.32
1650	1650: MCTC_C55_Headley Rd_W-E	52	48	-4	-7%	0.54
1659	1659: MCTC_A243_Leatherhead Bypass_N-S	954	1046	92	10%	2.90
1660	1660: MCTC_A243_Leatherhead Bypass_S-N	805	543	-262	-33%	10.09
1661	1661: MCTC_A24_Leatherhead Bypass_S-N	957	899	-58	-6%	1.92
1662	1662: MCTC_A24_Leatherhead Bypass_N-S	951	956	5	1%	0.17
1663	1663: MCTC_B2122_Epsom Rd_W-E	346	347	1	0%	0.04
1664	1664: MCTC_B2122_Epsom Rd_E-W	501	536	35	7%	1.54
1665	1665: MCTC_D2560_Ermyn Way_E-W	129	141	12	9%	0.99
1666	1666: MCTC_D2560_Ermyn Way_W-E	280	304	24	8%	1.38
1667	1667: MCTC_A24_Leatherhead Rd (south)_N-S	842	577	-265	-31%	9.94
1668	1668: MCTC_A24_Leatherhead Rd (south)_S-N	826	833	7	1%	0.24
1669	1669: MCTC_D2575_Grange Rd_W-E	301	275	-26	-9%	1.51
1670	1670: MCTC_D2575_Grange Rd_E-W	176	285	109	62%	7.19
1677	1677: MCTC_A245_Bypass Rd_W-E	242	388	146	60%	8.22
1678	1678: MCTC_A245_Bypass Rd_E-W	580	630	50	9%	2.04
1681	1681: MCTC_B2430_Kingston Rd_W-E	254	219	-35	-14%	2.27
1682	1682: MCTC_B2430_Kingston Rd_E-W	259	270	11	4%	0.69
1782	1782: MCTC_B290_Tattenham Corner Rd_W-E	342	260	-82	-24%	4.72
1783	1783: MCTC_B290_Tattenham Corner Rd_E-W	521	568	47	9%	1.99
1890	1890: MCTC_B2217_Sutton Lane_E-W	780	588	-192	-25%	7.34

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
1891	1891: MCTC_B2217_Sutton Lane_W-E	704	637	-67	-9%	2.58
1892	1892: MCTC_C134_Park Road_S-N	503	568	65	13%	2.80
1893	1893: MCTC_C134_Park Road_N-S	401	439	38	9%	1.86
1894	1894: MCTC_B2217_High Street_W-E	530	449	-81	-15%	3.68
1895	1895: MCTC_B2217_High Street_E-W	707	528	-179	-25%	7.20
1896	1896: MCTC_B2219_Bolters Ln_N-S	640	526	-114	-18%	4.74
1897	1897: MCTC_B2219_Bolters Ln_S-N	742	694	-48	-6%	1.79
1898	1898: MCTC_D1085_Court Rd_E-W	137	157	20	15%	1.64
1899	1899: MCTC_D1085_Court Rd_W-E	123	165	42	34%	3.50
1900	1900: MCTC_B2219_Garratts Ln_W-E	736	727	-9	-1%	0.35
1901	1901: MCTC_B2219_Garratts Ln_E-W	725	748	23	3%	0.85
1954	1954: ATC_A240_Reigate Rd_S-N	551	711	160	29%	6.36
1955	1955: ATC_A240_Reigate Rd_N-S	700	646	-54	-8%	2.09
2192	2192: DfT MCC_A243__S-N	1346	1250	-96	-7%	2.67
2221	2221: DfT MCC_A3__W-E	4139	4105	-34	-1%	0.52
2222	2222: DfT MCC_A3__E-W	3646	3667	21	1%	0.35
2231	2231: DfT MCC_A24__W-E	887	792	-95	-11%	3.27
2232	2232: DfT MCC_A24__E-W	976	969	-7	-1%	0.24
2234	2234: DfT MCC_U__S-N	44	42	-2	-4%	0.24
2235	2235: DfT MCC_U__N-S	163	112	-51	-31%	4.34
2260	2260: DfT MCC_U__S-N	79	120	41	52%	4.13
2261	2261: DfT MCC_U__N-S	149	202	53	36%	4.01
2292	2292: DfT MCC_U__W-E	28	0	-28	-100%	7.48
2293	2293: DfT MCC_U__E-W	34	35	1	2%	0.14
2300	2300: DfT MCC_U__S-N	185	144	-41	-22%	3.17
2301	2301: DfT MCC_U__N-S	101	130	29	29%	2.69
2306	2306: DfT MCC_B2218__S-N	588	575	-13	-2%	0.55
2307	2307: DfT MCC_B2218__N-S	461	492	31	7%	1.44
2353	2353: DfT MCC_U__N-S	13	13	0	2%	0.07
2354	2354: DfT MCC_U__W-E	32	34	2	7%	0.39
2355	2355: DfT MCC_U__E-W	31	12	-19	-62%	4.15
2362	2362: DfT MCC_B290__S-N	162	251	89	55%	6.17
2363	2363: DfT MCC_B290__N-S	290	326	36	12%	2.03
2370	2370: DfT MCC_U__S-N	42	41	-1	-3%	0.22
2371	2371: DfT MCC_U__N-S	59	125	66	111%	6.85
2424	2424: DfT MCC_B288__S-N	561	528	-33	-6%	1.44
2425	2425: DfT MCC_B288__N-S	425	419	-6	-1%	0.27
2460	2460: DfT MCC_B2033__W-E	378	433	55	15%	2.73
2461	2461: DfT MCC_B2033__E-W	602	495	-107	-18%	4.55
2563	2563: DfT MCC_U__S-N	38	65	27	72%	3.78
2564	2564: DfT MCC_U__N-S	67	160	93	139%	8.73
2571	2571: DfT MCC_U__W-E	33	24	-9	-27%	1.68

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
2572	2572: DfT MCC_U__E-W	25	24	-1	-5%	0.24
2590	2590: DfT MCC_U__N-S	166	155	-11	-6%	0.83
2617	2617: DfT MCC_A3__W-E	4610	4274	-336	-7%	5.04
2618	2618: DfT MCC_A3__E-W	4776	4497	-279	-6%	4.10
2637	2637: DfT MCC_A2043__S-N	656	850	194	30%	7.07
2638	2638: DfT MCC_A2043__N-S	660	826	166	25%	6.09
2644	2644: DfT MCC_A3__W-E	4799	4434	-365	-8%	5.38
2645	2645: DfT MCC_A3__E-W	4072	4417	345	8%	5.29
2672	2672: DfT MCC_A240__S-N	1547	1458	-89	-6%	2.30
2673	2673: DfT MCC_A240__N-S	1238	1268	30	2%	0.83
2723	2723: DfT MCC_U__S-N	348	381	33	10%	1.74
2724	2724: DfT MCC_U__N-S	57	25	-32	-56%	4.97
2733	2733: DfT MCC_U__W-E	9	3	-6	-71%	2.67
2734	2734: DfT MCC_U__E-W	15	7	-8	-56%	2.58
2735	2735: DfT MCC_U__W-E	268	402	134	50%	7.31
2736	2736: DfT MCC_U__E-W	298	253	-45	-15%	2.73
2746	2746: DfT MCC_A3__E-W	3866	4055	189	5%	3.00
2764	2764: DfT MCC_U__S-N	98	65	-33	-34%	3.69
2765	2765: DfT MCC_U__N-S	126	126	-0	0%	0.01
2802	2802: DfT MCC_A3__S-N	4446	4487	41	1%	0.61
2803	2803: DfT MCC_A3__N-S	4566	4258	-308	-7%	4.63
2828	2828: DfT MCC_A24__S-N	1010	881	-129	-13%	4.21
2829	2829: DfT MCC_A240__S-N	891	876	-15	-2%	0.52
2830	2830: DfT MCC_A240__N-S	1062	941	-121	-11%	3.82
2850	2850: DfT MCC_A24__S-N	539	398	-141	-26%	6.49
2851	2851: DfT MCC_A24__N-S	842	668	-174	-21%	6.34
2874	2874: DfT MCC_A245__W-E	273	241	-32	-12%	1.99
2875	2875: DfT MCC_A245__E-W	228	288	60	26%	3.72
2876	2876: DfT MCC_A307__W-E	731	535	-196	-27%	7.79
2877	2877: DfT MCC_A307__E-W	440	465	25	6%	1.16
2896	2896: DfT MCC_B284__E-W	864	756	-108	-12%	3.79
2897	2897: DfT MCC_B284__W-E	697	705	8	1%	0.29
2898	2898: DfT MCC_B2032__S-N	566	716	150	27%	5.93
2899	2899: DfT MCC_B2032__N-S	1295	972	-323	-25%	9.60
2934	2934: DfT MCC_A240__S-N	996	998	2	0%	0.07
2935	2935: DfT MCC_A240__N-S	885	852	-33	-4%	1.14
2963	2963: DfT MCC_A245__W-E	576	700	124	22%	4.92
2964	2964: DfT MCC_A245__E-W	788	801	13	2%	0.46
2980	2980: DfT MCC_A24__W-E	752	685	-67	-9%	2.49
2981	2981: DfT MCC_A24__E-W	616	519	-97	-16%	4.06
2988	2988: DfT MCC_A24__S-N	1072	899	-173	-16%	5.53
2989	2989: DfT MCC_A24__N-S	632	956	324	51%	11.51

Count No.	Name	AM Peak (8-9) Obs TOTAL	AM Peak (8-9) Mod TOTAL	Diff	% Diff	GEH
2996	2996: DfT MCC_A24__S-N	1133	1060	-73	-6%	2.19
2997	2997: DfT MCC_A24__N-S	1737	1514	-223	-13%	5.54
3000	3000: DfT MCC_A244__S-N	942	1024	82	9%	2.61
3001	3001: DfT MCC_A244__N-S	878	898	20	2%	0.67
3012	3012: DfT MCC_A24__S-N	672	604	-68	-10%	2.70
3013	3013: DfT MCC_A24__N-S	554	764	210	38%	8.19
3032	3032: DfT MCC_A2022__E-W	1019	941	-78	-8%	2.50
3033	3033: DfT MCC_A2022__W-E	841	918	77	9%	2.59
3096	3096: DfT MCC_C__S-N	194	182	-12	-6%	0.84
3097	3097: DfT MCC_C__N-S	673	653	-20	-3%	0.78
3102	3102: DfT MCC_U__E-W	5	3	-2	-40%	1.00
3103	3103: DfT MCC_U__W-E	5	0	-5	-100%	3.16
3138	3138: DfT MCC_U__E-W	331	285	-46	-14%	2.61
3139	3139: DfT MCC_U__W-E	455	428	-27	-6%	1.29
3174	3174: DfT MCC_U__E-W	89	98	9	10%	0.88
3479	3479: HE ATC_M25__W-E	4158	3450	-708	-17%	11.48
3480	3480: HE ATC_M25__E-W	5202	5713	511	10%	6.91
3494	3494: HE ATC_A3__S-N	2193	2196	3	0%	0.06
3495	3495: HE ATC_A3__S-N	2525	2183	-342	-14%	7.05
3496	3496: HE ATC_A3__N-S	2840	2993	153	5%	2.83

PM Peak Hour (1700 – 1800) Link Flow Validation Count Comparison

Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
5	5: Pseudo_S72_A307_MCTC_Portsmouth Rd_E-W	556	564	8	1%	0.33
25	25: Pseudo_S72_A24_MCTC_East Street_W-E	900	933	33	4%	1.10
26	26: Pseudo_S72_A307_MCTC_Fairmile Lane_N-S	379	377	-2	0%	0.09
31	31: Pseudo_S72_A2022_MCC_College Road_W-E	479	293	-186	-39%	9.48
36	36: Pseudo_S72_B280_ATC_Christchurch Rd_E-W	553	488	-65	-12%	2.86
37	37: Pseudo_S72_A2022_MCTC_Upper High St_W-E	196	190	-6	-3%	0.45
38	38: Pseudo_S72_C197_MCTC_Church Road_N-S	213	191	-22	-10%	1.51
56	56: Pseudo_S72_B2220_MCTC_Chequers Ln_E-W	130	141	11	9%	0.97
57	57: Pseudo_S72_D2462_MCTC_Worple Road_W-E	614	574	-40	-7%	1.65
67	67: Pseudo_S72_B290_MCTC_Epsom Ln North_S-N	550	422	-128	-23%	5.80
113	113: Pseudo_S72_C196_ATC_Horton Lane_S-N	466	378	-88	-19%	4.29
115	115: Pseudo_S72_D2267_ATC_Chantilly Way_E-W	229	215	-14	-6%	0.94
134	134: Pseudo_S72_D2116_MCTC_Depot Road_E-W	145	140	-5	-4%	0.46
140	140: Pseudo_S72_D2124_MCC_Dirdene Gdns_W-E	10	7	-3	-28%	0.95

Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
143	143: Pseudo_S72_D2116_MCTC_Depot Road_W-E	47	51	4	8%	0.52
158	158: Pseudo_S72_B2220_MCTC_Chequers Ln_W-E	100	97	-3	-3%	0.30
162	162: Pseudo_S72_D2267_ATC_Chantilly Way_W-E	204	138	-66	-33%	5.09
170	170: Pseudo_S72_A307_MCTC_Fairmile Lane_S-N	393	389	-4	-1%	0.23
183	183: MCC_D6855_Littleheath Lane_S-N	79	71	-8	-11%	0.98
184	184: MCC_D6855_Littleheath Lane_N-S	96	129	33	34%	3.09
267	267: ATC_A240_Kingston Road_S-N	1302	1030	-272	-21%	7.96
268	268: ATC_A240_Kingston Road_N-S	2007	1597	-410	-20%	9.65
285	285: ATC_A217_Brighton Road_S-N	1655	1655	-0	0%	0.01
286	286: ATC_A217_Brighton Road_S-N	1290	1220	-70	-5%	1.97
288	288: ATC_A217_Brighton Road_S-N	1373	1314	-59	-4%	1.61
289	289: ATC_A217_Brighton Road_S-N	1535	1565	30	2%	0.77
290	290: ATC_A217_Brighton Road_N-S	1471	1381	-90	-6%	2.37
291	291: ATC_A217_Brighton Road_N-S	1548	1437	-111	-7%	2.88
292	292: ATC_A217_Brighton Road_N-S	1603	1335	-268	-17%	6.98
293	293: ATC_A217_Brighton Road_N-S	1544	1484	-60	-4%	1.55
318	318: ATC_A232_Cheam Road_S-N	440	499	59	13%	2.71
319	319: ATC_A232_Cheam Road_N-S	359	274	-85	-24%	4.77
343	343: MCC_A245_Portsmouth Road_W-E	1110	1153	43	4%	1.29
344	344: MCC_A245_Portsmouth Road_E-W	1189	1075	-114	-10%	3.38
347	347: MCTC_D2507_Barnett Wood Ln_N-S	238	286	48	20%	2.95
348	348: MCTC_D2507_Barnett Wood Ln_S-N	303	290	-13	-4%	0.74
405	405: ATC_A217_Brighton Road_S-N	1506	1312	-194	-13%	5.16
406	406: ATC_A217_Brighton Road_N-S	1535	1484	-51	-3%	1.31
407	407: ATC_A244_Oxshott Road_S-N	665	674	9	1%	0.35
408	408: ATC_A244_Oxshott Road_N-S	419	636	217	52%	9.45
417	417: ATC_A217_Reigate Hill_N-S	1647	1583	-64	-4%	1.58
418	418: ATC_A217_Reigate Hill_S-N	529	568	39	7%	1.66
421	421: ATC_A217_Brighton Road_N-S	1070	1347	277	26%	7.96
422	422: ATC_A217_Brighton Road_S-N	1673	1539	-134	-8%	3.33
429	429: ATC_A245_Stoke Road_N-S	723	700	-23	-3%	0.85
430	430: ATC_A245_Stoke Road_S-N	854	713	-141	-17%	5.05
431	431: ATC_A217_Brighton Road_S-N	1992	2119	127	6%	2.80
432	432: ATC_A217_Brighton Road_N-S	1895	1869	-26	-1%	0.59
433	433: ATC_A217_Brighton Road_S-N	1358	1456	98	7%	2.63
434	434: ATC_A217_Brighton Road_N-S	1134	1141	7	1%	0.22
435	435: ATC_A240_Reigate Road_S-N	570	568	-2	0%	0.09
436	436: ATC_A240_Reigate Road_N-S	680	720	40	6%	1.50
437	437: ATC_A243_Kingston Road_S-N	701	658	-43	-6%	1.63
438	438: ATC_A243_Kingston Road_N-S	811	685	-126	-16%	4.62
441	441: ATC_A243_Leatherhead_N-S	1228	1261	33	3%	0.93
450	450: ATC_A309_Kingston By Pass_E-W	1158	1199	41	4%	1.19
461	461: ATC_A309_Kingston By Pass_W-E	1324	1311	-13	-1%	0.35
462	462: ATC_B280_Fair Oak Lane_W-E	637	697	60	9%	2.31
463	463: ATC_B280_Fair Oak Lane_E-W	325	533	208	64%	10.03

Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
464	464: ATC_B280_Christ Church Road_E-W	420	429	9	2%	0.45
465	465: ATC_B280_Christ Church Road_W-E	742	745	3	0%	0.11
513	513: HE ATC_M25_AC J9 - J8_N-S	6133	5979	-154	-3%	1.98
514	514: HE ATC_M25_CW J8 - J9_S-N	4931	4719	-212	-4%	3.06
515	515: HE ATC_M25_CW J9 - J10_S-N	5411	5120	-291	-5%	4.01
517	517: HE ATC_M25__W-E	1051	955	-96	-9%	3.04
523	523: HE ATC_M25__W-E	882	863	-19	-2%	0.63
524	524: HE ATC_M25__S-N	806	650	-156	-19%	5.77
535	535: HE ATC_M25__S-N	1029	1051	22	2%	0.70
540	540: HE ATC_M25__E-W	680	786	106	16%	3.93
541	541: HE ATC_M25_CW J7 - J8_E-W	5031	5143	112	2%	1.57
544	544: HE ATC_M25__W-E	1620	1398	-222	-14%	5.73
545	545: HE ATC_M25__E-W	1463	1329	-134	-9%	3.57
631	631: HE ATC_M25__W-E	1048	1159	111	11%	3.34
632	632: HE ATC_M25_AC J10 - Services_W-E	6395	5683	-712	-11%	9.16
687	687: ATC_A24_Ewell Bypass_S-N	1592	1419	-173	-11%	4.45
688	688: ATC_A24_Ewell Bypass_N-S	1511	1576	65	4%	1.65
689	689: ATC_A24_Leatherhead Rd_S-N	978	903	-75	-8%	2.44
690	690: ATC_A24_Leatherhead Rd_N-S	705	811	106	15%	3.86
715	715: ATC_A24_Dorking Rd_E-W	717	707	-10	-1%	0.37
716	716: ATC_A24_Dorking Rd_W-E	668	603	-65	-10%	2.60
718	718: ATC_A24_Epsom Road_N-S	754	667	-87	-11%	3.25
719	719: ATC_A24_Epsom Road_S-N	991	1076	85	9%	2.64
766	766: HE ATC_M25__E-W	1853	2067	214	12%	4.84
767	767: HE ATC_M25__W-E	2140	2132	-8	0%	0.18
771	771: HE ATC_A3__N-S	1965	1932	-33	-2%	0.75
772	772: HE ATC_A3__N-S	236	393	157	67%	8.86
773	773: HE ATC_A3__N-S	699	647	-52	-7%	2.02
774	774: HE ATC_A3__S-N	2628	2664	36	1%	0.70
775	775: HE ATC_A3__S-N	1255	1428	173	14%	4.72
778	778: HE ATC_A3__N-S	2370	2499	129	5%	2.62
779	779: HE ATC_A3__N-S	2625	2605	-20	-1%	0.38
780	780: ATC_A309__E-W	760	1194	434	57%	13.89
781	781: HE ATC_A3__N-S	816	865	49	6%	1.69
782	782: HE ATC_A3__S-N	2319	2402	83	4%	1.71
784	784: HE ATC_A3__S-N	2743	3086	343	13%	6.36
787	787: HE ATC_A3__S-N	2376	2302	-74	-3%	1.53
795	795: HE ATC_A3__N-S	3695	3988	293	8%	4.73
799	799: HE ATC_A3__N-S	1452	1555	103	7%	2.65
970	970: MCTC_A2022_Winkworth Rd_E-W	572	563	-9	-2%	0.40
971	971: MCTC_A2022_Winkworth Rd_W-E	810	709	-101	-13%	3.68
972	972: MCTC_B2217_Bolters Ln_S-N	396	338	-58	-15%	3.05
973	973: MCTC_B2217_Bolters Ln_N-S	369	393	24	6%	1.22
982	982: MCTC_B284_Ruxley Ln_N-S	519	454	-65	-13%	2.96
983	983: MCTC_B284_Ruxley Ln_S-N	662	592	-70	-11%	2.79

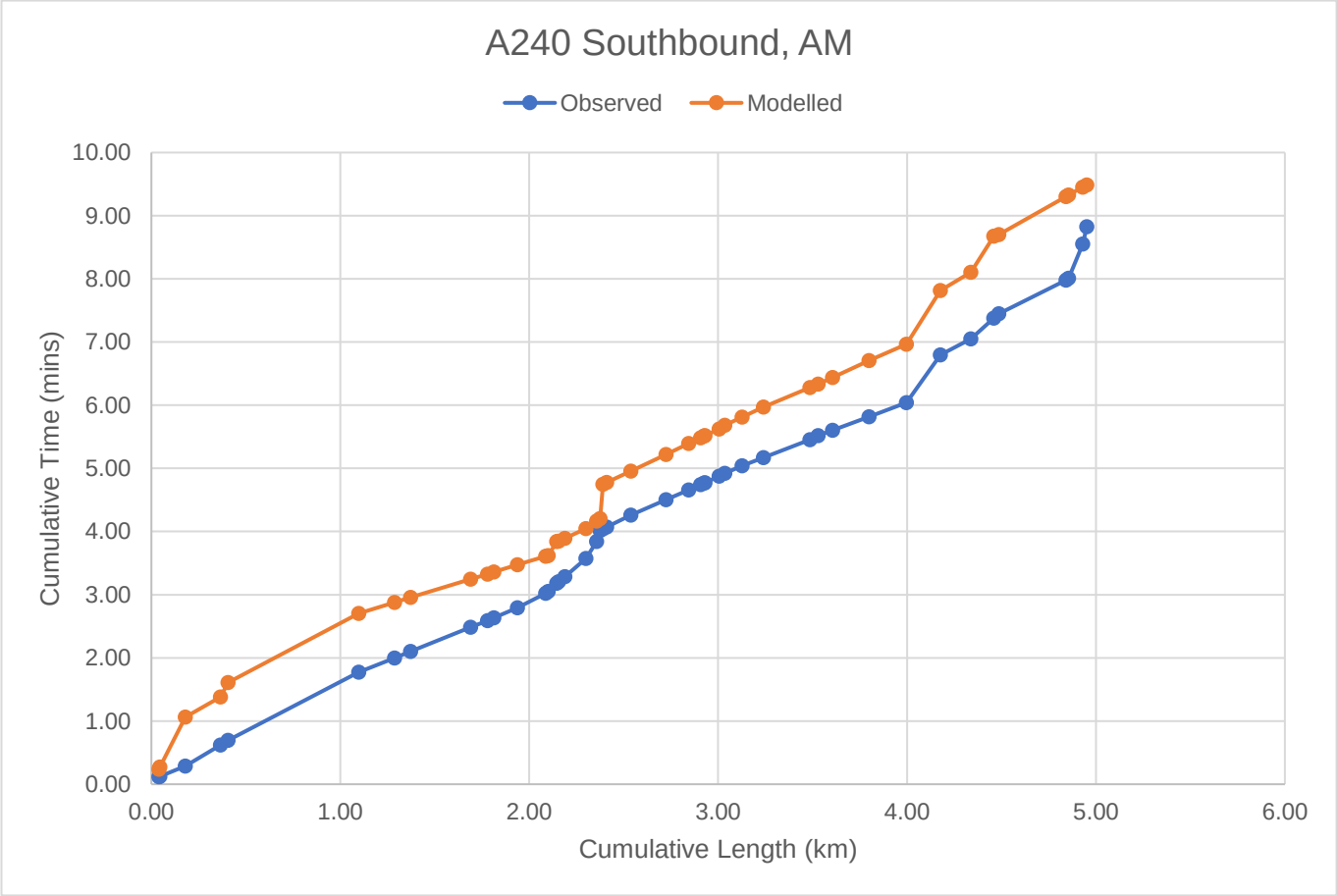
Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
984	984: MCTC_B284_Chessington Rd (Ewell)_W-E	797	825	28	4%	0.99
985	985: MCTC_B284_Chessington Rd (Ewell)_E-W	1155	1174	19	2%	0.57
986	986: MCTC_C164_Chessington Rd_W-E	488	654	166	34%	6.94
987	987: MCTC_C164_Chessington Rd_E-W	703	865	162	23%	5.77
1155	1155: MCTC_C55_Headley Road_W-E	455	626	171	38%	7.35
1156	1156: MCTC_C55_Headley Road_E-W	234	112	-122	-52%	9.31
1157	1157: MCTC_D2519_Overdale_E-W	62	76	14	22%	1.64
1158	1158: MCTC_D2519_Overdale_W-E	78	67	-11	-14%	1.27
1161	1161: MCTC_D2568_Woodfield Rd_W-E	67	67	0	0%	0.02
1162	1162: MCTC_D2568_Woodfield Rd_E-W	81	76	-5	-7%	0.61
1179	1179: MCTC_B284_Ruxley Ln_S-N	707	553	-154	-22%	6.12
1180	1180: MCTC_B284_Ruxley Ln_N-S	775	790	15	2%	0.53
1181	1181: MCTC_A240_Kingston Rd (west)_W-E	2157	2115	-42	-2%	0.90
1360	1360: MCTC_B290_Station Approach_N-S	330	242	-88	-27%	5.22
1361	1361: MCTC_B290_Station Approach_S-N	567	369	-198	-35%	9.16
1362	1362: MCTC_B2220_Tadworth St (from A217)_E-W	116	120	4	3%	0.34
1363	1363: MCTC_B2220_Tadworth St (from A217)_W-E	280	349	69	25%	3.87
1364	1364: MCTC_D1116_High Street_S-N	170	111	-59	-35%	4.99
1365	1365: MCTC_D1116_High Street_N-S	62	5	-57	-92%	9.84
1366	1366: MCTC_B2220_Tadworth_W-E	527	569	42	8%	1.81
1367	1367: MCTC_B2220_Tadworth St_E-W	233	319	86	37%	5.17
1470	1470: MCTC_D2099_Cromwell Rd (from B284)_N-S	340	302	-38	-11%	2.12
1471	1471: MCTC_D2099_Cromwell Rd (from B284)_S-N	85	507	422	497%	24.55
1472	1472: MCTC_D2020_Grafton Rd (from A2043)_E-W	107	22	-85	-80%	10.62
1473	1473: MCTC_D2020_Grafton Rd (from A2043)_W-E	187	242	55	29%	3.75
1474	1474: MCTC_D2099_Cromwell Rd (from A240)_S-N	35	497	462	1320%	28.32
1475	1475: MCTC_D2099_Cromwell Rd (from A240)_N-S	174	83	-91	-53%	8.08
1476	1476: MCTC_D2020_Grafton Rd (from A240)_W-E	32	22	-10	-31%	1.91
1477	1477: MCTC_D2020_Grafton Rd (from A240)_E-W	67	11	-56	-84%	8.99
1649	1649: MCTC_C55_Headley Rd_E-W	45	41	-4	-9%	0.63
1650	1650: MCTC_C55_Headley Rd_W-E	55	35	-20	-36%	2.98
1659	1659: MCTC_A243_Leatherhead Bypass_N-S	1086	1160	74	7%	2.22
1660	1660: MCTC_A243_Leatherhead Bypass_S-N	1281	1216	-65	-5%	1.83
1661	1661: MCTC_A24_Leatherhead Bypass_S-N	1100	917	-183	-17%	5.77
1662	1662: MCTC_A24_Leatherhead Bypass_N-S	1064	1167	103	10%	3.09
1663	1663: MCTC_B2122_Epsom Rd_W-E	599	620	21	4%	0.87
1664	1664: MCTC_B2122_Epsom Rd_E-W	437	416	-21	-5%	1.03
1665	1665: MCTC_D2560_Ermyn Way_E-W	298	300	2	1%	0.12
1666	1666: MCTC_D2560_Ermyn Way_W-E	105	118	13	12%	1.22
1667	1667: MCTC_A24_Leatherhead Rd (south)_N-S	876	906	30	3%	1.01
1668	1668: MCTC_A24_Leatherhead Rd (south)_S-N	903	805	-98	-11%	3.37
1669	1669: MCTC_D2575_Grange Rd_W-E	197	112	-85	-43%	6.82
1670	1670: MCTC_D2575_Grange Rd_E-W	116	101	-15	-13%	1.43
1677	1677: MCTC_A245_Bypass Rd_W-E	584	535	-49	-8%	2.07
1678	1678: MCTC_A245_Bypass Rd_E-W	452	392	-60	-13%	2.90

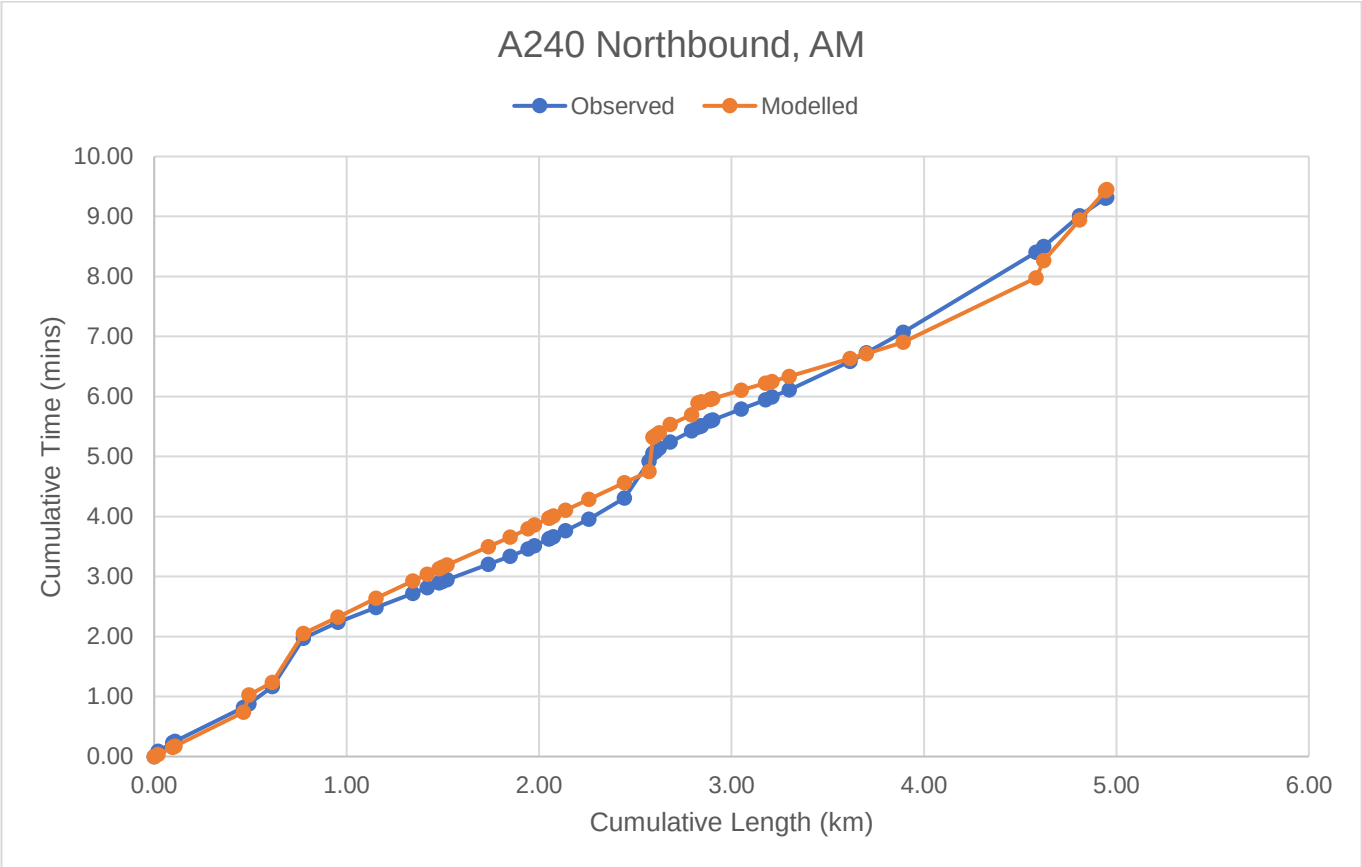
Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
1681	1681: MCTC_B2430_Kingston Rd_W-E	262	395	133	51%	7.34
1682	1682: MCTC_B2430_Kingston Rd_E-W	378	321	-57	-15%	3.03
1782	1782: MCTC_B290_Tattenham Corner Rd_W-E	531	458	-73	-14%	3.30
1783	1783: MCTC_B290_Tattenham Corner Rd_E-W	366	387	21	6%	1.09
1890	1890: MCTC_B2217_Sutton Lane_E-W	774	612	-162	-21%	6.16
1891	1891: MCTC_B2217_Sutton Lane_W-E	637	574	-63	-10%	2.54
1892	1892: MCTC_C134_Park Road_S-N	414	429	15	4%	0.72
1893	1893: MCTC_C134_Park Road_N-S	482	476	-6	-1%	0.27
1894	1894: MCTC_B2217_High Street_W-E	600	490	-110	-18%	4.70
1895	1895: MCTC_B2217_High Street_E-W	667	480	-187	-28%	7.79
1896	1896: MCTC_B2219_Bolters Ln_N-S	750	806	56	7%	2.01
1897	1897: MCTC_B2219_Bolters Ln_S-N	600	512	-88	-15%	3.72
1898	1898: MCTC_D1085_Court Rd_E-W	145	181	36	25%	2.85
1899	1899: MCTC_D1085_Court Rd_W-E	95	106	11	12%	1.10
1900	1900: MCTC_B2219_Garratts Ln_W-E	585	601	16	3%	0.67
1901	1901: MCTC_B2219_Garratts Ln_E-W	718	770	52	7%	1.91
1954	1954: ATC_A240_Reigate Rd_S-N	410	529	119	29%	5.49
1955	1955: ATC_A240_Reigate Rd_N-S	1027	995	-32	-3%	1.01
2192	2192: DfT MCC_A243__S-N	1137	1058	-79	-7%	2.38
2221	2221: DfT MCC_A3__W-E	3968	4092	124	3%	1.95
2222	2222: DfT MCC_A3__E-W	4428	4054	-374	-8%	5.74
2231	2231: DfT MCC_A24__W-E	936	931	-5	-1%	0.16
2232	2232: DfT MCC_A24__E-W	840	816	-24	-3%	0.84
2234	2234: DfT MCC_U__S-N	66	62	-4	-6%	0.47
2235	2235: DfT MCC_U__N-S	86	128	42	49%	4.04
2260	2260: DfT MCC_U__S-N	105	80	-25	-24%	2.60
2261	2261: DfT MCC_U__N-S	87	61	-26	-30%	3.02
2292	2292: DfT MCC_U__W-E	13	0	-13	-100%	5.10
2293	2293: DfT MCC_U__E-W	37	53	16	42%	2.34
2300	2300: DfT MCC_U__S-N	136	145	9	7%	0.80
2301	2301: DfT MCC_U__N-S	114	101	-13	-11%	1.21
2306	2306: DfT MCC_B2218__S-N	349	355	6	2%	0.32
2307	2307: DfT MCC_B2218__N-S	587	635	48	8%	1.96
2353	2353: DfT MCC_U__N-S	146	147	1	1%	0.09
2354	2354: DfT MCC_U__W-E	18	20	2	9%	0.38
2355	2355: DfT MCC_U__E-W	22	23	1	3%	0.13
2362	2362: DfT MCC_B290__S-N	238	235	-3	-1%	0.19
2363	2363: DfT MCC_B290__N-S	216	233	17	8%	1.13
2370	2370: DfT MCC_U__S-N	13	0	-13	-100%	5.10
2371	2371: DfT MCC_U__N-S	16	19	3	21%	0.81
2424	2424: DfT MCC_B288__S-N	424	327	-97	-23%	4.99
2425	2425: DfT MCC_B288__N-S	670	559	-111	-17%	4.50
2460	2460: DfT MCC_B2033__W-E	535	486	-49	-9%	2.17
2461	2461: DfT MCC_B2033__E-W	409	361	-48	-12%	2.45
2563	2563: DfT MCC_U__S-N	13	4	-9	-70%	3.15

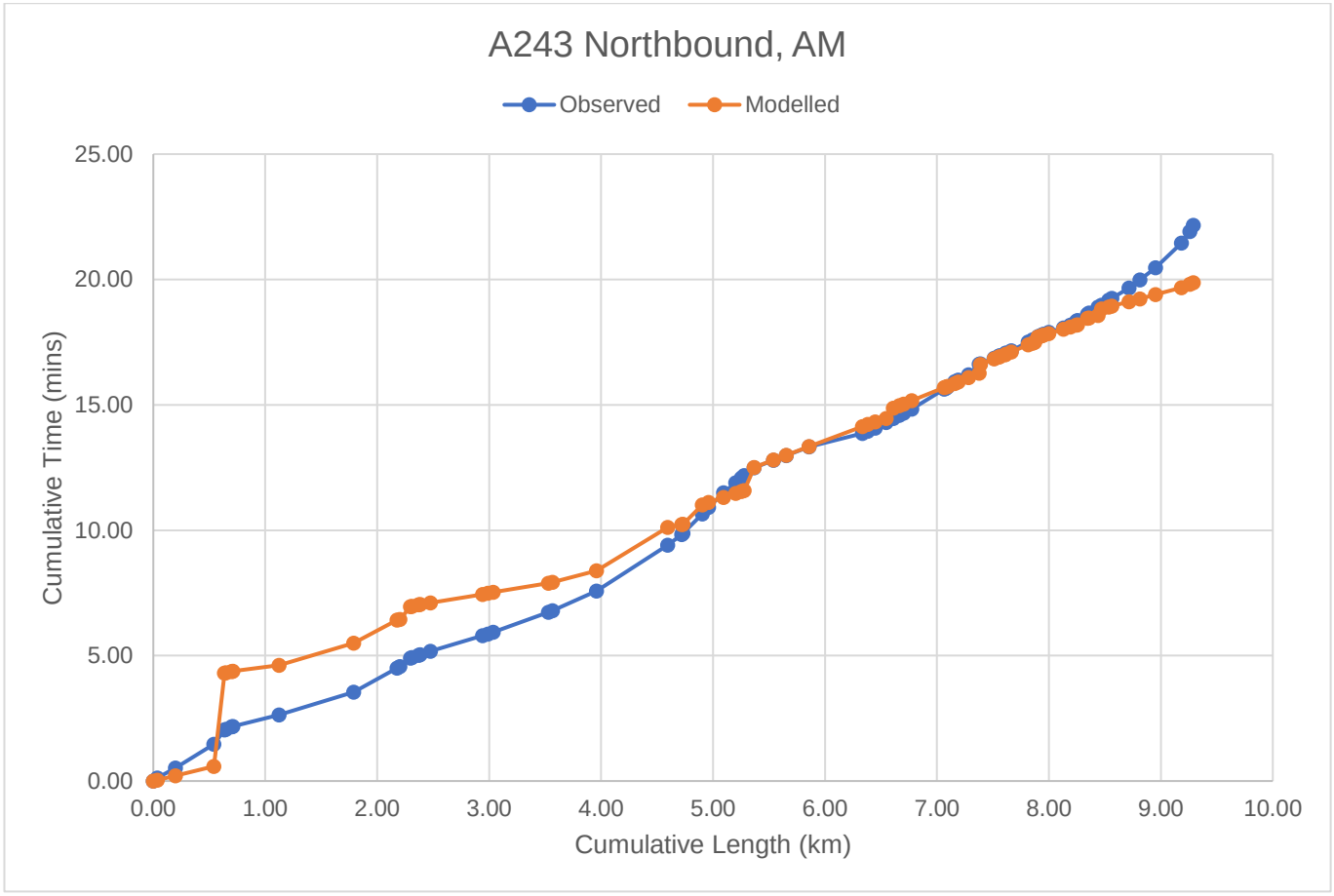
Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
2564	2564: DfT MCC_U__N-S	10	17	7	67%	1.84
2571	2571: DfT MCC_U__W-E	29	21	-8	-27%	1.57
2572	2572: DfT MCC_U__E-W	21	22	1	6%	0.25
2590	2590: DfT MCC_U__N-S	118	125	7	6%	0.64
2617	2617: DfT MCC_A3__W-E	4651	4400	-251	-5%	3.73
2618	2618: DfT MCC_A3__E-W	4846	4746	-100	-2%	1.44
2637	2637: DfT MCC_A2043__S-N	752	920	168	22%	5.79
2638	2638: DfT MCC_A2043__N-S	754	928	174	23%	6.01
2644	2644: DfT MCC_A3__W-E	4529	4511	-18	0%	0.26
2645	2645: DfT MCC_A3__E-W	5361	5277	-84	-2%	1.15
2672	2672: DfT MCC_A240__S-N	1457	1241	-216	-15%	5.88
2673	2673: DfT MCC_A240__N-S	1534	1576	42	3%	1.07
2723	2723: DfT MCC_U__S-N	109	301	192	176%	13.39
2724	2724: DfT MCC_U__N-S	146	55	-91	-62%	9.09
2733	2733: DfT MCC_U__W-E	14	16	2	12%	0.43
2734	2734: DfT MCC_U__E-W	10	2	-8	-77%	3.09
2735	2735: DfT MCC_U__W-E	338	473	135	40%	6.70
2736	2736: DfT MCC_U__E-W	309	223	-86	-28%	5.26
2746	2746: DfT MCC_A3__E-W	4968	4967	-1	0%	0.01
2764	2764: DfT MCC_U__S-N	106	146	40	38%	3.60
2765	2765: DfT MCC_U__N-S	94	50	-44	-47%	5.16
2802	2802: DfT MCC_A3__S-N	3933	4316	383	10%	5.96
2803	2803: DfT MCC_A3__N-S	4740	4790	50	1%	0.72
2828	2828: DfT MCC_A24__S-N	884	826	-58	-7%	1.98
2829	2829: DfT MCC_A240__S-N	821	816	-5	-1%	0.19
2830	2830: DfT MCC_A240__N-S	1015	884	-131	-13%	4.25
2850	2850: DfT MCC_A24__S-N	915	734	-181	-20%	6.32
2851	2851: DfT MCC_A24__N-S	755	595	-160	-21%	6.15
2874	2874: DfT MCC_A245__W-E	309	263	-46	-15%	2.70
2875	2875: DfT MCC_A245__E-W	381	297	-84	-22%	4.56
2876	2876: DfT MCC_A307__W-E	529	543	14	3%	0.59
2877	2877: DfT MCC_A307__E-W	558	519	-39	-7%	1.68
2896	2896: DfT MCC_B284__E-W	706	770	64	9%	2.37
2897	2897: DfT MCC_B284__W-E	912	935	23	3%	0.77
2898	2898: DfT MCC_B2032__S-N	919	869	-50	-5%	1.66
2899	2899: DfT MCC_B2032__N-S	729	708	-21	-3%	0.79
2934	2934: DfT MCC_A240__S-N	807	853	46	6%	1.59
2935	2935: DfT MCC_A240__N-S	1032	942	-90	-9%	2.88
2963	2963: DfT MCC_A245__W-E	805	770	-35	-4%	1.25
2964	2964: DfT MCC_A245__E-W	677	536	-141	-21%	5.71
2980	2980: DfT MCC_A24__W-E	759	762	3	0%	0.11
2981	2981: DfT MCC_A24__E-W	607	504	-103	-17%	4.36
2988	2988: DfT MCC_A24__S-N	920	917	-3	0%	0.10
2989	2989: DfT MCC_A24__N-S	1101	1167	66	6%	1.97
2996	2996: DfT MCC_A24__S-N	1673	1465	-208	-12%	5.26

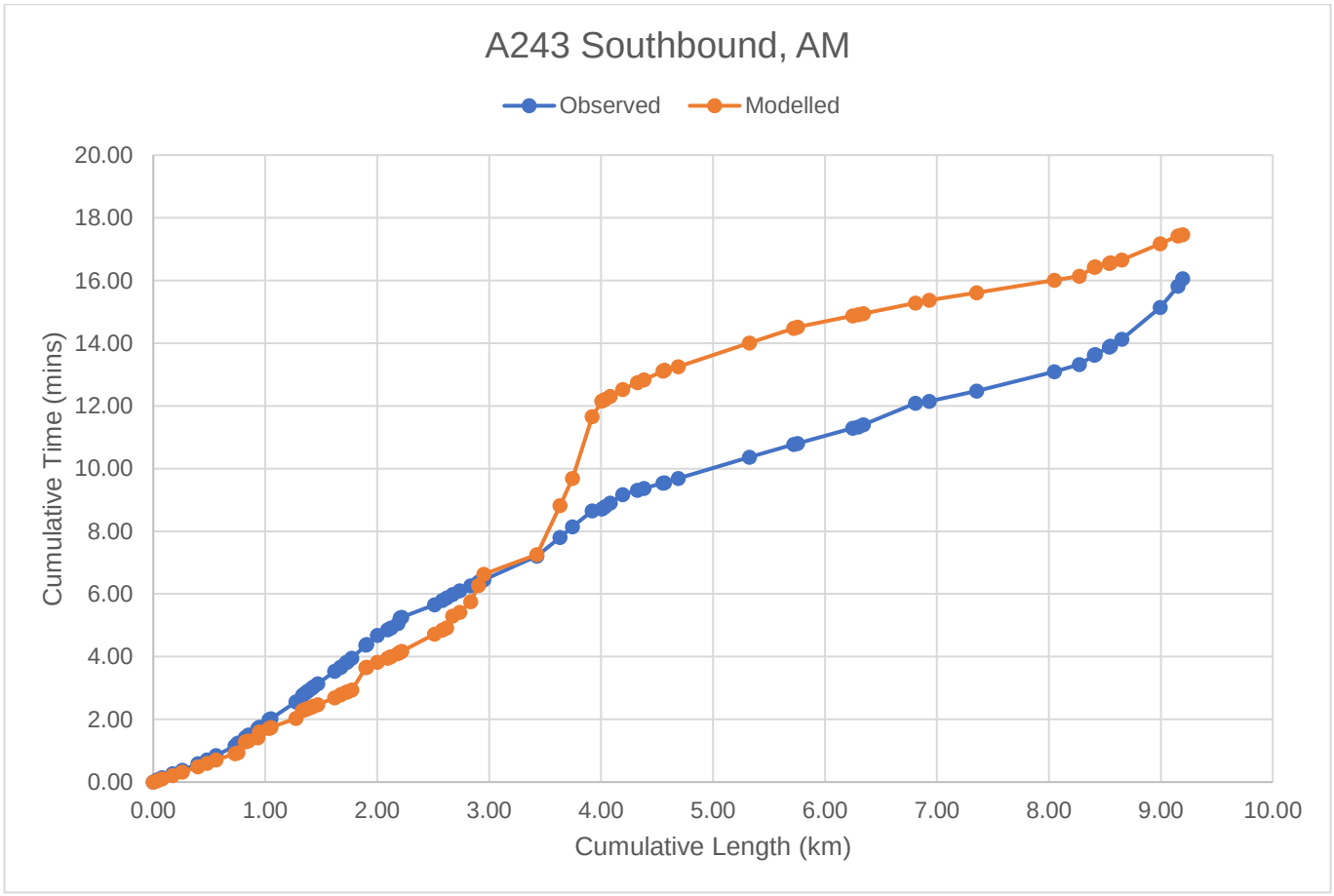
Count No.	Name	PM Peak (17-18) Obs TOTAL	PM Peak (17-18) Mod TOTAL	Diff	% Diff	GEH
2997	2997: DfT MCC_A24__N-S	1334	1276	-58	-4%	1.62
3000	3000: DfT MCC_A244__S-N	1110	1263	153	14%	4.44
3001	3001: DfT MCC_A244__N-S	946	1168	222	23%	6.82
3012	3012: DfT MCC_A24__S-N	880	792	-88	-10%	3.05
3013	3013: DfT MCC_A24__N-S	723	756	33	5%	1.21
3032	3032: DfT MCC_A2022__E-W	843	887	44	5%	1.50
3033	3033: DfT MCC_A2022__W-E	856	853	-3	0%	0.09
3096	3096: DfT MCC_C__S-N	457	438	-19	-4%	0.91
3097	3097: DfT MCC_C__N-S	289	207	-82	-28%	5.18
3102	3102: DfT MCC_U__E-W	3	1	-2	-53%	1.08
3103	3103: DfT MCC_U__W-E	3	0	-3	-100%	2.45
3138	3138: DfT MCC_U__E-W	300	254	-46	-15%	2.78
3139	3139: DfT MCC_U__W-E	562	575	13	2%	0.56
3174	3174: DfT MCC_U__E-W	153	137	-16	-11%	1.36
3479	3479: HE ATC_M25__W-E	5111	5024	-87	-2%	1.22
3480	3480: HE ATC_M25__E-W	4093	3932	-161	-4%	2.54
3494	3494: HE ATC_A3__S-N	2096	2037	-59	-3%	1.30
3495	3495: HE ATC_A3__S-N	2421	2221	-200	-8%	4.15
3496	3496: HE ATC_A3__N-S	2319	2325	6	0%	0.13

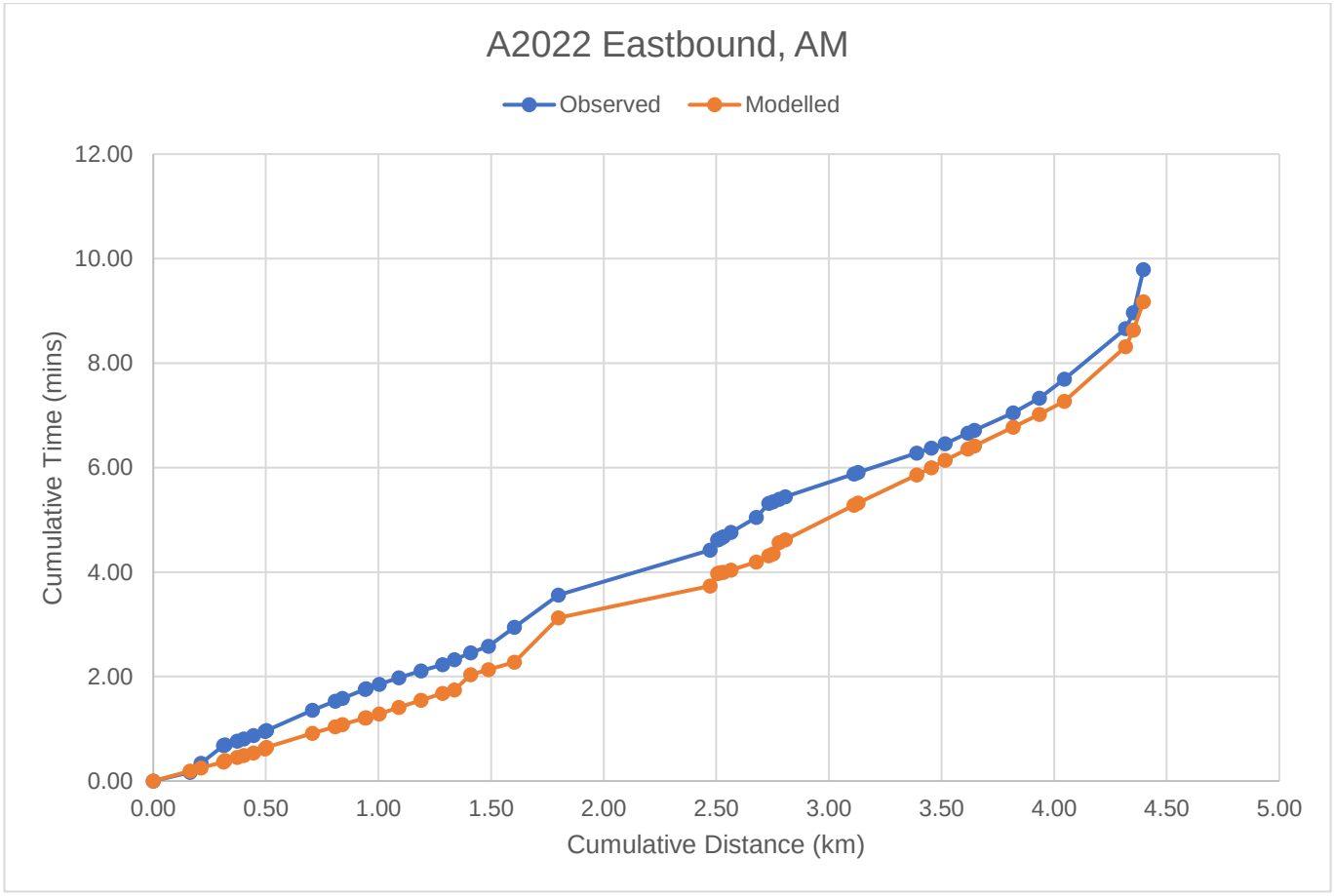
Journey Time Validation Route Comparison Graphs

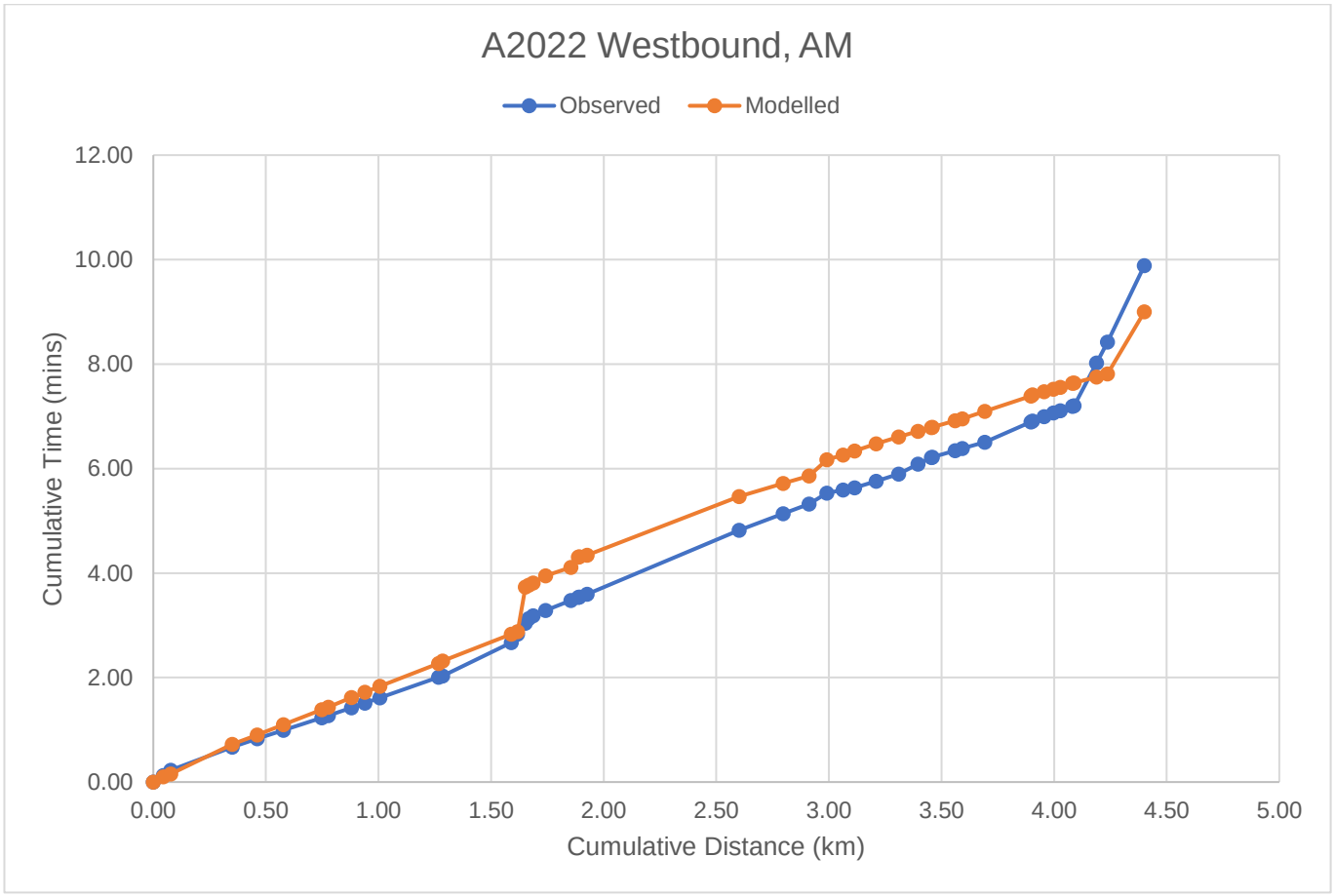


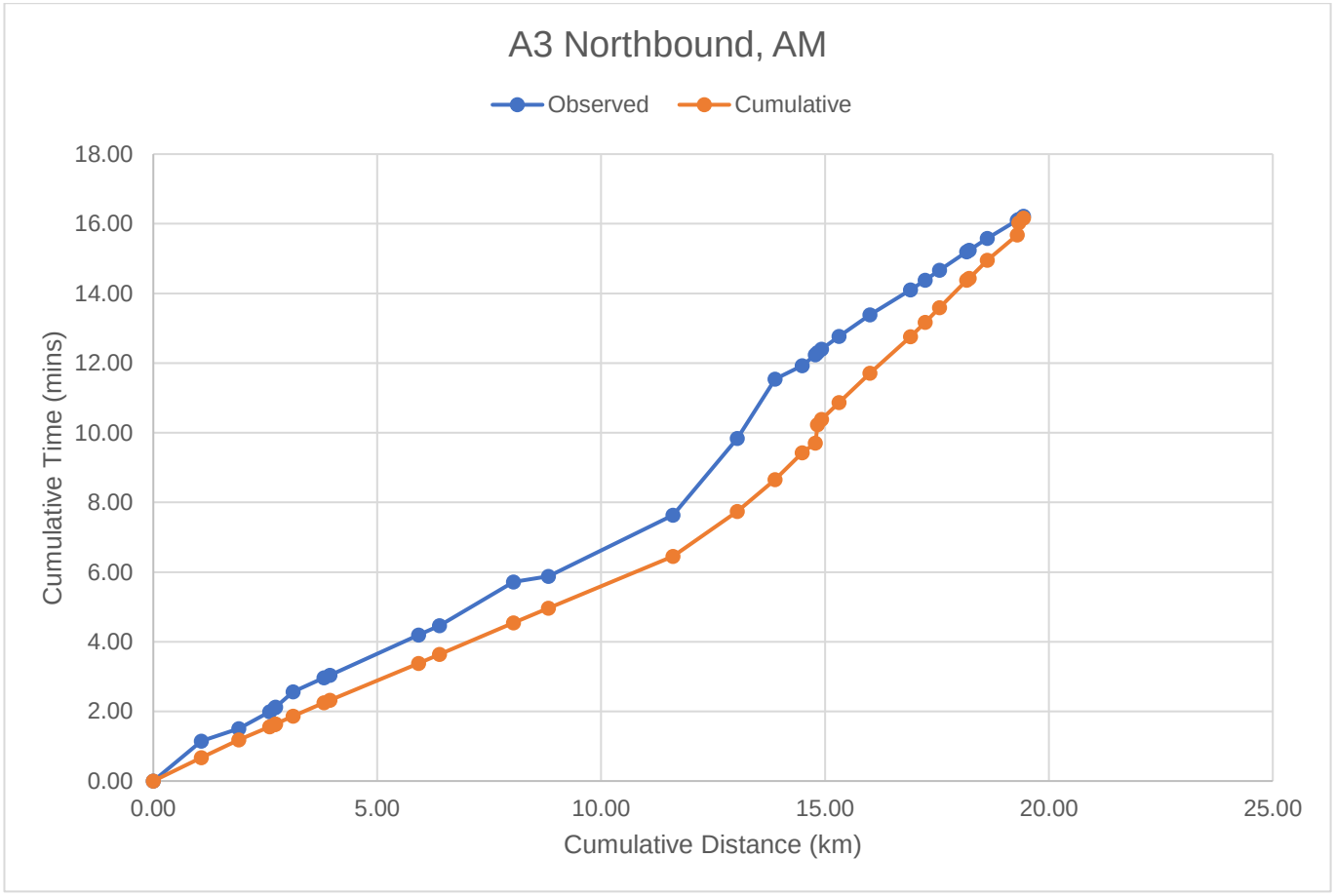


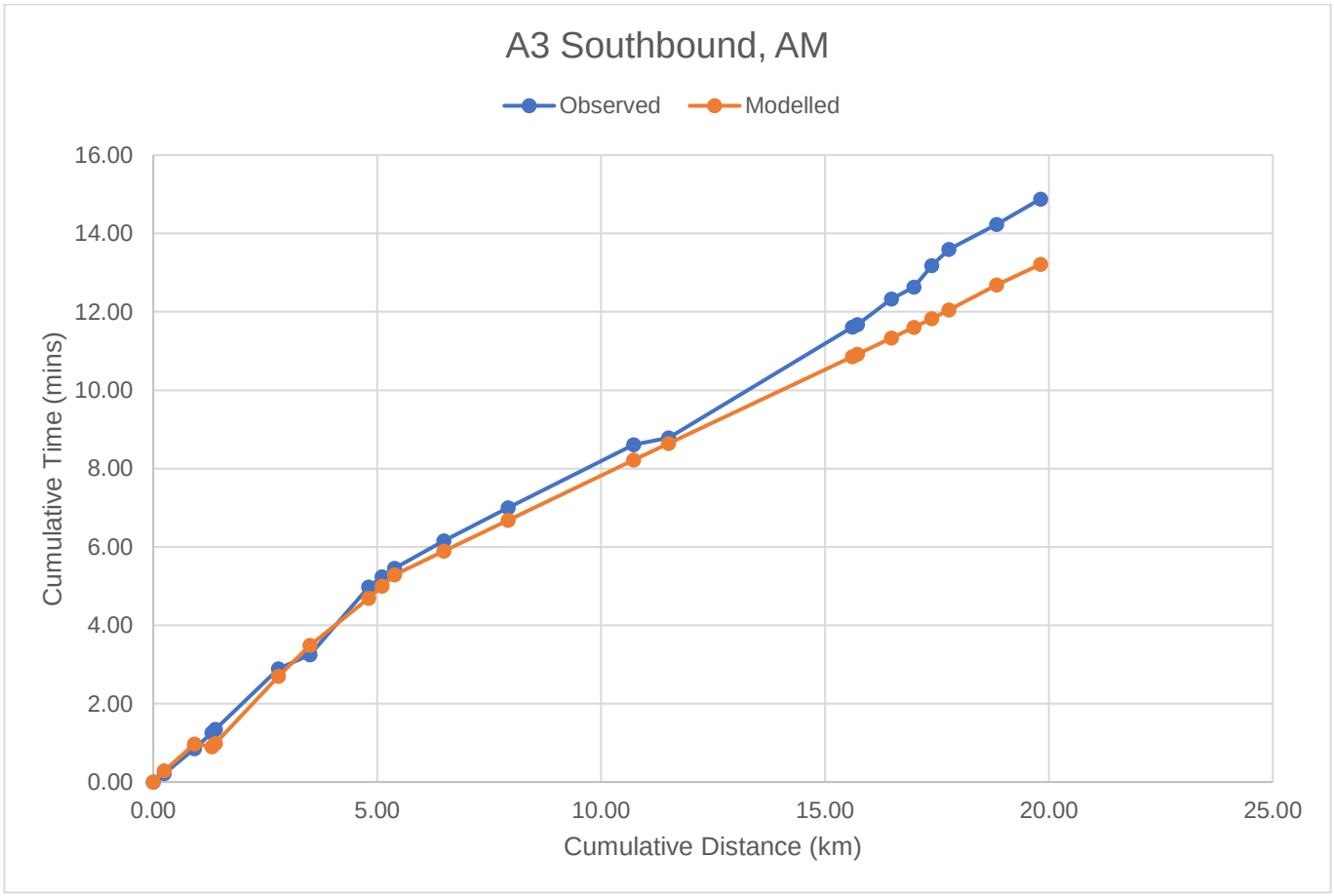

A243 Northbound, AM
Observed
Modelled
Cumulative Time (mins)
25.00
20.00
15.00
10.00
5.00
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Cumulative Length (km)

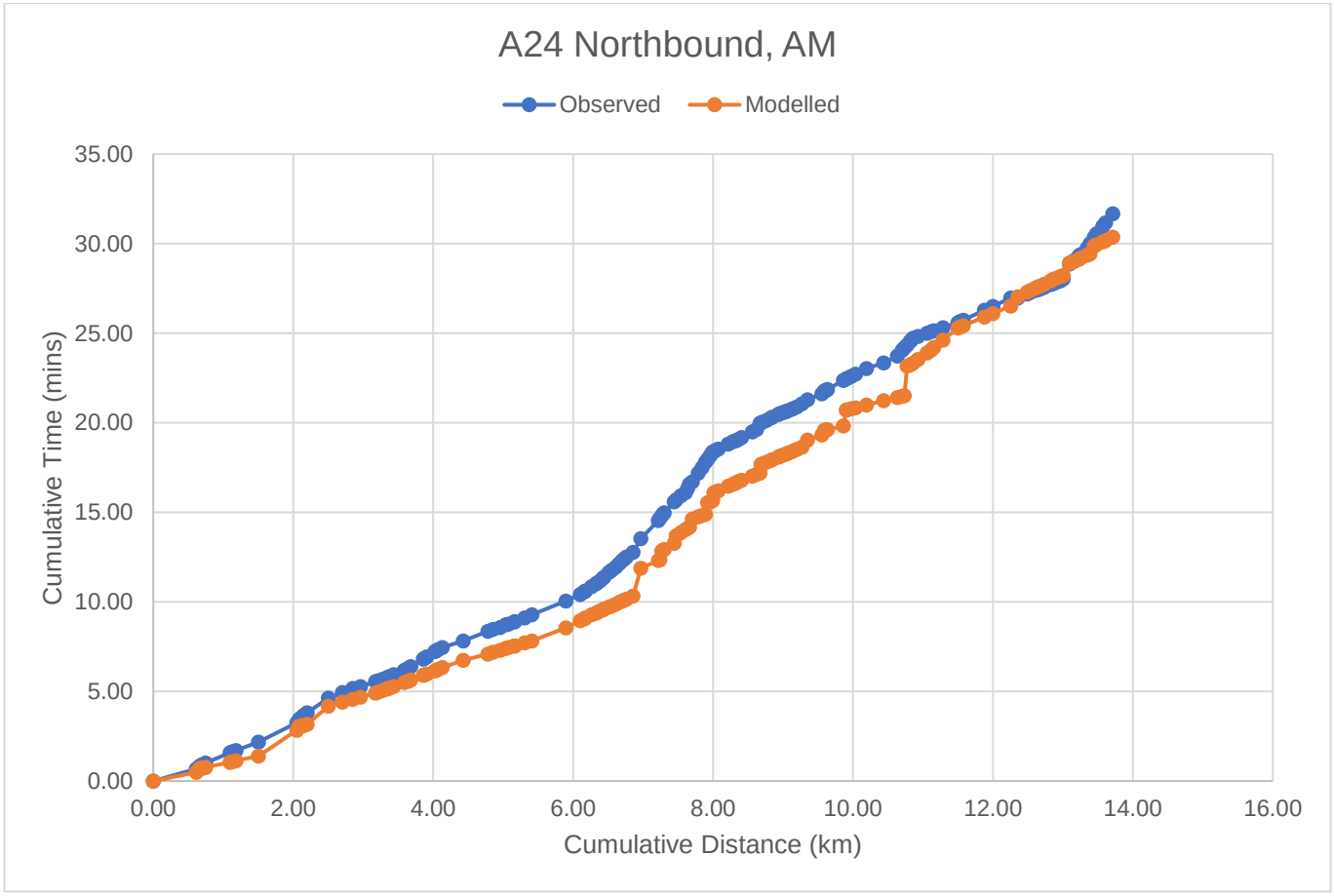

A243 Southbound, AM
Observed
Modelled
Cumulative Time (mins)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Cumulative Length (km)

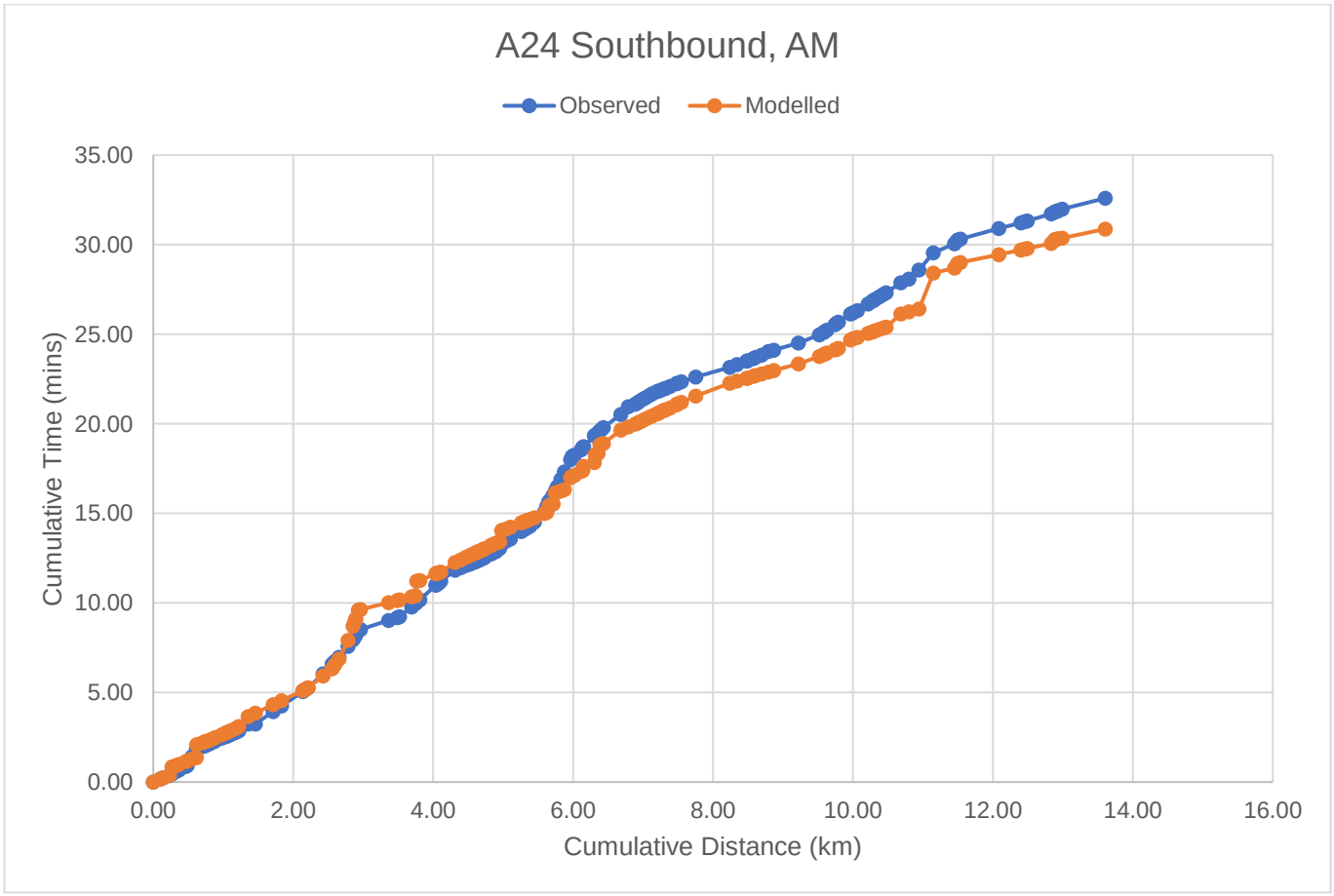

A2022 Eastbound, AM
Observed
Modelled
Cumulative Time (mins)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Cumulative Distance (km)

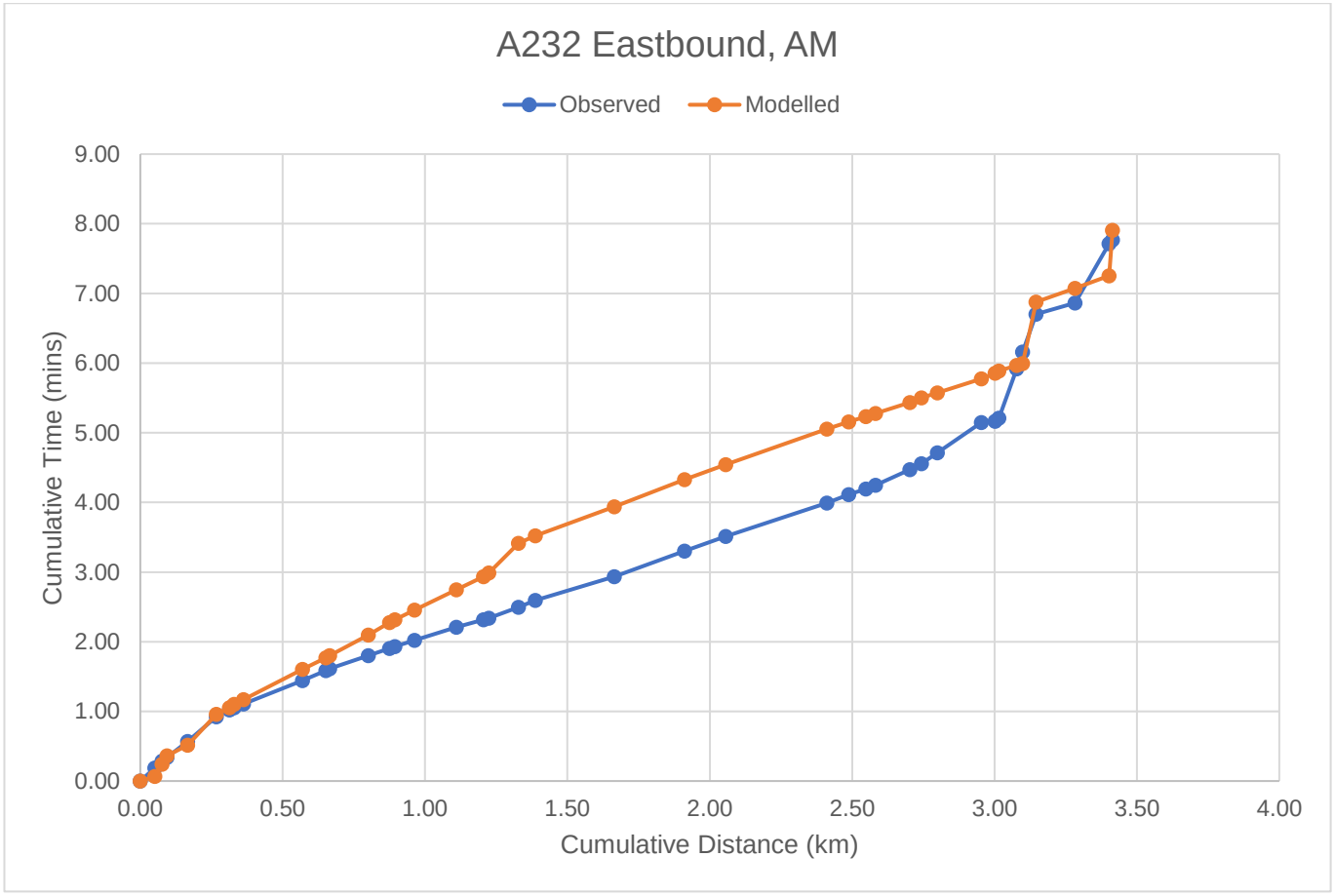

A2022 Westbound, AM
Observed
Modelled
Cumulative Time (mins)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Cumulative Distance (km)

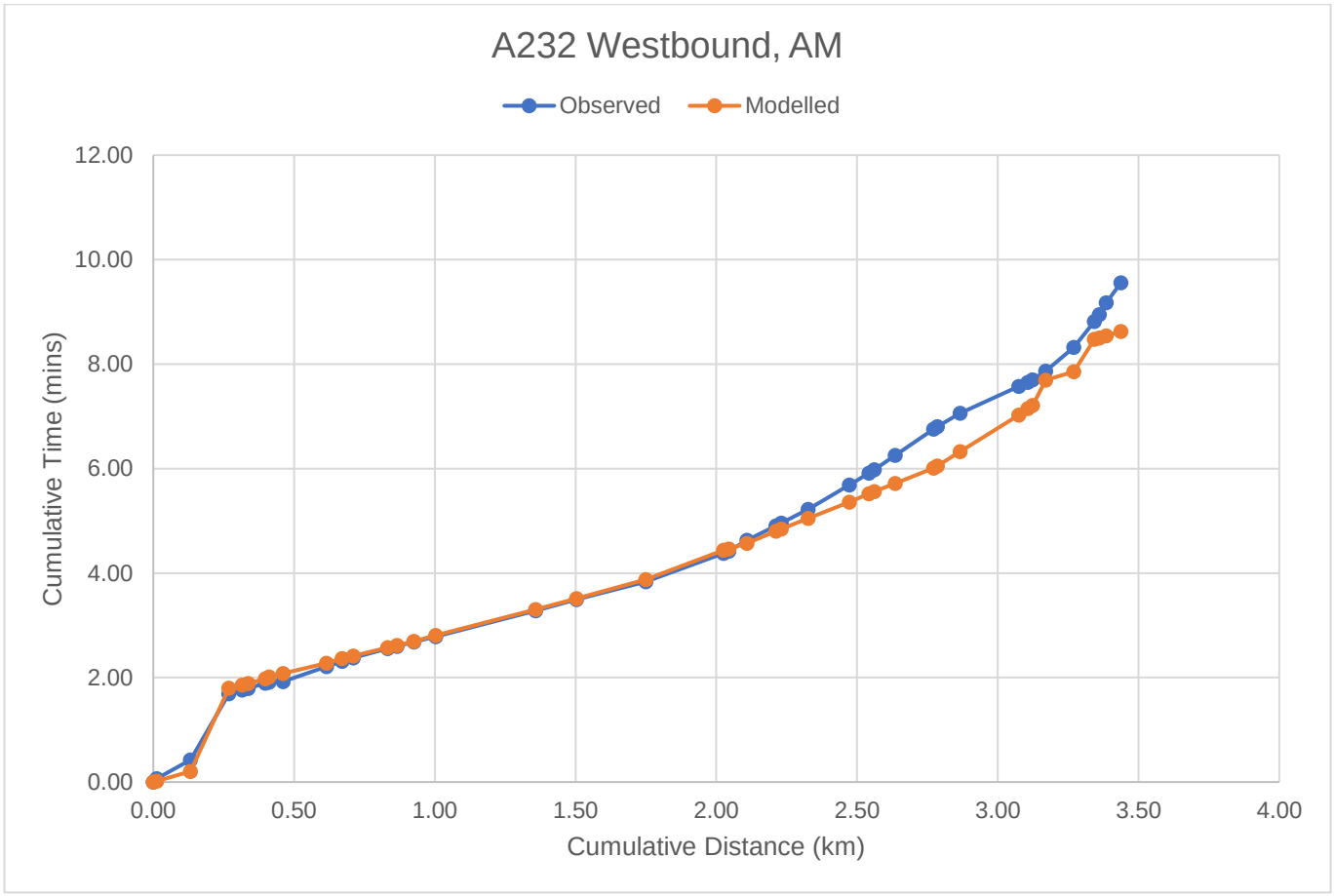

A3 Northbound, AM
Observed
Cumulative
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Cumulative Time (mins)
0.00
5.00
10.00
15.00
20.00
25.00
Cumulative Distance (km)

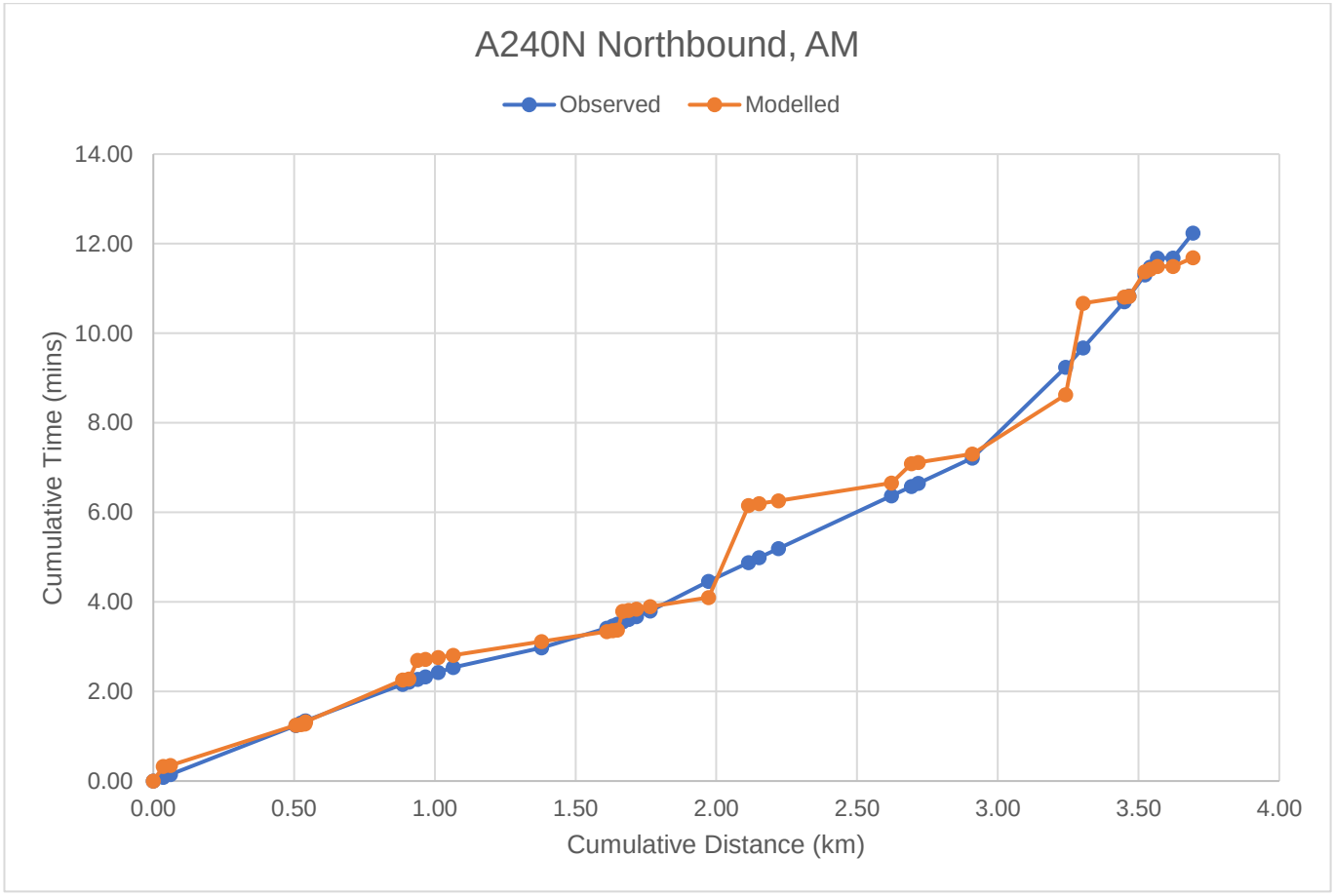

A3 Southbound, AM
Observed
Modelled
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Cumulative Time (mins)
0.00
5.00
10.00
15.00
20.00
25.00
Cumulative Distance (km)

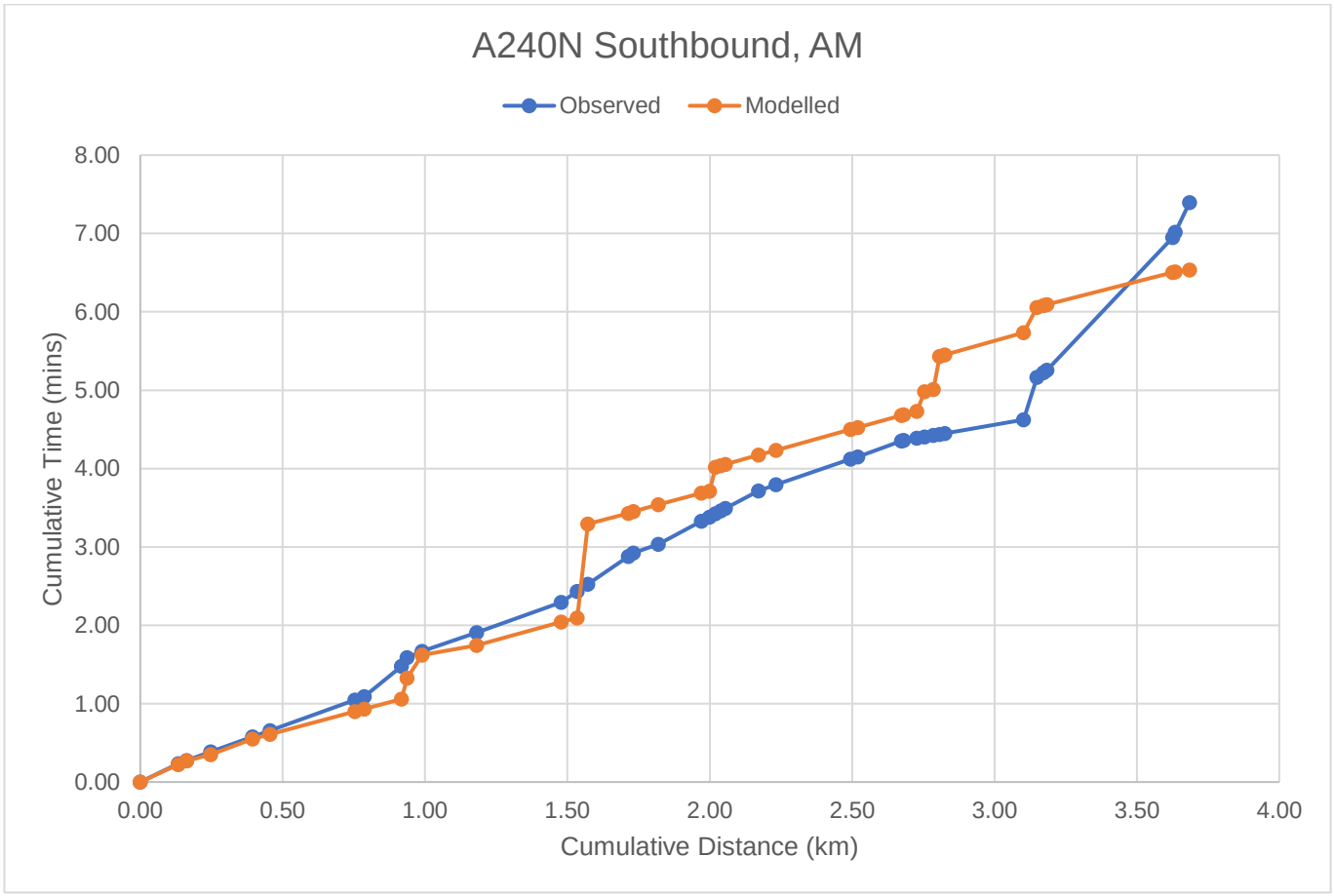

A24 Northbound, AM
Observed
Modelled
Cumulative Time (mins)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Cumulative Distance (km)

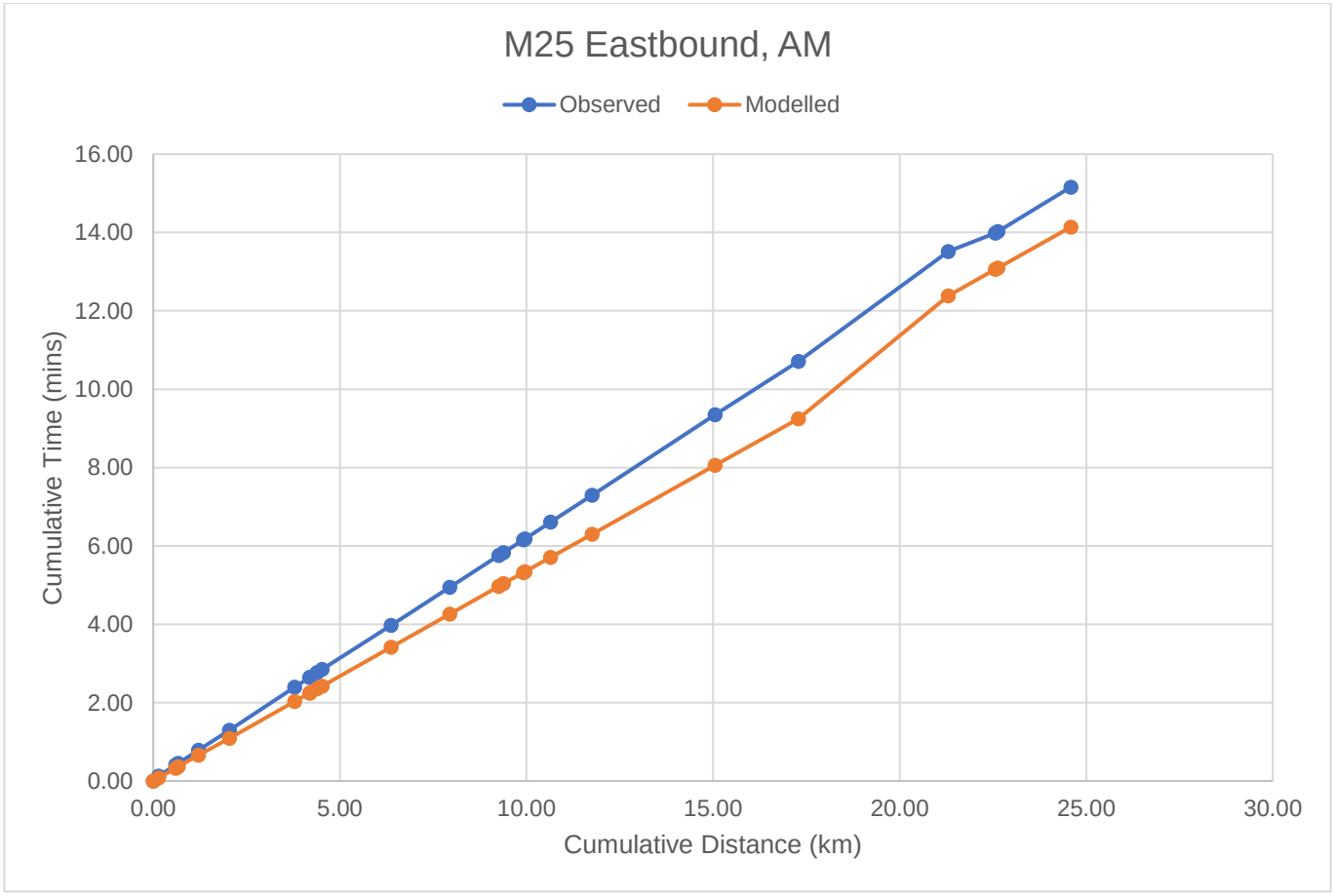

A24 Southbound, AM
Observed
Modelled
Cumulative Time (mins)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Cumulative Distance (km)

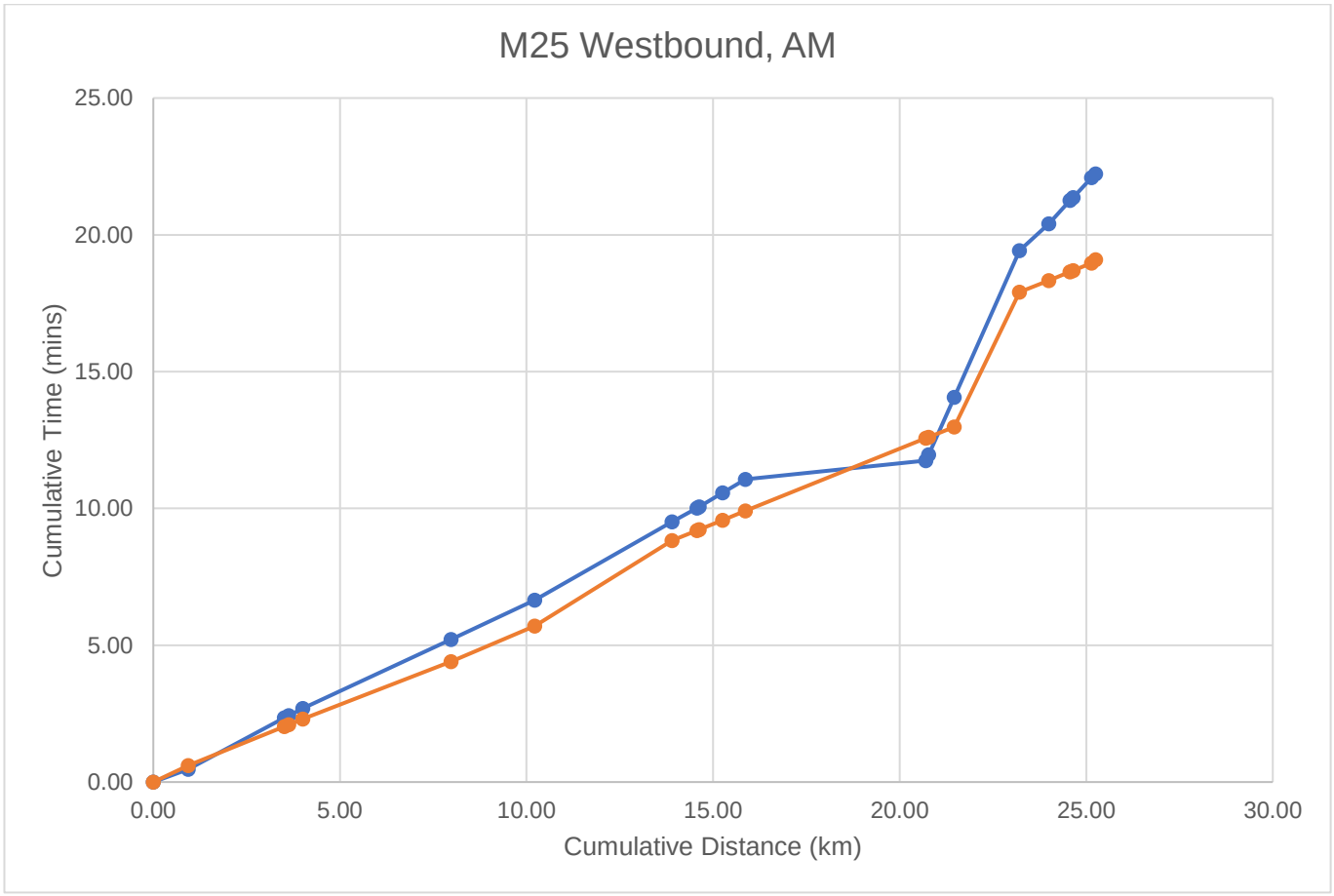

A232 Eastbound, AM
Observed
Modelled
Cumulative Time (mins)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)

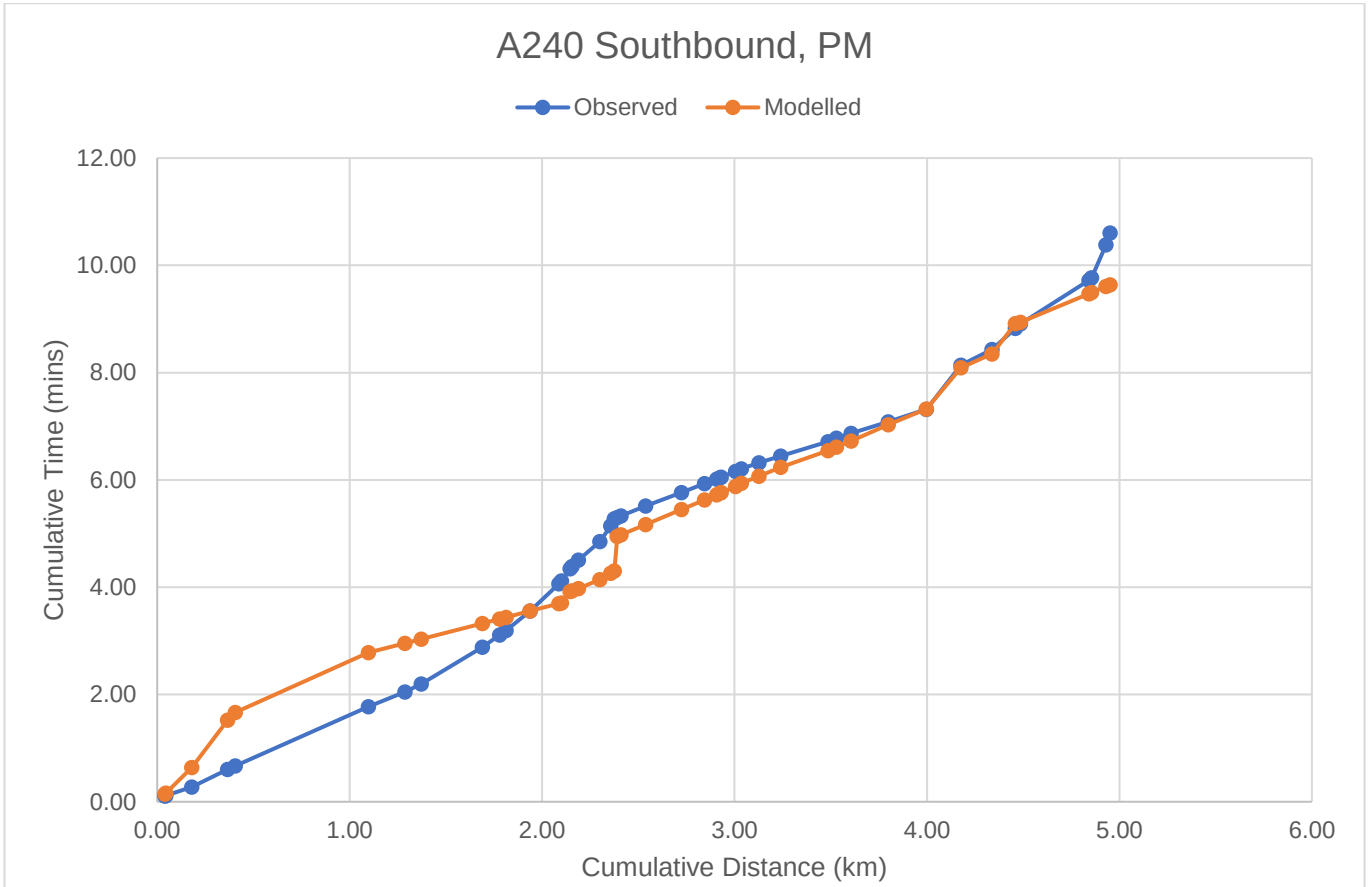

A232 Westbound, AM
Observed
Modelled
Cumulative Time (mins)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)

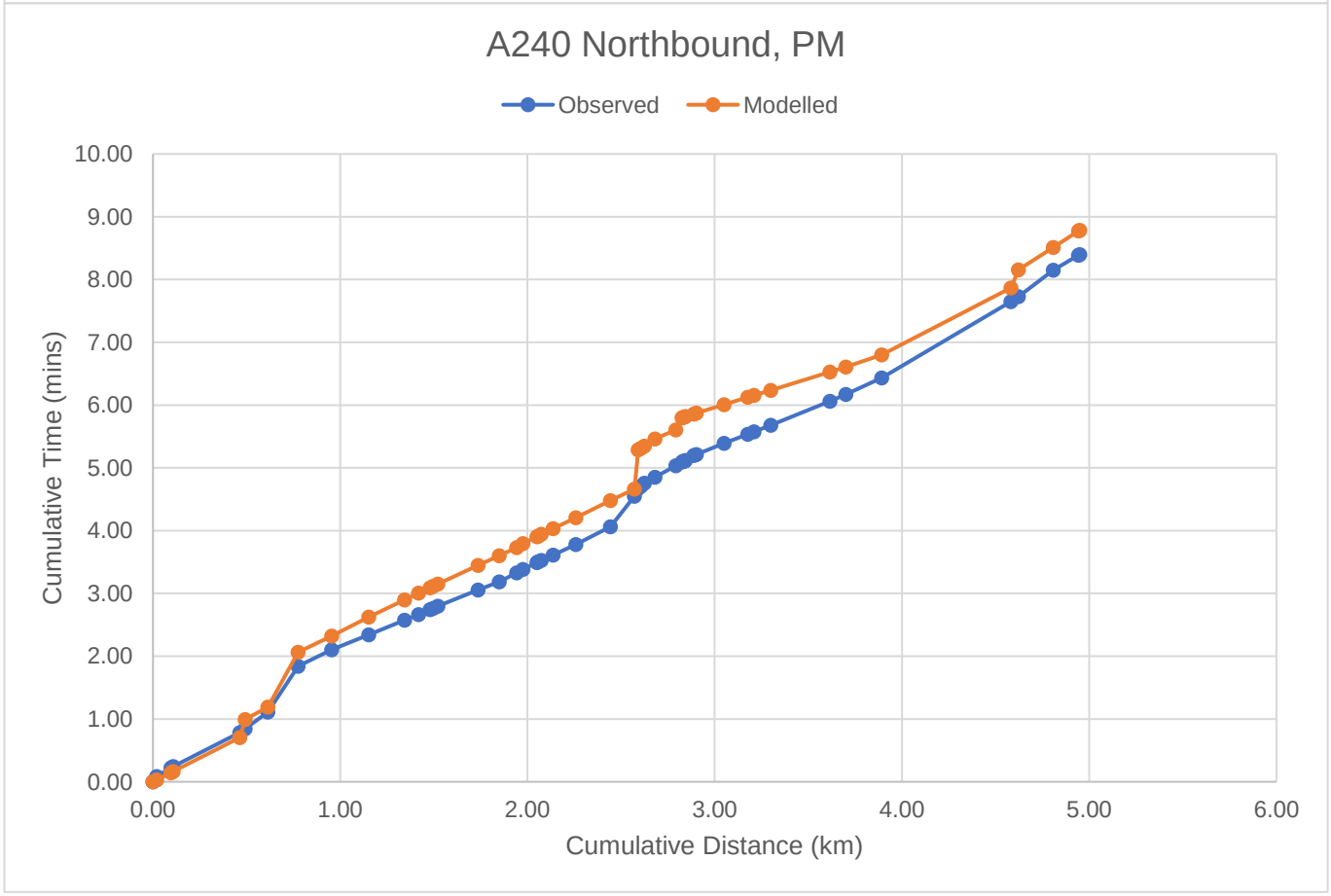

A240N Northbound, AM
Observed
Modelled
Cumulative Time (mins)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)

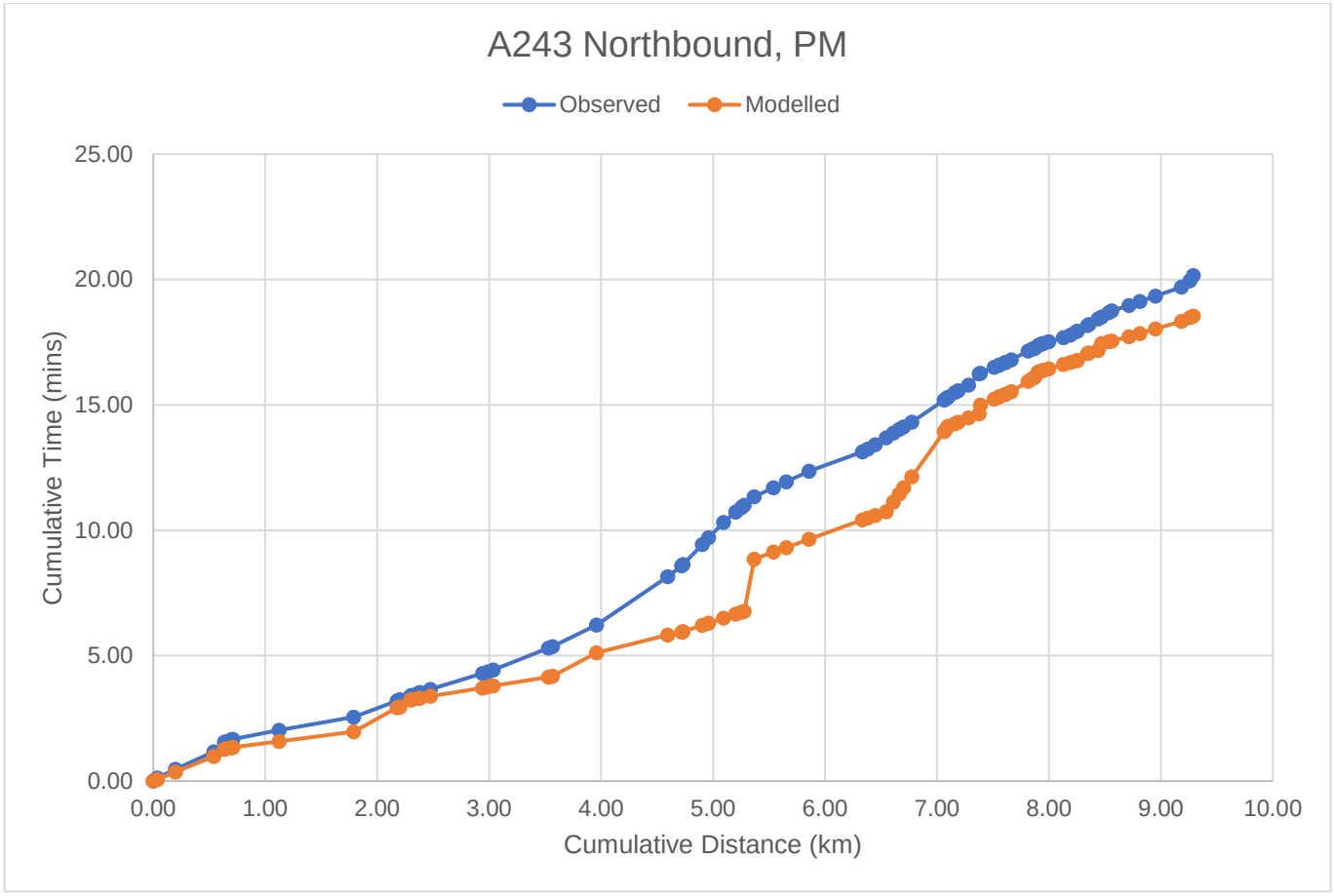

A240N Southbound, AM
Observed
Modelled
Cumulative Time (mins)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)

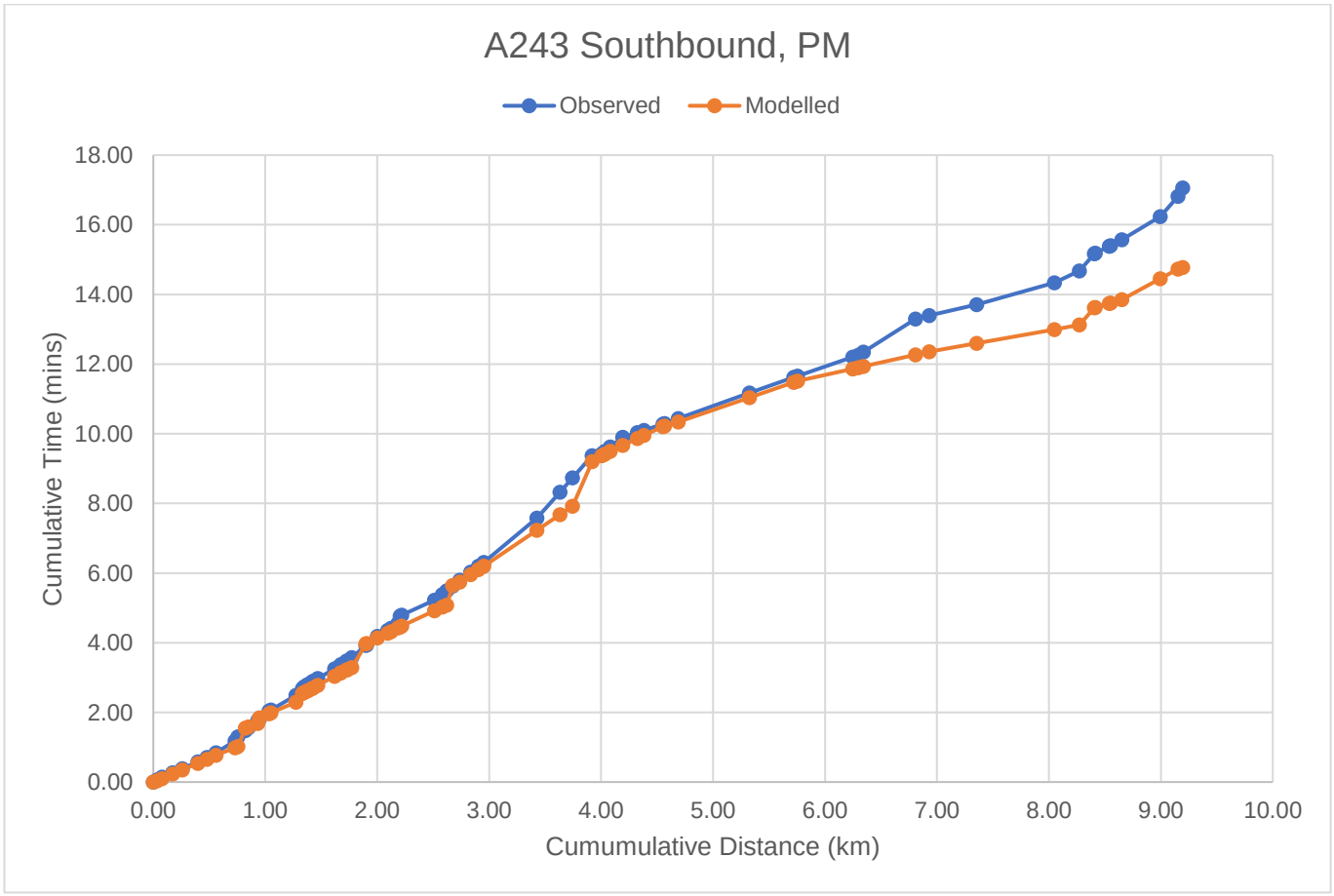

M25 Eastbound, AM
Observed
Modelled
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Cumulative Time (mins)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Cumulative Distance (km)

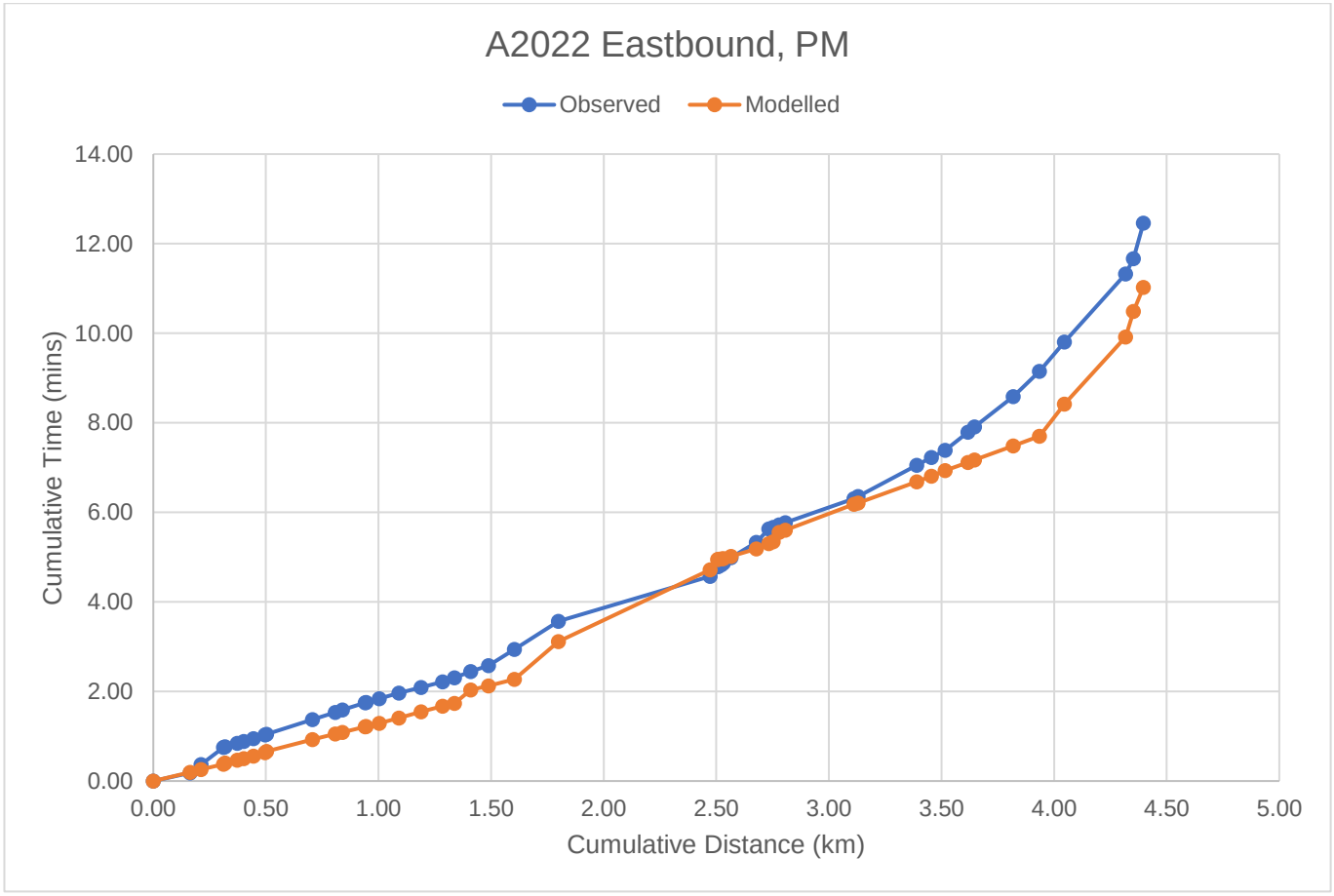

M25 Westbound, AM
25.00
20.00
15.00
10.00
5.00
0.00
Cumulative Time (mins)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Cumulative Distance (km)

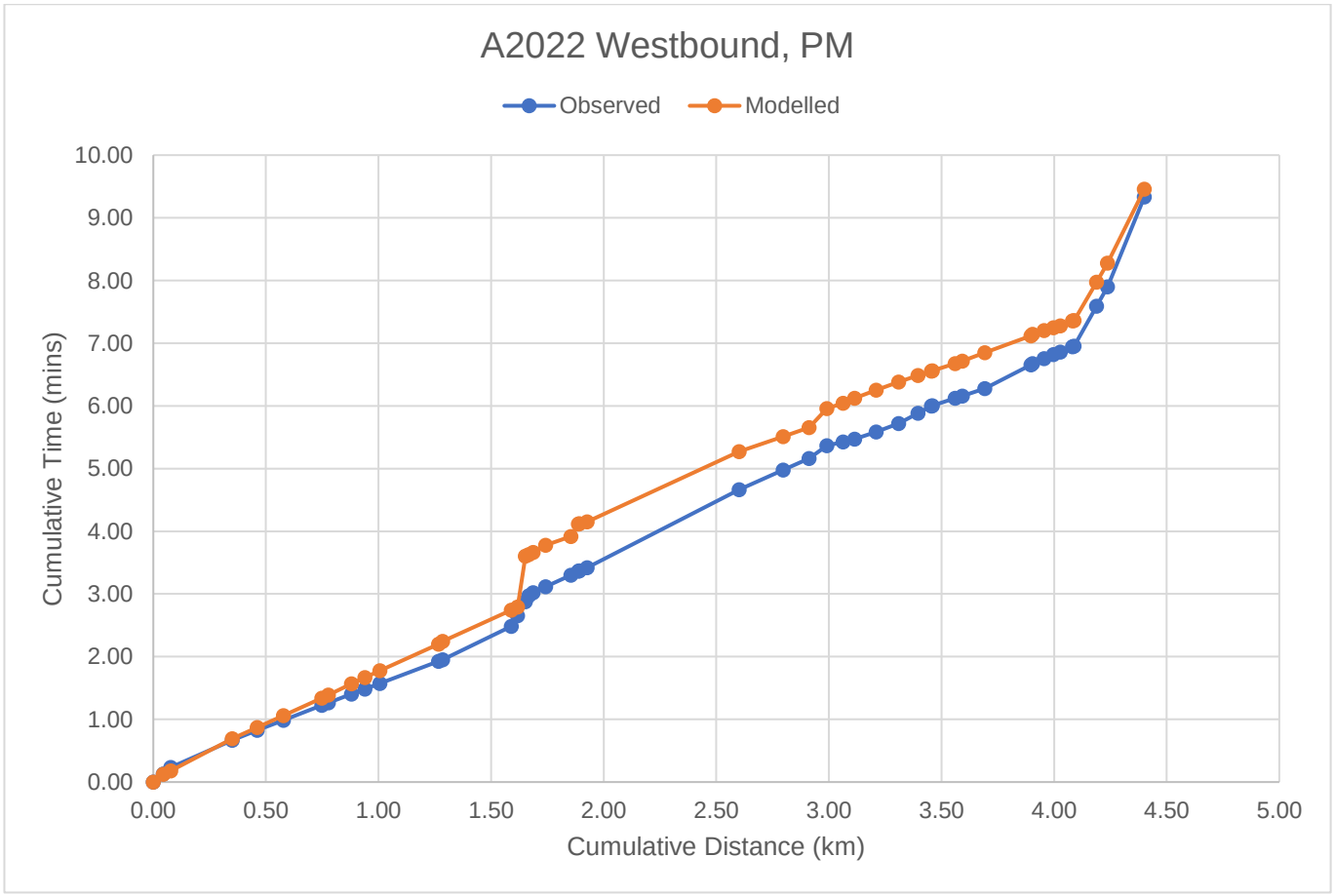

A240 Southbound, PM
Observed
Modelled
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Cumulative Time (mins)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Cumulative Distance (km)

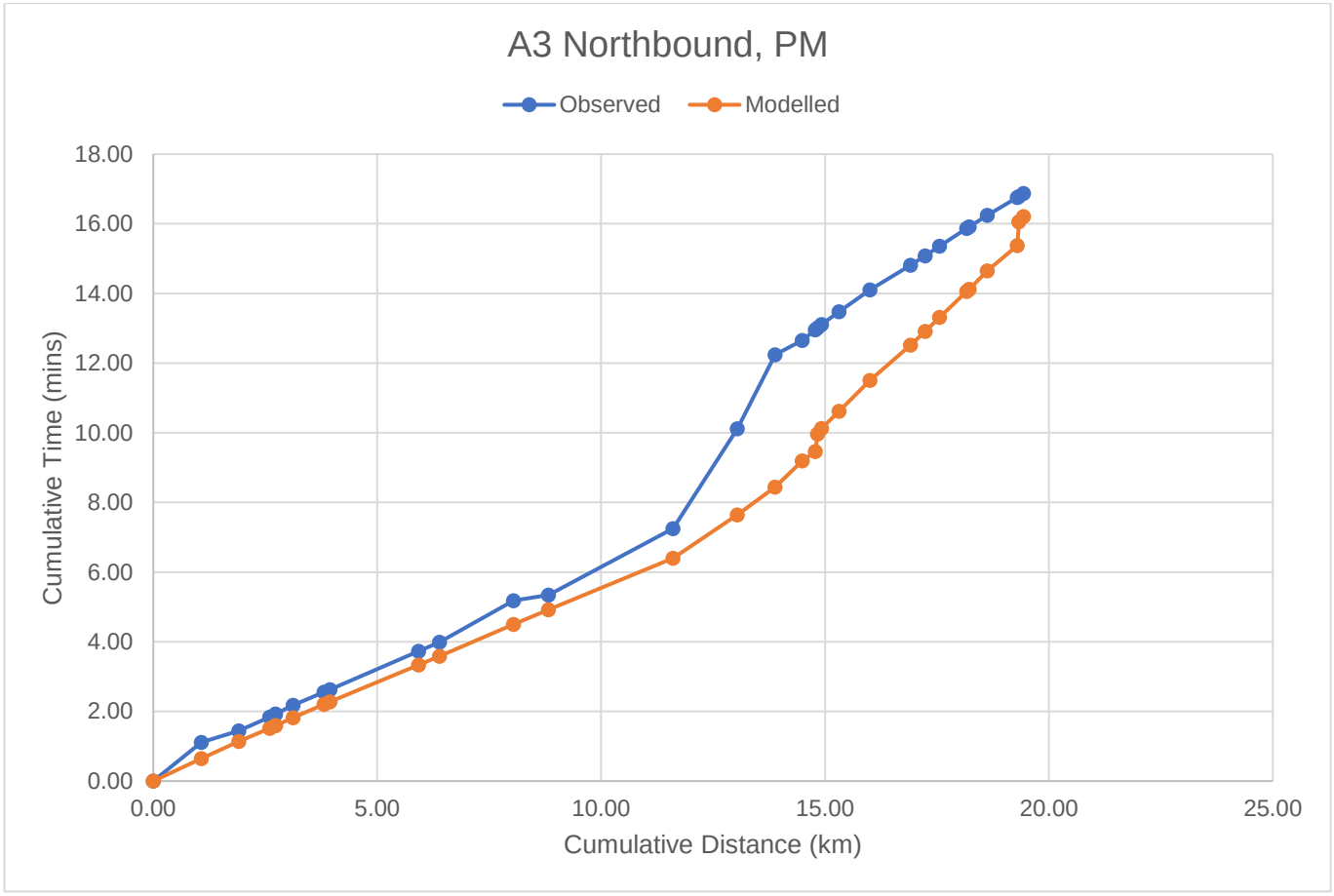

A240 Northbound, PM
Observed
Modelled
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Cumulative Time (mins)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Cumulative Distance (km)

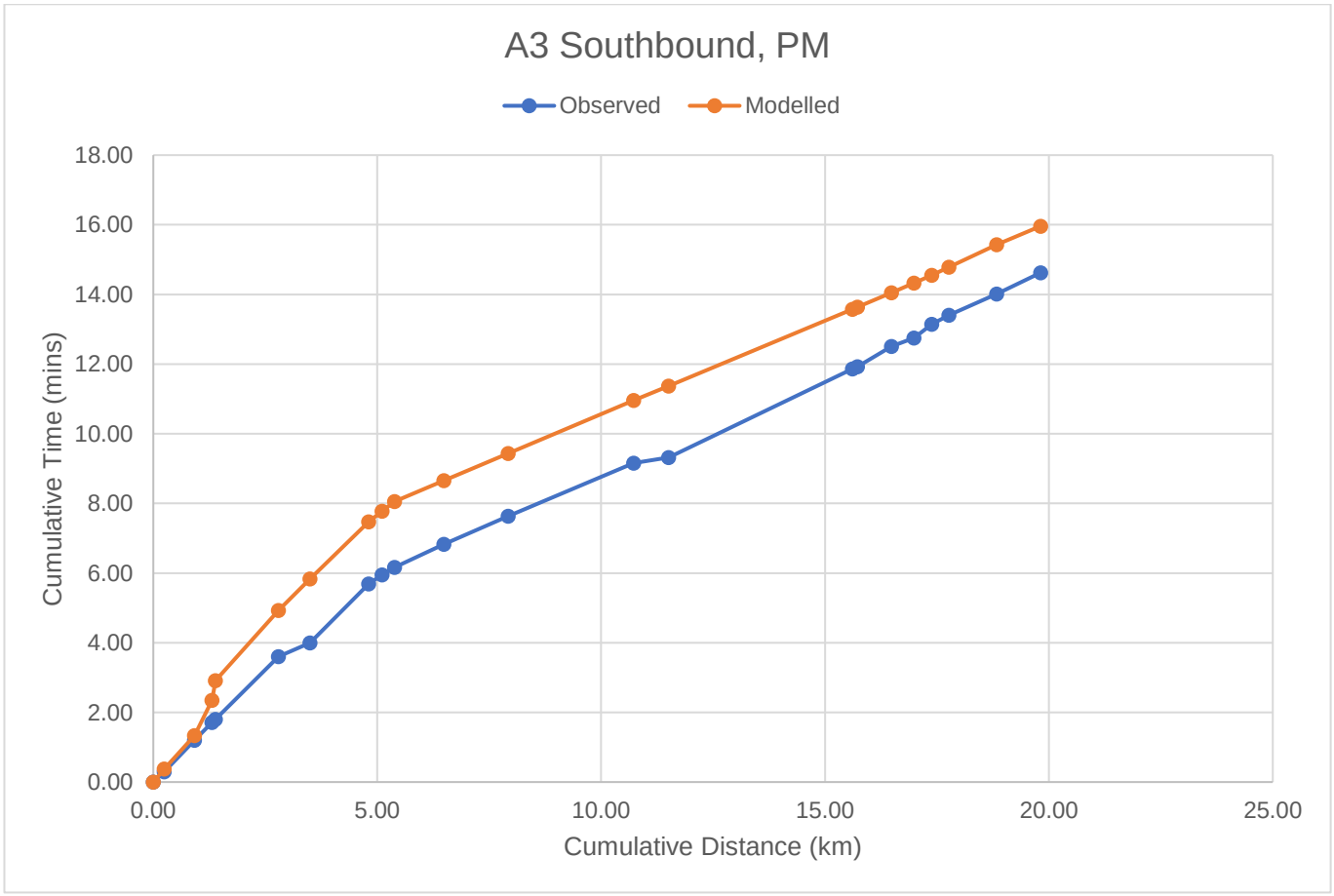

A243 Northbound, PM
Observed
Modelled
25.00
20.00
15.00
10.00
5.00
0.00
Cumulative Time (mins)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Cumulative Distance (km)

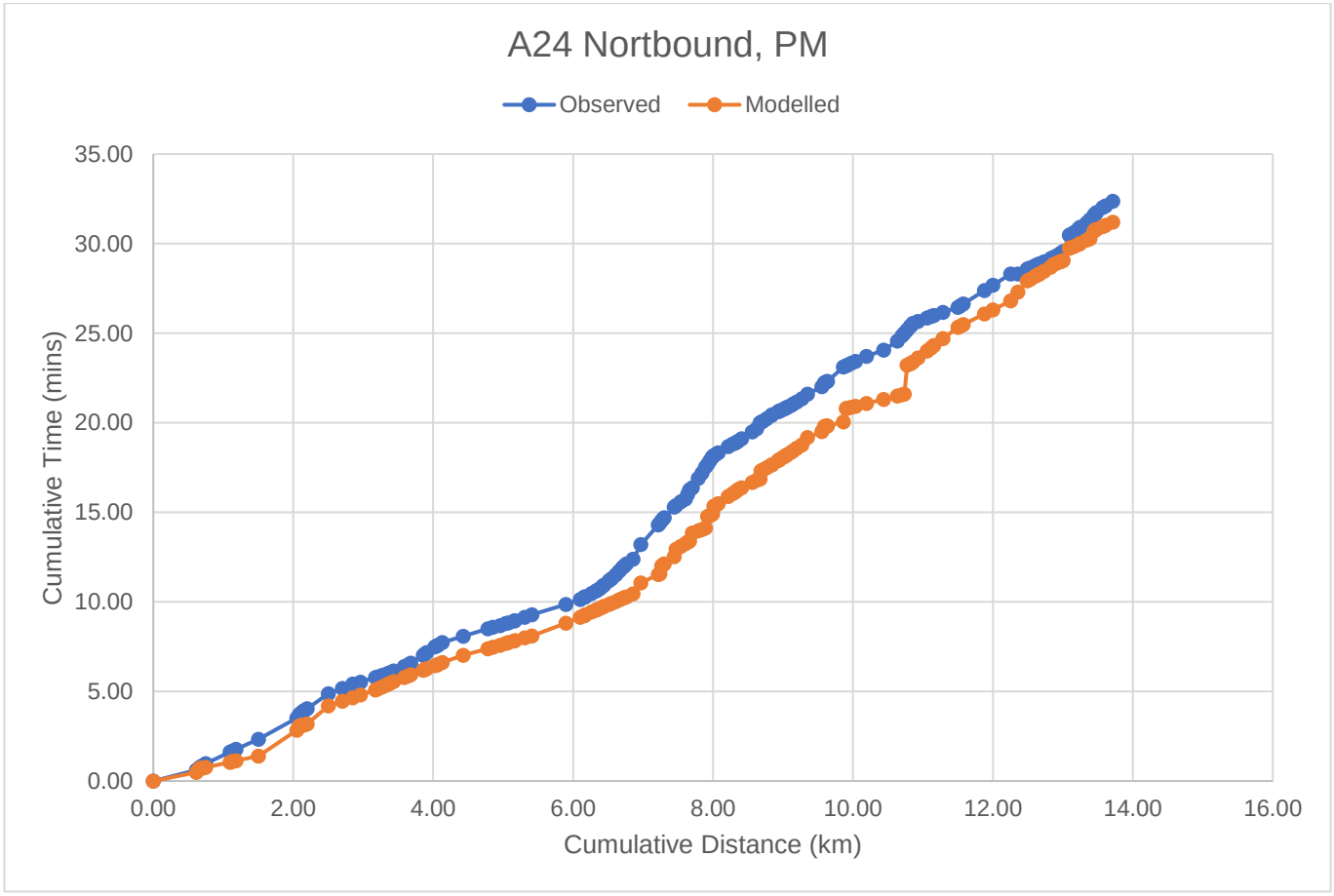

A243 Southbound, PM
Observed
Modelled
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Cumulative Time (mins)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Cumumulative Distance (km)

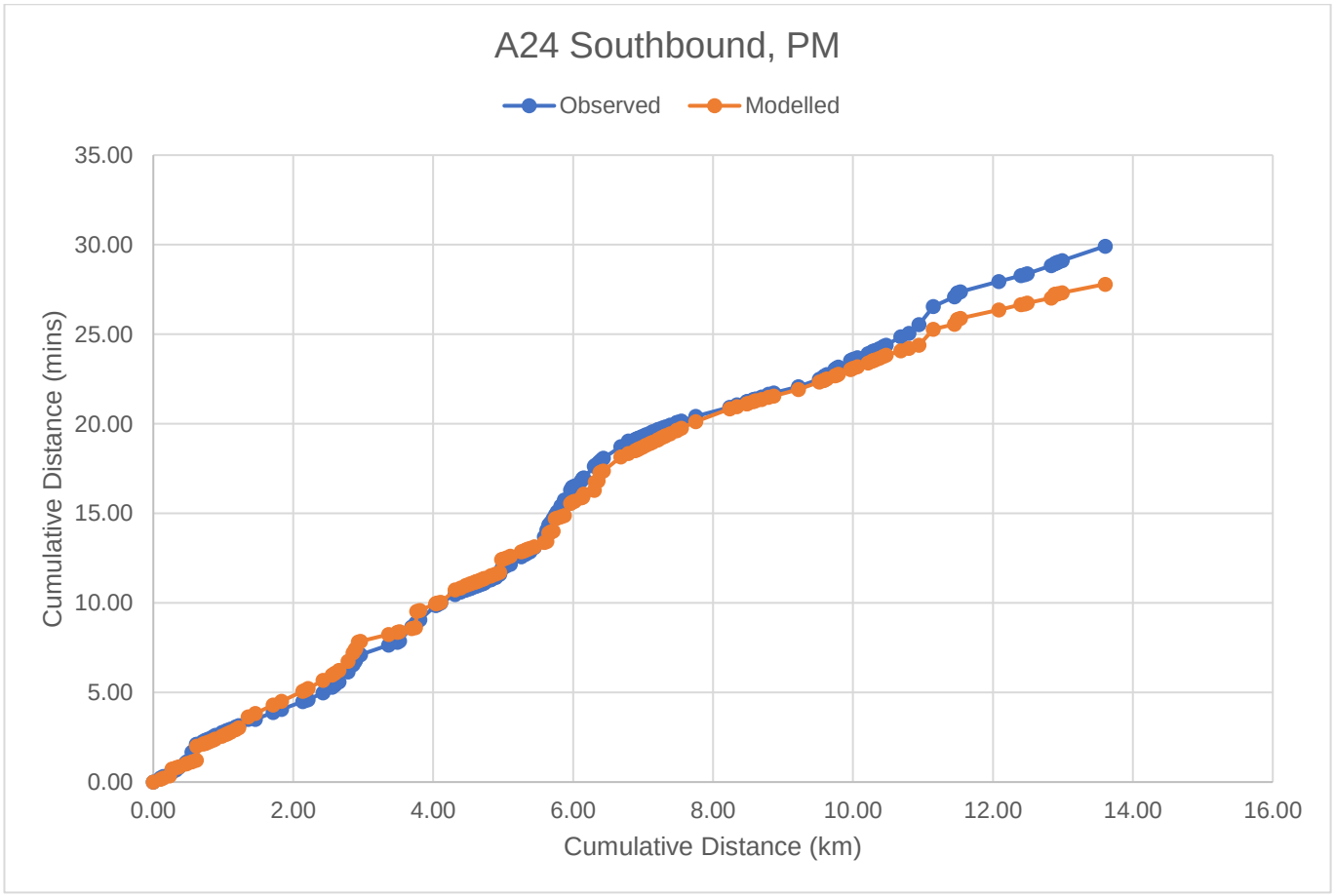

A2022 Eastbound, PM
Observed
Modelled
Cumulative Time (mins)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Cumulative Distance (km)

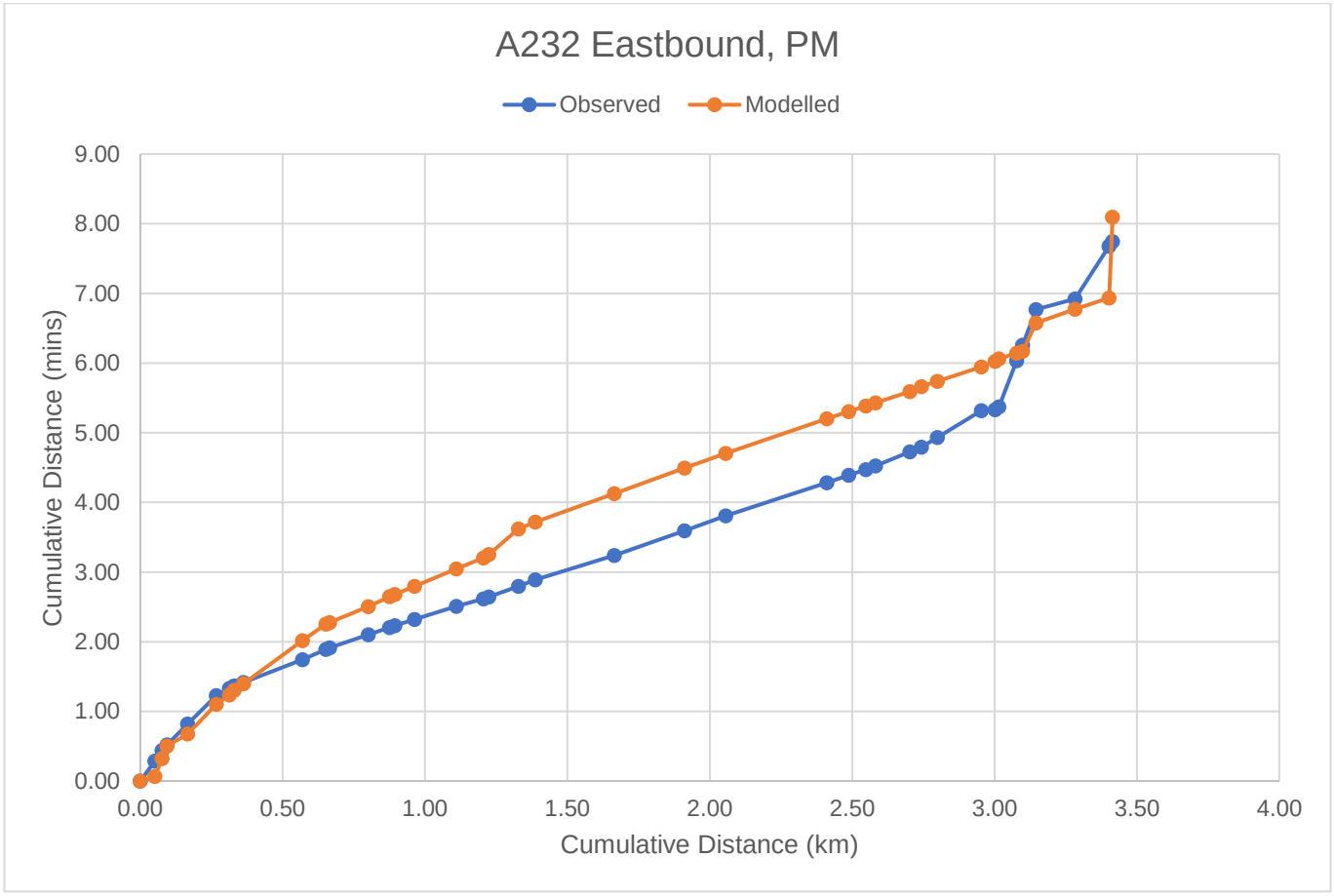

A2022 Westbound, PM
Observed
Modelled
Cumulative Time (mins)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Cumulative Distance (km)

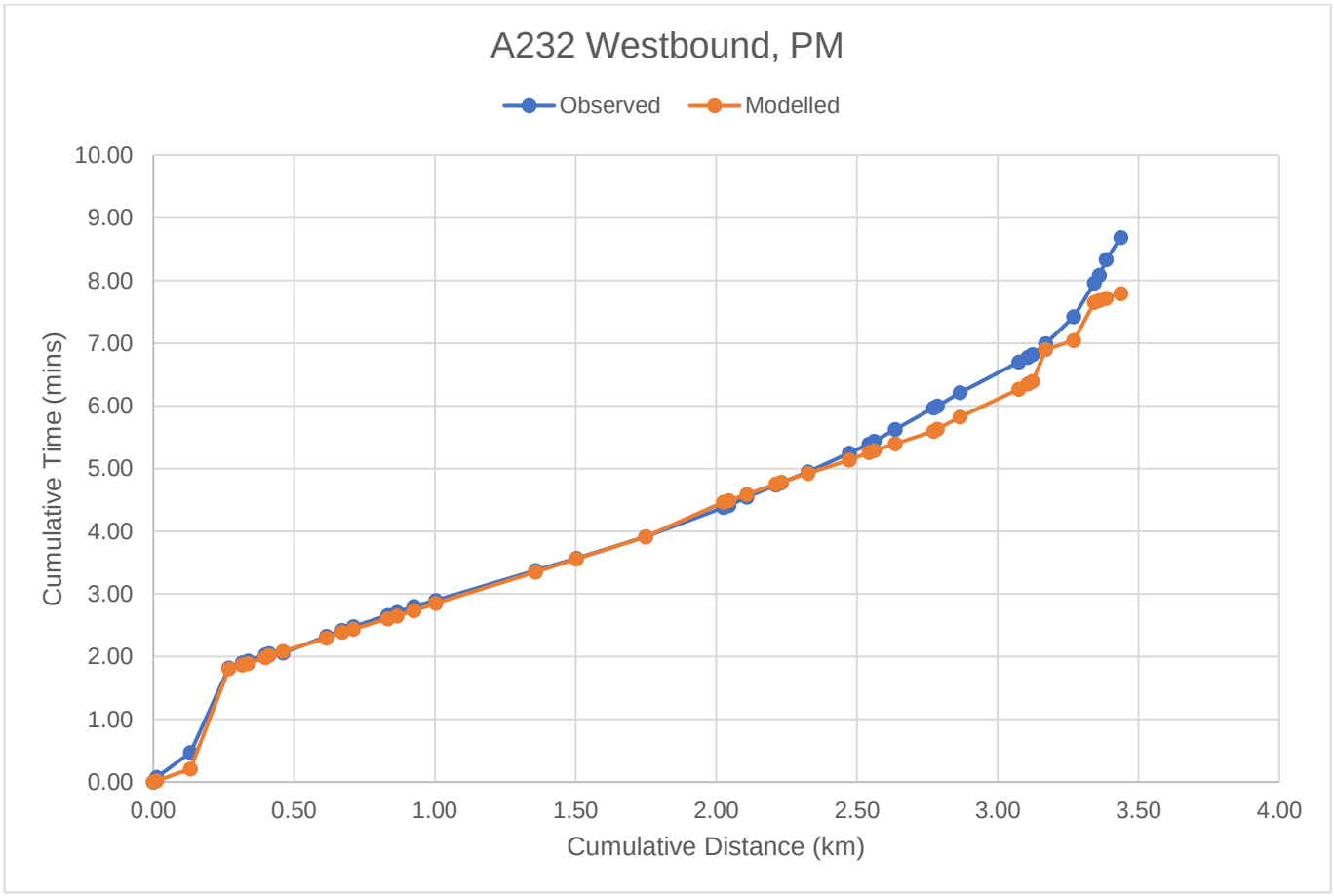

A3 Northbound, PM
Observed
Modelled
Cumulative Time (mins)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
5.00
10.00
15.00
20.00
25.00
Cumulative Distance (km)

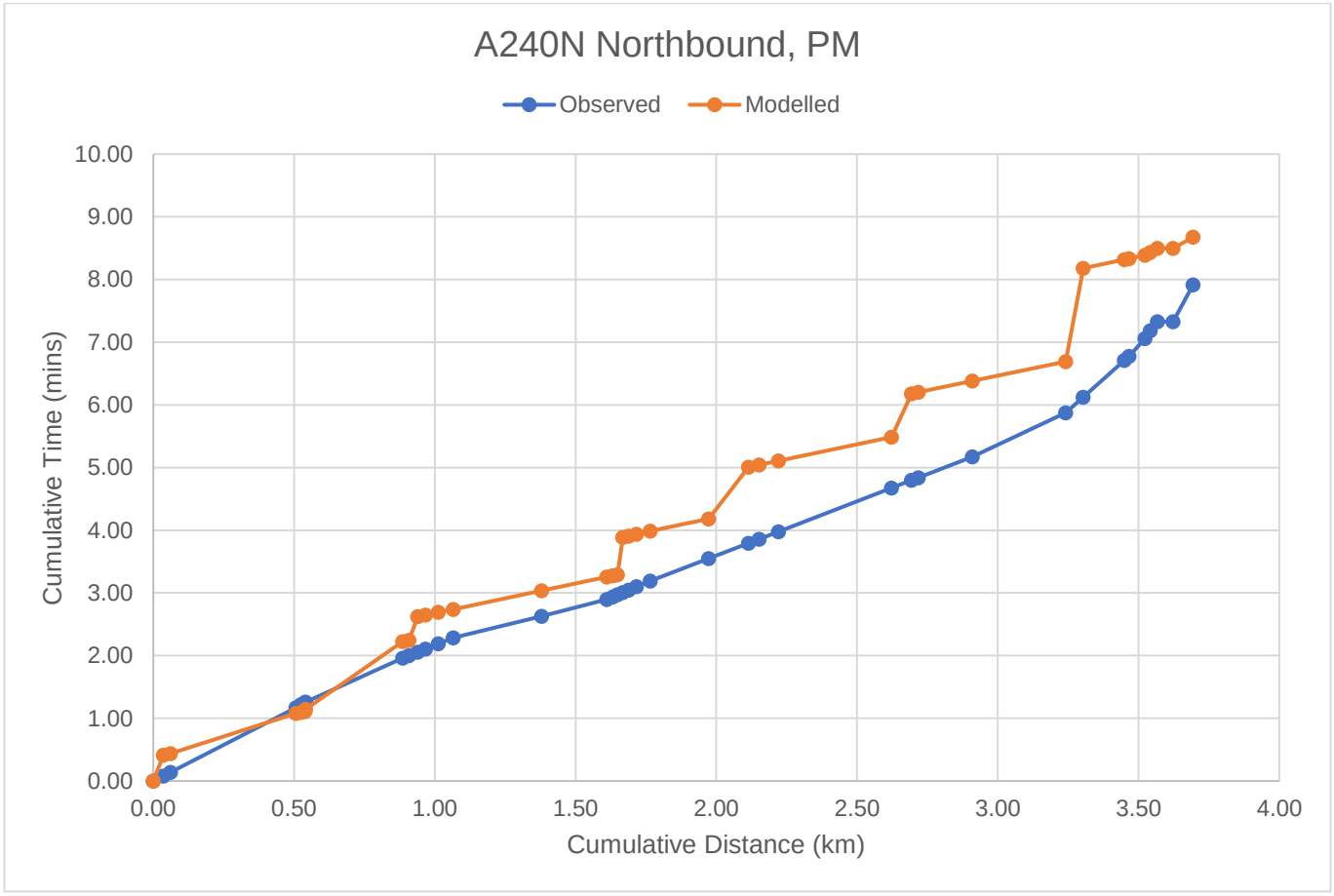

A3 Southbound, PM
Observed
Modelled
Cumulative Time (mins)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
5.00
10.00
15.00
20.00
25.00
Cumulative Distance (km)

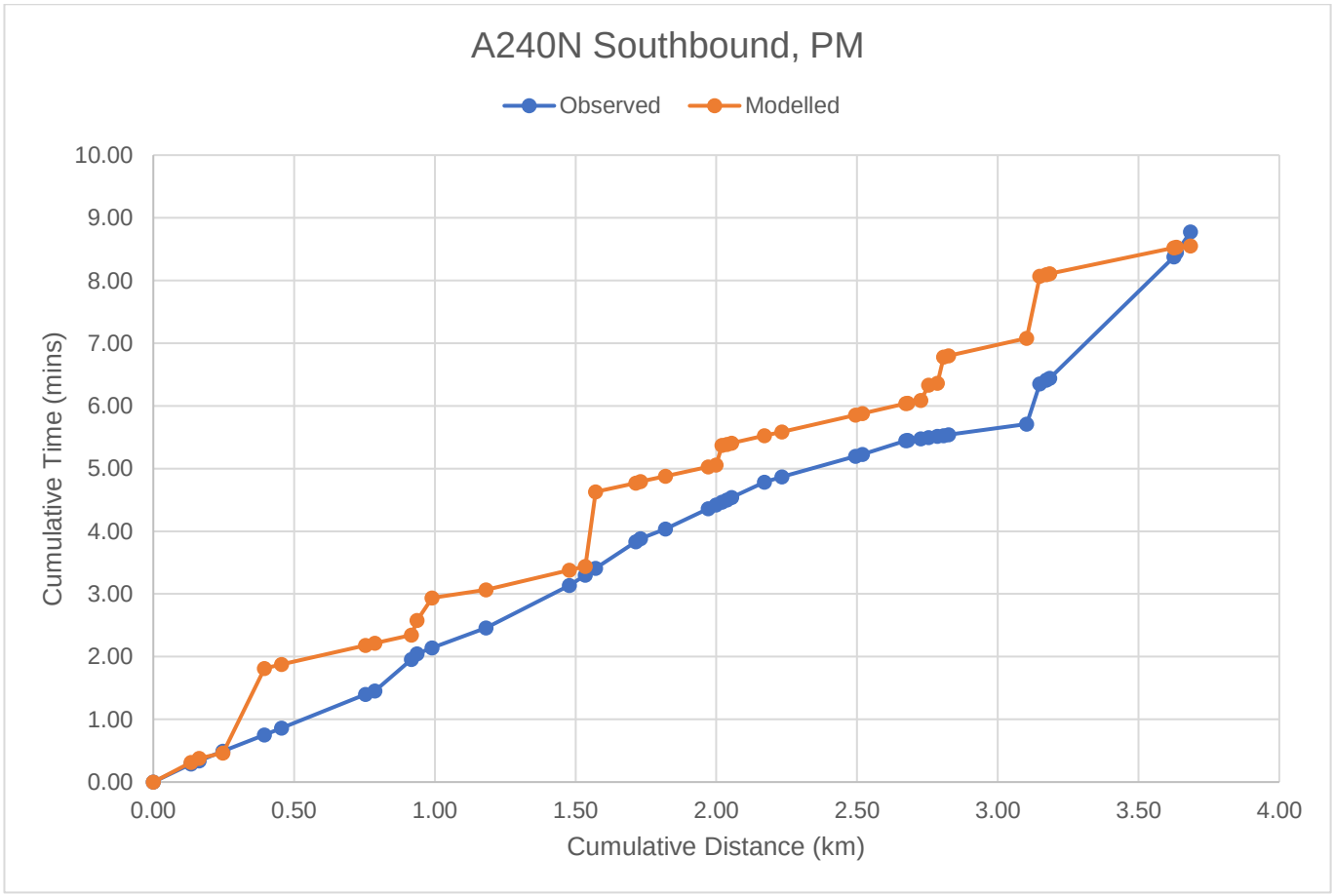

A24 Nortbound, PM
Observed
Modelled
Cumulative Time (mins)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Cumulative Distance (km)

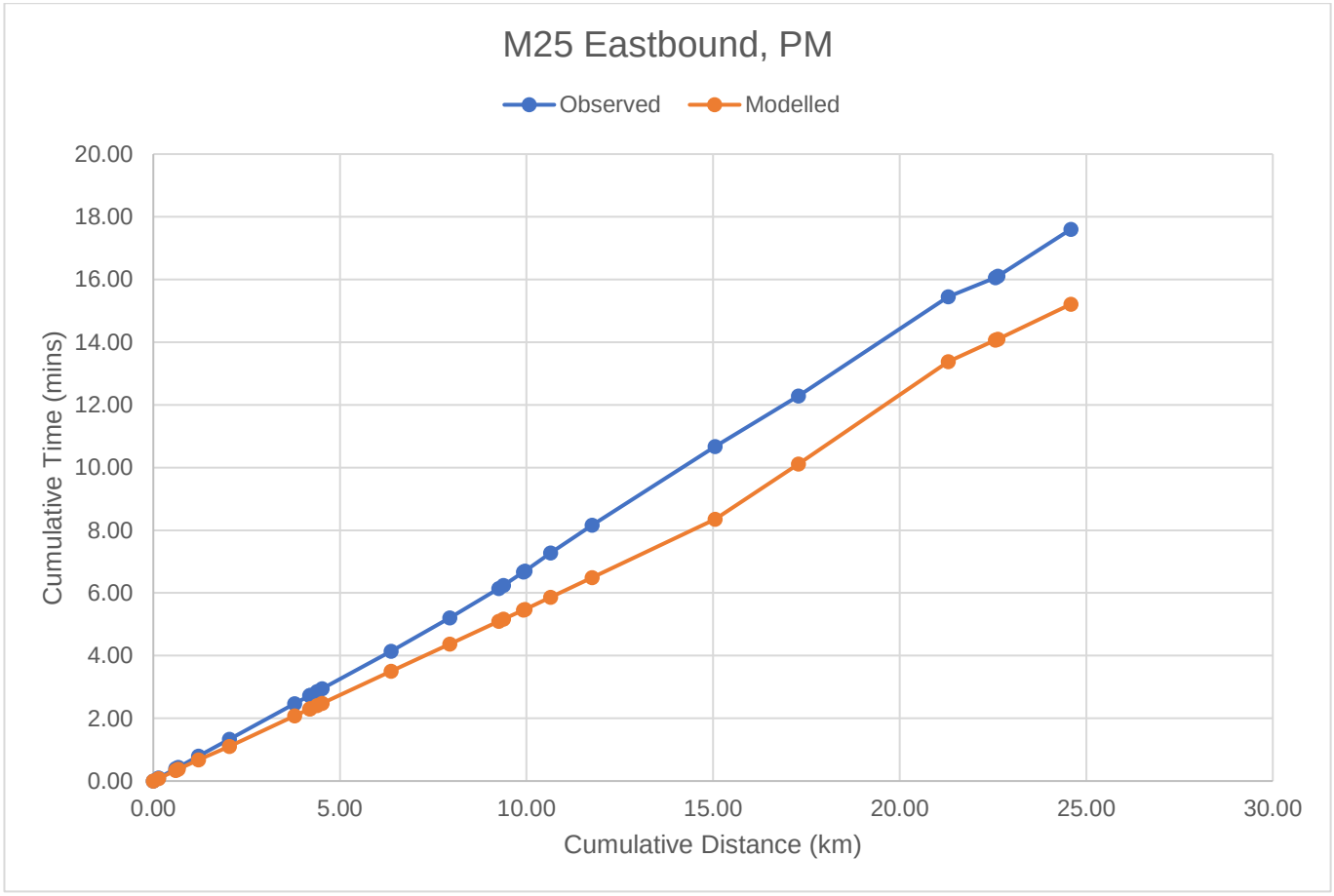

A24 Southbound, PM
Observed
Modelled
Cumulative Distance (mins)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Cumulative Distance (km)

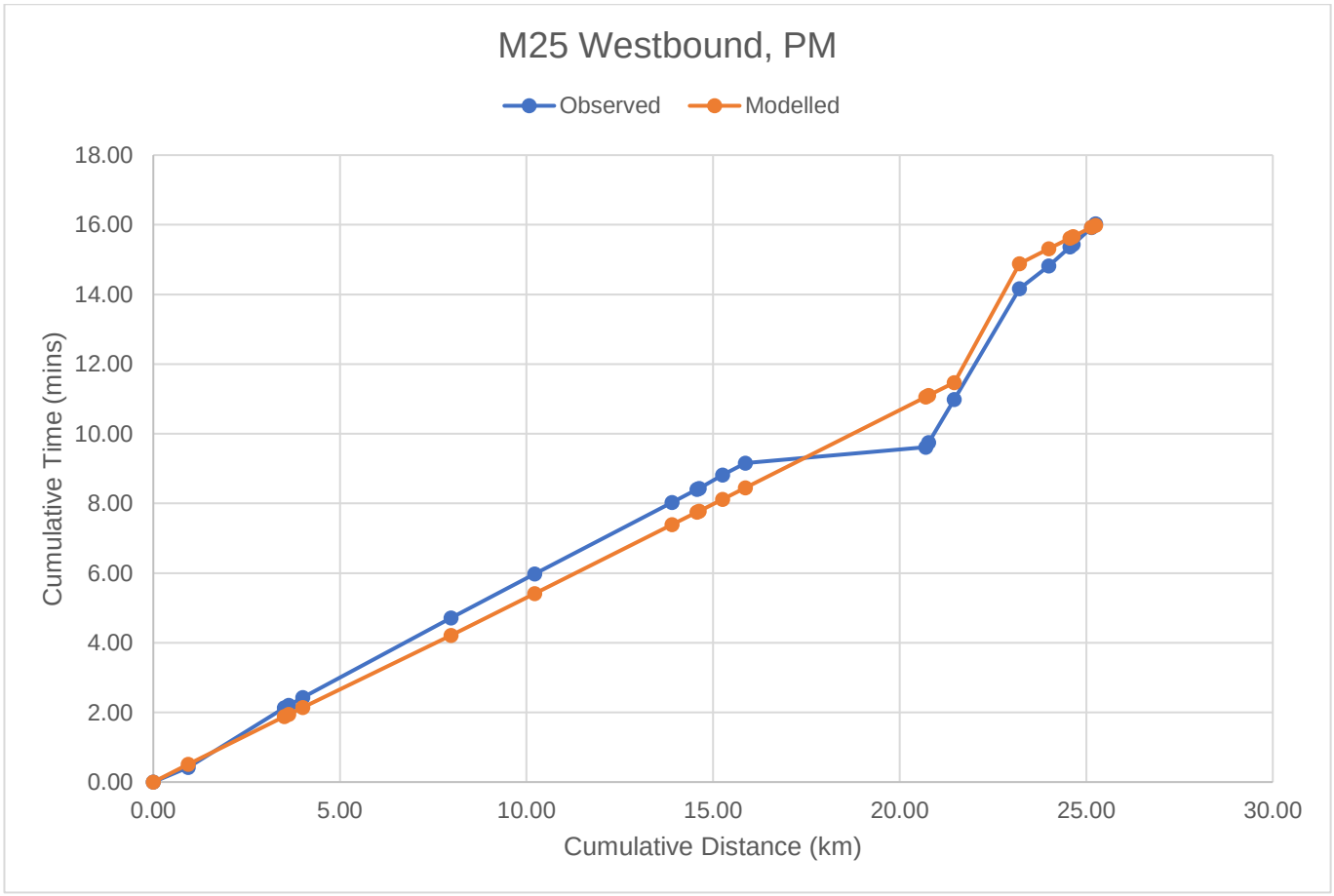

A232 Eastbound, PM
Observed
Modelled
Cumulative Distance (mins)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)


A232 Westbound, PM
Observed
Modelled
Cumulative Time (mins)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)


A240N Northbound, PM
Observed
Modelled
Cumulative Time (mins)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)


A240N Southbound, PM
Observed
Modelled
Cumulative Time (mins)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Cumulative Distance (km)


M25 Eastbound, PM
Observed
Modelled
Cumulative Time (mins)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Cumulative Distance (km)


M25 Westbound, PM
Observed
Modelled
Cumulative Time (mins)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Cumulative Distance (km)