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Bracknell Multi-Modal Transport Model
Model Development and Validation Report
Bracknell Forest Council

June 2011

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft	Draft following Client comment		
Date	31 May 2011	16 June 2011		
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Project number	11570343			
File reference	N:\Bracknell Forest BMMTM\TEXT\REPORTS\Wokingham area model update\LMVR update\Bracknell Multi Modal Model MDVR (Wokingham update)_v3.docx			

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Executive Summary

In 2009 WSP produced a multi modal traffic model of the Bracknell Forest administrative areas and wider strategic area, known as the Bracknell Transport Model (BTM), on behalf of Bracknell Forest Council (BFC). The model, validated to a 2007 Base Year, was designed to be used to inform the assessment of the Local Development Framework (LDF) Core Strategy, to assess individual development proposals, highway infrastructure schemes and assist BFC with obtaining central government funding.

WSP has recently been commissioned to undertake an update of the BTM providing a greater level of detail within the Wokingham Borough Council (WBC) area. This has involved 'infilling' the highway network and disaggregating the zones within the Wokingham area, to a level of detail sufficient to represent proposed development locations in Wokingham.

The BTM has been updated to include greater detail in the Wokingham area in terms of highway network and zone structure, and has been revalidated to the same Base Year 2007. The model has been developed in accordance with DfT and WebTAG guidance. The strategic transport network is modelled across the entire study area with detailed representation of traffic and public transport service level within the BFC.

The Base Year model has been calibrated and validated using observed data from a range of surveys, including road side interviews (RSIs), automatic traffic counts (ATCs), manual classified traffic counts (MCCs), journey time surveys (for both car and bus routes) and bus and rail patronage surveys. RSI samples were used to create Car/LGV (Light Goods Vehicles) and HGV (Heavy Goods Vehicles) initial 'prior' matrices, which were then factored up to peak hour proportions (derived from traffic counts). After assigning the prior matrices to the network a matrix-estimation procedure was performed to calibrate the flows. This calibration process produced Car/LGV and HGV matrices more closely-matched to observed flows which, when assigned to the network, were then validated against the remaining traffic count data. The bus and rail matrices were developed using origin-destination survey data factored up to observed peak hour boarding and alighting numbers.

The Base Year demand model uses population data from the 2001 Census and National Travel Survey (NTS). A number of factors that influence demand such as value of time (VOT), vehicle operating costs (VOC), parking charges (applied to particular zones) and public transport fares (distance-based) have been incorporated in the demand model based on 2007 values. These are all subject to change in each forecast year model.

The assignment model results show a good level of calibration and validation which satisfies DMRB[1] requirements. The demand model has been calibrated to the observed mode split and trip distribution data using parameters which fall within the WebTAG specified range. Sensitivity tests carried out show the model to be reasonably close to the WebTAG recommended values of elasticity for car journey time and public transport fare, although is fairly inelastic in relation to fuel cost. The model can be considered a sound basis for the assessment of the Core Strategy proposals and other local developments or highway schemes.

[1] Design Manual for Roads and Bridges Volume 12a, Chapter 4 Traffic Appraisal in Urban Areas

1 Introduction

1.1 INTRODUCTION

1.1.1 WSP currently maintain and use the Bracknell VISUM multi-modal model, known as the BTM, as originally developed for Bracknell Forest Council (BFC). This traffic model was developed using a 2007 traffic base, for an AM peak and PM peak period, and allowed the assessment of transport proposals associated with the Local Development Framework (LDF) process.

1.1.2 As part of the current highway and transport framework contract WSP has performed an update to the BTM to include more detailed coding of the Wokingham Borough Council (WBC) area. This has involved an 'infilling' of highway network to a level of detail suitable for handling zone connections for the increased level of zoning detail in this area. The model has been revalidated to the same Base Year (2007) to provide an increased level of accuracy within the Bracknell and Wokingham areas, and to enable more accurate forecasting of development in Wokingham.

1.1.3 This report builds on the original 2007 Base model validation report ("Bracknell Multi Modal Model MDVR_Final BFC comments", October 2009), incorporating the development, calibration and validation of the updated BTM in order for it to serve as a suitable platform for the forecasting of future traffic conditions and the robust appraisal of improvement options.

1.1.4 Previous forecasting has been carried out using the original model to assess the Core Strategy proposals as well as the impacts of SADPD sites. The updated 2007 Base Year BTM will be used in the first instance to assess the impacts of the 2026 Core Strategy and the proposed SADPD sites, and to inform the development of a package of mitigation measures to be put together by BFC.

1.2 REPORT PURPOSE & STRUCTURE

1.2.1 The purpose of this report is to summarise the work carried out by WSP in the update of the BTM and to demonstrate that the model is a fair and accurate representation of existing (2007) traffic conditions in the BFC area, making it suitable for option testing of future year scenarios. This report is structured as follows:

- Section 2 – provides model overview
- Section 3 – provides details of the model networks and zone system
- Section 4 – provides a summary of the data collection
- Section 5 – provides details of the development of the observed matrices
- Section 6 – summarises the calibration of assignment model
- Section 7 – summarises the validation of the assignment model
- Section 8 – contains details of the calculation of generalised costs of travel
- Section 9 – details the trip generation stage
- Section 10 – describes the mode split and distribution stages and other demand model development matters
- Section 11 – concludes the work carried out

2 Model Overview

2.1 INTRODUCTION

2.1.1 The BTM is designed to enable future land -use planning and transport policy initiatives to be assessed in an integrated fashion. This integration aims to take account of:

- The impacts of economic and demographic trends and of land-use change on the spatial and modal pattern of the demand for passenger transport
- The impacts of changes in transport costs and characteristics on the costs and spatial patterns of location of employment and households

2.1.2 The modelling specified is wide ranging, in that it includes all modes of travel and has the ability to assess a wider set of short-term and longer-term behavioural responses to policy initiatives than is the norm in more traditional models.

2.1.3 This model represents, at the strategic level, the main long-distance transport routes in the entire study area. There is a detailed representation of traffic and public transport services within the BFC area, as well as a more detailed highway network within the Wokingham Borough area. As a result the key abilities of the model will ensure that it is able to undertake the following areas of assessment:

- To be able to assess the transport impacts (public transport and private vehicle) of developments of more than 100 houses or 5000m^2
- Review the impact of development plans on the strategic road network (M4, M3 and A329 M)
- Forecast changes in demand as a result of changes in the socio-economic characteristics of the area
- Provide output in a user-friendly GIS-based format
- Allow forecasting of demand by all modes for a period in line with current Local Development Framework timescales
- Assess the impacts of key policy objectives, for example car park charges and public transport fares
- To identify current and future congestion hotspots and assist in the modelling of network management scenarios assisting the Local Transport Authority (LTA) to fulfil its requirements as required by the Traffic Management Act 2004

2.1.4 The model has been developed with due cognisance of the Variable Demand Modelling (VaDMA) and WebTAG guidance from DfT. WebTAG is web-based multimodal guidance from DfT on appraising transport projects and proposals. This guidance is used in this instance on model form and development to accommodate major public transport improvements.

2.1.5 The main requirement is that the transport model should be built on a behavioural basis that determines the travel demand from the underlying characteristics of the transport supply and the characteristics of the travellers in the area. In addition the model requires a detailed representation of the highway network in and around the centre of Bracknell to accurately reflect current and changing levels of congestion. A further important feature of the model is the ability to take account of the external influences of other growth areas such as Milton Keynes, Reading, outer London and the Thames Valley.

2.1.6 To meet these requirements, the key features of the model are therefore:

- The input of detailed planning / land use assumptions The generation of trips by all modes of travel for the different segments of the population
- The choice of mode of travel
- The distribution of the different trip types from the origin of a trip to the various destinations available
- Sufficient spatial detail to represent alternative configurations of the transport supply in the town centre
- The choice of route of travel – primarily for car trips, taking into account congestion and junction delays
- The influence of the external areas such as Milton Keynes, outer London and the Thames Valley on the trips to and from Bracknell
- An accurate representation of the "observed" base year travel patterns
- Realistic representation of congestion and queuing in the peak periods
- Input to social and environmental appraisals.

2.1.7 The list of requirements is a mixture of the features typically found in strategic transport models focusing primarily on travel demand choices and the features of a local highway model representing the local road network in detail incorporating junction delays. The local models typically use highway demand matrices derived from survey data which can be calibrated to accurately match traffic counts in the base year.

2.1.8 However, the lack of any behavioural basis in the derivation of these matrices means that a relatively crude approach is used to produce future year matrices for a range of alternative development scenarios. This crude forecasting approach has typically involved the scaling of matrices based on population and employment growth, with Furnessing procedures to ensure the trip productions and trip attractions balance. This approach cannot take into account any fundamental changes in trip patterns arising through changing population profiles and attraction opportunities.

2.1.9 Strategic travel demand models often derive synthetic trip matrices through a series of behaviourally-based relationships using population, employment and trip rate information combined with measures of accessibility. Unless these synthetic matrices are subsequently manipulated to match some observed target matrices, it is unlikely that a validation of resulting traffic flows would be as accurate in the base year as those obtained in a local model using matrices built from survey data.

2.1.10 To produce a satisfactory model for this study validated to DfT standards it is important to bring the best aspects of the two types of model together into a single modelling framework. Synthetic travel demand matrices based on the choices facing travellers need to be generated and calibrated with "observed" origin destination information from survey data. By making the two sets of matrices comparable, the demand model is able to more accurately forecast changes in demand.

2.2 MODEL FORM AND STRUCTURE

2.2.1 Current guidance indicates one of the main decisions required at an early stage is the form of the choice models – particularly the distribution models. Namely whether they are implemented as incremental models or whether they are absolute models. WebTAG Unit 3.10.3 section 1.5 sets out the three main types of model form:

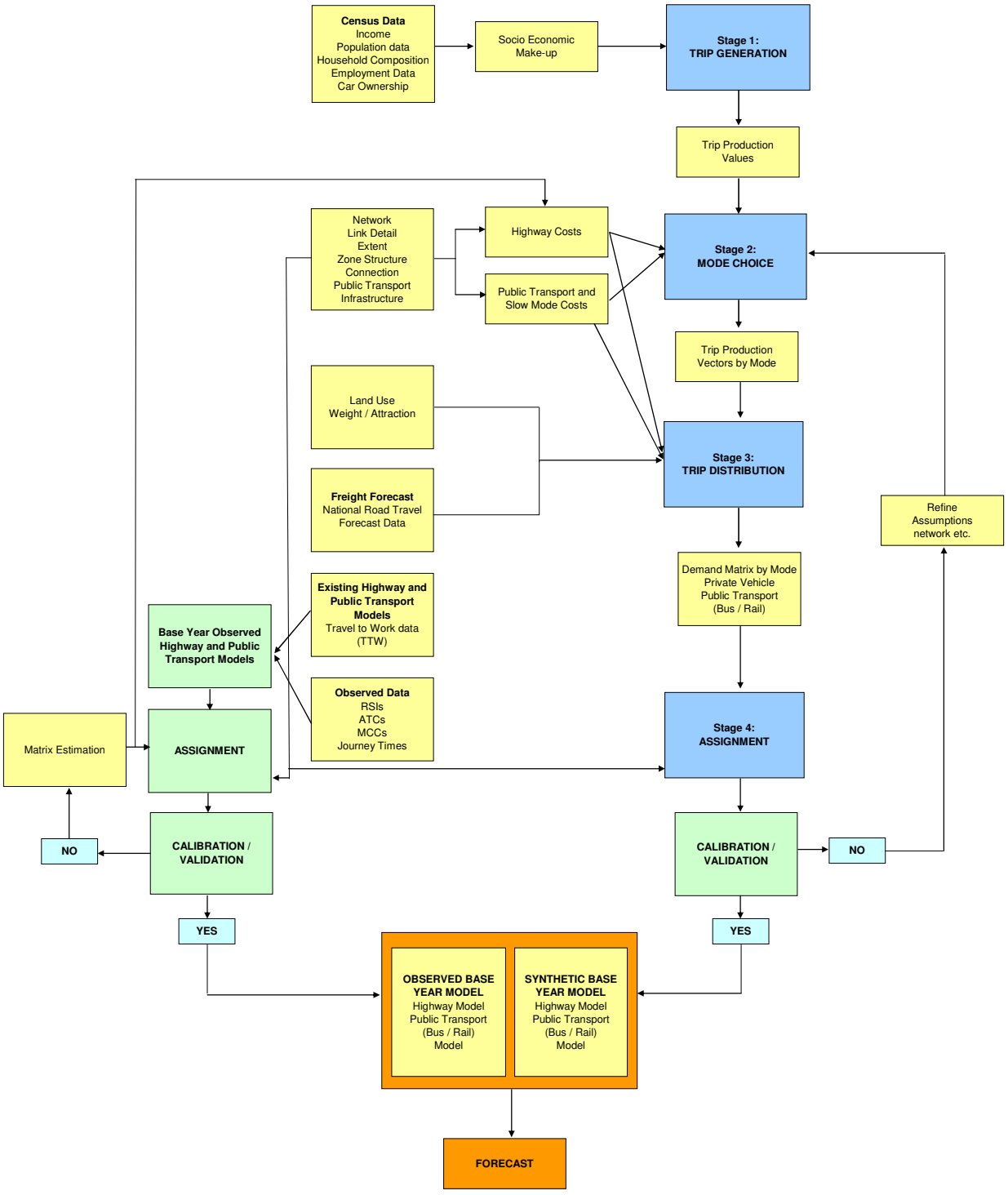
- Absolute models that use a direct estimate of the numbers of trips in each category
- Absolute models applied incrementally that use absolute model estimates to apply changes to a base matrix
- Pivot point models that use cost changes to estimate the changes in the numbers of trips from a base matrix

2.2.2 The DfT's preference is for an incremental form of model whether pivot-point or based on incremental application of absolute estimates. The BTM demand model is an absolute model applied incrementally. The model has been developed in VISUM and its overall structure is shown in **Figure 2.1**. The model consists of two main modules:

- Synthetic demand model
- Observed assignment model

2.2.3 The model forecasts trips from the output of a base year synthetic model that has been calibrated to fit as closely as possible to the known observed travel patterns. Base year and forecast trip mode choices are produced independently of each other, using common model parameters. The forecast distribution of these trips is calculated as a pivot from the base year distribution, taking into account changes in generalised cost and zone attraction rates. The forecast and base year synthetic matrices are then compared and the net change, on a cell-by-cell basis, calculated. This net change matrix is then added to the base year observed validated matrix to produce the future year forecast. The model can therefore be described as an absolute model applied incrementally.

Figure 2.1: Bracknell Transport Model Structure



2.3 OBSERVED ASSIGNMENT MODEL

2.3.1 AM peak (8-9am) and PM peak (5-6pm) hour observed assignment models have been developed for a 2007 base year. The models have been calibrated and validated to the current acceptability criteria as contained within DMRB Volume 12.

2.3.2 Observed highway matrices have been developed using a combination of London and South East Travel Survey (LATS) data, Roadside Interview (RSI) data gathered specifically for the study, RSI data around Wokingham gathered as part of the WSTM study, and select link matrices taken from the South East Regional Transport Model (SERTM) SATURN model. Highway matrices for Car/LGV and HGV vehicle classifications were developed separately. Observed public transport matrices have been constructed from bespoke travel surveys for bus and rail travel for both peak hours modelled. Refer to **Section 5** for more detailed information on matrix development.

2.3.3 The assignment algorithm used in the models is the Equilibrium Lohse assignment method. This method models the "learning process" of road users using the network. Initially it is based on an "all or nothing" assignment, following which drivers make use of information gained during their previous trip for the new route search i.e. an heuristic process. Several shortest routes are searched in an iterative process in which the impedance (which can be a combination of distance and journey time) is calculated by taking into account the impedance for the route in a previous iteration and the impedance for the current traffic volume being calculated.

2.3.4 The Equilibrium Lohse method produces realistic, stable results provided it is ensured a sufficient number of iterations can be carried out (N > 200), and the assignment procedure is not terminated purely because it reaches this maximum number of iterations (n = N).

2.4 SYNTHETIC DEMAND MODEL

2.4.1 The 24-hour synthetic demand model has been calibrated to fit the known observed movements to ensure that robust estimates of future trip numbers are being generated. The synthetic demand model uses the same network and zoning system as in the observed assignment model.

2.4.2 The guidance available from WebTAG contains advice on the most appropriate choice hierarchies to adopt for the mode and distribution stages within travel demand models. The WebTAG guidance states that the hierarchy of choice components, ranging from the choices that are least sensitive to supply characteristics (top) in order of increasing sensitivity to the bottom, is as follows:

- Trip frequency (i.e. trip rate of population) which may be represented as inelastic if all modes of transport (i.e. walk and cycle) are included
- Main mode choice (i.e. between car, PT and walk/cycle) is as (in)sensitive as macro time of day (TOD) choice (i.e. as peak period versus inter-peak period, rather than micro TOD choice, i.e. minor peak spreading variations within a period)
- Destination choice (i.e. trip distribution) is more sensitive than mode choice
- Route assignment is at the bottom of the hierarchy, being the most sensitive of choices to the measured cost and time characteristics of the route options available

2.4.3 The BTM follows the hierarchy stated above for all trip purposes and is compliant with current guidance and advice.

3 Networks and Zones

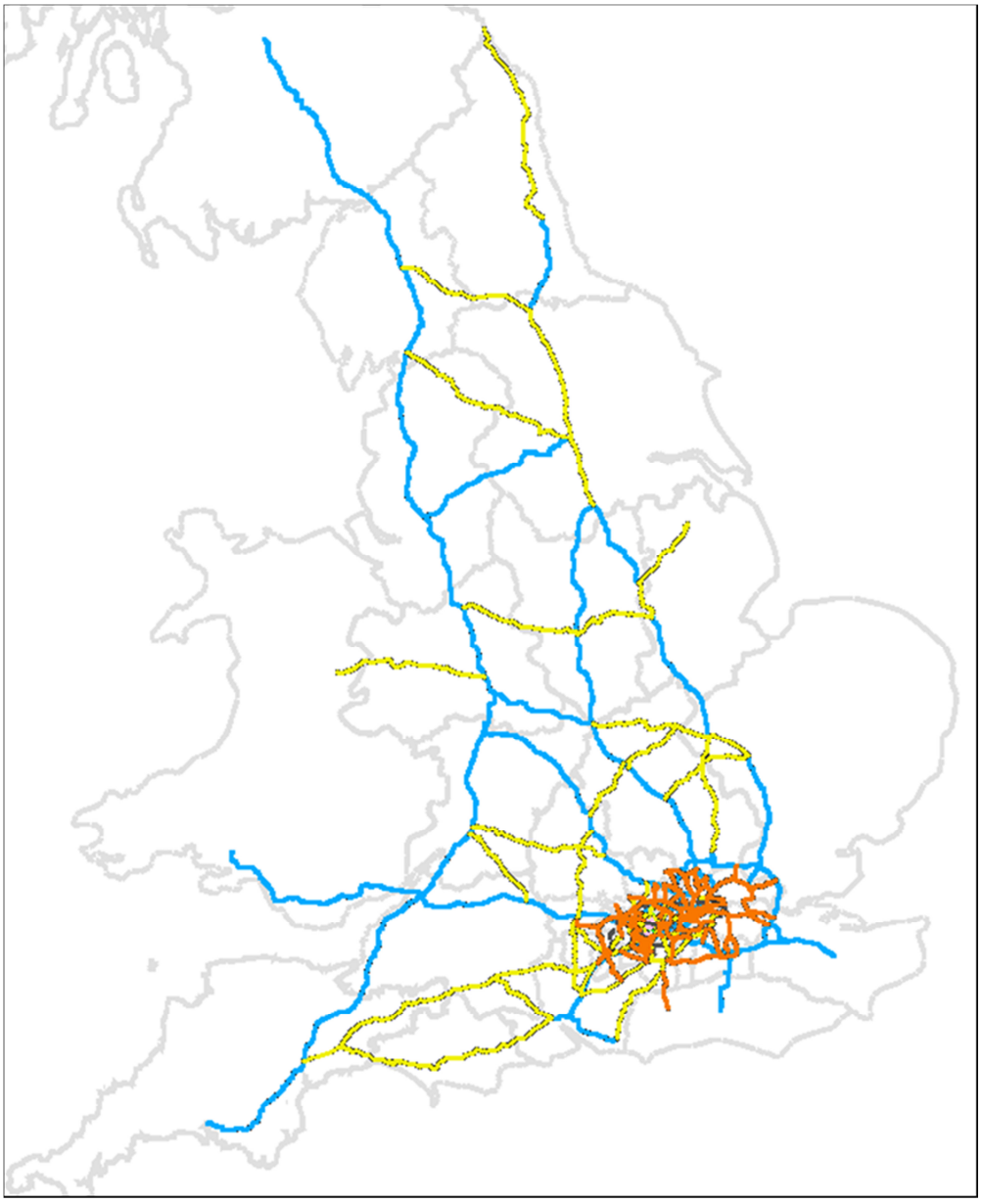
3.1 INTRODUCTION

3.1.1 This chapter outlines the processes undertaken in the development of the highway and public transport networks and the derivation of the associated zoning system.

3.2 MODEL EXTENT

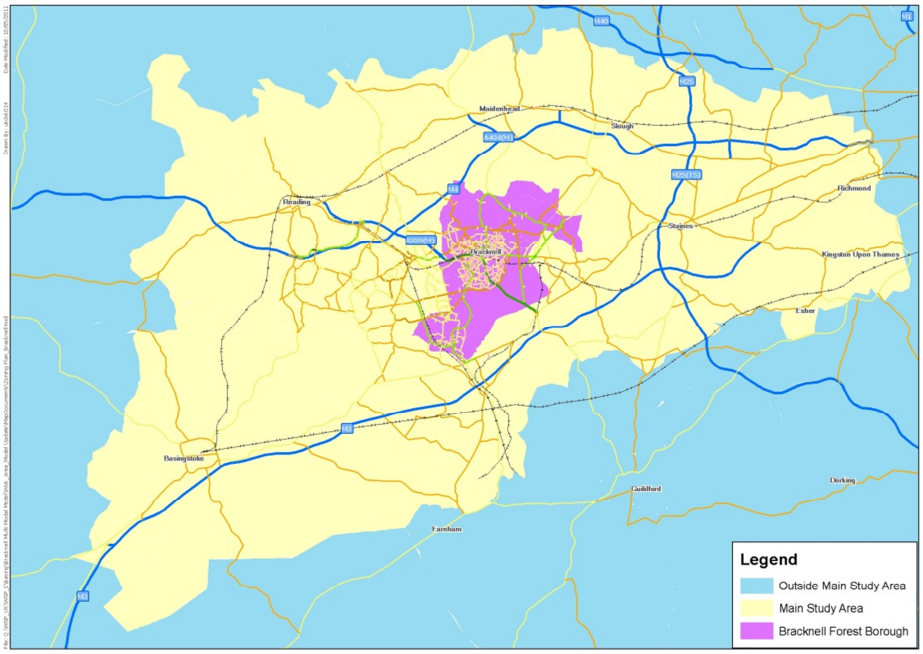
3.2.1 The highway corridors influencing travel patterns within BFC include major motorways and trunk roads. In order to reflect these movements the model area extends to include a representation of motorways to outlying areas of the UK as indicated in **Figure 3.1**.

Figure 3.1: Bracknell BTM VISUM Network Coverage



3.2.2 Closer to Bracknell Forest the density of road links necessary to accurately model the movements increases and forms the main study area (MSA) for the model as shown in **Figure 3.2**. The main study area, encompassed by the outer blue boundary, extends from Reading to Basingstoke in the west to Heathrow and beyond in the east. As such it encompasses the major motorways of the M3 (junctions 7 to 1), M4 (junctions 12 to 1) and the M25 (junctions 11 to 15). The area also includes key strategic routes of the A329M and the A329, A322, A30 and A4 and covers the residential, commercial and town centre development sites proposed in the Core Strategy of the LDF and the associated strategic re-routing of trips or potential modal transfer to public transport. Bracknell Forest itself covers the inner purple area.

Figure 3.2: Bracknell VISUM Main Study Area Network Coverage



3.2.3 This area has been identified due to the importance of the sub regional economy within it and connections from it to outlying areas such as the Milton Keynes sub regional growth area, cross border issues with Surrey, the Lightwater Valley route (A322), the Blackwater Valley route (A331), the significant influence of Heathrow airport and its intended expansion and development of the Airtrack route on commuting patterns to, from and through the MSA. This area was chosen to cover the residential, commercial and town centre development sites proposed in the Core Strategy of the LDF and the associated strategic re-routing of trips or potential modal transfer to public transport.

3.2.4 The detailed modelling area identified above covers the administrative area of BFC and Wokingham Borough, within which junctions are modelled in much greater detail.

3.3 HIGHWAY NETWORK

3.3.1 The highway network has been developed in a GIS environment using NAVTEQ road vector data where highway centre line alignments and detail such as speed limits, road classification, the number of lanes and geographically correct road lengths are incorporated and can aid the speedy and accurate development of the network. Following the development of the full network, an on-site inventory has been carried out to check and clarify the number of lanes, link type, capacity and speed limit in some areas. The road network includes all A and B roads and other strategic local roads and rat runs. Other unclassified local roads have also been included to a high level of detail.

3.3.2 For the strategic network where junctions were not modelled in detail, speed-flow curves based on 'COst Benefit Analysis' (COBA) software developed by the Transport Research Laboratory (TRL) have been used to model the relationship between traffic volumes and vehicle travel times. COBA speed-flow curves have been calibrated with the volume-delay function within VISUM to ensure they matched (contained within **Appendix A**).

3.3.3 In addition details of cycle/walk networks have also been included to facilitate the calculation of the generalised cost of travel by slow modes where more direct "crow-fly" routes are possible. In these networks speeds assumed were 4 kph for pedestrians and 12 kph for cyclists as defined in WebTAG.

3.3.4 The network was developed to facilitate the potential export to the VISSIM micro-simulation package to enable smaller scale modelling to be completed if required at a later date.

3.4 JUNCTIONS

3.4.1 All strategic routes leading into Bracknell were modelled in detail including the A329, A3095, A322, B3430, B3408, B3018 and B3034. All junctions within the vicinity of these routes were modelled in some detail. The junction coding for the network included junction type (priority, roundabout or signalised), the number of approach lanes, saturation flows, and signal configurations where relevant. Detailed junction information including signal layouts and timings where appropriate was obtained for the key junctions listed in **Table 3.1**.

Table 3.1: Key Signalised Junctions

Key Signal Junction Location
A30 London Road / A331 Marshall Road roundabout
New Wokingham Road / Dukes Ride
A3095 / Ringmead
Mill Lane / Ellesfield Avenue
Twin Bridges roundabout
Met Office roundabout
Bagshot Road / Ringmead roundabout

3.5 BUS NETWORK

3.5.1 The main local bus services in Bracknell were included in the BTM and are listed in **Table 3.2**. The location of the bus stops was taken from the Thales FTP website, and the bus routes and service frequencies were gathered from published 2007 timetables and site visits.

Table 3.2: Bus Services Included in the BTM

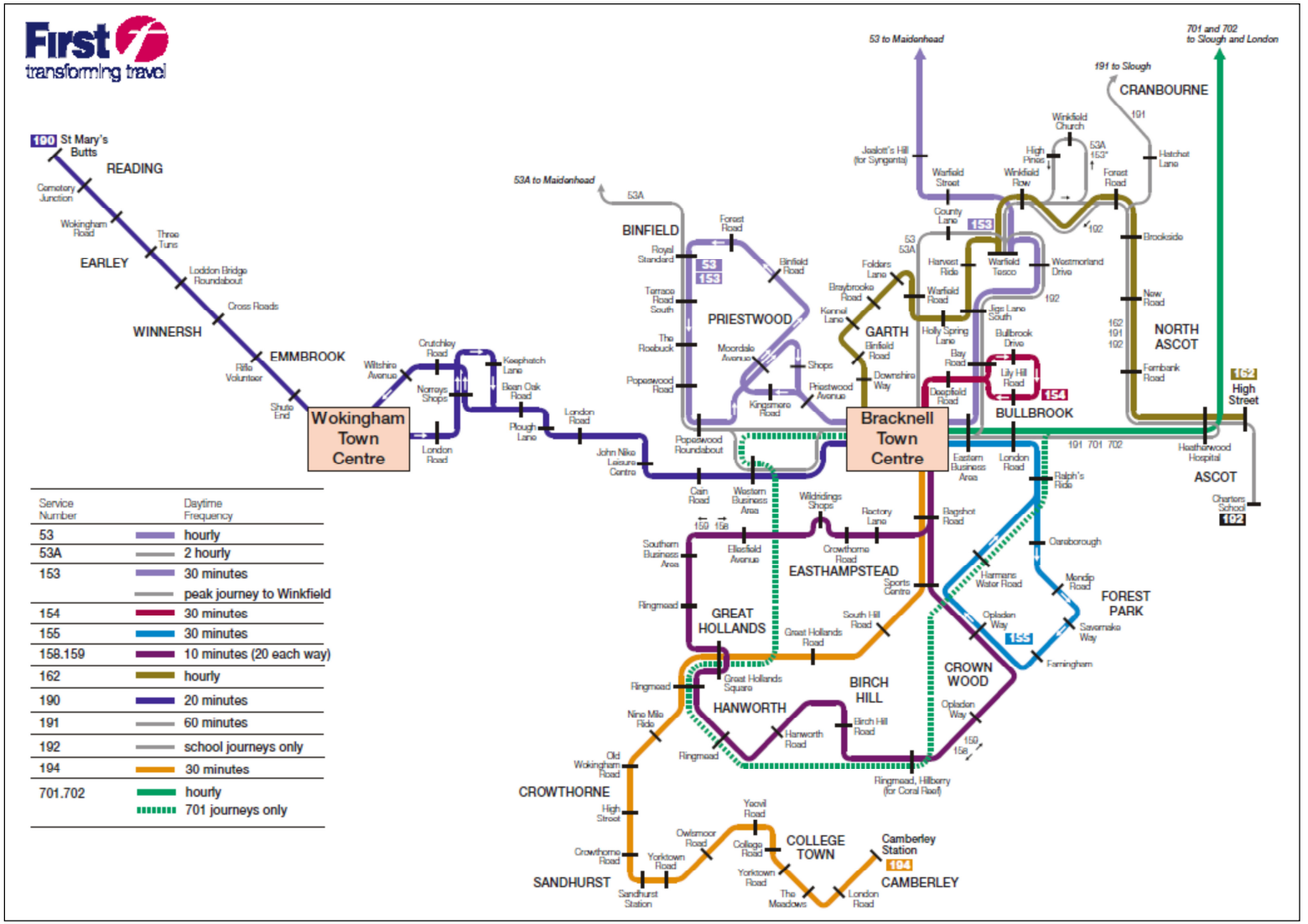
Service Number	Route Description
153	Binfield – Bracknell Town Centre – Warfield
154	Bracknell Town Centre – Bullbrook - Bracknell Town Centre
155	Bracknell Town Centre – Forest Park - Bracknell Town Centre
158	Bracknell Town Centre – Crown Wood – Birch Hill - Bracknell Town Centre
159	Bracknell Town Centre – Birch Hill – Crown Wood - Bracknell Town Centre
190	Reading – Wokingham - Bracknell Town Centre
194	Bracknell – Crowthorne - Sandhurst - Camberley

3.5.2 The bus routes, displayed in **Figure 3.3**, were coded into VISUM by first inputting the bus stops of the chosen routes, which were then linked together by the relevant bus route or routes. Attached to the bus network was a data table containing the service information: the bus stops served, the dwell time at each stop, and the headway (bus frequency) for each route. The bus service headways input into the model are presented in **Table 3.3** below. In general only those bus routes with a frequency within the peak hours were input into the model.

Table 3.3: Bus Service Headways

Service Number	Headway (mins)	
	AM Peak	PM Peak
153 (NB)	1 hour 20mins 8:08 and 9:28	1 hour 10mins 17:03 and 18:13
153 (SB)	1 hour 10 mins 8:23 and 9:33	1 hour 5 mins 17:50 and 18:55
154 (C)	20 mins 8:27 and 8:47	40 mins 17:12 and 17:52
155 (C)	35 mins - 7:50 and 8:25	30 mins 17:05 and 17:35
158 (C)	20 mins 7:55, 8:15 and 8:35	20 mins 17:00, 17:20 and 17:40
159 (C)	20 mins 8:05, 8:25 and 8:45	20 mins 17:10, 17:30 and 17:50
190 (EB)	30 mins 8:20 and 8:50	20/25 mins 17:10, 17:30 and 17:55
190 (WB)	25 mins 8:05 and 8:35	35 mins 17:10 and 17:45
194 (NB)	40 mins 7:50 and 8:30	25 mins 17:20 and 17:55
194 (SB)	35 mins 8:00 and 8:35	35 mins 16:55 and 17:30

Figure 3.3: Bus Routes in Bracknell

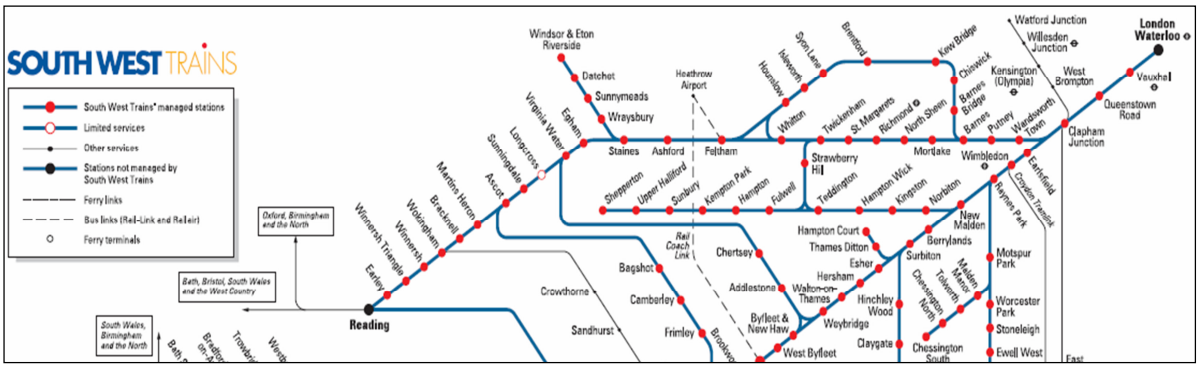


3.5.3 In total 16 bus routes were included within the model which incorporated 278 bus stops. Bus fares were calculated on a distance based formula as used in the demand model.

3.6 RAIL NETWORK

3.6.1 Bracknell railway station is part of the South West Trains network. It is situated on the London Waterloo – Reading line as shown in **Figure 3.4**. The location of the railway lines and stations was extracted from NAVTEQ datasets.

Figure 3.4: Rail Network Going Through Bracknell



3.6.2 The train services in the AM and PM peak from and to Bracknell Station are detailed in **Table 3.4**. In total rail services were modelled on 14 lines and 51 stations were included within the model.

Table 3.4: Rail Service Frequency

Service	Frequency	
	AM Peak	PM Peak
From Bracknell to London	2	2
From Bracknell to Reading	4	3
From Reading to Bracknell	2	2
From London to Bracknell	4	3

3.7 ZONING SYSTEM

3.7.1 The zone system was based on 2001 Census Output Areas (COA) and wards, ensuring compatibility with Census household data. The COAs were aggregated or disaggregated into different land uses within Bracknell where deemed appropriate. Zones were created with the proposed developments in mind, to accommodate the future trip generation.

3.7.2 The original model contained 203 zones, of which 121 are allocated to the BFC area. In the original model the WBC area was represented by 11 zones, each covering a relatively wide area. This model update involved the disaggregation of WBC zones into 150 smaller zones, with greater detail on the highway network to a level of detail sufficient to represent proposed development locations in Wokingham.

3.7.3 The Wokingham were first disaggregated geographically into smaller parcels, based on the zone boundaries assumed in the WSTM. In some cases, very small zones in the WSTM were grouped together in the BTM if such a level was not required. Each of the original Wokingham zones then 'contained' a number of new zones, amongst which the housing and employment assumptions had to be shared. This was done by applying the proportionate representation of housing and employment in the WSTM, to the new zones contained in the BTM. Thus the total level of housing and employment in Wokingham is unchanged from the original model, but more accurately spread across the Borough.

3.7.4 The level of zoning detail is centred on Bracknell and to a certain extent Wokingham, with the zones increasing in size with distance away from Bracknell. There are an additional 42 zones within the main study area and a further 29 external zones, making up a total of 342 zones in the BTM.

4 Data Collection Summary

4.1 INTRODUCTION

4.1.1 To construct the required transport model for BFC a series of transport surveys was required to enhance already available data. This section provides an overview summary of the surveys undertaken. More details on the results of the surveys are contained within the Traffic Data Report produced as part of the deliverables of the project.

4.1.2 The surveys were undertaken during June and July 2007 and included the following:

- Road side interviews
- Automatic traffic counts
- Manual classified traffic counts
- Journey time surveys
- Bus and rail surveys

4.1.3 The aim of these surveys was to collect data on the origin – destination of trip movements as well as the purpose of the trip.

4.1.4 In addition a wealth of traffic volume data was collected and collated from the sources listed below:

- Highways Agency (HA) southern region monitoring report
- HA's Traffic Flow Database System (TRADS)
- BFC annual monitoring program
- BFC volume and speed surveys

4.1.5 In order to facilitate the update of the original BTM with greater detail in the WBC area, ATC data was obtained for the period of June 2007 for a number of permanent ATC sites around Wokingham. The inclusion of this data enabled a better level of highway network calibration in the Wokingham area.

4.2 ROADSIDE INTERVIEWS

4.2.1 The roadside interviews were undertaken during June 2007 at the following locations:

- Site 1 – A329 Berkshire Way (West of Twin Bridges Roundabout)
- Site 2 – A3095 Crowthorne Road (North of Ringmead)
- Site 3 – A322 Bagshot Road (O/S Shell PFS)
- Site 4 - A329 London Road (East of Swinley Road)
- Site 5 - A3095 Maidenhead Road (near Grange Road)
- Site 6 - B3408 London Road (East of A329 near Beehive Lane)
- Site 7 – B3430 Nine Mile Ride (West of A3095)
- Site 8 – Doncastle Road (Southbound)

4.2.2 In conjunction with the surveys, some of which were conducted via a post-back method due to safety issues, manual and automatic traffic counts were also conducted in order to provide sample factors for conversion to an average weekday value and confirm whether the survey days were typical. The RSI sample rates achieved from these surveys are shown in **Table 4.1**.

Table 4.1: RSI Sample Rates

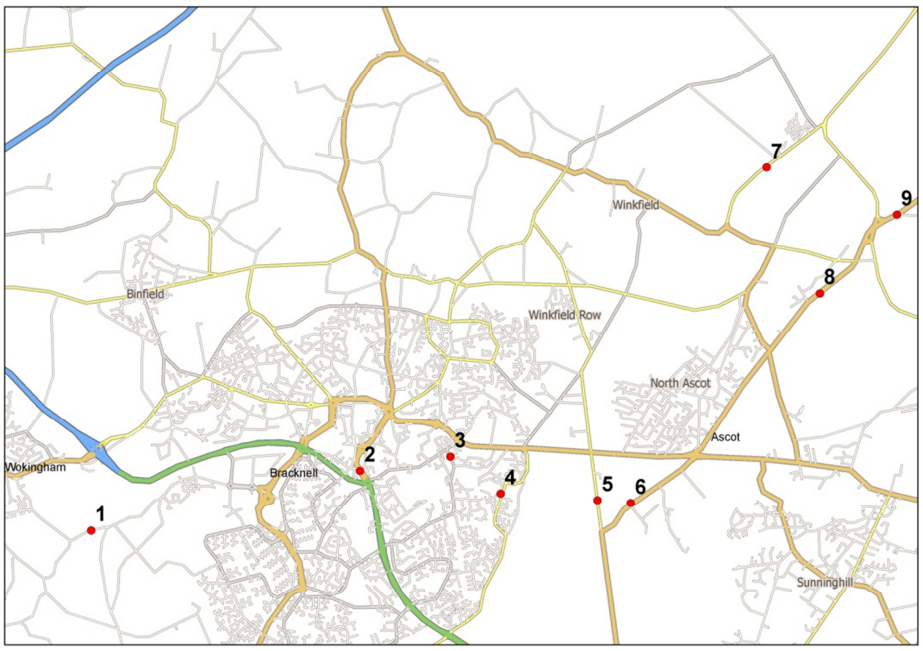
	ATC AM peak hour (0800-0900)	RSI AM peak hour as % of ATC AM peak hour (0800-0900)	RSI AM peak period as % of ATC AM peak hour (0700-1000)	ATC PM peak hour (1700-1800)	RSI PM peak hour as % of ATC PM peak hour (1700-1800)	RSI PM peak period as % of ATC PM peak hour (1600-1900)
Site 1	1670	7.54	20.66	1360	3.60	9.63
Site 2	680	13.09	43.38	840	8.21	15.83
Site 3	1950	9.90	26.67	1670	12.22	23.11
Site 4	900	15.11	40.67	1000	9.00	19.10
Site 5	610	22.62	45.90	450	14.67	36.00
Site 6	670	28.36	67.16	830	12.65	28.07
Site 7	1490	11.07	29.60	990	8.28	21.31
Site 8	700	16.43	41.86	1120	5.45	11.61
Average		15.52	39.49		9.26	20.58

4.3 AUTOMATIC TRAFFIC COUNT SURVEYS

4.3.1 The ATC surveys were undertaken for a 14-day period commencing on Wednesday 19th September 2007 at the following ten locations (in addition to the RSI locations) around Bracknell and are shown on **Error! Reference source not found.**.

- Site 1 - Waterloo Road
- Site 2 and 22 - Bagshot Road
- Site 3 - Ralphs Ride
- Site 4 – New Forest Ride
- Site 5 – Swinley Road
- Site 6 – Kings Ride
- Site 7 – North Street
- Site 8 – A332 Windsor Road
- Site 9 – A332 Sheet Street

Figure 4.1: ATC Survey Locations (Bracknell)

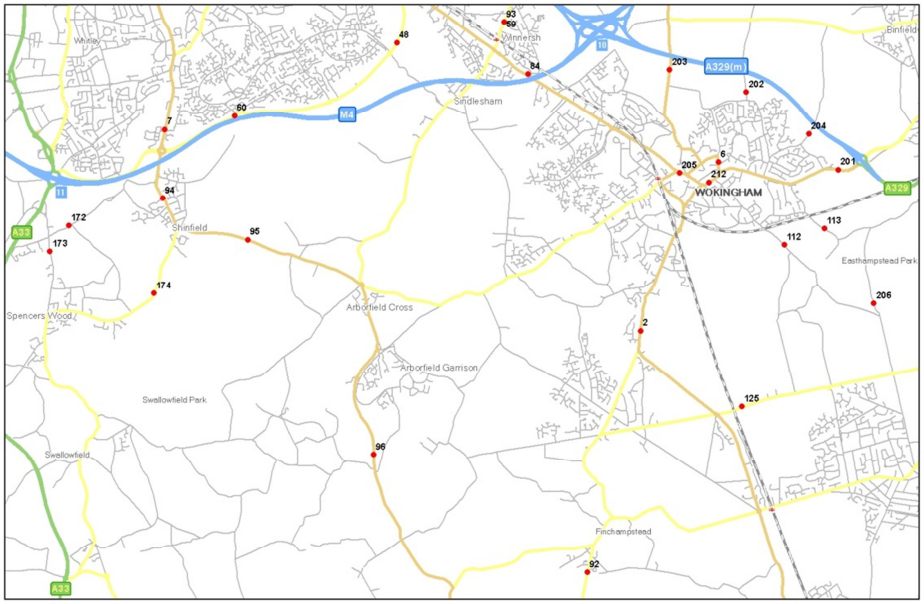


4.3.2 Permanent ATC data was extracted for a 14-day period during June 2007 at the following 25 locations around Wokingham, which are also shown on **Figure 4.2**:

- Site 2 – A321 Finchampstead Road (north of B3016)
- Site 6 – A321 Wiltshire Road, Wokingham
- Site 7 – A327 Shinfield Road, Reading
- Site 48 – B3270 Lower Earley Way north
- Site 59 – B3030 Robin Hood Lane, Reading
- Site 60 – B3270 Lower Earley Way south
- Site 84 – A329 (under M4 bridge), Reading
- Site 92 – B3016 Eversley Cross, Eversley
- Site 93 – Whitley Wood Lane, Reading
- Site 94 – A327 Hollow Lane, Shinfield
- Site 95 – A327 Reading Road, Arborfield
- Site 96 – A327 Reading Road, Arborfield Garrison
- Site 112 – Easthampstead Road, Wokingham
- Site 113 – Waterloo Road, Wokingham
- Site 125 – B3420 Nine Mile Road, Crowthorne
- Site 172 – Church Road (west of Hyde End Lane)
- Site 173 – Basingstoke Road (south of Church Road)

- Site 174 – Hyde End Road
- Site 201 – A329 London Road, Wokingham
- Site 202 – Warren House Road, Wokingham
- Site 203 – A321 Twyford Road, Wokingham
- Site 204 – Binfield Road, Wokingham
- Site 205 – A329 Shute End, Wokingham
- Site 206 – Old Wokingham Road (northern end)
- Site 212 – Peach Street, Wokingham

Figure 4.2: ATC Survey Locations (Wokingham)



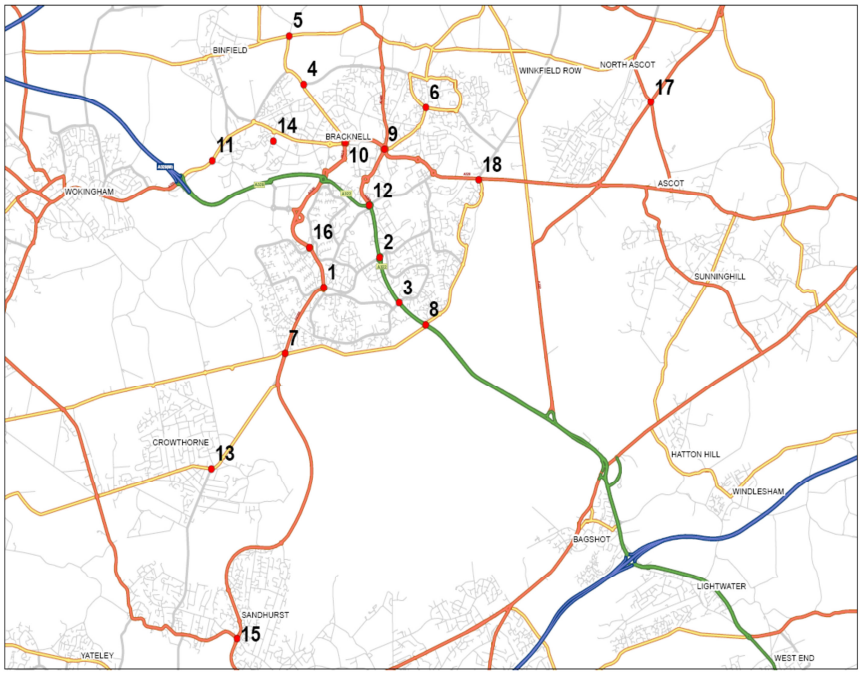
4.4 MANUAL CLASSIFIED COUNTS

4.4.1 In addition to the MCCs associated with the RSIs, Count On Us was commissioned to undertake classified traffic turning counts at the following 18 locations in Bracknell. The locations are displayed in **Figure 4.3**.

- Site 1 - A3095 / Great Hollands Rd / Crowthorne Rd / South Hills Rd
- Site 2 - A322 Bagshot Road / South Hill Road / Opladen Way
- Site 3 - A322 Bagshot Road / Ringmead / Opladen Way
- Site 4 - B3018 / Binfield Road / Harvest Ride
- Site 5 - Hazelwood Lane / Forest Road / Binfield Road
- Site 6 - Jigs Lane / Holly Spring Lane / Park Road / Bay Road

- Site 7 - Crowthorne Road / Nine Mile Road / Foresters Road
- Site 8 - Bagshot Road / Nine Mile Ride / New Forest Ride
- Site 9 - Met Office Roundabout
- Site 10 - Western Roundabout
- Site 11 - B3408 London Road/ John Nike Way
- Site 12 - Bagshot Road/ Downshire Way/ Rectory Lane/ Lime Walk/ Broad Lane (Horse and Groom Roundabout)
- Site 13 - Dukes Ride/ High Street/ Upper Broadmoor Road/ Bracknell Road
- Site 14 - Western Road/ Cain Road
- Site 15 - Rackstraw Road/ Yorktown Road/ Marshall Road
- Site 16 - A3095 Mill Lane
- Site 17 - Winkfield Road/ Windsor Road
- Site 18 - Long Hill Road/ London Road/ New Forest Ride

Figure 4.3: MCC Locations



4.5 JOURNEY TIME SURVEYS

4.5.1 Journey time surveys were undertaken in both directions for five routes as specified below:

- Route A: Coppid Beech Roundabout/ A329/ Twin Bridges Roundabout/ Downshire Way/ Bagshot Road - Swinley Road
- Route B: Coppid Beech Roundabout/ London Road (North)/ Wokingham Road/ 3M Roundabout/ Millennium Way/ Met Office Roundabout/ London Road - Windsor Road
- Route C: 3M Roundabout/ Skimped Hill Lane Roundabout/ Twin Bridges Roundabout/ Mill Lane/ Crowthorne Road/ Foresters Way - Bracknell Road
- Route D: Newell Green/ Warfield Road/ Met Office Roundabout/ Church Road/ Bagshot Road - Downshire Way Roundabout
- Route E: Foresters Way - Bracknell Road/ Rackstraw Road/ Yorktown Road/ High Street/ A321/ Wellingtonia Roundabout/ Duke Ride/ Bracknell Road - Foresters Way

4.5.2 **Table 4.2** shows the accuracy of the journey time data collected. Because of the relatively low number of journey times collected within the peak hour the accuracy is low and this led to the decision to use journey time data gathered throughout the entire peak period to give us a better sample size and therefore a higher confidence level.

4.5.3 Further investigation of the journey time survey data showed there to be a few extreme observations (outliers) so these were excluded from the analysis. The PM peak in particular contained a widely varying sample of journey times, therefore the decision was taken to collect additional samples in March 2009 in order to provide a more robust sample for comparison with the model.

Table 4.2: Journey Time Survey Accuracy

Route & Time period surveyed	Sum all Journey Times (seconds)	Number of Observations	t	Mean Journey Time (seconds)	Standard Deviation	Accuracy (95% confidence interval)
Route 1 SB AM Peak Hour	1965	2	12.706	982.50	190.212	174%
Route 1 SB AM Peak Period	5315	6	2.571	885.83	165.623	20%
Route 1 SB PM Peak Hour	1310	2	12.706	655.00	8.485	12%
Route 1 SB PM Peak Period	3626	7	2.447	518.00	104.112	19%
Route 1 NB AM Peak Hour	2143	2	12.706	1071.50	139.300	117%
Route 1 NB AM Peak Period	5917	6	2.571	986.17	292.859	31%
Route 1 NB PM Peak Hour	2191	2	12.706	1095.50	243.952	200%
Route 1 NB PM Peak Period	6079	7	2.447	868.43	206.368	22%
Route 2 EB AM Peak Hour	2027	1	-	2027.00	-	-
Route 2 EB AM Peak Period	5848	6	2.571	974.67	536.312	58%
Route 2 EB PM Peak Hour	2276	2	12.706	1138.00	5.657	4%
Route 2 EB PM Peak Period	6478	7	2.447	925.43	173.547	17%
Route 2 WB AM Peak Hour	1283	1	-	1283.00	-	-
Route 2 WB AM Peak Period	5410	6	2.571	901.67	270.652	32%
Route 2 WB PM Peak Hour	4471	4	3.182	1117.75	135.4	19%
Route 2 WB PM Peak Period	6060	6	2.571	1010.00	200.1	21%
Route 3 SB AM Peak Hour	1215	3	4.303	405.00	46.808	29%
Route 3 SB AM Peak Period	2341	6	2.571	390.17	36.460	10%
Route 3 SB PM Peak Hour	1556	3	4.303	518.67	149.018	71%
Route 3 SB PM Peak Period	3238	6	2.571	539.67	231.321	45%
Route 3 NB AM Peak Hour	378	1	-	378.00	-	-
Route 3 NB AM Peak Period	2064	5	2.776	412.80	104.507	31%
Route 3 NB PM Peak Hour	805	2	12.706	402.50	34.648	77%
Route 3 NB PM Peak Period	2491	6	2.571	415.17	93.653	24%
Route 4 SB AM Peak Hour	949	3	4.303	316.33	29.838	23%
Route 4 SB AM Peak Period	2080	6	2.571	346.67	109.398	33%
Route 4 SB PM Peak Hour	1482	3	4.303	494.00	172.711	87%
Route 4 SB PM Peak Period	2423	6	2.571	403.83	154.043	40%
Route 4 NB AM Peak Hour	2560	5	2.776	512.00	170.699	41%
Route 4 NB AM Peak Period	2901	6	2.571	483.50	167.881	36%
Route 4 NB PM Peak Hour	2711	4	3.182	677.75	85.094	20%
Route 4 NB PM Peak Period	3643	6	2.571	607.17	127.833	22%
Route 5 Clockwise AM Peak Hour	3916	3	4.303	1305.33	99.811	19%
Route 5 Clockwise AM Peak Period	8921	8	2.365	1115.13	171.956	13%
Route 5 Clockwise PM Peak Hour	3291	3	4.303	1097.00	74.081	17%
Route 5 Clockwise PM Peak Period	7464	7	2.447	1066.29	60.268	5%
Route 5 Anti-Clockwise AM Peak Hour	2356	2	12.706	1178.00	202.233	154%
Route 5 Anti-Clockwise AM Peak Period	6687	6	2.571	1114.50	130.172	12%
Route 5 Anti-Clockwise PM Peak Hour	3246	3	4.303	1082.00	35.791	8%
Route 5 Anti-Clockwise PM Peak Period	7266	7	2.447	1038.00	78.801	7%

4.6 BUS SURVEYS

4.6.1 Seven main bus routes in Bracknell, listed in **Table 3.2**, were surveyed on Tuesday 10th July and Wednesday 11th July 2007 over a 12-hour period providing the following data:

- Boarding and alighting data at each stop
- Face to face interviews on bus services, at town centre bus stops and the bus station
- Self completion free post questionnaires given out on bus services at town centre bus stops and the bus station

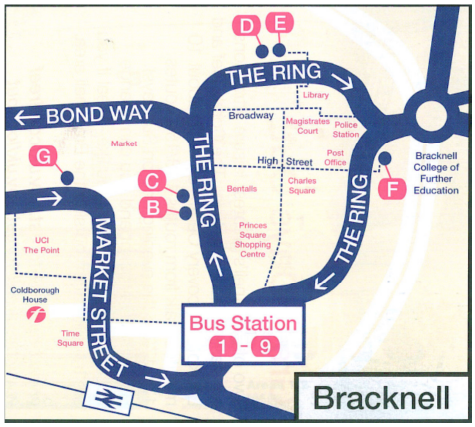
4.6.2 OD surveys were conducted in three different locations:

- On the buses where boarding and alighting data was collected
- At the Bus Station
- At the town centre bus stops (see **Figure 4.4**):
  - High Street
  - Millennium Way
  - The Ring

– Market Street

4.6.3 OD data was collected for a proportion of passengers (approximately 50%) on a proportion of services on each route (approximately 50%), resulting in a sample rate of approximately 25% of all passengers travelling on the surveyed routes.

Figure 4.4: Location of Bus Stops Surveyed



4.6.4 The number of interviews received throughout the day on the bus services is outlined in **Table 4.3**.

Table 4.3: Bus Surveys on Bus Services

	153	154	155	158	159	190	194	Other Bus Route
5:00-6:00	1	0	0	0	0	0	0	0
6:00-7:00	0	0	2	1	0	1	1	5
7:00-8:00	1	3	2	2	4	9	5	5
8:00-9:00	7	1	5	8	12	8	4	11
9:00-10:00	10	1	6	5	6	7	7	9
10:00-11:00	9	6	9	6	6	5	2	6
11:00-12:00	2	1	5	3	3	4	5	7
12:00-13:00	4	3	2	2	3	4	1	3
13:00-14:00	0	1	3	2	3	2	1	2
14:00-15:00	1	2	1	2	3	2	3	1
15:00-16:00	6	1	2	2	1	2	1	1
16:00-17:00	4	2	1	3	2	2	1	1
17:00-18:00	2	0	2	0	4	6	3	4
18:00-19:00	1	0	0	0	1	1	2	0
No Time given	0	1	1	2	1	5	2	6
Total	48	22	41	38	49	58	38	61

4.6.5 The number of interviews received throughout the day at the town centre bus stops is shown in **Table 4.4**.

Table 4.4: Bus Surveys in Bracknell Town Centre

	Parish Church, The Ring	S. Hill Lane	Bus Station	Stand 2	Stand 4	Stand 6	Stand 7	Stand 8	Stand 9	The Ring High Street
5:00-6:00	0	0	0	0	0	0	0	0	0	0
6:00-7:00	0	0	4	4	0	0	0	0	0	0
7:00-8:00	2	0	15	0	8	2	8	9	3	0
8:00-9:00	2	5	11	8	3	3	0	0	10	0
9:00-10:00	2	1	8	11	5	2	5	6	6	0
10:00-11:00	6	2	9	8	5	4	4	0	4	1
11:00-12:00	6	1	13	8	0	1	3	2	2	0
12:00-13:00	3	2	8	0	2	5	0	2	4	1
13:00-14:00	2	1	11	0	2	2	4	2	1	0
14:00-15:00	2	0	15	0	3	1	0	2	0	0
15:00-16:00	0	1	13	1	1	3	1	2	1	0
16:00-17:00	0	0	7	1	2	1	0	4	0	0
17:00-18:00	0	0	8	2	5	1	2	1	0	0
18:00-19:00	0	0	3	0	0	0	4	0	0	0
Total	25	13	125	43	36	25	31	30	31	2

4.6.6 The final expansion factors for each bus route and section by direction are shown in **Table 4.5** and **Table 4.6**. Where a cell appears blank this is a result of there being no interview for this route and section therefore there was nothing to factor up for the matrix.

Table 4.5: AM Peak Hour Bus Expansion Factors

	Direction	Section		
		1	2	3
153	Eastbound	0.5	3.5	-
	Westbound	2.0	-	1.1
154	One direction	2.1	-	-
155	One direction	6.5	1.3	-
158	One direction	-	1.8	4.3
159	One direction	3.5	4.0	2.6
190	Eastbound	-	1.3	4.0
	Westbound	1.3	1.0	2.5
194	Northbound	2.5	4.7	4.0
	Southbound	0.3	1.5	2.7

Table 4.6: PM Peak Hour Bus Expansion Factors

	Direction	Section		
		1	2	3
153	Eastbound	5.0	-	-
	Westbound	3.7	2.0	-
154	One direction	2.8	-	-
155	One direction	7.3	1.0	-
158	One direction	6.3	0.5	-
159	One direction	5.3	3.0	2.0
190	Eastbound	-	-	4.0
	Westbound	3.5	-	-
194	Northbound	-	2.0	4.0
	Southbound	5.5	-	-

4.7 RAIL ORIGIN DESTINATION SURVEYS

4.7.1 Bracknell mainline rail station serves the Reading to London Waterloo rail route, with frequencies displayed in **Table 3.4**. All the services that stopped at this rail station during the peak hours were included within the analysis.

4.7.2 OD surveys were conducted at the railway station by either face to face interviews or self completion questionnaires. These were completed on 10th and 11th July 2007 from 0600 – 2100 hours. **Table 4.7** shows the number of rail OD surveys received throughout the day.

Table 4.7: Number of Rail OD Surveys 10th and 11th July 2007

	Interviews
5:00-6:00	5
6:00-7:00	26
7:00-8:00	59
8:00-9:00	54
9:00-10:00	23
10:00-11:00	20
11:00-12:00	11
12:00-13:00	9
13:00-14:00	14
14:00-15:00	13
15:00-16:00	11
16:00-17:00	23
17:00-18:00	39
18:00-19:00	10
19:00-20:00	1
No Time given	56
Total	374

4.8 RAIL BOARDING AND ALIGHTING DATA

4.8.1 Boarding and alighting data was collected at both platforms at Bracknell train Station from 0600 – 2100 hours on Wednesday 11th July 2007. The data collected at both platforms is presented in **Table 4.9**.

4.8.2 The final rail expansion factors for each different rail journey route are shown in **Table 4.8**.

Table 4.8: Peak Hour Rail Expansion Factors

Service		AM Peak Factor	PM Peak Factor
To/From London	On	1.65	5.32
	Off	5.36	1.63
To/From Reading	On	0.9	2.01
	Off	12.42	19.33

Table 4.9: Bracknell Station Platform Boarding and Alightings

Platform 1				Platform 2			
Time	**Service Dir.**	**On**	**Off**	**Time**	**Service Dir.**	**On**	**Off**
06:02	London, Waterloo	24	7	06:20	Reading	11	4
06:32	London, Waterloo	38	6	06:50	Reading	24	4
07:02	London, Waterloo	65	12	08:50	Reading	27	163
07:32	London, Waterloo	79	46	07:50	Reading	63	44
07:39	London, Waterloo	23	25	07:20	Reading	49	26
08:02	London, Waterloo	66	95	08:20	Reading	79	212
08:32	London, Waterloo	46	228	09:10	Reading	27	73
09:02	London, Waterloo	42	115	09:20	Reading	9	42
09:06	London, Waterloo	18	8	09:38	Reading	8	34
09:32	London, Waterloo	38	49	09:50	Reading	12	25
10:12	London, Waterloo	28	14	10:50	Reading	17	22
10:16	London, Waterloo	23	14	10:20	Reading	40	27
11:02	London, Waterloo	44	22	11:20	Reading	30	16
11:32	London, Waterloo	35	19	11:50	Reading	21	27
12:02	London, Waterloo	34	11	12:20	Reading	25	18
12:32	London, Waterloo	17	15	12:50	Reading	30	18
13:02	London, Waterloo	20	22	13:20	Reading	21	39
13:32	London, Waterloo	64	14	13:50	Reading	14	27
14:02	London, Waterloo	12	17	14:20	Reading	15	29
14:32	London, Waterloo	14	21	14:50	Reading	16	41
15:02	London, Waterloo	25	19	15:20	Reading	20	35
15:32	London, Waterloo	51	17	15:50	Reading	86	31
16:02	London, Waterloo	43	34	16:20	Reading	55	34
16:32	London, Waterloo	37	25	16:50	Reading	58	55
17:04	London, Waterloo	34	38	17:08	Reading	57	22
17:32	London, Waterloo	83	78	17:20	Reading	91	19
18:02	London, Waterloo	17	29	17:40	Reading	82	35
18:12	Ascot	60	26	17:50	Reading	92	41
18:32	London, Waterloo	17	24	18:20	Reading	74	89
19:02	London, Waterloo	38	26	18:38	Reading	9	51
19:12	Ascot	2	7	18:50	Reading	19	34
19:32	London, Waterloo	22	19	19:20	Reading	15	74
20:02	London, Waterloo	7	18	19:38	Reading	6	33
20:32	London, Waterloo	8	17	19:50	Reading	15	35
07:02	London, Waterloo	65	12	20:08	Reading	2	22
				20:20	Reading	14	19
				20:50	Reading	12	43

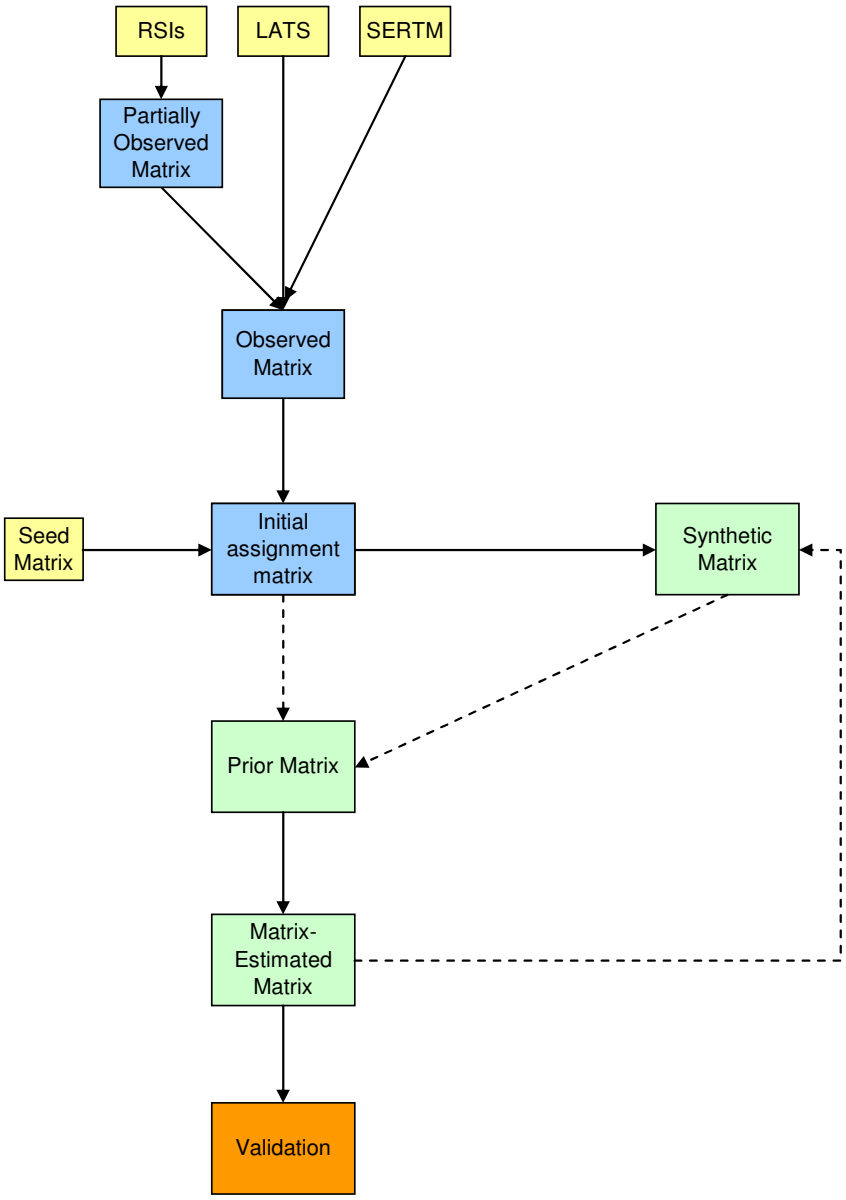
5 Assignment Model Matrix Development

5.1 HIGHWAY MATRIX DEVELOPMENT

5.1.1 The highway matrices were developed using a combination of London and South East Travel Survey (LATS) data, Roadside Interview (RSI) data, and select link matrices taken from the SERTM SATURN model. Highway matrices for Car/LGV and HGV vehicle classifications were developed separately. All Car/LGV and HGV volumes presented in this report are in vehicle numbers rather than Passenger Car Units (PCUs).

5.1.2 The matrix development process described in this section is summarised below in **Figure 5.1**.

Figure 5.1: Matrix Development Flowchart



5.1.3 The RSI data collected from the eight sites in and around Bracknell was used to construct partially-observed trip matrices for individual trip purposes. The surveyed RSI movements represented the interview direction (ID), whereas the non-interview direction (NID) trips were derived from the transpose of the opposite time period; the origins and destinations of the AM peak ID records were reversed to represent the PM NID trips and vice versa. The process described below was applied on a site by site basis to the AM and PM peak periods in the interview and non-interview directions.

5.1.4 Generally the number of interviews obtained at an RSI can typically represent between 10-20% of the total flow. Therefore to develop a matrix that is equal in size to the observed traffic flow the RSI samples have to be factored up. The key to developing a well distributed matrix is to derive as small as possible expansion factors. Small expansion factors can be derived by using RSI survey data from three hours to produce a single peak hour distribution pattern. Large expansion factors based on a single hour of data can lead to an over-reliance on a small sample of data. Using RSI data over three hours helps to alleviate this problem.

5.1.5 The peak hour MCC totals observed at each site were factored by the peak hour journey purpose proportions obtained from the peak hour records. This generated MCC based counts for the peak hours for each journey purpose. The peak period records were then expanded to the appropriate peak hour total for each journey purpose. This method increased the sample size by using interviews from the three hour peak periods instead of those only from the peak hour while maintaining the journey purpose distribution pattern of the peak hours. The peak hour factored ATC flows and sample sizes are shown in **Table 5.1** and **Table 5.2** for the AM peak and PM peak periods respectively.

Table 5.1: AM Peak Hour Factored ATC and Peak Period Sample Size

Data Source	Location	Peak Hour Factored ATC		Sample Size		Proportion	
		Car /LGV	HGV	Car /LGV	HGV	Car /LGV	HGV
RSI	Site 1 ID	1523	151	288	3	18.9%	2.0%
RSI	Site 2 ID	647	37	232	1	35.8%	2.7%
RSI	Site 3 ID	1872	79	429	3	22.9%	3.8%
RSI	Site 4 ID	874	31	312	1	35.7%	3.2%
RSI	Site 5 ID	596	11	229	0	38.4%	0.0%
RSI	Site 6 ID	651	19	355	1	54.6%	5.4%
RSI	Site 7 ID	1418	76	323	0	22.8%	0.0%
RSI	Site 8 ID	668	29	246	0	36.8%	0.0%

Table 5.2: PM Peak Hour Factored ATC and Peak Period Sample Size

Data Source	Location	Peak Hour Factored ATC		Sample Size		Proportion	
		Car /LGV	HGV	Car /LGV	HGV	Car /LGV	HGV
RSI	Site 1 ID	1249	114	113	0	9.0%	0.0%
RSI	Site 2 ID	808	29	112	0	13.9%	0.0%
RSI	Site 3 ID	1541	128	327	1	21.2%	0.8%
RSI	Site 4 ID	967	29	171	0	17.7%	0.0%
RSI	Site 5 ID	449	5	143	0	31.8%	0.0%
RSI	Site 6 ID	817	10	189	1	23.1%	9.8%
RSI	Site 7 ID	949	38	151	0	15.9%	0.0%
RSI	Site 8 ID	1110	14	97	1	8.7%	7.2%

5.1.6 Where an expansion factor derived from the three hour peak period interviews exceeded 10, either interview data from outside the peak periods was added to increase the sample size, or journey purposes were combined in order to lower the expansion factor. Expansion factors for the AM and PM peak hours are displayed in **Table 5.3** below.

Table 5.3: AM and PM Peak Hour Expansion Factors by Purpose

Site	Direction-Period	HBW	Emp Bus	HEd	HBO	NHB	LGV	HGV
1	ID-AM	5.43	4.79	6.81	4.19	2.48	11.17	50.32
	ID-PM	10.74	10.23	10.74	10.74	10.23	28.97	
	NID-AM	9.86	9.86	9.86	9.86	2.21	27.18	
	NID-PM	3.46	5.61	6.32	3.24	4.59	7.90	41.53
2	ID-AM	2.56	2.24	2.17	4.34	5.79	19.90	36.66
	ID-PM	7.08	7.23	2.17	6.94	8.13	26.64	
	NID-AM	8.88	8.49	1.59	1.91	2.39	24.53	
	NID-PM	2.63	3.15	2.68	2.63	3.15	24.58	16.05
3	ID-AM	4.68	3.02	4.10	3.13	3.22	17.89	26.33
	ID-PM	4.68	4.71	1.69	3.70	4.83	14.68	128.49
	NID-AM	4.87	2.89	4.29	1.43	2.56	18.97	112.38
	NID-PM	3.78	4.14	1.36	6.78	5.11	16.52	30.72
4	ID-AM	2.89	2.86	2.71	1.31	3.57	13.07	30.81
	ID-PM	6.25	4.95	1.50	4.73	4.50	10.95	
	NID-AM	6.33	6.33	6.33	2.30	12.63	14.45	
	NID-PM	4.37	1.43	0.42	3.25	1.53	16.21	43.23
5	ID-AM	2.38	2.00	3.64	1.98	3.46	28.60	
	ID-PM	4.02	2.28	1.55	2.01	1.94	2.21	
	NID-AM	5.49	4.96	3.77	3.77	3.77	5.85	
	NID-PM	3.38	1.78	1.01	3.14	3.46	25.52	
6	ID-AM	1.79	1.45	1.69	1.38	2.49	6.85	18.62
	ID-PM	4.56	3.92	0.00	2.57	2.92	64.43	10.23
	NID-AM	4.63	4.43	3.12	3.12	4.43	50.66	17.67
	NID-PM	3.06	3.04	0.00	2.67	0.80	7.75	6.32
7	ID-AM	4.31	4.30	5.69	2.84	4.55	22.15	
	ID-PM	7.22	5.80	9.00	3.00	3.50	49.36	
	NID-AM	8.61	6.09	7.09	2.76	5.51	54.64	
	NID-PM	3.72	4.23	7.44	3.19	2.98	30.54	
8	ID-AM	2.51	2.97	3.16	1.94		9.18	
	ID-PM	10.87	11.55	16.49	8.25	12.37	35.29	13.89
	NID-AM	14.51	13.62	8.51	5.68	0.00	44.86	18.16
	NID-PM	2.83	3.80	9.22	4.26		6.86	

5.1.7 ATC data was collected over a two week period in September 2007 encompassing the week of RSIs. ATCs are considered to provide a more reliable estimate of average flows compared to MCCs undertaken on the day of the RSI. The average ATC flow was taken from Tuesday to Thursday inclusive. Each interview was factored to account for the difference between the MCC and the average ATC flows.

5.1.8 The individual matrices for each journey purpose in the ID and NID were combined to produce the partially observed AM and PM interview matrices, containing all the trips considered to have passed through the RSI sites.

5.1.9 For each peak period and vehicle class modelled, the partially observed matrix was assigned to the network and subsequent sensitivity testing of traffic routings and comparisons between observed and modelled flows were undertaken. This ensured that the best possible partially observed matrix, producing the optimum fit to the observed flows, was progressed to the full matrix development.

5.1.10 The partially observed matrix was combined with the LATS and SERTM data to produce the fully observed trip matrix, which was then 'seeded' so that there were no zero values in any cell of the matrix. Non-zero trip matrix cell values are required in VISUM to ensure paths and costs are generated for all movements.

5.1.11 The demand (synthetic) model was then incorporated into the Car/LGV matrix development process. The observed matrix was assigned in the demand model to supply generalised cost skim matrices for each O-D pair. The demand model was then run (see **Section 10**) to create a synthetic Car/LGV matrix which was used to 'infill' the observed matrix to form our 'prior' matrix. The Car/LGV and HGV prior matrices were subsequently taken forward to the matrix estimation stage as described below.

5.2 HIGHWAY MATRIX ESTIMATION

5.2.1 Matrix estimation techniques, referenced in **Figure 5.1**, were employed to further improve the quality of the highway matrices in weak areas. Matrix estimation aims to control the assigned flow to the observed flow while maintaining the trip length distribution throughout the matrix. The matrix estimation procedure (known as TFlowFuzzy within VISUM) was run independently for Cars/LGVs and HGVs. The result of the matrix estimation exercise depended on the following inputs and controlling parameters:

- The model network
- The prior matrix
- Observed traffic count data

5.2.2 Approximately 75% of available BFB traffic count data, along with additional observed data collected in the Wokingham area, was used as a target for TFlowFuzzy with the remaining BFB count data reserved for validation purposes.

5.2.3 To assess the change in trip distribution brought about by the matrix estimation exercise the following comparisons were made between the prior and final matrices:

- Change at matrix sector level
- Change in trip length distribution

5.2.4 These comparisons, which are displayed in **Appendix B**, provide some indication of the level of distortion caused by the matrix estimation process.

5.2.5 The majority of sector to sector cells were not changed significantly and any changes were typically trip increases, i.e. infilling. This was to be expected as the prior matrix was low in trips in some areas (e.g. the Bracknell internal sector).

5.2.6 Trip length distributions were also relatively similar between prior and final matrices with the majority of changes being increases spread across all trip-length categories.

5.3 FINAL HIGHWAY MATRIX SUMMARY

5.3.1 The final highway matrices were developed using matrix estimation techniques with a maximum of two iterations performed. The total numbers of Cars/LGVs and HGVs in the model are detailed in **Table 5.4**.

Table 5.4: Highway Matrix Totals

Peak Hour	Matrix Total, Veh	
	Car	HGV
AM	197,140	14,273
PM	232,403	10,212

5.3.2 The traffic matrices are each input as an hourly total since no profiling has been applied to the peak hours, and as such each of the models represents an average hourly situation.

5.4 PUBLIC TRANSPORT MATRIX DEVELOPMENT

5.4.1 Public transport survey data from the main bus routes in Bracknell was used to construct bus demand matrices for the Bracknell Transport Model. Rail survey data collected at Bracknell railway station was used to develop rail demand matrices. Refer to **Section 4** for details on the survey data collected.

5.4.2 Each public transport survey record was assigned an origin and destination model zone number based upon the Ordnance Survey Grid Reference associated with the postcode details collected. Using a set of logical rules developed for each individual site, the survey data was cleaned of trips that were deemed to be illogical to produce sets of clean data covering the survey period.

5.4.3 The number of interviews obtained on each bus was factored up to represent the observed number of passengers on that bus (the number of boarders). These were in turn factored by the number of buses in the peak hour to represent total hourly patronage levels. OD survey data from the three hour peak period was used in creating the peak hour demand in order to increase the sample size and reduce the expansion factors.

5.4.4 The number of interviews obtained during each time period at the railway station was factored up to represent the observed number of passengers during that hour at the train station, the number of boarders or alighters depending on the direction the interviewer was travelling. These were in turn factored by the number of trains in the peak hour in that direction to represent total hourly patronage levels. OD survey data from the three hour peak period was used in creating the peak hour demand in order to increase the sample size and reduce the expansion factors.

5.4.5 Some peak hour services on a number of routes either started or finished outside of the peak hour. A view was taken on their inclusion in the analysis and manual adjustments were made to produce sensible matrices.

5.4.6 OD survey data from the three hour peak period was initially used to derive the interview expansion factors. However, where the initial factors were greater than ten, survey records from outside of the three hour peak period were added to reduce the expansion factors.

5.4.7 The bus surveys were conducted on the vehicle and with passengers interviewed at some point during their journey. As such, there is no fixed point at which the interview data can be expanded to represent full passenger volumes at all points along the route. It was found that expanding all interviews collected to the total number of boarders for each route can create a bias in trip patterns. This occurs when the distribution of the interviewed passengers' boarding points is not the same as that of the number of boarding passengers. Passengers boarding during quiet sections of the route and for longer journeys are more likely to be surveyed than those boarding during busier sections of the route and travelling for shorter periods of time. The example shown in **Table 5.5** illustrates the problems arising from expanding the interviews across the entire route.

Table 5.5: Survey Expansion Example – By Route

Stop	Boarders	Surveys	% Pax at Stop	Exp Factor	PAX Exp	% Pax at Stop	PAX Error
1	5	5	6%		13	15%	8
2	8	7	9%		18	21%	10
3	25	7	28%		18	21%	-7
4	20	7	23%		18	21%	-2
5	20	6	23%		16	18%	-4
6	10	2	11%		5	6%	-5
Total	88	34		2.59	88		

** PAX = Passengers; Exp = Expansion/Expanded

5.4.8 In this example, few passengers board at the start of the route whereas the stops in the middle of the route are more popular. Here the distribution of the expanded data is biased towards the start of the route and shows a lower proportion of passengers boarding at the more popular stops.

5.4.9 Ideally the survey data should be expanded at each bus stop, although in reality this is not practical. Firstly, the specific boarding point must be known. Due to the difficulty in collecting on board surveys, passengers are not generally interviewed at their boarding point and may be some way into their journey at the time of the interview.

5.4.10 To reduce the bias in passenger travel patterns, each route was divided into three to four sections and each bus stop was allocated to a particular route section. Each interview was associated with the most likely origin and destination sections of the appropriate route based on the postcode data collected. This enabled the derivation of different expansion factors for different sections of each route. **Table 5.6** illustrates how this method reduced the expanded passenger travel pattern bias.

Table 5.6: Survey Expansion Example – By Route and Route Selection

Route Section	Stop	Boarders	Surveys	% Pax at Stop	Exp Factor	PAX Exp	% Pax at Stop	PAX Error
1	1	5	5	6%	1.08	5	6%	0
	2	8	7	9%		8	9%	0
2	3	25	7	28%	3.21	23	26%	-3
	4	20	7	23%		23	26%	3
3	5	20	6	23%	3.75	23	26%	3
	6	10	2	11%		8	9%	-3
	Total	88	34		2.59	88		

** PAX = Passengers; Exp = Expansion/Expanded

5.4.11 A number of passengers used more than one public transport service to complete their journey. These trips were considered as double counted on surveyed services. To account for this, the assigned bus matrix was factored down where more than one other surveyed service was used.

5.4.12 Once the final expansion was completed, the bus trips were divided into two categories: car available (CA) and non-car available (NCA), and into five journey purposes similarly to the highway matrices.

5.5 FINAL PUBLIC TRANSPORT MATRIX SUMMARY

5.5.1 The PT matrices developed were not adjusted using any matrix estimation techniques. The distribution patterns were as close to the surveys as possible given the matrix development process adopted. The total numbers of bus and rail users in the observed model are detailed in **Table 5.7**.

Table 5.7: Bus and Train Matrix Totals

Peak Period	Matrix Totals	
	Bus PAX	Rail PAX
AM	394	1,094
PM	126	676

6 Assignment Model Calibration

6.1 INTRODUCTION

6.1.1 The assignment model and the demand model were calibrated in tandem. This section describes the calibration of the assignment model. The principle difference between the two models is that the demand model derives synthetic matrices from census data which is calibrated to observed data whether from RSI or NTS, whilst the assignment model is based on matrices built primarily from observed data.

6.1.2 From this point of view the observed models are built from the origin destination data outlined in **Section 4** collected as part of the survey programme and that obtained from the SERTM model and the process described in **Section 5**.

6.1.3 The process of model calibration is designed to ensure that the parameters that control the model's calculation of route choices and the resulting delays lead to accurate replication of traffic patterns in the network. The calibration of a model crucially relies on traffic entering the detailed modelling area at the correct points, as this is the information from which the model trip matrix is constructed. The model's ability to replicate the main urban area cordon traffic flows is, therefore, a key indication of calibration.

6.2 MODEL CONVERGENCE

6.2.1 An element of calibrating the model is ensuring a satisfactory convergence is achieved. Model convergence is needed to ensure traffic flows remain stable between successive iterations of the model.

6.2.2 DMRB guidelines stipulate that the parameters %Flow and delta (δ) should be monitored to determine the level of convergence. %Flow, also known as model stability indicator 'P', measures the proportion of links in the network with flows changing by less than 5% from the previous iteration. δ is the difference between costs on chosen routes and costs on minimum cost paths. **Table 6.1** shows the criteria for when a model is considered to have converged.

Table 6.1: Convergence Criteria

Measure of Convergence	Acceptable Value
'Delta'	Less than 1%
Percentage of links with flow changes < 5%	Four consecutive iterations greater than 90%

Source: DMRB Volume 12 Section 2 Part 1 Chapter 4 Table 4.1

6.2.3 In VISUM, the duality gap expresses the convergence quality as the volume-weighted difference between the total impedance calculated along the chosen routes and the hypothetical vehicle impedance if all vehicles used the minimum impedance routes, as a proportion of the minimum vehicle impedance. The duality gap is comparable to the 'delta' described in the DMRB which asserts that iterations should continue until delta < 1%. This is displayed in **Table 6.2**, which indicates that a satisfactory convergence is achieved after 131 iterations for the AM peak and 200 iterations for the PM peak.

6.2.4 **Table 6.3** displays the %Flow values for the last four iterations of the AM and PM peak models, indicating that both models exceed DMRB criteria in this aspect.

Table 6.2: Model Convergence (Duality Gap)

	AM Peak	PM peak
Duality Gap	0.001667	0.001274
Iterations	131	200

Table 6.3: Model Stability Indication 'P' (Car)

Iteration	AM Peak	PM peak
n-3	99.9%	100%
n-2	99.9%	100%
n-1	100%	100%
n	100%	100%

6.3 MODEL CALIBRATION CRITERIA

6.3.1 A modified Chi² statistic known as the GEH (Geoffrey Edward Havers) statistic was used to determine the best fit. The statistic uses the following formula to calculate a value for the difference between observed (O) and modelled (M) flows:

$$GEH = \sqrt{\frac{(O - M)^2}{0.5(O + M)}}$$

6.3.2 The criteria used to assess the acceptable performance of a traffic model are defined in DMRB Volume 12 and are contained in **Table 6.4** below.

Table 6.4: Assignment Acceptability Guidelines

Criteria and Measure	Assigned Model Hourly Flows compared with Observed Flows	Acceptability Guideline
Flow Criteria		
Observed flow < 700 vph	Modelled flow within ±100 vph	> 85 % of links
Observed flow 700 - 2,700 vph	Modelled flow within ±15%	> 85 % of links
Observed flow > 2,700 vph	Modelled flow within ±400 vph	> 85 % of links
Total screenline flows (normally >5 links) to be within ±5%		All (or nearly all) screenlines
GEH Criteria		
GEH Statistic for individual links < 5		> 85 % of links
GEH Statistic for screenline totals < 4		All (or nearly all) screenlines

Source: DMRB Volume 12 Section 2 Part 1 Chapter 4 Table 4.2

6.3.3 The GEH statistic takes account of the fact that when traffic flows are low the percentage difference between observed and modelled flows may be high but the significance of this difference is small. A GEH value greater than 10 indicates that closer attention is required as the match between observed and modelled flows is poor, while a GEH of less than 5 indicates a very good fit.

6.3.4 The calibration of the model has been conducted for the following user classes:

- Cars/light goods vehicles
- Heavy goods vehicles

- Bus services
- Rail services

6.4 HIGHWAY MODEL CALIBRATION RESULTS

6.4.1 The calibration of the highway model in terms of the Car/LGV and HGV traffic was conducted on a number of different screenlines and cordons which were derived from the available traffic data as collated and described in the Traffic Data Report. The screenlines are shown in **Appendix G** and comprise the following:

- RSI screenline
- Inner cordon
- Outer Cordon
- Railway screenline
- A329/A322/A3095

6.4.2 In addition there were a number of strategic count sites as obtained from the Trads2 HA database for traffic on the M3, M4 and A404(M) which were included as motorway counts and total some 22 items of data.

6.4.3 Including the ATC data available in the Wokingham, there were 155 items of count data for both the car/LGV and HGV calibration. A full list of the calibration flows and GEH values for each vehicle class is contained within **Appendix C**. The resultant screenline calibration is shown in **Table 6.5** to **Table 6.8**.

Table 6.5: AM Peak Car/LGV Screenline Calibration Statistics

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	8296	8585	289	3%	3.1	✓		8	7	7
2	RSI Screenline	Outbound	8143	8211	68	1%	0.8	✓		8	8	8
3	Inner Cordon	Inbound	9183	9280	97	1%	1.0	✓		12	11	11
4	Inner Cordon	Outbound	7672	7565	-107	-1%	1.2	✓		12	11	12
5	Railway Screenline	Northbound	3840	3773	-67	-2%	1.1	✓		6	4	4
6	Railway Screenline	Southbound	2119	1760	-391	-18%	8.8	✗		6	4	5
7	Outer Cordon	Inbound	9799	9975	176	2%	1.8	✓		10	9	9
8	Outer Cordon	Outbound	8501	8410	-91	-1%	1.0	✓		10	10	10
9	A329/ A322/ A3095	Clockwise	7051	7001	-50	-1%	0.6	✓		7	7	7
10	A329/ A322/ A3096	Anti-clockwise	6295	6325	30	0%	0.4	✓		7	7	7
									screenline/cordon counts	86	78	80
									motorway counts	22	22	22
									Wokingham counts	47	39	39
									total calibration counts	155	139	141
											90%	**91%**

Table 6.6: AM Peak HGV Screenline Calibration Statistics

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	384	318	-66	-17%	3.5	✓		8	8	8
2	RSI Screenline	Outbound	356	360	4	1%	0.2	✓		8	8	8
3	Inner Cordon	Inbound	128	136	8	6%	0.7	✓		12	12	12
4	Inner Cordon	Outbound	163	169	6	4%	0.5	✓		12	12	12
5	Railway Screenline	Northbound	80	43	-37	-46%	4.7	✗		6	5	6
6	Railway Screenline	Southbound	44	60	18	43%	2.5	✓		6	6	6
7	Outer Cordon	Inbound	250	251	1	0%	0.0	✓		10	10	10
8	Outer Cordon	Outbound	241	277	36	15%	2.2	✓		10	10	10
9	A329/ A322/ A3095	Clockwise	259	266	70	36%	4.6	✗		7	7	7
10	A329/ A322/ A3096	Anti-clockwise	196	257	-2	-1%	0.1	✓		7	7	7
									screenline/cordon counts	86	85	86
									motorway counts	22	22	22
									Wokingham counts	47	32	37
									total calibration counts	155	139	145
											90%	**94%**

Table 6.7: PM Peak Car/LGV Screenline Calibration Statistics

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	8072	7822	-250	-3%	2.8	✓		8	7	7
2	RSI Screenline	Outbound	9273	8720	-553	-6%	5.8	✗		8	6	7
3	Inner Cordon	Inbound	8805	8823	18	0%	0.1	✓		12	11	9
4	Inner Cordon	Outbound	9791	9492	-299	-3%	3.0	✓		12	10	10
5	Railway Screenline	Northbound	2400	2162	-238	-10%	4.9	✗		6	5	5
6	Railway Screenline	Southbound	3418	3295	-123	-4%	2.1	✓		6	6	6
7	Outer Cordon	Inbound	8715	8743	28	0%	0.2	✓		10	10	10
8	Outer Cordon	Outbound	9744	10022	278	3%	2.8	✓		10	9	9
9	A329/ A322/ A3095	Clockwise	6482	6479	-3	0%	0.0	✓		7	7	7
10	A329/ A322/ A3096	Anti-clockwise	6989	6749	-240	-3%	2.8	✓		7	7	7
									screenline/cordon counts	86	80	77
									motorway counts	22	22	22
									Wokingham counts	47	40	40
									total calibration counts	155	140	139
											90%	**90%**

Table 6.8: PM Peak HGV Screenline Calibration Statistics

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	362	341	-21	-6%	1.1	✓		8	7	8
2	RSI Screenline	Outbound	315	284	-31	-10%	1.8	✓		8	6	8
3	Inner Cordon	Inbound	125	220	95	76%	7.2	✗		12	11	12
4	Inner Cordon	Outbound	139	156	17	12%	1.3	✓		12	12	12
5	Railway Screenline	Northbound	36	18	-18	-50%	3.4	✓		6	6	6
6	Railway Screenline	Southbound	34	50	16	48%	2.5	✓		6	6	6
7	Outer Cordon	Inbound	138	292	154	112%	10.5	✗		10	9	9
8	Outer Cordon	Outbound	111	150	39	35%	3.4	✓		10	10	10
9	A329/ A322/ A3095	Clockwise	148	397	226	132%	13.3	✗		7	5	6
10	A329/ A322/ A3096	Anti-clockwise	171	195	47	31%	3.5	✓		7	7	7
									screenline/cordon counts	86	79	84
									motorway counts	22	21	22
									Wokingham counts	47	46	47
									total calibration counts	155	146	153
											94%	**99%**

6.4.4 The tables above indicate the very high level of calibration achieved for the AM and PM peak models for both car/light goods and heavy goods vehicles.

6.5 PUBLIC TRANSPORT CALIBRATION RESULTS

6.5.1 There are no prescriptive guidelines on the calibration or validation of public transport services but for the purposes of providing a comparison for the same criteria as used for highway traffic has been adopted as shown in **Table 6.9** to **Table 6.12**.

Table 6.9: AM Peak Bus Service Patronage Calibration

Service No	Dir	Bus Station Stand	Route	Observed	Modelled	Diff	GEH	GEH
153	EB	2	Binfield - North Bracknell (153-AM 1)	16	24	8	1.8	✓
153	WB	5	North Bracknell - Binfield (153-AM 2)	12	54	42	7.3	✗
154	Circ	6	Bracknell - Bullbrook - Bracknell	21	32	11	2.1	✓
155	Circ	2	Bracknell - Crown Wood - Bracknell	58	52	-6	0.8	✓
158	Circ	8	Bracknell - Birch Hill - Bracknell	111	114	3	0.3	✓
159	Circ	9	Bracknell - Birch Hill - Bracknell	213	200	-13	0.9	✓
190	SB	4	Reading - Bracknell (190-AM 1)	32	59	27	4.0	✓
190	NB	4	Bracknell - Reading (190-AM 1)	46	68	22	2.9	✓
194	NB	7	Camberley - Bracknell (194-AM 1)	54	60	6	0.8	✓
194	SB	7	Bracknell - Camberley (194-AM 2)	24	38	14	2.5	✓
				587	**701**	**114**	**4.5**	✓
								90%

Table 6.10: AM Peak Rail Service Patronage Calibration

Service No	On / Off	Platform	Route	Observed	Modelled	Diff	%	GEH	GEH
T Reading - Waterloo via Bracknell	Board	1	Bracknell - Waterloo (AM 11)	112	89	-23	-21%	2.3	✓
T Waterloo - Reading via Bracknell	Alight	2	Waterloo - Bracknell (AM 21)	375	332	-43	-11%	2.3	✓
T Waterloo - Reading via Bracknell	Board	2	Bracknell - Reading (AM 12)	106	90	-16	-15%	1.6	✓
T Reading - Waterloo via Bracknell	Alight	1	Reading - Bracknell (AM 22)	323	293	-30	-9%	1.7	✓
				916	**804**	**-112**	**-12%**	**3.8**	✓
									100%

Table 6.11: PM Peak Bus Service Patronage Calibration

Service No	Dir	Bus Station Stand	Route	Observed	Modelled	Diff	GEH	GEH
153	EB	2	Binfield - North Bracknell (153-AM 1)	5	18	13	3.8	✓
153	WB	5	North Bracknell - Binfield (153-AM 2)	15	28	13	2.8	✓
154	Circ	6	Bracknell - Bullbrook - Bracknell	11	9	-2	0.6	✓
155	Circ	2	Bracknell - Crown Wood - Bracknell	31	38	7	1.2	✓
158	Circ	8	Bracknell - Birch Hill - Bracknell	60	29	-31	4.6	✓
159	Circ	9	Bracknell - Birch Hill - Bracknell	84	96	12	1.3	✓
190	SB	4	Reading - Bracknell (190-AM 1)	12	47	35	6.4	✗
190	NB	4	Bracknell - Reading (190-AM 1)	28	60	32	4.8	✓
194	NB	7	Camberley - Bracknell (194-AM 1)	28	45	17	2.8	✓
194	SB	7	Bracknell - Camberley (194-AM 2)	66	41	-25	3.4	✓
				340	**411**	**71**	**3.7**	✓
								90%

Table 6.12: PM Peak Rail Service Patronage Calibration

Service No	On / Off	Platform	Route	Observed	Modelled	Diff	%	GEH	GEH
T Reading - Waterloo via Bracknell	Board	1	Bracknell - Waterloo (AM 11)	117	108	-9	15%	0.8	✓
T Waterloo - Reading via Bracknell	Alight	1	Waterloo - Bracknell (AM 21)	117	96	-21	-15%	2.0	✓
T Waterloo - Reading via Bracknell	Board	2	Bracknell - Reading (AM 12)	322	293	-29	-22%	1.7	✓
T Reading - Waterloo via Bracknell	Alight	2	Reading - Bracknell (AM 22)	116	93	-23	3%	2.2	✓
				672	**590**	**-82**	**-12%**	**3.3**	✓
									100%

6.5.2 From the above tables it can be seen that both the AM peak and PM peak public transport models are well calibrated.

7 Assignment Model Validation

7.1 MODEL VALIDATION

7.1.1 The validation of the assignment models has been conducted under four main headings, namely:

- Network validation
- Link flow validation
- Screenline validation
- Journey time validation

7.2 NETWORK VALIDATION

7.2.1 Range checking of network parameters was conducted to identify any questionable items of data and, where necessary, these were checked against relevant source data. Parameters checked included:

- Link lengths and speeds
- Signal timings
- Saturation flow
- Number of lanes
- Junction type

7.2.2 In general link lengths are all geographically correct as they were derived from the NavTeq database during network development. Due to the use of this method all link lengths are assumed to be correct.

7.2.3 Signal timings were compared with original data received together with number of lanes. Saturation flows and junction types were compared with network inventory data. During the validation process, changes were made to signal timings to better replicate observed flows in locations where maximum green phase values were supplied.

7.3 LINK FLOW VALIDATION (HIGHWAY MODEL)

7.3.1 A primary element of assessing the performance of a model is its ability to match an independent set of count data, which has not been used in the calibration matrix estimation process. For this purpose, a set of counts were identified that had not been used in the matrix estimation process.

7.3.2 The validation of the model has been assessed in a similar way to that of the calibration by the calculation of the GEH statistic. Acceptability guidelines on validation have been taken from DMRB Volume 12a and are as shown in **Table 6.4**. Validation has been carried out using total modelled flows extracted from a stacked assignment and compared to observed light and heavy goods vehicle flows combined.

7.3.3 The validation of the two peak hour models is shown in **Table 7.1**.

Table 7.1: Model Validation

	AM Peak		PM Peak	
	No.	%	No.	%
Number of counts	34		34	
Counts with GEH < 5	29	85%	30	88%
Counts that match flow criteria	29	85%	30	88%

7.3.4 The results show that the model is a good representation of traffic behaviour in the study area, using independent data. The breakdown of the GEH statistic, shown in **Table 7.2**, demonstrates a robust level of validation. A full set of the results is contained in **Appendix D**.

Table 7.2: Breakdown of GEH Statistics

GEH Value	AM Peak		PM Peak	
	No of Counts	%	No of Counts	%
0 – 2	18	45%	14	41%
2 – 4	11	28%	12	35%
4 – 6	4	10%	4	12%
6 - 8	4	10%	2	6%
8 – 10	3	8%	0	0%
> 10	0	0%	2	6%
<5	29	85%	30	88%

7.4 SCREENLINE VALIDATION (HIGHWAY MODEL)

7.4.1 Three screenlines/datasets have been examined as part of the validation, a Sandhurst / Crowthorne cordon, a northern screenline and a central screenline. These are shown in **Appendix G**.

7.4.2 **Table 7.3** and **Table 7.4** contain the screenline total flow results for the AM and PM peak hours. **Appendix D** contains the breakdown of each screenline by link.

Table 7.3: AM Peak Screenline Validation

Screenline / dataset	Count	Model	Diff	%	GEH	GEH
Sandhurst/Crowthorne Cordon (Inbound)	3926	3904	-22	-1%	0.4	✓
Sandhurst/Crowthorne Cordon (Outbound)	4931	4940	9	0%	0.1	✓
Northern Screenline (Northbound)	2823	2686	-137	-5%	2.6	✓
Northern Screenline (Southbound)	2321	2086	-235	-10%	5.0	✗
Central Screenline (Northbound)	6185	6130	-55	-1%	0.7	✓
Central Screenline (Southbound)	3831	4082	251	7%	4.0	✓

Table 7.4: PM Peak Screenline Validation

Screenline / dataset	Count	Model	Diff	%	GEH	GEH
Sandhurst/Crowthorne Cordon (Inbound)	5208	5110	-98	-2%	1.3	✓
Sandhurst/Crowthorne Cordon (Outbound)	4155	4044	-111	-3%	1.7	✓
Northern Screenline (Northbound)	1890	2028	138	7%	3.1	✓
Northern Screenline (Southbound)	2832	2686	-146	-5%	2.7	✓
Central Screenline (Northbound)	3796	3794	-2	0%	0.0	✓
Central Screenline (Southbound)	5553	5040	-513	-9%	7.0	✗

7.4.3 From a traffic flow perspective the highway model is therefore considered to be validated.

7.5 JOURNEY TIME VALIDATION (HIGHWAY MODEL)

7.5.1 Journey time validation has been carried out using data from the journey time surveys. Equivalent journey times for both directions of each route, displayed in **Appendix G**, have been extracted from the highway model and compared with the observed journey time limits (plus and minus 15% or 1 minute, whichever is the greater). The results of this for the whole route are shown below in **Table 7.5** and **Table 7.6** for the AM peak and PM peak respectively, with results on a link basis contained within **Appendix E**.

Table 7.5: AM Peak Journey Time Validation

AM PEAK	Observed Journey Time			Modelled Time	Within limit
	Average Observed	Lower Limit	Upper Limit		
Route A SB	14:46	12:33	16:59	11:08	✗
Route A NB	14:48	12:35	17:01	13:38	✓
Route B EB	12:44	10:50	14:39	12:36	✓
Route B WB	12:10	10:20	13:59	13:40	✓
Route C SB	06:30	05:30	07:30	06:38	✓
Route C NB	07:42	06:32	08:51	07:09	✓
Route D NB	04:46	03:46	05:46	05:01	✓
Route D SB	04:43	03:43	05:43	04:09	✓
Route E CW	18:35	15:48	21:22	18:29	✓
Route E ACW	18:35	15:47	21:22	16:37	✓
					90%

Table 7.6: PM Peak Journey Time Validation

AM PEAK	Observed Journey Time			Modelled Time	Within limit
	Average Observed	Lower Limit	Upper Limit		
Route A SB	11:43	09:57	13:28	11:08	✓
Route A NB	11:42	09:57	13:28	10:21	✓
Route B EB	15:10	12:53	17:26	12:55	✓
Route B WB	18:25	15:39	21:10	13:35	✗
Route C SB	10:04	08:33	11:35	09:29	✓
Route C NB	06:41	05:41	07:41	05:57	✓
Route D NB	05:11	04:11	06:11	04:25	✓
Route D SB	06:18	05:18	07:18	05:13	✓
Route E CW	18:25	15:39	21:10	18:53	✓
Route E ACW	17:35	14:57	20:13	16:58	✓
					90%

7.5.2 The AM peak and PM peak models validates well on 9 of the 10 routes which exceeds DMRB criteria in both cases.

7.6 JOURNEY TIME VALIDATION (PT MODEL)

7.6.1 The validation of the PT network has concentrated on bus services with a comparison of journey times which is summarised in **Table 7.7** and **Table 7.8**. In a similar way to the highway journey times, 9 out of 10 are within the limits in both AM and PM peaks, with one route being marginally too fast.

Table 7.7: AM Peak Bus Service Journey Time Validation

Route	Direction	Distance (km)	Timetabled Journey Time			Modelled Time	Within Limit
			Timetable	Lower Limit	Upper Limit		
154E	BINFIELD - NORTH BRACKNELL	10.6	35:00	29:45	40:15	32:24	✓
154W	NORTH BRACKNELL - BINFIELD	10.7	26:00	22:06	29:54	25:27	✓
154	BRACKNELL - BULLBROOK -BRACKNELL	5.6	14:00	11:54	16:06	14:28	✓
155	BRACKNELL - CROWN WOOD - BRACKNELL	10.0	25:00	21:15	28:45	27:01	✓
158	BRACKNELL - BIRCH HILL - BRACKNELL (clockwise)	15.2	45:00	38:15	51:45	38:17	✓
159	BRACKNELL - BIRCH HILL - BRACKNELL (anti-clockwise)	15.3	45:00	38:15	51:45	40:14	✓
190E	READING - BRACKNELL	5.0	12:02	10:14	13:50	11:30	✓
190W	BRACKNELL - READING	4.9	13:20	11:20	15:20	11:09	✗
194N	CAMBERLEY - BRACKNELL	17.2	43:00	36:33	49:27	43:10	✓
194S	BRACKNELL - CAMBERLEY	17.5	41:00	34:51	47:09	41:09	✓
							90%

Table 7.8: PM Peak Bus Service Journey Time Validation

Route	Direction	Distance (km)	Timetabled Journey Time			Modelled Time	Within Limit
			Timetable	Lower Limit	Upper Limit		
154E	BINFIELD - NORTH BRACKNELL	10.6	35:00	29:45	40:15	29:49	✓
154W	NORTH BRACKNELL - BINFIELD	10.7	26:00	22:06	29:54	25:25	✓
154	BRACKNELL - BULLBROOK -BRACKNELL	5.6	14:00	11:54	16:06	14:22	✓
155	BRACKNELL - CROWN WOOD - BRACKNELL	10.0	25:00	21:15	28:45	26:24	✓
158	BRACKNELL - BIRCH HILL - BRACKNELL (clockwise)	15.2	45:00	38:15	51:45	46:01	✓
159	BRACKNELL - BIRCH HILL - BRACKNELL (anti-clockwise)	15.3	45:00	38:15	51:45	38:32	✓
190E	READING - BRACKNELL	5.0	12:02	10:14	13:50	11:08	✓
190W	BRACKNELL - READING	4.9	13:20	11:20	15:20	11:18	✗
194N	CAMBERLEY - BRACKNELL	17.2	43:00	36:33	49:27	40:57	✓
194S	BRACKNELL - CAMBERLEY	17.5	41:00	34:51	47:09	44:17	✓
							90%

7.7 CONCLUSION

7.7.1 Overall both the private and public transport models are considered to provide an acceptable level of calibration and validation to 2007 traffic levels and are suitable to provide a robust platform for forecast scheme assessment.

8 Inputs to Demand Model: Generalised Cost of Travel

8.1 INTRODUCTION

8.1.1 The calculation of the generalised cost of travel by all modes is a key input to both mode and distribution choice models. This section describes generalised cost formulation for each mode and the parameter values applied in the BTM.

8.2 HIGHWAY GENERALISED COST

8.2.1 For car trips the calculation of generalised cost is based on:

- Journey distance
- Journey time
- Vehicle operating cost
- Other costs (parking charges, toll)
- Value of time

8.2.2 Highway generalised costs are calculated, in minutes, as:

$$G_{car} = T + D*VOC/(occ*VOT) + PC/(occ*VOT)$$

Where T is the journey time, VOC is the vehicle operating cost, D is the total distance travelled, occ is the number of people in a vehicle, VOT is the appropriate value of time, and PC is the parking cost.

8.2.3 Vehicle operating costs (VOC) for both cars and goods vehicles were derived following guidance produced by the Department for Transport and published in the Transport Economics Note 2001 subsequently updated and provided within WebTAG unit 3.5.6

8.2.4 VOC for cars is primarily made up of fuel costs and is determined using the function:

$$Fuelcost\ per\ km = a + bv + cv^2 + dv^3$$

Where v is the speed of travel (km/h) and a,b,c,d are parameters for each vehicle type to the cost function

Table 8.1: Fuel VOC Formulae Parameter Values (pence per km 2007)

Parameter					AM	PM
Vehicle Category	a	b	C	D	Vehicle Proportion from MCC	Vehicle Proportion from MCC
Average Car	4.977	-0.113	0.001	0.000	86.72%	88.13%
Average LGV	5.764	-0.088	0.000	0.000	7.58%	7.04%
OGV1	22.666	-0.666	0.009	0.000	2.90%	1.88%
OGV2	30.221	-0.891	0.013	0.000	1.17%	1.59%
PSV	18.723	-0.560	0.008	0.000	0.59%	0.41%

8.2.5 The elements making up non-fuel vehicle operating costs include oil, tyres, maintenance, depreciation and vehicle capital saving (only for vehicles in working time). The non-fuel elements of VOC are combined in a formula of the form

$$C = a1 + b1/V,$$

Where

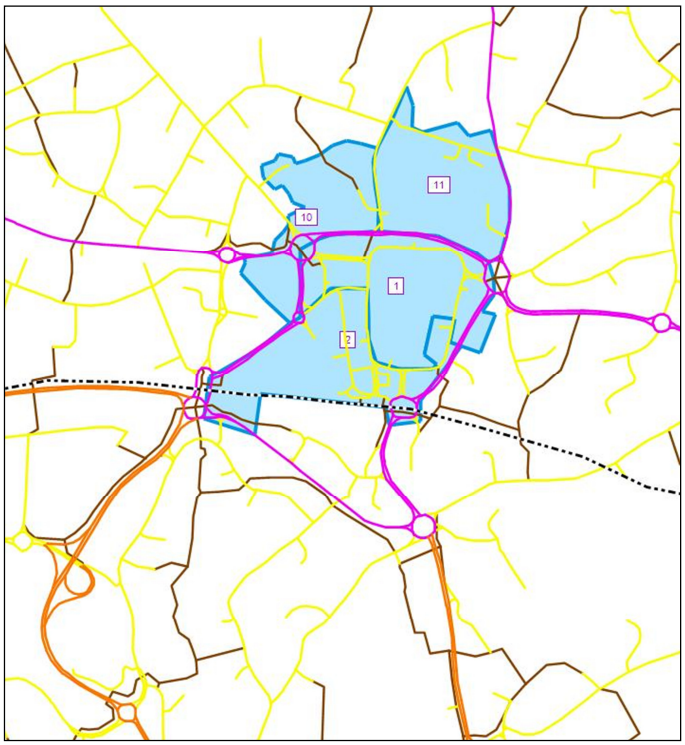
C = cost in pence per kilometre travelled,
V = average link speed in kilometres per hour,
a1 is a parameter for distance related costs defined for each vehicle category,
b1 is a parameter for vehicle capital saving defined for each vehicle category. (This parameter is only relevant to working vehicles).

Table 8.2: Non-Fuel VOC Formulae Parameter Values (pence per km, 2002 prices)

Vehicle Category	Resource Cost Parameters		Perceived Cost Parameters	
	a1	b1	a1	b1
Car				
Average Car	3.308	19.048	3.765	19.048
LGV				
Average LGV	5.91	33.97	6.035	33.97
OGV1	5.501	216.165	5.501	216.165
OGV2	10.702	416.672	10.702	416.672
PSV	24.959	569.094	24.959	569.094

8.2.6 Parking costs obtained from site visits and the BFC website. The data collated was summarised to form a charge for short stay parking (£3) and long stay parking (£8). These charges were applied to the main car parks (as listed below) which are present in the traffic model zones shown diagrammatically in **Figure 8.1**.

Figure 8.1: Location of Zones where Parking Charges Apply



8.2.7 Long term parking charges were applied to HBW trips with short term charges applied to all other trip purposes.

8.3 PUBLIC TRANSPORT GENERALISED COST

8.3.1 For public transport mode generalised cost is derived from:

- fares
- in-vehicle time
- walking time to and from the service
- waiting times
- interchange penalty
- non-walked access, e.g. park and ride
- value of time

and is formulated, in minutes, as:

$$G_{PT} = V_{wk}*A + V_{wt}*W + T + F/VOT + I$$

where A is the total walking time to and from the service, W is the total waiting time for all services used on the journey, T is the total in-vehicle time, F is the journey fare and I is the interchange penalty if the journey involves transferring from one service to another. Vwk and Vwt are the weights applied to time spent walking and waiting which are assumed to be 2 and 2 correspondingly.

8.3.2 Data on bus fares was obtained from timetable information and site visits. The fare zone structure that was incorporated into the Bracknell model is shown in **Table 8.3**, and applies a set fare to each bus journey based on the number of 'fare points' traversed in the network. The parameter 'fare point' is manually defined and in the BTM, one fare point is equal to one metre. This pricing structure was based on assessment of real fares charged.

Table 8.3: Bus Fares Modelled

Distance (number of fare points)	2007 Base model (pence per point)
15000	1.35
17000	2.25
24000	2.75
>24000	10.00

8.3.3 Rail fares were extracted from the national rail website for a wide range of origins and destination within the main study area. However in order to get a structure which worked within the model the fares function from the National Transport Model were implemented. No variation by purpose was introduced within the model. The function was derived in 2001 and grown in accordance with national rail fare growth (shown in **Figure 8.2**) to give the figures shown in **Table 8.4**.

Figure 8.2: Growth in Rail Fares 1997 – 2007

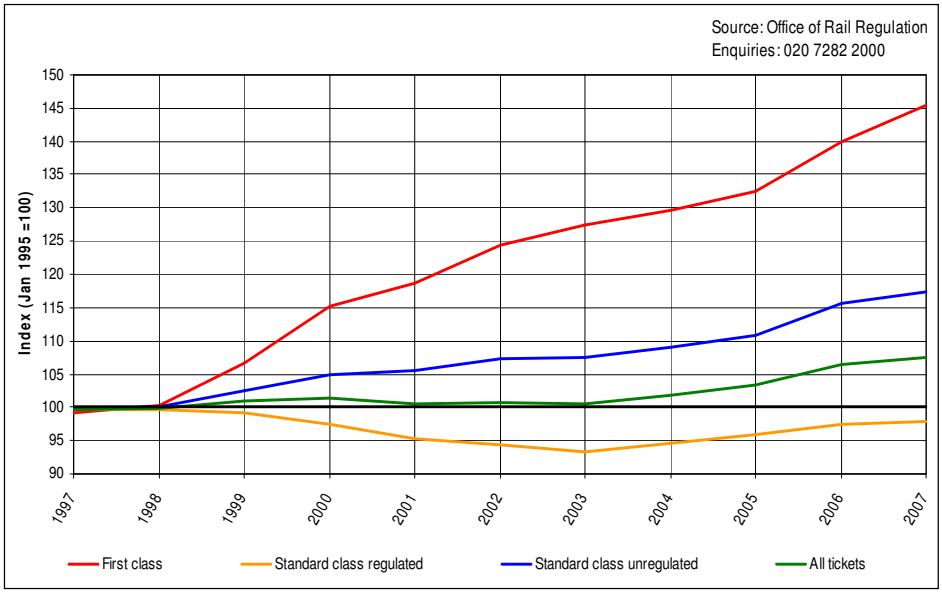


Table 8.4: Rail Fare Calculation

Fixed Cost	2.6
Fare per KM 1997	0.12
Fare per KM 2007-Standard class unregulated	0.14
Fare per KM 2007-All tickets	0.13

8.4 SLOW MODE GENERALISED COST

8.4.1 For slow modes (walking and cycling) a set of generalised costs is calculated from a set of travel distances and an assumed speed of travel. Distances are taken from the highway assignment model using the minimum of (i,j) and (j,i) costs to obtain symmetry and minimise the impact of one way systems and lack of motorised access. Speeds of travel of 4kph for walking and 12 kph for cycling are assumed to give a travel time between each zone pair. There is no monetary cost for this mode.

8.4.2 Generalised costs are calculated as:

$$G_{SLOW} = V_{wk} * D/S$$

where D is the total distance travelled, S is walking/cycling speed and Vwk is the weight applied to time spent walking/cycling, which is assumed to be 2.

8.5 VALUE OF TIME

8.5.1 WebTAG gives values of time in 2002 prices and also supplies a table (Table 3 in WebTAG Unit 3.5.6) of forecast growth. In particular, the percentage growth from 2002 to 2007 is forecast as 13.5 for work related trips and 10.7 for non-work related trips.

8.5.2 Non-working time value per person is given in Unit 3.5.6 Table 2 (perceived cost) in £ per hour as shown in **Table 8.5**.

Table 8.5: Non Working Time Values

Purpose	Year	
	2002	2007
Commuting	£5.04	£5.58
Other	£4.46	£4.94

8.5.3 WebTAG unit 3.12.2 Table A3 displays the value of time by income resulting in the values shown in **Table 8.6**.

Table 8.6: VOT by Income Band

Purpose	Year	
	2002	2007 (using Growth)
Commuting		
Income < £17,500	2.66	2.94
Income £17,500 - £35,000	4.33	4.79
Income >£35,000	6.3	6.97
Total	4.85	5.37
Other		
Income < £17,500	3.38	3.74
Income £17,500 - £35,000	4.36	4.83
Income >£35,000	5.24	5.80
Total	4.33	4.79
High & Low Commuting (see income split below)		
Low	3.69	4.09
High	5.95	6.58
Total	4.85	5.37

8.5.4 In order to make these high/low split commuting values compatible with the perceived (WebTAG Unit 3.5.6, Table 2) other non-work values they have been scaled by the total values to give the values in **Table 8.7**.

Table 8.7: Commuting Values of Time

	Year	
	2002	2007
Commuting Low	3.84	4.25
Commuting High	6.18	6.84

8.5.5 WebTAG Unit 3.12.2 (Table A1) gives proportions of trips by income for non-work purposes, which is replicated in **Table 8.8**.

Table 8.8: Non-Work VOT by Income Band

Range	Income	Commuting	Other	All Non Work
V_1	< £17,500	23.5	36.5	34.1
V_2	£17,500 - £35,000	44.9	37.5	38.8
V_3	> £35,000	31.6	26	27.1
Total		100	100	100

8.5.6 In the BTM model areas 38.5% of employed persons are graded as "high income" (more than £35,000) and 61.5% as low. For commuting the following formulae was applied to the WebTAG values of time to calculate the BTM values of time.

For low income:

$$[23.5*V_1 + (61.5-23.5)*V_2]/61.5 = 0.382V_1 + 0.618V_2,$$

For high income:

$$[(38.5-31.6)*V_2 + 31.6*V_3]/38.5 = 0.179V_2 + 0.821V_3$$

where V_1, V_2, and V_3 refer to values of time for WebTAG income bands

8.5.7 The final values of time used in the model in developing the generalised cost of travel are shown in **Table 8.9**.

Table 8.9: Final VOT Used in BTM

Purpose	2002	2007
Commuting High	£6.18	£6.84
Commuting Low	£3.84	£4.25
Employers Business High	£52.03	£59.05
Employers Business Low	£24.66	£27.99
Other (including Education, Other and Shopping)	£4.46	£4.94

9 Trip Generation

9.1 INTRODUCTION

9.1.1 The personal travel demand in the main study area is forecast by applying trip rates for different trip purposes to the underlying segmented population in 2007. The 2007 population totals were estimated from the base population information as contained in the 2001 census with the trip rates for different purposes being derived from the National Travel Survey (NTS) with authorisation from Department for Transport (DfT) for their use.

9.2 SEGMENTATION OF POPULATION

9.2.1 An important consideration in model development is the consideration of the purposes to which the model will be put. The need for the model to be behaviourally based, enabling the forecasting of changing population structure through time, the segmentation of population is a key element. Typical segmentation as employed on other WSP models, as shown in **Table 9.1**, is created via the cross classification of census tables to produce a classification based on person type (age, employment status), household type (by car availability) and size.

Table 9.1: Segmentation of Population in Database Processing

Person type	Household type				
	1 adult 0 car	1 adult 1+ car	2+ adults 0 car	2+ adults 1 car	2+ adults 2+ cars
Children (0-15)	1	2	3	4	5
Adults (16-64) in full time employment	6	7	8	9	10
Adults (16-64) in part time employment	11	12	13	14	15
Adults (16-64) not employed	16	17	18	19	20
Pensioners (65+)	21	22	23	24	25

9.2.2 The input to the travel demand model is a set of population data for each year/scenario the model is to be run. The starting point for the population data is the 2001 Census of Population since this provides a detailed profile of the resident and working population in the study area.

9.2.3 Within the BFC area there is recognition of the anticipated change in the socio-economic characteristics of the population over time. As a result employed adults have been segmented into low and high income groups. Data for splitting into socio-economic class is projectable over time and is based on TEMPRO v5.3 datasets to project changes in industry type over time. A static cross section of socio-economic class and industry type for employment is used to allocate socio-economic class on a pro-rata basis as per **Table 9.2**. It has been assumed that this relationship does not change over time and changes only as a result of changes in the industrial composition of the economy.

Table 9.2: Proposed Population Segmentation of Bracknell

Person type	Household type				
	1 adult 0 car	1 adult 1+ car	2+ adults 0 car	2+ adults 1 car	2+ adults 2+ cars
Children (0-15)	1	2	3	4	5
Adults (16-64) in full time emp – high SeC	6	7	8	9	10
Adults (16-64) in full time emp – low SeC	11	12	13	14	15
Adults (16-64) in part time emp – high SeC	16	17	18	19	20
Adults (16-64) in part time emp – low SeC	21	22	23	24	25
Adults (16-64) not employed	26	27	28	29	30
Pensioners (65+)	31	32	33	34	35

NB. SeC = Socio economic Class

9.3 NTS TRIP RATES

9.3.1 The NTS is a rolling programme of surveys containing demographic and travel information for a sample of the population. Travel demand data from these surveys was used to derive the trip rates for the multi modal version of the National Trip End Model (NTEM). The NTS enables the variations in travel behaviour due to trip purpose, car availability, person type, household size, economic status etc to be taken into account.

9.3.2 Trip and person data from the NTS was therefore used to determine the average number of home-based trips per person per day for each population segment from the Census and the trip purposes being modelled. The disaggregated trip rates are shown in **Table 9.3** for home-based work (HBW), employer's business (HBEB), education (HBEd), shopping (HBSh) and other (HBO).

Table 9.3: NTS Trip Rates

Purpose	Car ownership	Children (0-15)	Adults (16-64) in full time emp (Low SEC)	Adults (16-64) in part time emp (Low SEC)	Adults (16-64) in full time emp (High SEC)	Adults (16-64) in part time emp (High SEC)	Adults (16-64) unemployed	Pensioners (65+)
HBW	1 adult / 0 car	0.012473	0.79973	0.72670	0.79973	0.72670	0.03376	0.01309
HBW	2+ adults / 0 car	0.018473	0.87612	0.70920	0.87612	0.70920	0.05039	0.06624
HBW	2+ adults / 1 car	0.068723	0.88108	0.69064	0.88108	0.69064	0.06269	0.01834
HBW	1 adult / 1+ car	0.032742	0.79246	0.56190	0.79246	0.56190	0.13033	0.05857
HBW	2+ adults / 2+ cars	0.041647	0.80344	0.60535	0.80344	0.60535	0.14827	0.10152
HBEb	1 adult / 0 car	0.005946	0.02599	0.03560	0.02599	0.03560	0.00633	0.00068
HBEb	2+ adults / 0 car	0.002776	0.02847	0.02904	0.02847	0.02904	0.01165	0.01624
HBEb	2+ adults / 1 car	0.005963	0.06436	0.04537	0.06436	0.04537	0.00181	0.00132
HBEb	1 adult / 1+ car	0.008731	0.10168	0.08254	0.10168	0.08254	0.00851	0.00668
HBEb	2+ adults / 2+ cars	0.007532	0.11665	0.06270	0.11665	0.06270	0.01630	0.04264
HBEd	1 adult / 0 car	0.544162	0.02079	0.10157	0.02079	0.10157	0.23065	0.00179
HBEd	2+ adults / 0 car	0.526321	0.01908	0.12311	0.01908	0.12311	0.24441	0.01314
HBEd	2+ adults / 1 car	0.59938	0.04786	0.21059	0.04786	0.21059	0.19193	0.00707
HBEd	1 adult / 1+ car	0.595634	0.02683	0.20317	0.02683	0.20317	0.25520	0.01492
HBEd	2+ adults / 2+ cars	0.592687	0.04092	0.24129	0.04092	0.24129	0.34398	0.01269
HBSh	1 adult / 0 car	0.47832	0.45335	0.67120	0.45335	0.67120	0.85064	0.65053
HBSh	2+ adults / 0 car	0.40769	0.35285	0.57014	0.35285	0.57014	0.97669	0.95438
HBSh	2+ adults / 1 car	0.47383	0.48618	0.67696	0.48618	0.67696	0.73686	0.66480
HBSh	1 adult / 1+ car	0.45566	0.50934	0.77249	0.50934	0.77249	0.79450	0.82962
HBSh	2+ adults / 2+ cars	0.48789	0.47238	0.76012	0.47238	0.76012	0.79718	0.74010
HBO	1 adult / 0 car	0.50703	0.58413	0.56545	0.58413	0.56545	0.71172	0.42236
HBO	2+ adults / 0 car	0.44357	0.41628	0.43149	0.41628	0.43149	0.96441	0.83634
HBO	2+ adults / 1 car	0.55283	0.60874	0.61103	0.60874	0.61103	0.51420	0.33503
HBO	1 adult / 1+ car	0.62428	0.84096	0.85608	0.84096	0.85608	0.69167	0.57007
HBO	2+ adults / 2+ cars	0.63004	0.66763	0.72872	0.66763	0.72872	0.83622	0.64848

Notes:
1 - HBO is a combination of HBREc, Visfriend and Holiday
2 - 1 adult / 1+car = 1ad 1 car
3 - 2+ adults / 2+ cars = 2ad 2car
4 - low and high SEC are assumed the same for trip-making

9.3.3 Non-home based trips are by definition trips from workplaces or trip chains where one trip follows on from another, thus a reasonable estimate of non-home based trips starting in an area is to apply a trip rate to the number of home based trips arriving in the area.

9.3.4 NTS data was used to provide observed trip chain information in terms of a primary and secondary trip purpose. From this data a ratio was calculated for each trip chain to provide a trip rate which could then be applied to the home based trips by purpose. The trip production for each non-home based purpose was calculated as a linear combination of home-based trip productions using these factors, which are displayed in **Table 9.4**. This is very close to the approach adopted in NTEM, which followed the same concept but for trips by mode as well as purpose.

Table 9.4: Non Home Based Trip Rates (Secondary Ratio to HB)

Purpose	HBW	HBEB	HBEd	HBPB/Shop	HBRec/Hol
NHBEB	0.07890	0.59930	0.00244	0.00409	0.00604
NHBO	0.17558	0.77502	0.15193	0.25040	0.32569

9.4 TRIP ATTRACTION WEIGHTS

9.4.1 Two shopping centres a similar distance, cost and time from a zone but one of which was five times larger than the other would not be expected to attract the same number of trips. The larger centre would attract proportionally more trips than the smaller one. The attraction weights are input to provide this differential and are used in combination with the generalised times of travel in the trip distribution model.

9.4.2 A number of different variables have been used to define the attraction weights for trips of different purposes to the Bracknell forest internal transport zones and these are summarised in the inception report and are also repeated in **Table 9.5**. The attraction weights are to reflect the differences in physical size of competing areas that may have similar travel costs.

Table 9.5: Trip Attraction Variables

Purpose Segmentation	Attraction Source
1. Home-based work (commuting)	NTEM trip rates and employees
2. Home-based employer's business	Employees
3. Home-based education	Number of school places
4. Home-based shopping / personal business	Rateable value for retail/leisure (4 and 5), number of households (6), leisure (7)
5. Home-based recreation	
6. Home-based visiting friends & relatives	
7 Holiday / day trips	
8. Non home-based employer's business	Employees
9. Non home-based other	Rateable value

9.4.3 The sets of data sets used to derive the trip attraction rates are:

- Number of employees at the workplace in the zone
- Number of household in a zone
- Number of school/college pupils in a zone
- Rateable value for retail in a zone

9.4.4 The number of school pupils in a zone was derived both directly from BFC and from the Edubase database. EduBase is a register of all educational establishments in England and Wales, maintained by the Department for Children, Schools and Families. It allows both the general public and government officials to access up to date information. To ensure accuracy, the information on the site is provided by a range of suppliers, from the establishments themselves to Local Education Authorities and specialist agencies.

9.4.5 The rateable value of retail in a zone was obtained from the Valuation Office agency (VOA).

10 Demand Model

10.1 INTRODUCTION

10.1.1 As explained in **Section 2**, the 24-hour synthetic demand model has been calibrated to fit the known observed movements to ensure that robust estimates of future trip numbers are being generated. Following WebTAG guidance the choice hierarchy is set out as follows:

- Trip frequency (i.e. trip rate of population)
- Main mode choice (i.e. between car, PT and walk/cycle)
- Destination choice (i.e. trip distribution)
- Route assignment (i.e. choice of path between origin and destination)

10.1.2 Following trip generation, which is described in **Section 9**, the mode choice and trip distribution steps are undertaken in turn and calibrated using observed data at 24-hour level. Prior to route assignment, the calibrated synthetic person-trip matrices are converted into vehicle-trip matrices using occupancy factors derived from RSI data, and then split into AM and PM peak hour time-slice matrices using proportions obtained from NTS data.

10.1.3 The final route assignment stage is subsequently carried out in the observed assignment model which is calibrated and validated against observed flows.

10.2 MODE SPLIT

10.2.1 The mode choice model is a logit function which splits the 24-hour trip ends by the available modes of transport (car, public transport and slow mode) based on their comparative cost of travel between an origin and destination. The logit choice model took the form:

$$prob_i^{mode} = \frac{\exp\left(-\lambda\beta^{mode}u_i^{mode}\right)}{\sum_k \exp\left(-\lambda\beta^{mode}u_i^{k}\right)}$$

where: u_i^{mode} is the composite cost (disutility) of mode in trip production zone i.

k is the set of modes being modelled

λ is the mode choice parameter for a given traveller type / trip purpose

β^{mode} allows for variation in λ values across different modes

10.2.2 The composite cost of travel is calculated, in minutes, as:

$$u_i^{mode} = -\frac{1}{\vartheta}\ln\left(\sum_j \exp\left(-\vartheta u_{ij}^{mode}\right) + z_i^{mode}\right)$$

where: u_{ij}^{mode} is the generalised cost (disutility) of travel between zones i and j by mode.

ϑ is the destination choice parameter for a given traveller type / trip purpose and $\vartheta \geq \lambda$

z_i^{mode} is any origin / mode specific constant required to calibrate the model

10.2.3 The calibration of the mode choice model involved an appropriate value for the lambda parameter λ (following calibration of the parameters within the calibration of the disutility of travel function). The lambda parameter controls the way in which the relative probability of choosing modes varies with the disutility of choosing each mode i.e. it affects the probability of choosing a non-optimal mode of travel and will determine the spread of trips across available modes between each mode pair. The mode choice parameter values ($\lambda\beta^{mode}$) are shown in **Table 10.1**.

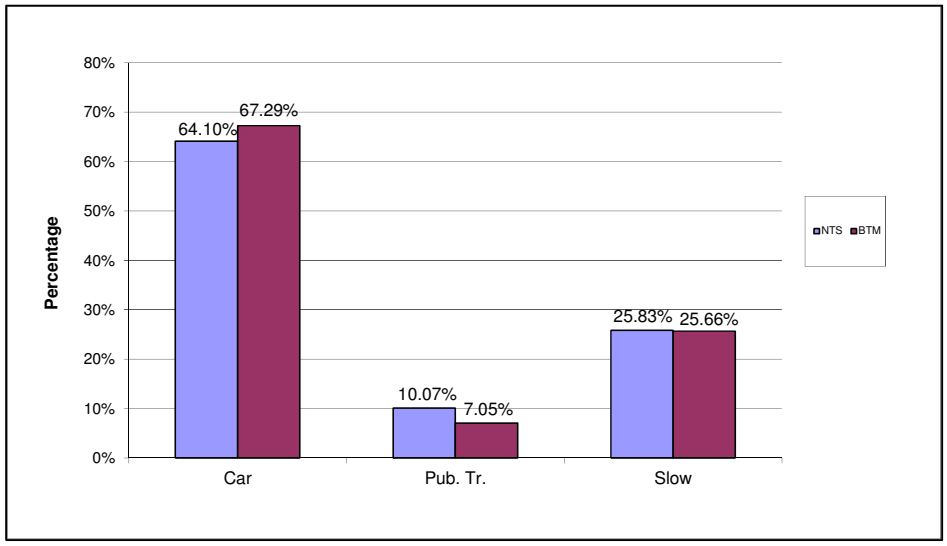
Table 10.1: Mode Choice Parameter Values

Trip Purpose	Car	PT	Slow
Home-based work	0.047	0.0009	0.028
Home-based employers business	0.103	0.010	0.028
Home-based other	0.072	0.008	0.136

10.2.4 The calibration of the mode split model was iterative and based on assessing the relative levels of transport networks within sub areas of the network especially outside the BFC administrative area in order to match the observed mode split targets.

10.2.5 The mode split results for all Home-Based trip purposes in Bracknell Forest were compared with the mode split information from the National Travel Survey (NTS). The results are shown in **Figure 10.1**.

Figure 10.1: All Purpose Home Based Trips Mode Split in Bracknell



10.2.6 The chart indicates that, within Bracknell Forest, the model closely predicts proportions of trips by mode as in the NTS.

10.2.7 Within the NTS data it is also possible to compare mode split by journey purpose. **Table 10.2** contains and **Figure 10.2** to **Figure 10.4** display these results for Bracknell Forest.

Table 10.2: Mode Split Proportions

Purpose	NTS			BTM		
	CAR	PUT	SLOW	CAR	PUT	SLOW
HBEB	71.24%	14.97%	13.79%	73.13%	13.62%	13.24%
HBEd	43.19%	12.90%	43.91%	44.29%	8.14%	47.56%
HBO	65.18%	8.38%	26.44%	66.58%	6.13%	27.29%
All purposes	64.10%	10.07%	25.83%	67.29%	7.05%	25.66%

Figure 10.2: Home Based Employers Business Mode Split Results

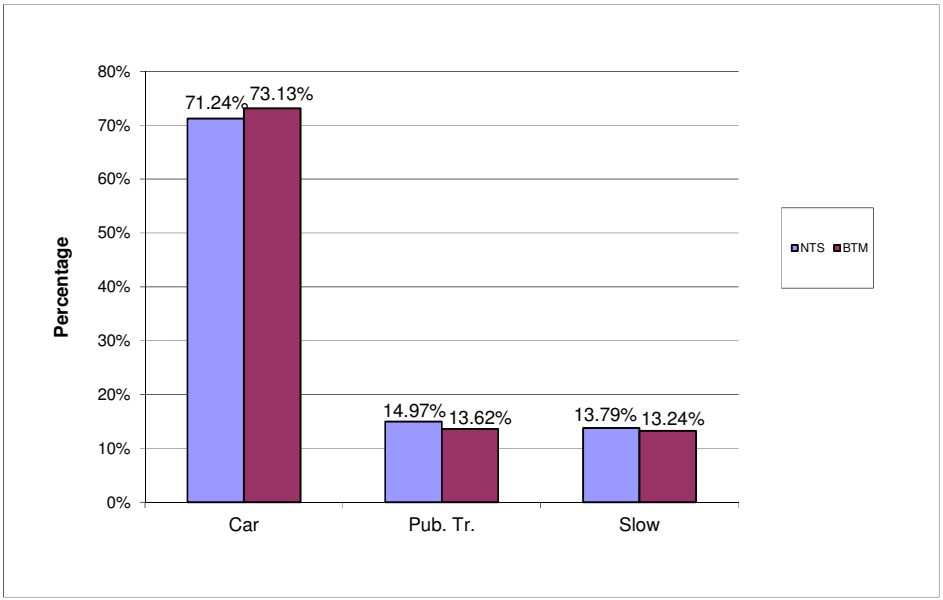


Figure 10.3: Home Based Education Trips Mode Split Results

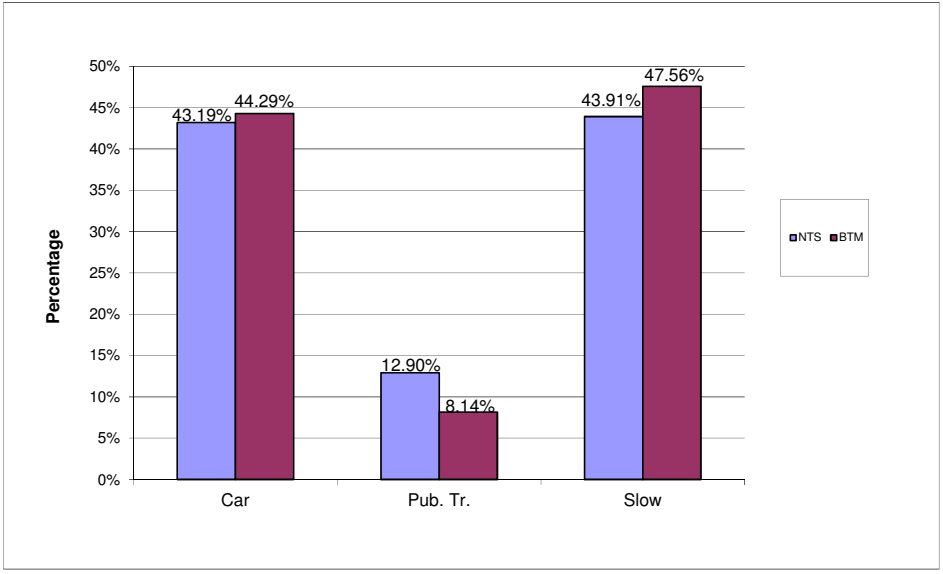
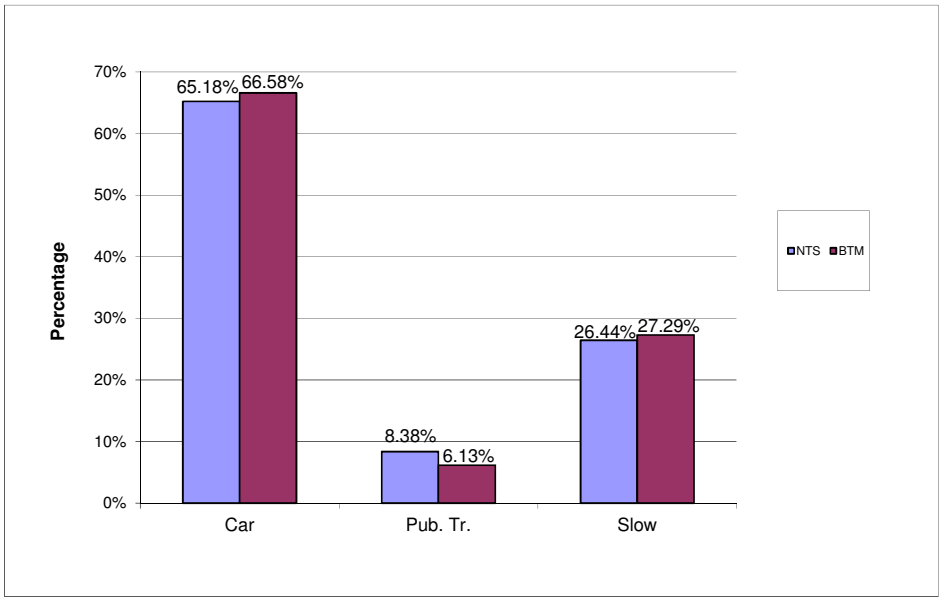


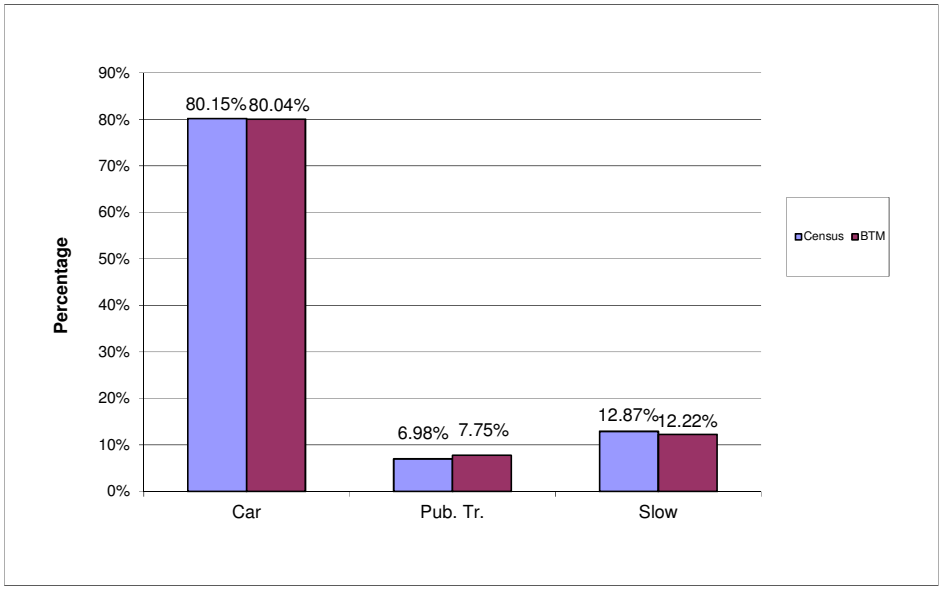
Figure 10.4: Home Based Other Trips Mode Split Results



10.2.8 Comparison of these three purpose mode split results provides further confidence in the ability of the model to provide a robust estimation of the modal share by purpose based on a comparison with statistical data contained within the NTS.

10.2.9 A further examination of the Bracknell Forest mode split results can be made by using the 2001 Census of Population journey to work data specific to the Bracknell Forest (shown in **Figure 10.5**) area. This can also be undertaken for the wider study area including West Berkshire and its other unitary authorities and the greater London zones contained within the model. **Table 10.3** shows these results.

Figure 10.5: Home Based Work Trips Mode Split Results



10.2.10 The above figure clearly demonstrates the accuracy of the model with respect to a different and more comprehensive dataset in terms of the census journey to work data.

Table 10.3: Observed Home Based Work Mode Share

	Observed Data: 2001 Census			Mode Choice Result			Difference		
	CAR	PUT	SLOW	CAR	PUT	SLOW	CAR	PUT	SLOW
West Berkshire	77.5%	9.6%	12.9%	81.4%	9.1%	9.5%	3.9%	-0.5%	-3.4%
Bracknell Forest	**80.1%**	**7.0%**	**12.9%**	**80.0%**	**7.8%**	**12.2%**	-0.1%	0.8%	-0.7%
Reading	58.1%	20.5%	21.3%	75.6%	11.2%	13.2%	17.4%	-9.3%	-8.1%
Slough	75.0%	10.5%	14.5%	80.5%	10.8%	8.8%	5.5%	0.3%	-5.7%
Windsor and Maidenhead	76.6%	9.7%	13.8%	83.3%	7.9%	9.6%	6.7%	-2.5%	-4.2%
Wokingham	79.0%	11.1%	9.8%	80.3%	8.5%	11.3%	1.2%	-2.7%	1.5%

10.2.11 **Table 10.2** and **Table 10.3** clearly demonstrate that the model has achieved a very high level of calibration with available and independent data sources which confirm the robustness of the base year model in terms of modal share by all the main modes.

10.3 TRIP DISTRIBUTION AND TRIP LENGTH

10.3.1 Within the demand model, logit choice models are used to allocate the modal trip generations to alternative attraction zones. Thus for a singly constrained model the probability of trips from zone i being attracted to zone j is calculated as:

$$prob_{jli}^{mode} = \frac{\alpha_{ij}^{mode} S_j \exp\left(-\vartheta u_{ij}^{mode}\right)}{\sum_k \alpha_{ij}^{mode} S_k \exp\left(-\vartheta u_{ik}^{mode}\right)}$$

where: u_{ij}^{mode} is the generalised cost (disutility) of travel between zones i and j by mode

ϑ is the destination choice parameter for a given traveller type / trip purpose and $\vartheta \geq \lambda$

S_j is the weight / size of attraction zone j for the trip purpose being considered. This could be the amount of floorspace of a particular type (e.g. retail floorspace for shopping trips or the numbers of employees for business trips)

α_{ij}^{mode} are factors that represent that part of the interaction between zones that does not conform to the general synthetic model expectations.

10.3.2 The constraint types used for distribution are shown in **Table 10.4**.

Table 10.4: Distribution Constraint Type by Purpose

Purpose segmentation	Constraint	Production source	Attraction source
1.Home-based work (commuting)	Double	NTEM trip rate and relevant pop segment	NTEM trip rates and employees
2.Home-based employer's business	Single	NTEM trip rate and relevant pop segment	Employees
3. Home-based education	Double	NTEM trip rate and children (0-15)	Number of school places
4. Home-based shopping / personal business	Single	NTEM trip rates	Rateable value for retail/leisure (4 and 5), number of households (6), leisure (7)
5. Home-based recreation			
6. Home-based visiting friends & relatives			
7. Holiday / day trips			
8. Non home-based employer's business	Single	Output trip attractions for HBW and HBEB combined with trip chain rates NTS	Employees
9. Non home-based other	Single	Output trip attractions for 4-6 combined with trip chain rates NTS	Rateable value

10.3.3 The parameters controlling the logit model for trip distribution were calibrated to achieve a reasonable spread of trips across the zone pairs, while ensuring the parameters are no smaller than the mode choice parameters with the theta value in this instance controlling the spread of trips across available zone pairs based on their relative disutility. This means that the theta value has to be greater than or equal to the lamba parameters. The trip distribution parameter values (ϑ) are shown in **Table 10.5**.

Table 10.5: Trip Distribution Parameter Values

Trip Purpose	Car	PuT	Slow
Home-based work	0.054	0.023	0.054
Home-based employers business	0.104	0.044	0.05
Home-based other	0.074	0.062	0.074
Non-home-based employers business	0.069	0.045	0.081
Non-home-based other	0.073	0.035	0.077

10.3.4 **Figure 10.6** and **Figure 10.7** provide the results of the car trip distribution. These have been compared with the available data from the NTS which provides estimates of distance travelled by purpose and mode. Currently these are provided for the whole of Great Britain but they provide a reasonable (and only) source of data. In addition the trip length distributions have been compared to the relatively small sample of roadside interview data collected as part of the study.

10.3.5 The profiles of the different purposes vary as would be expected with education trips being much shorter than either commuting or business trips. In general the results compare well with both NTS and the RSI data. The RSI data shows a smaller level for short distance trips for all purposes which is due to the location of the surveys being on major arterial routes into Bracknell which would focus trip making from longer distant locations.

10.3.6 The synthetic data matches the observed NTS and RSI data for the aggregated all purpose definitions to a good degree of correlation. For commuting trips it tends to overestimate the 15-35 mile band when compared to NTS but this closely matches RSI data. Overall the model matches observed data to a suitable degree to be worthy of forecasting purposes.

Figure 10.6: All Purpose Trip Length Distribution

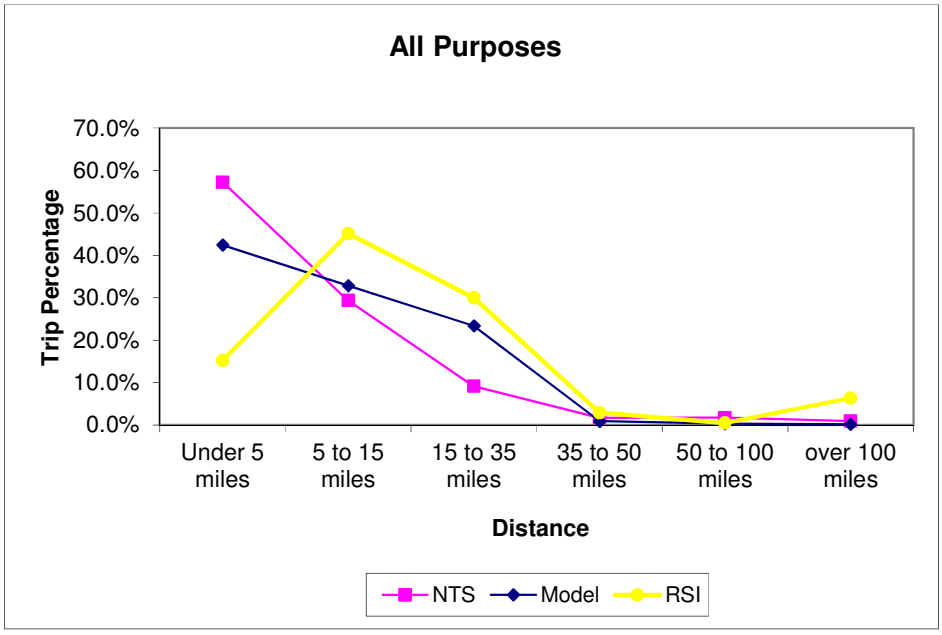
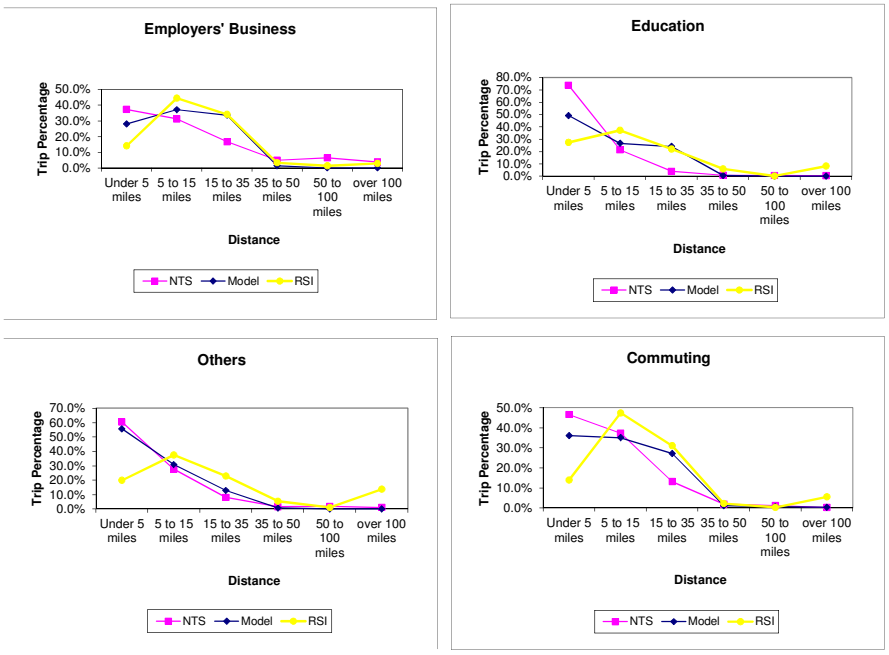


Figure 10.7: Trip Length Distributions by Purpose



10.3.7 The distribution of public transport trips has also been calibrated using theta and alpha values as with car trips. Due to the limited amount of observed data for bus and rail movements the focus has been to achieve a good match for those particular OD pairs where we have observed trips. It is therefore not recommended that the model be used for the purpose of accurately forecasting patronage on bus routes, particularly if that route does not exist in the base year, as the majority of OD pairs cannot be calibrated against observed values in order to provide a reliable basis for projections.

10.3.8 Following the calibration of the final matrices for mode split and distribution the matrices have to be converted from PA to OD, 24 hour to peak hour and also from person trips to vehicle trips as described below.

10.4 VEHICLE OCCUPANCIES

10.4.1 The trip generation, mode split and distribution stages of the model all work with person trips. At the assignment stage the person trips by car are converted into vehicle trips via the application of occupancy factors by purpose.

10.4.2 In the BTM the occupancy factors were derived from the RSI surveys and are summarised in **Table 10.6**. These were also compared with NTS figures.

Table 10.6: Car Occupancies by Purpose

Trip Purpose	NTS	Bracknell RSI	
		AM	PM
Home Based Work	1.2	1.1	1.08
Home Based Employers Business	1.1	1.14	1.1
Home Based Education	2	2.24	2.14
Home Based Other	1.75	1.54	1.83
Non Home Based	1.6	1.74	2.11

10.5 TIME SLICE

10.5.1 Trips produced by the demand model are 24 hours totals and prior to an assignment need to be converted to an AM or PM peak hour via the application of scaling factors. These are derived from NTS data (for 24-hour to 3-hour conversion) and available RSI survey data (for 3-hour to 1-hour peak conversion). The combined 24-hour to 1-hour time slice factors are summarised in **Table 10.7**.

Table 10.7: Peak Hour Time Slice Factors by Purpose

Purpose	Direction	AM Peak	PM Peak
HBW	From home	0.267	0.033
	To home	0.024	0.233
HBEB	From home	0.179	0.044
	To home	0.019	0.163
HBED	From home	0.354	0.008
	To home	0.043	0.100
HBO	From home	0.043	0.066
	To home	0.014	0.073
NHBEB	From home	0.083	0.055
NHBO	From home	0.054	0.071

10.6 AGGREGATION OF TRAVEL DEMAND

10.6.1 The proposed segmentation of the trip generations input to the transport model is described in **Section 9** and is replicated in **Table 10.8**. For each trip purpose trips are categorised by the car availability of the household in which the traveller resides. For commuting and business trips the socio-economic / income classification of trips is also included.

Table 10.8: Trip Segmentation for Input to Travel Demand Model

	Household type				
Person type	1 adult 0 car	1 adult 1+ car	2+ adults 0 car	2+ adults 1 car	2+ adults 2+ cars
Children (0-15)	1	2	3	4	5
Adults (16-64) in full time emp – high SeC	6	7	8	9	10
Adults (16-64) in full time emp – low SeC	11	12	13	14	15
Adults (16-64) in part time emp – high SeC	16	17	18	19	20
Adults (16-64) in part time emp – low SeC	21	22	23	24	25
Adults (16-64) not employed	26	27	28	29	30
Pensioners (65+)	31	32	33	34	35

10.6.2 Data is aggregated at different stages in the process. The aggregation requirements are shown in **Appendix F**.

10.7 MATRIX FORMAT

10.7.1 Trips produced by the demand model are in production/attraction (P/A) formulation and prior to assignment have to be converted into origin/destination (O/D) format.

10.7.2 P/A based trips are converted into O/D based trips by using conversion factors disaggregated by time of day and trip purpose (distinguishing between inbound and outbound home-based trips). The factors have been obtained locally or by using NTS data tables.

10.8 REALISM TESTING

10.8.1 After the demand model has been set up realism tests should be undertaken in accordance with WebTAG requirements. Realism testing is designed to check if changes in various components of generalised costs give sensible overall response in demand. The elasticity of demand with respect to car fuel cost, car journey time and public transport fares has been checked.

10.8.2 Sensitivity tests were undertaken as a variation of the standard approach due to the low level of competition between the different transport modes. The tests involved applying changes to specific components of the generalised cost function as follows:

- Increasing car fuel cost by 20%
- Increasing car journey time (for the purpose of generalised cost) by 10%
- Increasing public transport fares by 10%

10.8.3 These tests have been undertaken on the calibrated and validated 2007 AM peak model, applying the following formulae to the trip outputs from the Base model and Test model in each case:

$$\text{Elasticity} = [\log(T^1) - \log(T^0)] / [\log(C^1) - \log(C^0)]$$

where: superscripts 0 and 1 indicate Base and Test models respectively

T = trip output total (or vehicle kilometres total)

C = cost component

Since:

$$[\log(C^1) - \log(C^0)] = \log\left(\frac{C^1}{C^0}\right)$$

then our change in cost component (eg. fuel cost) $\frac{C^1}{C^0}$ will be 1.2 (for an increase of 20%) or 1.1 (for an increase of 10%)

10.8.4 **Table 10.9** presents the results of the realism tests based on the mode choice and distribution sensitivity parameter values presented in **Table 10.1** and **Table 10.5**.

Table 10.9: Realism Test Statistics (by purpose)

Elasticities of Demand		Car Trips	Car VehKm	PT Trips
20% increase in Fuel Cost	W	-0.044	-0.101	
	EB	-0.031	-0.063	
	O	-0.064	-0.070	
	HBEB	-0.015	-0.012	
	HBO	-0.065	-0.053	
	HBEd	-0.065	-0.085	
	NHBEB	-0.070	-0.192	
	NHBO	-0.063	-0.067	
	Total	**-0.051**	**-0.089**	
10% increase in Car Journey Time	W	-0.122	-0.508	
	EB	-0.210	-0.475	
	O	-0.170	-0.579	
	HBEB	-0.234	-0.449	
	HBO	-0.178	-0.548	
	HBEd	-0.166	-0.606	
	NHBEB	-0.152	-0.540	
	NHBO	-0.164	-0.576	
	Total	**-0.145**	**-0.527**	
10% increase in PT Fares				**-0.383**

10.8.5 The results indicated a relatively low elasticity of car use with respect to a 20% change in fuel cost. The overall elasticity is -0.089 against the WebTAG value of -0.3.

10.8.6 The overall elasticity of car use with respect to change in car journey time is -0.527, which is below the highest acceptable value of -2.0 set in the WebTAG guidance.

10.8.7 Elasticity of public transport trips with respect to a 10% increase public transport fares is -0.383, which falls within the suggested WebTAG range of -0.2 to -0.9.

10.8.8 The above tests provide sufficient evidence that the demand model is producing the right order of response with respect to change in input variables for private transport modes, although fuel elasticity is relatively low. The model is considered suitable for forecasting in this respect, given that if anything the model may overestimate car use, presenting a 'worst-case' scenario in terms of forecasting outputs.

11 Conclusion

11.1.1 WSP developed a comprehensive transport model in 2009 of the Bracknell Forest Borough, known as the BTM, and surrounding wider strategic area stretching as far as Reading and Basingstoke to the west and Heathrow to the East. The model was developed within the holistic GIS software of VISUM enabling both private and public vehicle assignments to be contained within the same environment.

11.1.2 The model was constructed from a combination of bespoke travel demand and origin destination surveys for private car, bus and rail journeys, the South East Regional Transport Model, Census data from 2001 and National Trip End Model/National Transport Survey statistics. In parallel a comprehensive demand model covering all modes and based on the behavioural characteristics of both transport supply and demand has been developed within a WebTAG compliant structure. Output trip purpose matrices were calibrated for mode choice and trip distribution based on NTS and Census data to replicate observed characteristics to an acceptable degree. The resultant combined synthetic demand and observed assignment supply model was validated to a 2007 Base Year.

11.1.3 WSP has been commissioned to undertake an update of the BTM providing a greater level of detail within the Wokingham Borough Council (WBC) area. This has involved 'infilling' the highway network and disaggregating the zones within the Wokingham area, to a level of detail sufficient to represent proposed development locations in Wokingham.

11.1.4 The BTM has been updated to include greater detail in the Wokingham area in terms of highway network and zone structure, and has been revalidated to the same Base Year 2007. The demand model has been successfully calibrated to observed census and NTS data whilst the observed supply model has been calibrated and validated to traffic data according to the acceptability criteria within DMRB.

11.1.5 Forecast models will take inputs of population, households, car availability, socio economic class, retail floor space, the number of employees and education places. These will generate new absolute trip generations and attractions which will be applied incrementally to the observed base year models to obtain forecasts of future year travel demand and provide the ability to undertake scheme assessments.

Appendices, Figures & Tables

Appendix A Volume Delay Functions

Volume Delay Functions

The BPR function was used for volume-delay functions (VDF) in this model. Parameters applied in each VDF are displayed in Table A.1, with associated model link types listed in Table A.2. The link types which use VDFs are mainly external to the main study area, covering the uncongested network. Within the main study area, a constant VDF is used as delay is represented by detailed junction modelling.

Table A.1 – BPR Volume Delay Function

VDF Number	BPR values		
	a	b	c
1	Constant		
2	1	3.5	1
3	0.6	3	0.9
4	0.9	2.5	1.5
5	1	3	1
6	0.5	4	1
7	0.15	3	0.7
8	1	4	1

where:

$t_{cur} = t_0 * (1 + a * sat^b)$

$sat = \frac{q}{q_{max}^{\ c}}$

Table A.2 – Link Types

Link Type Number	VDF	Road Type
0	2	Motorway
1	8	Motorway
2	2	Motorway
3	2	Motorway
16	5	Rural
60	3	Trunk Road
61	3	Trunk Road
62	3	Trunk Road
63	3	Trunk Road
66	5	Rural/Suburb
69	5	Rural
72	5	Rural
73	5	Rural/Suburb
74	5	Rural/Suburb
79	5	Rural/Suburb
81	2	Rural/Suburb
82	4	Rural/Suburb
83	6	Rural/Suburb
90	7	Minor Urban/Suburb
91	7	Minor Urban/Suburb
92	7	Minor Urban/Suburb
99	5	Rural/Suburb

Appendix B Prior-Final Matrix Comparison

Prior-Final Matrix Comparison

Figures B.1 and B.2 show the Prior-Final sectored Car matrix comparison for the AM and PM peak hours, and associated trip length distributions are displayed in Figures B.3 to B.6.

Figure B.1 – AM Peak Prior-Final Sectored Matrix Comparison

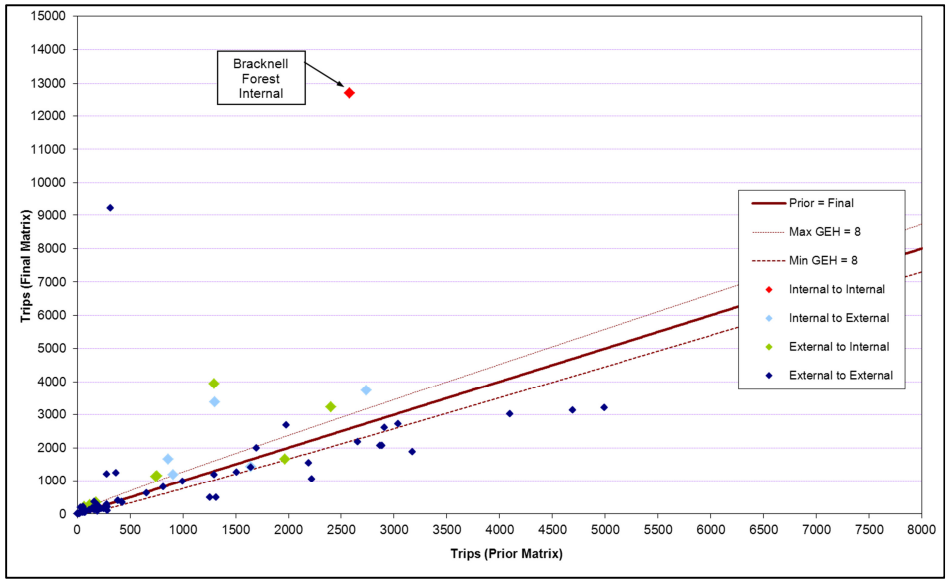


Figure B.2 – PM Peak Prior-Final Sectored Matrix Comparison

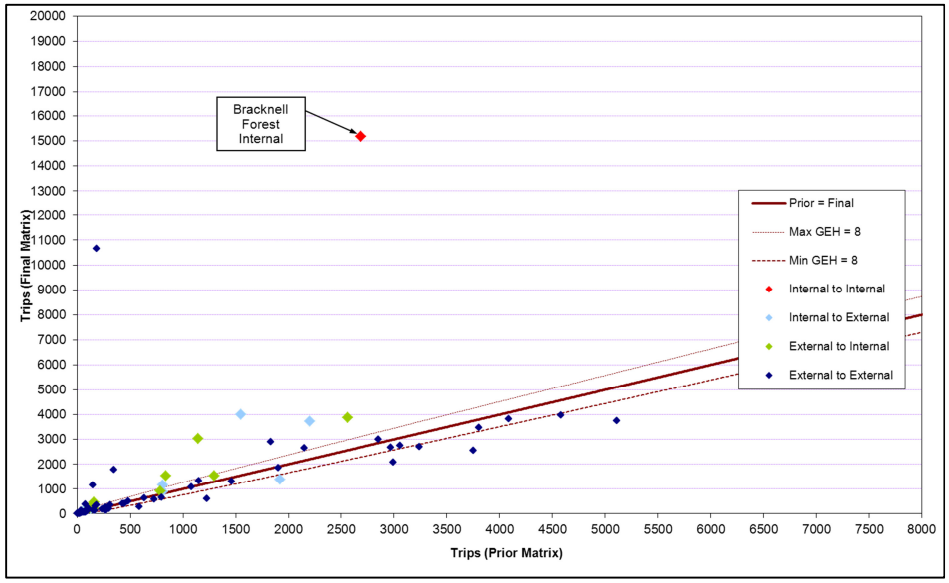


Figure B.3 – AM Peak Prior and Final Car Matrix Trip Length Distribution

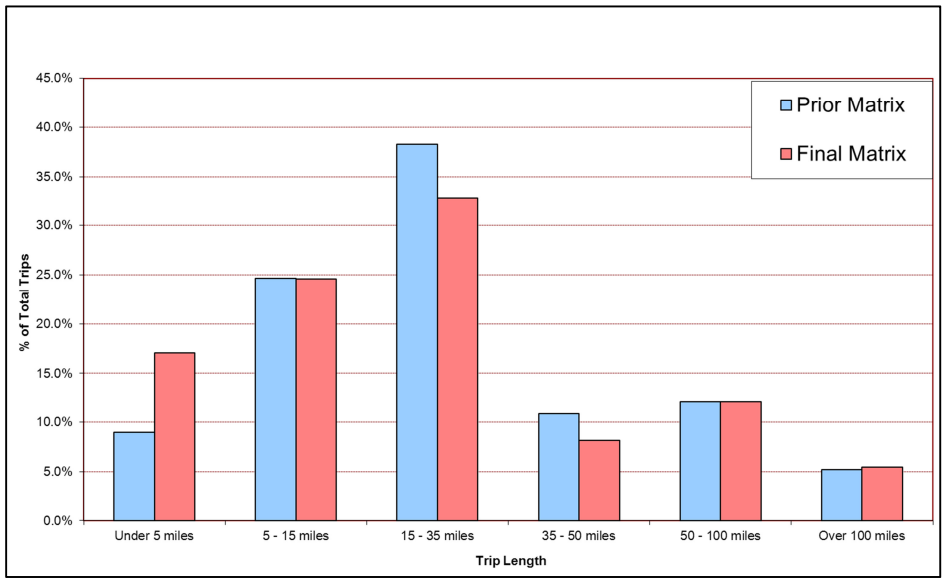


Figure B.4 – AM Peak Prior and Final HGV Matrix Trip Length Distribution

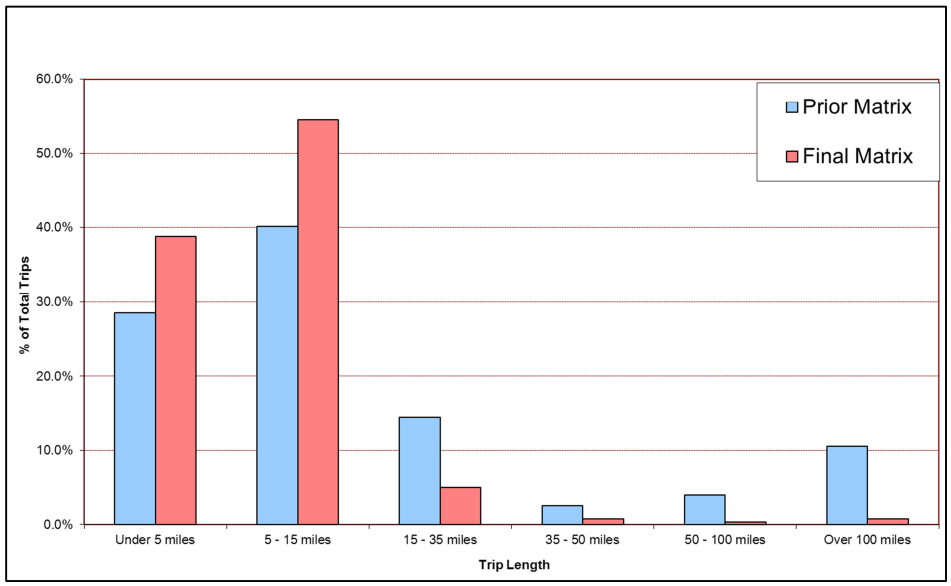


Figure B.5 – PM Peak Prior and Final Car Matrix Trip Length Distribution

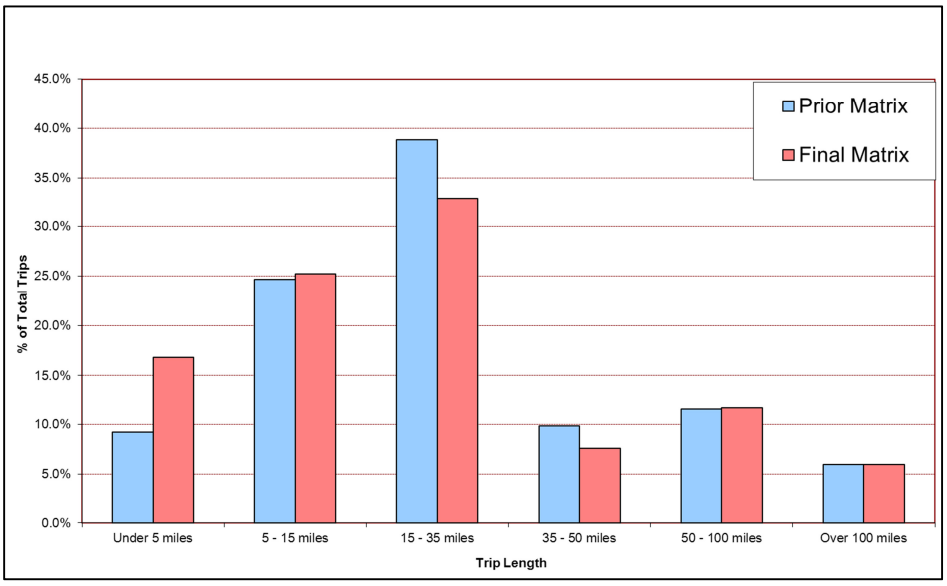
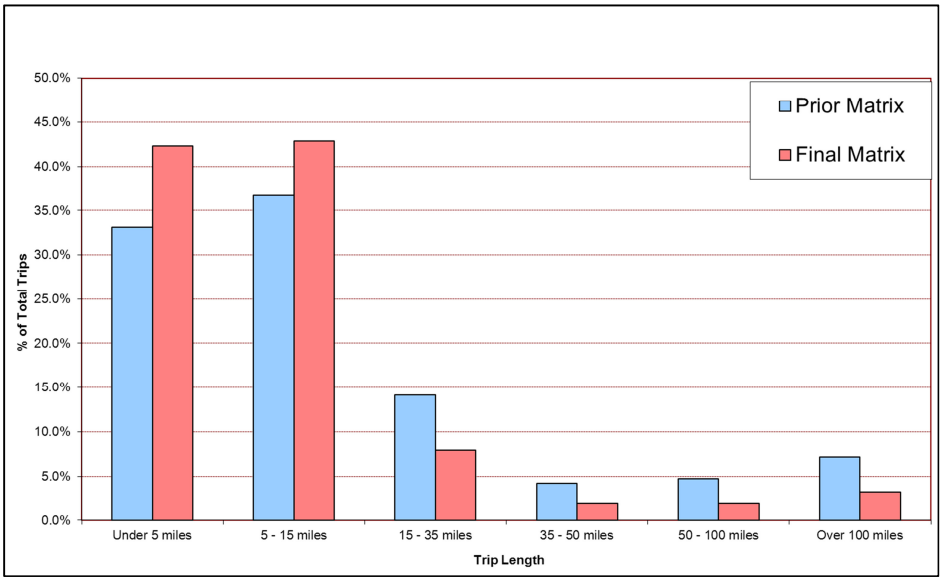


Figure B.6 – PM Peak Prior and Final HGV Matrix Trip Length Distribution



Appendix C Assignment Model Calibration

Assignment Model Calibration

Table C.1 displays the AM Peak model calibration results for cars/light vehicles, Table C.2 shows the AM Peak model calibration results for heavy vehicles. PM Peak results are shown in Tables C.3 and C.4 respectively.

Table C.1 – AM Peak Calibration Results – Car / Light Vehicle

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
RSI										
Inbound										
748-878	RSI 1EB	748	878	1518	1360	-158	-10.0%	4.2	✓	✓
2606-991	RSI 2NB	2606	991	1433	1492	59	4.0%	1.5	✓	✓
10711-777	RSI 3NB	10711	777	1885	1921	36	2.0%	0.8	✓	✓
1608-10825	RSI 4WB	1608	10825	883	1019	136	15.0%	4.4	✓	✓
1312-1306	RSI 5SB	1312	1306	599	536	-63	-10.0%	2.6	✓	✓
595-10560	RSI 6EB	595	10560	654	848	194	30.0%	7.1	✗	✗
2247-822	RSI 7NB EB	100093	822	653	721	68	10.0%	2.6	✓	✓
785-954	RSI 8SB	785	954	671	688	17	3.0%	0.6	✓	✓
		8		**8296**	**8585**	**289**	**3.5%**	**3.1**	✓	✓
Outbound										
877-756	RSI 1WB	877	756	1087	987	-100	-9.0%	3.1	✓	✓
991-2606	RSI 2SB	991	2606	1069	1194	125	12.0%	3.7	✓	✓
1248-10673	RSI 3SB	1248	10673	1319	1142	-177	-13.0%	5.0	✓	✓
10825-1608	RSI 4EB	10825	1608	1045	1109	64	6.0%	1.9	✓	✓
1306-1312	RSI 5NB	1306	1312	711	723	12	2.0%	0.4	✓	✓
10560-595	RSI 6WB	10560	595	862	976	114	13.0%	3.8	✓	✓
822-2247	RSI 7SB WB	822	100093	722	719	-3	0.0%	0.1	✓	✓
954-785	RSI 8NB	954	785	1328	1361	33	2.0%	0.9	✓	✓
		8		**8143**	**8211**	**68**	**0.8%**	**0.8**	✓	✓
Inner Cordon										
Inbound										
1086-1101	Western Rbt	1086	1101	415	381	-34	-8.0%	1.7	✓	✓
1080-1087	Western Rbt	1080	1087	1063	1212	149	14.0%	4.4	✓	✓
1028-1029	Twin Bridge Rbt N	1028	1029	627	553	-74	-12.0%	3.0	✓	✓
1003-1011	Twin Bridge Rbt N	1003	1011	297	292	-5	-2.0%	0.3	✓	✓
2522-993	Twin Bridge Rbt S	2522	993	1730	1653	-77	-4.0%	1.9	✓	✓
1211-1220	Bagshot Rd & Downshire Way	1211	1220	444	448	4	1.0%	0.2	✓	✓
100106-1234	Bagshot Rd & Downshire Way	100106	1234	1928	1921	-7	0.0%	0.2	✓	✓
1244-1238	Bagshot Rd & Downshire Way	1244	1238	25	25	0	0.0%	0.0	✓	✓
1241-1237	Bagshot Rd & Downshire Way	1241	1237	388	446	58	15.0%	2.8	✓	✓
1315-1303	Met Office Rbt	1315	1303	1182	1175	-7	-1.0%	0.2	✓	✓
1319-1318	Met Office Rbt	1319	1318	520	451	-69	-13.0%	3.1	✓	✓
1306-1308	Met Office Rbt	1306	1308	494	536	42	9.0%	1.9	✓	✓
		12		**9112**	**9093**	**-19**	**0.0%**	**0.2**	✓	✓
Outbound										
1091-1086	Western Rbt	1091	1086	191	270	79	41.0%	5.2	✗	✓
1088-1080	Western Rbt	1088	1080	1079	1080	1	0.0%	0.0	✓	✓
1017-1028	Twin Bridge Rbt N	1017	1028	1093	1013	-80	-7.0%	2.5	✓	✓
1007-1003	Twin Bridge Rbt N	1007	1003	631	542	-89	-14.0%	3.7	✓	✓
1006-980	Twin Bridge Rbt S	1006	980	1227	1250	23	2.0%	0.7	✓	✓
1232-1211	Bagshot Rd & Downshire Way	1232	1211	276	300	24	9.0%	1.4	✓	✓
1236-10672	Bagshot Rd & Downshire Way	1236	10672	1240	1144	-96	-8.0%	2.8	✓	✓
1239-1244	Bagshot Rd &	1239	1244	15	15	0	0.0%	0.0	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
1231-1241	Downshire Way Bagshot Rd & Downshire Way	1231	1241	373	370	-3	-1.0%	0.2	✓	✓
1311-2516	Met Office Rbt	1311	2516	704	696	-8	-1.0%	0.3	✓	✓
1316-1319	Met Office Rbt	1316	1319	349	349	0	0.0%	0.0	✓	✓
1296-1306	Met Office Rbt	1296	1306	565	723	158	28.0%	6.2	×	×
		12		**7743**	**7752**	**9**	**0.0%**	**0.1**	✓	✓
Railway Screenline										
Northbound										
541-11513	Waterloo Road, Bracknell	541	11513	229	209	-20	-9.0%	1.3	✓	✓
1191-1187	Bagshot Road	1191	1187	1263	1301	38	3.0%	1.1	✓	✓
2562-1458	Ralphs Ride	2562	1458	606	541	-65	-11.0%	2.7	✓	✓
2570-2084	New Forst Ride	2570	2084	514	777	264	51.0%	10.4	×	×
1582-2515	Swinley Road	1582	2515	458	379	-79	-17.0%	3.9	✓	✓
1582-1609	Kings Ride	1582	1609	772	566	-206	-27.0%	8.0	×	×
		6		**3840**	**3773**	**-67**	**-2.0%**	**1.1**	✓	✓
Southbound										
11513-541	Waterloo Road, Bracknell	11513	541	212	132	-80	-38.0%	6.1	×	✓
2534-2535	Bagshot Road	2534	2535	659	608	-51	-8.0%	2.0	✓	✓
1458-2562	Ralphs Ride	1458	2562	235	230	-5	-2.0%	0.3	✓	✓
2084-2570	New Forst Ride	2084	2570	182	191	9	5.0%	0.7	✓	✓
2515-1582	Swinley Road	2515	1582	289	252	-37	-13.0%	2.2	✓	✓
1609-1582	Kings Ride	1609	1582	575	347	-228	-40.0%	10.6	×	×
		6		**2151**	**1760**	**-391**	**-18.2%**	**8.8**	×	✓
Outer Cordon										
Inbound										
1280-2107	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	1280	2107	524	535	11	2.0%	0.5	✓	✓
873-10553	Forest Rd / Binfield Rd	873	10553	729	682	-47	-6.0%	1.8	✓	✓
526-561	Coppid Beech Rbt	526	561	1680	1884	204	12.0%	4.8	✓	✓
679-758	Entry from Peacock Lane	679	758	642	600	-42	-7.0%	1.7	✓	✓
822-836	Golden Retriever Rbt	822	836	653	721	68	10.0%	2.6	✓	✓
801-837	Golden Retriever Rbt	801	837	1684	1553	-131	-8.0%	3.3	✓	✓
152-1443	Coral Reef Rbt	152	1443	2114	2116	2	0.0%	0.0	✓	✓
2515-1574	Entry from Swinley Rd	2515	1574	388	379	-9	-2.0%	0.5	✓	✓
10825-1574	Entry from A329 E	10825	1574	863	1019	156	18.0%	5.1	×	×
579-1565	Entry from B3017	579	1565	523	486	-37	-7.0%	1.6	✓	✓
		10		**9799**	**9975**	**176**	**1.8%**	**1.8**	✓	✓
Outbound										
2107-1280	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	2107	1280	754	837	83	11.0%	2.9	✓	✓
10553-873	Forest Rd / Binfield Rd	10553	873	388	424	36	9.0%	1.8	✓	✓
561-530	Coppid Beech Rbt	561	530	1358	1298	-60	-4.0%	1.6	✓	✓
758-679	Exit to Peacock Lane	758	679	317	389	72	23.0%	3.8	✓	✓
834-822	Golden Retriever Rbt	834	822	769	719	-50	-7.0%	1.8	✓	✓
847-803	Golden Retriever Rbt	847	803	1166	1153	-13	-1.0%	0.4	✓	✓
1449-2518	Coral Reef Rbt	1449	2518	1999	1787	-212	-11.0%	4.9	✓	✓
1574-2515	Exit to Swinley Rd	1574	2515	251	252	1	0.0%	0.1	✓	✓
1574-10825	Exit to A329 E	1574	10825	1001	1109	108	11.0%	3.3	✓	✓
1565-579	Exit to B3017	1565	579	497	442	-55	-11.0%	2.5	✓	✓
		10		**8501**	**8410**	**-91**	**-1.1%**	**1.0**	✓	✓
A329/ A322/ A3095										
Clockwise										

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
1106-1166	Western Rbt	1106	1166	1105	1150	45	4.0%	1.3	✓	✓
2529-1094	Western Rbt	2529	1094	591	594	3	1.0%	0.1	✓	✓
1031-2525	Twin Bridge Rbt N	1031	2525	1157	1174	17	2.0%	0.5	✓	✓
1033-1013	Twin Bridge Rbt S	1033	1013	1688	1684	-4	0.0%	0.1	✓	✓
1217-1206	Bagshot Rd & Downshire Way	1217	1206	1150	1118	-32	-3.0%	1.0	✓	✓
100105-1227	Bagshot Rd & Downshire Way	100105	1227	659	608	-51	-8.0%	2.0	✓	✓
1298-1252	Met Office Rbt	1298	1252	701	673	-28	-4.0%	1.1	✓	✓
		7		**7051**	**7001**	**-50**	**-0.7%**	**0.6**	✓	✓
Anti-Clockwise										
2530-1118	Western Rbt	2530	1118	1044	957	-87	-8.0%	2.8	✓	✓
1108-1103	Western Rbt	1108	1103	739	790	51	7.0%	1.8	✓	✓
2594-1030	Twin Bridge Rbt N	2594	1030	524	596	72	14.0%	3.0	✓	✓
1024-1049	Twin Bridge Rbt S	1024	1049	1186	1171	-15	-1.0%	0.4	✓	✓
1206-1218	Bagshot Rd & Downshire Way	1206	1218	906	862	-44	-5.0%	1.5	✓	✓
1219-1191	Bagshot Rd & Downshire Way	1219	1191	1296	1364	68	5.0%	1.9	✓	✓
2533-1291	Met Office Rbt	2533	1291	600	585	-15	-3.0%	0.6	✓	✓
		7		**6295**	**6325**	**30**	**0.5%**	**0.4**	✓	✓
Motorway Counts										
1788-1815	M4, Junction 5 - 4b	1788	1815	4511	4838	327	7.0%	4.8	✓	✓
1815-1788	M4, Junction 5 - 4b	1815	1788	5298	5397	99	2.0%	1.4	✓	✓
841-2373	M4, Junction 6-7	841	2373	4492	4569	77	2.0%	1.1	✓	✓
2373-841	M4, Junction 6-7	2373	841	4068	4083	15	0.0%	0.2	✓	✓
389-1504	M4, Junction 8/9 -10	389	1504	3994	3986	-8	0.0%	0.1	✓	✓
1504-389	M4, Junction 8/9 -10	1504	389	4355	4255	-100	-2.0%	1.5	✓	✓
2334-2360	M3, Junction 5-6	2334	2360	3129	3132	3	0.0%	0.1	✓	✓
2360-2334	M3, Junction 5-6	2360	2334	3271	3239	-32	-1.0%	0.6	✓	✓
2360-2331	M3, Junction 5-4A	2360	2331	3147	3171	24	1.0%	0.4	✓	✓
2331-2360	M3, Junction 5-4A	2331	2360	3131	3118	-13	0.0%	0.2	✓	✓
2331-2327	M3, Junction 4A-4	2331	2327	3416	3481	65	2.0%	1.1	✓	✓
2327-2331	M3, Junction 4A-4	2327	2331	3601	3533	-68	-2.0%	1.1	✓	✓
2327-2359	M3, Junction 4-3	2327	2359	4078	4127	49	1.0%	0.8	✓	✓
2359-2327	M3, Junction 4-3	2359	2327	3446	3318	-128	-4.0%	2.2	✓	✓
2359-1797	M3, Junction 3-2	2359	1797	4577	4574	-3	0.0%	0.0	✓	✓
1797-2359	M3, Junction 3-2	1797	2359	3994	3972	-22	-1.0%	0.3	✓	✓
2326-1504	A404 N of M4 J8/9	2326	1504	2414	2400	-14	-1.0%	0.3	✓	✓
1504-2326	A404 N of M4 J8/9	1504	2326	1978	2061	83	4.0%	1.8	✓	✓
1504-2355	A308(M) bet A404 and A308	1504	2355	1055	1077	22	2.0%	0.7	✓	✓
2355-1504	A308(M) bet A404 and A308	2355	1504	861	991	130	15.0%	4.3	✓	✓
1814-1830	A30 bet A315 and B378	1814	1830	1286	1254	-32	-3.0%	0.9	✓	✓
1830-1814	A30 bet A315 and B378	1830	1814	1035	984	-51	-5.0%	1.6	✓	✓
		22		**71136**	**71560**	**424**	**0.6%**	**1.6**	✓	✓
Wokingham Counts										
541-548	Old Wokingham Road Northern End	541	548	196	180	-16	-8.0%	1.2	✓	✓
548-541	Old Wokingham Road Northern End	548	541	579	496	-83	-14.0%	3.6	✓	✓
438-10936	B3420 Nine Mile Ride, Crowthorne	438	10936	530	436	-94	-18.0%	4.3	✓	✓
10936-438	B3420 Nine Mile Ride,	10936	438	344	334	-10	-3.0%	0.5	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
	Crowthorne									
428-11271	A321 Twyford Road, Wokingham	428	11271	393	434	41	10.0%	2.0	✓	✓
11271-428	A321 Twyford Road, Wokingham	11271	428	508	494	-14	-3.0%	0.6	✓	✓
11275-2371	A321 Wiltshire Rd, Wokingham	11275	2371	935	98	-837	-90.0%	36.8	✗	✗
11232-11277	U8269 Binfield Rd, Wokingham	11232	11277	90	155	65	72.0%	5.9	✗	✓
11277-11232	U8269 Binfield Rd, Wokingham	11277	11232	119	40	-79	-66.0%	8.8	✗	✓
11213-11333	B3270 Lower Earley Way North, Lwr Earley	11213	11333	800	764	-36	-5.0%	1.3	✓	✓
11333-11213	B3270 Lower Earley Way North, Lwr Earley	11333	11213	1248	1476	228	18.0%	6.2	✗	✗
11262-11405	A327 Reading Rd, Arborfield	11262	11405	612	571	-41	-7.0%	1.7	✓	✓
11405-11262	A327 Reading Rd, Arborfield	11405	11262	651	604	-47	-7.0%	1.9	✓	✓
404-11439	A329 Shute End, Wokingham	404	11439	520	405	-115	-22.0%	5.4	✗	✗
11278-11447	C8701 Warren House Rd, Wokingham	11278	11447	307	221	-86	-28.0%	5.3	✗	✓
11447-11278	C8701 Warren House Rd, Wokingham	11447	11278	466	216	-250	-54.0%	13.5	✗	✗
11324-11484	A321 Finchampstead Rd, N Of B3017	11324	11484	732	873	141	19.0%	5.0	✓	✗
11484-11324	A321 Finchampstead Rd, N Of B3016	11484	11324	502	505	3	1.0%	0.1	✓	✓
11276-11504	A329 London Road, Wokingham	11276	11504	1181	1215	34	3.0%	1.0	✓	✓
11504-11276	A329 London Road, Wokingham	11504	11276	803	816	13	2.0%	0.5	✓	✓
446-11506	Peach Street, Wokingham	446	11506	814	759	-55	-7.0%	2.0	✓	✓
440-11513	N60 Waterloo Rd, Wokingham	440	11513	144	121	-23	-16.0%	2.0	✓	✓
11513-440	N60 Waterloo Rd, Wokingham	11513	440	97	115	18	19.0%	1.8	✓	✓
2243-11523	N33 Easthampstead Rd, Wokingham	2243	11523	462	458	-4	-1.0%	0.2	✓	✓
11523-2243	N33 Easthampstead Rd, Wokingham	11523	2243	323	316	-7	-2.0%	0.4	✓	✓
388-11621	B3016 Eversley Cross, Eversley	388	11621	191	195	4	2.0%	0.3	✓	✓
11621-388	B3016 Eversley Cross, Eversley	11621	388	230	172	-58	-25.0%	4.1	✓	✓
11397-11638	A327 Reading Rd, Arborfield Gsn	11397	11638	551	653	102	19.0%	4.2	✓	✗
11638-11397	A327 Reading Rd, Arborfield Gsn	11638	11397	585	543	-42	-7.0%	1.8	✓	✓
11401-11702	Church Rd, W Of Hyde End Lane	11401	11702	240	234	-6	-3.0%	0.4	✓	✓
11702-11401	Church Rd, W Of Hyde End Lane	11702	11401	299	321	22	7.0%	1.2	✓	✓
11404-11704	Hyde End Road	11404	11704	235	230	-5	-2.0%	0.3	✓	✓
11704-11404	Hyde End Road	11704	11404	210	226	16	8.0%	1.1	✓	✓
11708-11710	Basingstoke Rd, S Of Church Rd	11708	11710	358	367	9	3.0%	0.5	✓	✓
11710-11708	Basingstoke Rd, S Of Church Rd	11710	11708	274	332	58	21.0%	3.3	✓	✓
11587-11801	A329 Under M4 Bridge,	11587	11801	751	750	-1	0.0%	0.0	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
	Reading									
11801-11587	A329 Under M4 Bridge, Reading	11801	11587	750	745	-5	-1.0%	0.2	✓	✓
132-11805	B3030 Robin Hood Lane, Reading	132	11805	311	360	49	16.0%	2.7	✓	✓
11805-132	B3030 Robin Hood Lane, Reading	11805	132	278	389	111	40.0%	6.1	✗	✗
11811-11813	B3270 Lower Earley Way South, Lwr Earley	11811	11813	549	567	18	3.0%	0.8	✓	✓
11813-11811	B3270 Lower Earley Way South, Lwr Earley	11813	11811	722	740	18	2.0%	0.7	✓	✓
11342-11817	A327 Shinfield Rd, Reading	11342	11817	637	646	9	1.0%	0.4	✓	✓
11817-11342	A327 Shinfield Rd, Reading	11817	11342	460	569	109	24.0%	4.8	✓	✗
11819-11821	Whitley Wood Lane, Reading	11819	11821	967	917	-50	-5.0%	1.6	✓	✓
11821-11819	Whitley Wood Lane, Reading	11821	11819	751	656	-95	-13.0%	3.6	✓	✓
11403-11349	A327 Hollow Lane, Shinfield	11403	11349	1005	965	-40	-4.0%	1.3	✓	✓
11349-11403	A327 Hollow Lane, Shinfield	11349	11403	867	878	11	1.0%	0.4	✓	✓

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	8296	8585	289	3.5%	3.1	✓		8	7	7
2	RSI Screenline	Outbound	8143	8211	68	0.8%	0.8	✓		8	8	8
3	Inner Cordon	Inbound	9112	9093	-19	0.0%	0.2	✓		12	12	12
4	Inner Cordon	Outbound	7743	7752	9	0.0%	0.1	✓		12	10	11
5	Railway Screenline	Northbound	3840	3773	-67	-2.0%	1.1	✓		6	4	4
6	Railway Screenline	Southbound	2151	1760	-391	-18.2%	8.8	✗		6	4	5
7	Outer Cordon	Inbound	9799	9975	176	1.8%	1.8	✓		10	9	9
8	Outer Cordon	Outbound	8501	8410	-91	-1.1%	1.0	✓		10	10	10
9	A329/ A322/ A3095	Clockwise	7051	7001	-50	-0.7%	0.6	✓		7	7	7
10	A329/ A322/ A3096	Anti-clockwise	6295	6325	30	0.5%	0.4	✓		7	7	7
								9	screenline/cordon counts	86	78	80
								90%	motorway counts	22	22	22
									Wokingham counts	47	39	39
									total calibration counts	155	139	141
											90%	**91%**

Table C.2 – AM Peak Calibration Results – Heavy Vehicle

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
RSI										
Inbound										
748-878	RSI 1EB	748	878	156	119	-37	-24.0%	3.2	✓	✓
2606-991	RSI 2NB	2606	991	61	66	5	8.0%	0.6	✓	✓
10711-777	RSI 3NB	10711	777	66	69	3	5.0%	0.4	✓	✓
1608-10825	RSI 4WB	1608	10825	22	17	-5	-24.0%	1.2	✓	✓
1312-1306	RSI 5SB	1312	1306	8	12	4	51.0%	1.3	✓	✓
595-10560	RSI 6EB	595	10560	15	10	-5	-33.0%	1.4	✓	✓
100093-822	RSI 7NB EB	100093	822	31	15	-16	-52.0%	3.3	✓	✓
785-954	RSI 8SB	785	954	25	10	-15	-60.0%	3.6	✓	✓
		8		**384**	**318**	**-66**	**-17.2%**	**3.5**	✓	✓
Outbound										
877-756	RSI 1WB	877	756	120	99	-21	-18.0%	2.0	✓	✓
991-2606	RSI 2SB	991	2606	45	56	11	24.0%	1.5	✓	✓
1248-10673	RSI 3SB	1248	10673	114	121	7	6.0%	0.6	✓	✓
10825-1608	RSI 4EB	10825	1608	10	12	2	18.0%	0.6	✓	✓
1306-1312	RSI 5NB	1306	1312	10	28	18	176.0%	4.1	✓	✓
10560-595	RSI 6WB	10560	595	10	15	5	48.0%	1.4	✓	✓
822-100093	RSI 7SB WB	822	100093	27	10	-17	-63.0%	4.0	✓	✓
954-785	RSI 8NB	954	785	18	19	1	3.0%	0.1	✓	✓
		8		**356**	**360**	**4**	**1.2%**	**0.2**	✓	✓
Inner Cordon										
Inbound										
1086-1101	Western Rbt	1086	1101	8	5	-3	-38.0%	1.2	✓	✓
1080-1087	Western Rbt	1080	1087	20	23	3	15.0%	0.6	✓	✓
1028-1029	Twin Bridge Rbt N	1028	1029	19	8	-11	-59.0%	3.1	✓	✓
1003-1011	Twin Bridge Rbt N	1003	1011	34	29	-5	-14.0%	0.8	✓	✓
2522-993	Twin Bridge Rbt S	2522	993	43	80	37	85.0%	4.7	✓	✓
1211-1220	Bagshot Rd & Downshire Way	1211	1220	4	2	-2	-50.0%	1.2	✓	✓
100106-1234	Bagshot Rd & Downshire Way	100106	1234	65	69	4	6.0%	0.5	✓	✓
1244-1238	Bagshot Rd & Downshire Way	1244	1238	1	1	0	0.0%	0.0	✓	✓
1241-1237	Bagshot Rd & Downshire Way	1241	1237	11	9	-2	-18.0%	0.6	✓	✓
1315-1303	Met Office Rbt	1315	1303	27	19	-8	-30.0%	1.7	✓	✓
1319-1318	Met Office Rbt	1319	1318	8	8	0	0.0%	0.0	✓	✓
1306-1308	Met Office Rbt	1306	1308	14	12	-2	-14.0%	0.6	✓	✓
		12		**130**	**120**	**-10**	**-7.7%**	**0.9**	✓	✓
Outbound										
1091-1086	Western Rbt	1091	1086	2	6	4	200.0%	2.0	✓	✓
1088-1080	Western Rbt	1088	1080	21	14	-7	-33.0%	1.7	✓	✓
1017-1028	Twin Bridge Rbt N	1017	1028	22	14	-8	-35.0%	1.8	✓	✓
1007-1003	Twin Bridge Rbt N	1007	1003	29	30	1	3.0%	0.1	✓	✓
1006-980	Twin Bridge Rbt S	1006	980	63	47	-16	-25.0%	2.1	✓	✓
1232-1211	Bagshot Rd & Downshire Way	1232	1211	5	8	3	60.0%	1.2	✓	✓
1236-10672	Bagshot Rd & Downshire Way	1236	10672	107	122	15	14.0%	1.4	✓	✓
1239-1244	Bagshot Rd & Downshire Way	1239	1244	3	3	0	0.0%	0.0	✓	✓
1231-1241	Bagshot Rd & Downshire Way	1231	1241	7	6	-1	-14.0%	0.4	✓	✓
1311-2516	Met Office Rbt	1311	2516	23	16	-7	-30.0%	1.6	✓	✓
1316-1319	Met Office Rbt	1316	1319	4	2	-2	-50.0%	1.2	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
1296-1306	Met Office Rbt	1296	1306	12	28	16	133.0%	3.6	✓	✓
		12		**161**	**185**	**24**	**14.9%**	**1.8**	✓	✓
Railway Screenline										
Northbound										
541-11513	Waterloo Road, Bracknell	541	11513	1	1	0	25.0%	0.2	✓	✓
1191-1187	Bagshot Road	1191	1187	20	19	-1	-6.0%	0.3	✓	✓
2562-1458	Ralphs Ride	2562	1458	26	1	-25	-96.0%	6.8	✗	✓
2570-2084	New Forst Ride	2570	2084	11	11	0	0.0%	0.0	✓	✓
1582-2515	Swinley Road	1582	2515	5	6	2	33.0%	0.7	✓	✓
1582-1609	Kings Ride	1582	1609	18	5	-13	-71.0%	3.7	✓	✓
		6		**80**	**43**	**-37**	**-46.1%**	**4.7**	✗	✓
Southbound										
11513-541	Waterloo Road, Bracknell	11513	541	2	0	-2	-100.0%	2.0	✓	✓
2534-2535	Bagshot Road	2534	2535	21	40	19	90.0%	3.4	✓	✓
1458-2562	Ralphs Ride	1458	2562	4	0	-4	-100.0%	2.6	✓	✓
2084-2570	New Forst Ride	2084	2570	2	5	3	117.0%	1.4	✓	✓
2515-1582	Swinley Road	2515	1582	2	4	2	82.0%	1.0	✓	✓
1609-1582	Kings Ride	1609	1582	11	11	0	0.0%	0.0	✓	✓
		6		**42**	**60**	**18**	**42.9%**	**2.5**	✓	✓
Outer Cordon										
Inbound										
1280-2107	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	1280	2107	11	15	4	30.0%	1.0	✓	✓
873-10553	Forest Rd / Binfield Rd	873	10553	12	17	5	42.0%	1.3	✓	✓
526-561	Coppid Beech Rbt	526	561	47	20	-27	-57.0%	4.6	✓	✓
679-758	Entry from Peacock Lane	679	758	6	11	5	78.0%	1.6	✓	✓
822-836	Golden Retriever Rbt	822	836	13	15	2	15.0%	0.5	✓	✓
801-837	Golden Retriever Rbt	801	837	48	75	27	56.0%	3.4	✓	✓
152-1443	Coral Reef Rbt	152	1443	93	72	-21	-23.0%	2.3	✓	✓
2515-1574	Entry from Swinley Rd	2515	1574	2	6	4	200.0%	2.0	✓	✓
10825-1574	Entry from A329 E	10825	1574	11	17	6	55.0%	1.6	✓	✓
579-1565	Entry from B3017	579	1565	7	3	-4	-57.0%	1.8	✓	✓
		10		**250**	**251**	**1**	**0.3%**	**0.0**	✓	✓
Outbound										
2107-1280	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	2107	1280	16	35	19	123.0%	3.8	✓	✓
10553-873	Forest Rd / Binfield Rd	10553	873	6	7	1	17.0%	0.4	✓	✓
561-530	Coppid Beech Rbt	561	530	47	26	-21	-44.0%	3.4	✓	✓
758-679	Exit to Peacock Lane	758	679	1	1	0	-3.0%	0.0	✓	✓
834-822	Golden Retriever Rbt	834	822	18	10	-8	-44.0%	2.1	✓	✓
847-803	Golden Retriever Rbt	847	803	46	61	15	33.0%	2.1	✓	✓
1449-2518	Coral Reef Rbt	1449	2518	89	116	27	30.0%	2.7	✓	✓
1574-2515	Exit to Swinley Rd	1574	2515	0	4	4	0.0%	2.8	✓	✓
1574-10825	Exit to A329 E	1574	10825	15	12	-3	-20.0%	0.8	✓	✓
1565-579	Exit to B3017	1565	579	4	5	1	25.0%	0.5	✓	✓
		10		**241**	**277**	**36**	**14.8%**	**2.2**	✓	✓
A329/ A322/ A3095										
Anti-Clockwise										
2530-1118	Western Rbt	2530	1118	25	11	-14	-56.0%	3.3	✓	✓
1108-1103	Western Rbt	1108	1103	17	13	-4	-24.0%	1.0	✓	✓
2594-1030	Twin Bridge Rbt N	2594	1030	17	7	-10	-60.0%	3.0	✓	✓
1024-1049	Twin Bridge Rbt S	1024	1049	83	98	15	18.0%	1.5	✓	✓
1206-1218	Bagshot Rd & Downshire Way	1206	1218	93	99	6	6.0%	0.6	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
1219-1191	Bagshot Rd & Downshire Way	1219	1191	14	19	5	36.0%	1.2	✓	✓
2533-1291	Met Office Rbt	2533	1291	9	10	1	11.0%	0.3	✓	✓
		7		**259**	**257**	**-2**	**-0.7%**	**0.1**	✓	✓
Clockwise										
1106-1166	Western Rbt	1106	1166	28	30	2	7.0%	0.4	✓	✓
2529-1094	Western Rbt	2529	1094	9	22	13	144.0%	3.3	✓	✓
1031-2525	Twin Bridge Rbt N	1031	2525	11	22	11	103.0%	2.8	✓	✓
1033-1013	Twin Bridge Rbt S	1033	1013	51	66	15	30.0%	2.0	✓	✓
1217-1206	Bagshot Rd & Downshire Way	1217	1206	59	60	1	2.0%	0.1	✓	✓
100105-1227	Bagshot Rd & Downshire Way	100105	1227	21	40	19	90.0%	3.4	✓	✓
1298-1252	Met Office Rbt	1298	1252	17	26	9	53.0%	1.9	✓	✓
		7		**196**	**266**	**70**	**35.9%**	**4.6**	✗	✓
Motorway Counts										
1788-1815	M4, Junction 5 - 4b	1788	1815	620	656	36	6.0%	1.4	✓	✓
1815-1788	M4, Junction 5 - 4b	1815	1788	596	623	27	5.0%	1.1	✓	✓
841-2373	M4, Junction 6-7	841	2373	534	542	8	1.0%	0.3	✓	✓
2373-841	M4, Junction 6-7	2373	841	505	528	23	5.0%	1.0	✓	✓
389-1504	M4, Junction 8/9 -10	389	1504	506	529	23	5.0%	1.0	✓	✓
1504-389	M4, Junction 8/9 -10	1504	389	482	481	-1	0.0%	0.1	✓	✓
2334-2360	M3, Junction 5-6	2334	2360	431	407	-24	-6.0%	1.2	✓	✓
2360-2334	M3, Junction 5-6	2360	2334	472	460	-12	-3.0%	0.6	✓	✓
2360-2331	M3, Junction 5-4A	2360	2331	463	446	-17	-4.0%	0.8	✓	✓
2331-2360	M3, Junction 5-4A	2331	2360	422	452	30	7.0%	1.4	✓	✓
2331-2327	M3, Junction 4A-4	2331	2327	471	455	-16	-3.0%	0.7	✓	✓
2327-2331	M3, Junction 4A-4	2327	2331	519	459	-60	-12.0%	2.7	✓	✓
2327-2359	M3, Junction 4-3	2327	2359	525	514	-11	-2.0%	0.5	✓	✓
2359-2327	M3, Junction 4-3	2359	2327	531	546	15	3.0%	0.7	✓	✓
2359-1797	M3, Junction 3-2	2359	1797	558	544	-14	-2.0%	0.6	✓	✓
1797-2359	M3, Junction 3-2	1797	2359	576	624	48	8.0%	1.9	✓	✓
2326-1504	A404 N of M4 J8/9	2326	1504	239	242	3	1.0%	0.2	✓	✓
1504-2326	A404 N of M4 J8/9	1504	2326	195	230	35	18.0%	2.4	✓	✓
1504-2355	A308(M) bet A404 and A308	1504	2355	104	104	0	0.0%	0.0	✓	✓
2355-1504	A308(M) bet A404 and A308	2355	1504	85	78	-7	-8.0%	0.8	✓	✓
1814-1830	A30 bet A315 and B378	1814	1830	115	100	-15	-13.0%	1.4	✓	✓
1830-1814	A30 bet A315 and B378	1830	1814	112	112	0	0.0%	0.0	✓	✓
		22		**9062**	**9132**	**70**	**0.8%**	**0.7**	✓	✓
Wokingham Counts										
541-548	Old Wokingham Road Northern End	541	548	8	0	-8	-100.0%	3.9	✓	✓
548-541	Old Wokingham Road Northern End	548	541	23	11	-12	-52.0%	2.9	✓	✓
438-10936	B3420 Nine Mile Ride, Crowthorne	438	10936	21	15	-6	-29.0%	1.4	✓	✓
10936-438	B3420 Nine Mile Ride, Crowthorne	10936	438	14	9	-5	-34.0%	1.4	✓	✓
428-11271	A321 Twyford Road, Wokingham	428	11271	16	14	-2	-10.0%	0.4	✓	✓
11271-428	A321 Twyford Road, Wokingham	11271	428	20	14	-6	-30.0%	1.5	✓	✓
11275-2371	A321 Wiltshire Rd, Wokingham	11275	2371	37	45	8	21.0%	1.2	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
11232-11277	U8269 Binfield Rd, Wokingham	11232	11277	4	4	0	12.0%	0.2	✓	✓
11277-11232	U8269 Binfield Rd, Wokingham	11277	11232	5	4	-1	-15.0%	0.3	✓	✓
11213-11333	B3270 Lower Earley Way North, Lwr Earley	11213	11333	32	3	-29	-91.0%	6.9	✗	✓
11333-11213	B3270 Lower Earley Way North, Lwr Earley	11333	11213	49	37	-12	-25.0%	1.9	✓	✓
11262-11405	A327 Reading Rd, Arborfield	11262	11405	24	16	-8	-34.0%	1.8	✓	✓
11405-11262	A327 Reading Rd, Arborfield	11405	11262	26	32	6	24.0%	1.2	✓	✓
404-11439	A329 Shute End, Wokingham	404	11439	21	23	2	12.0%	0.5	✓	✓
11278-11447	C8701 Warren House Rd, Wokingham	11278	11447	12	1	-11	-92.0%	4.3	✓	✓
11447-11278	C8701 Warren House Rd, Wokingham	11447	11278	18	0	-18	-100.0%	6.1	✗	✓
11324-11484	A321 Finchampstead Rd, N Of B3017	11324	11484	29	11	-18	-62.0%	4.0	✓	✓
11484-11324	A321 Finchampstead Rd, N Of B3016	11484	11324	20	18	-2	-10.0%	0.4	✓	✓
11276-11504	A329 London Road, Wokingham	11276	11504	47	33	-14	-29.0%	2.2	✓	✓
11504-11276	A329 London Road, Wokingham	11504	11276	32	27	-5	-15.0%	0.9	✓	✓
446-11506	Peach Street, Wokingham	446	11506	32	34	2	5.0%	0.3	✓	✓
440-11513	N60 Waterloo Rd, Wokingham	440	11513	6	0	-6	-100.0%	3.4	✓	✓
11513-440	N60 Waterloo Rd, Wokingham	11513	440	4	1	-3	-74.0%	1.8	✓	✓
2243-11523	N33 Easthampstead Rd, Wokingham	2243	11523	18	8	-10	-56.0%	2.8	✓	✓
11523-2243	N33 Easthampstead Rd, Wokingham	11523	2243	13	15	2	17.0%	0.6	✓	✓
388-11621	B3016 Eversley Cross, Eversley	388	11621	8	3	-5	-60.0%	2.0	✓	✓
11621-388	B3016 Eversley Cross, Eversley	11621	388	9	8	-1	-12.0%	0.4	✓	✓
11397-11638	A327 Reading Rd, Arborfield Gsn	11397	11638	22	28	6	28.0%	1.2	✓	✓
11638-11397	A327 Reading Rd, Arborfield Gsn	11638	11397	23	33	10	42.0%	1.9	✓	✓
11401-11702	Church Rd, W Of Hyde End Lane	11401	11702	10	8	-2	-16.0%	0.5	✓	✓
11702-11401	Church Rd, W Of Hyde End Lane	11702	11401	12	16	4	35.0%	1.1	✓	✓
11404-11704	Hyde End Road	11404	11704	9	1	-8	-89.0%	3.7	✓	✓
11704-11404	Hyde End Road	11704	11404	8	5	-3	-40.0%	1.3	✓	✓
11708-11710	Basingstoke Rd, S Of Church Rd	11708	11710	14	17	3	20.0%	0.7	✓	✓
11710-11708	Basingstoke Rd, S Of Church Rd	11710	11708	11	8	-3	-26.0%	0.9	✓	✓
11587-11801	A329 Under M4 Bridge, Reading	11587	11801	30	16	-14	-46.0%	2.9	✓	✓
11801-11587	A329 Under M4 Bridge, Reading	11801	11587	30	27	-3	-9.0%	0.5	✓	✓
132-11805	B3030 Robin Hood Lane, Reading	132	11805	12	29	17	136.0%	3.7	✓	✓
11805-132	B3030 Robin Hood Lane, Reading	11805	132	11	38	27	245.0%	5.5	✗	✓
11811-11813	B3270 Lower Earley Way	11811	11813	22	17	-5	-22.0%	1.1	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
	South, Lwr Earley									
11813-11811	B3270 Lower Earley Way South, Lwr Earley	11813	11811	29	3	-26	-90.0%	6.4	✗	✓
11342-11817	A327 Shinfield Rd, Reading	11342	11817	25	21	-4	-17.0%	0.9	✓	✓
11817-11342	A327 Shinfield Rd, Reading	11817	11342	18	9	-9	-51.0%	2.5	✓	✓
11819-11821	Whitley Wood Lane, Reading	11819	11821	38	0	-38	-100.0%	8.8	✗	✓
11821-11819	Whitley Wood Lane, Reading	11821	11819	30	41	11	38.0%	1.9	✓	✓
11403-11349	A327 Hollow Lane, Shinfield	11403	11349	40	8	-32	-80.0%	6.5	✗	✓
11349-11403	A327 Hollow Lane, Shinfield	11349	11403	34	34	0	-1.0%	0.1	✓	✓

Cordon/ Screenline		Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	384	318	-66	-17.2%	3.5	✓		8	8	8
2	RSI Screenline	Outbound	356	360	4	1.2%	0.2	✓		8	8	8
3	Inner Cordon	Inbound	130	120	-10	-7.7%	0.9	✓		12	12	12
4	Inner Cordon	Outbound	161	185	24	14.9%	1.8	✓		12	12	12
5	Railway Screenline	Northbound	80	43	-37	-46.1%	4.7	✗		6	5	6
6	Railway Screenline	Southbound	42	60	18	42.9%	2.5	✓		6	6	6
7	Outer Cordon	Inbound	250	251	1	0.3%	0.0	✓		10	10	10
8	Outer Cordon	Outbound	241	277	36	14.8%	2.2	✓		10	10	10
9	A329/ A322/ A3095	Clockwise	196	257	-2	-0.7%	0.1	✓		7	7	7
10	A329/ A322/ A3096	Anti-clockwise	259	266	70	35.9%	4.6	✗		7	7	7
								8	screenline/cordon counts	86	85	86
								80%	motorway counts	22	22	22
									Wokingham counts	47	32	37
									total calibration counts	155	139	145
											90%	**94%**

Table C.3 – PM Peak Calibration Results – Car / Light Vehicle

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
RSI										
Inbound										
748-878	RSI 1EB	748	878	1418	1375	-43	-3.0%	1.1	✓	✓
2606-991	RSI 2NB	2606	991	951	1084	133	14.0%	4.1	✓	✓
10711-777	RSI 3NB	10711	777	1545	1442	-103	-6.7%	2.6	✓	✓
1608-10825	RSI 4WB	1608	10825	971	1032	61	6.3%	1.9	✓	✓
1312-1306	RSI 5SB	1312	1306	382	345	-37	-9.7%	1.9	✓	✓
595-10560	RSI 6EB	595	10560	818	856	38	4.6%	1.3	✓	✓
100093-822	RSI 7NB EB	100093	822	762	680	-82	-10.8%	3.0	✓	✓
785-954	RSI 8SB	785	954	1225	1008	-217	-17.7%	6.4	✗	✗
		8		**8072**	**7822**	**-250**	**-3.1%**	**2.8**	✓	✓
Outbound										
877-756	RSI 1WB	877	756	1524	1398	-126	-8.3%	3.2	✓	✓
991-2606	RSI 2SB	991	2606	1362	1560	198	14.6%	5.1	✗	✓
1248-10673	RSI 3SB	1248	10673	1938	1867	-71	-3.6%	1.6	✓	✓
10825-1608	RSI 4EB	10825	1608	998	964	-34	-3.4%	1.0	✓	✓
1306-1312	RSI 5NB	1306	1312	734	776	42	5.8%	1.5	✓	✓
10560-595	RSI 6WB	10560	595	1028	954	-74	-7.2%	2.3	✓	✓
822-100093	RSI 7SB WB	822	100093	675	681	6	0.9%	0.2	✓	✓
954-785	RSI 8NB	954	785	1015	520	-495	-48.8%	17.8	✗	✗
		8		**9273**	**8720**	**-553**	**-6.0%**	**5.8**	✗	✓
Inner Cordon										
Inbound										
1086-1101	Western Rbt	1086	1101	251	283	32	12.7%	1.9	✓	✓
1080-1087	Western Rbt	1080	1087	1164	1344	180	15.5%	5.0	✓	✗
1028-1029	Twin Bridge Rbt N	1028	1029	1046	1109	63	6.0%	1.9	✓	✓
1003-1011	Twin Bridge Rbt N	1003	1011	1073	745	-328	-30.5%	10.8	✗	✗
2522-993	Twin Bridge Rbt S	2522	993	1220	1089	-131	-10.7%	3.8	✓	✓
1211-1220	Bagshot Rd & Downshire Way	1211	1220	224	243	19	8.5%	1.2	✓	✓
100106-1234	Bagshot Rd & Downshire Way	100106	1234	1574	1442	-132	-8.4%	3.3	✓	✓
1244-1238	Bagshot Rd & Downshire Way	1244	1238	36	34	-2	-5.6%	0.3	✓	✓
1241-1237	Bagshot Rd & Downshire Way	1241	1237	374	366	-8	-2.1%	0.4	✓	✓
1315-1303	Met Office Rbt	1315	1303	842	950	108	12.8%	3.6	✓	✓
1319-1318	Met Office Rbt	1319	1318	353	442	89	25.2%	4.4	✓	✓
1306-1308	Met Office Rbt	1306	1308	382	345	-37	-9.7%	1.9	✓	✓
		12		**8539**	**8392**	**-147**	**-1.7%**	**1.5**	✓	✓
Outbound										
1091-1086	Western Rbt	1091	1086	466	504	38	8.2%	1.7	✓	✓
1088-1080	Western Rbt	1088	1080	1306	1319	13	1.0%	0.3	✓	✓
1017-1028	Twin Bridge Rbt N	1017	1028	666	755	89	13.3%	3.3	✓	✓
1007-1003	Twin Bridge Rbt N	1007	1003	254	55	-199	-78.3%	15.9	✗	✗
1006-980	Twin Bridge Rbt S	1006	980	2068	2183	115	5.5%	2.4	✓	✓
1232-1211	Bagshot Rd & Downshire Way	1232	1211	467	357	-110	-23.6%	5.4	✗	✗
1236-10672	Bagshot Rd & Downshire Way	1236	10672	2071	1905	-166	-8.0%	3.7	✓	✓
1239-1244	Bagshot Rd & Downshire Way	1239	1244	45	47	2	4.4%	0.2	✓	✓
1231-1241	Bagshot Rd & Downshire Way	1231	1241	359	445	86	24.0%	4.2	✓	✓
1311-2516	Met Office Rbt	1311	2516	1271	1112	-159	-12.5%	4.6	✓	✓
1316-1319	Met Office Rbt	1316	1319	436	465	29	6.7%	1.3	✓	✓
1296-1306	Met Office Rbt	1296	1306	648	776	128	19.8%	4.7	✓	✗
		12		**10057**	**9923**	**-134**	**-1.3%**	**1.3**	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
Railway Screenline										
Northbound										
541-11513	Waterloo Road, Bracknell	541	11513	186	198	12	6.5%	0.8	✓	✓
1191-1187	Bagshot Road	1191	1187	745	666	-79	-10.6%	2.9	✓	✓
2562-1458	Ralphs Ride	2562	1458	345	323	-22	-6.4%	1.2	✓	✓
2570-2084	New Forst Ride	2570	2084	296	339	43	14.6%	2.4	✓	✓
1582-2515	Swinley Road	1582	2515	369	289	-80	-21.7%	4.4	✓	✓
1582-1609	Kings Ride	1582	1609	460	347	-113	-24.5%	5.6	✗	✗
		6		**2400**	**2162**	**-238**	**-9.9%**	**4.9**	✗	✓
Southbound										
11513-541	Waterloo Road, Bracknell	11513	541	196	150	-46	-23.4%	3.4	✓	✓
2534-2535	Bagshot Road	2534	2535	982	1053	71	7.2%	2.2	✓	✓
1458-2562	Ralphs Ride	1458	2562	800	686	-114	-14.2%	4.1	✓	✓
2084-2570	New Forst Ride	2084	2570	574	585	11	2.0%	0.4	✓	✓
2515-1582	Swinley Road	2515	1582	203	173	-30	-14.8%	2.1	✓	✓
1609-1582	Kings Ride	1609	1582	664	648	-16	-2.3%	0.6	✓	✓
		6		**3418**	**3295**	**-123**	**-3.6%**	**2.1**	✓	✓
Outer Cordon										
Inbound										
1280-2107	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	1280	2107	642	668	26	4.1%	1.0	✓	✓
873-10553	Forest Rd / Binfield Rd	873	10553	466	451	-15	-3.2%	0.7	✓	✓
526-561	Coppid Beech Rbt	526	561	1140	1127	-13	-1.2%	0.3	✓	✓
679-758	Entry from Peacock Lane	679	758	183	237	54	29.4%	3.7	✓	✓
822-836	Golden Retriever Rbt	822	836	762	680	-82	-10.8%	3.0	✓	✓
801-837	Golden Retriever Rbt	801	837	1083	1104	21	1.9%	0.6	✓	✓
152-1443	Coral Reef Rbt	152	1443	2464	2515	51	2.1%	1.0	✓	✓
2515-1574	Entry from Swinley Rd	2515	1574	357	289	-68	-19.0%	3.7	✓	✓
10825-1574	Entry from A329 E	10825	1574	950	1032	82	8.6%	2.6	✓	✓
579-1565	Entry from B3017	579	1565	668	640	-28	-4.2%	1.0	✓	✓
		10		**8715**	**8743**	**28**	**0.3%**	**0.2**	✓	✓
Outbound										
2107-1280	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	2107	1280	564	532	-32	-5.7%	1.3	✓	✓
10553-873	Forest Rd / Binfield Rd	10553	873	533	517	-16	-3.0%	0.6	✓	✓
561-530	Coppid Beech Rbt	561	530	1888	1762	-126	-6.7%	2.9	✓	✓
758-679	Exit to Peacock Lane	758	679	732	949	217	29.7%	7.4	✗	✗
834-822	Golden Retriever Rbt	834	822	675	681	6	0.9%	0.2	✓	✓
847-803	Golden Retriever Rbt	847	803	1762	1831	69	3.9%	1.6	✓	✓
1449-2518	Coral Reef Rbt	1449	2518	1965	2171	206	10.5%	4.5	✓	✓
1574-2515	Exit to Swinley Rd	1574	2515	203	173	-30	-14.8%	2.1	✓	✓
1574-10825	Exit to A329 E	1574	10825	1017	964	-53	-5.2%	1.6	✓	✓
1565-579	Exit to B3017	1565	579	405	442	37	9.1%	1.7	✓	✓
		10		**9744**	**10022**	**278**	**2.9%**	**2.8**	✓	✓
A329/ A322/ A3095										
Clockwise										
1106-1166	Western Rbt	1106	1166	1314	1160	-154	-11.7%	4.3	✓	✓
2529-1094	Western Rbt	2529	1094	725	668	-57	-7.9%	2.1	✓	✓
1031-2525	Twin Bridge Rbt N	1031	2525	547	496	-51	-9.3%	2.2	✓	✓
1033-1013	Twin Bridge Rbt S	1033	1013	1301	1341	40	3.1%	1.1	✓	✓
1217-1206	Bagshot Rd & Downshire Way	1217	1206	1107	1226	119	10.7%	3.4	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
100105-1227	Bagshot Rd & Downshire Way	100105	1227	982	1053	71	7.2%	2.2	✓	✓
1298-1252	Met Office Rbt	1298	1252	506	535	29	5.7%	1.2	✓	✓
		7		**6482**	**6479**	**-3**	**0.0%**	**0.0**	✓	✓
Anti-Clockwise										
2530-1118	Western Rbt	2530	1118	907	886	-21	-2.3%	0.7	✓	✓
1108-1103	Western Rbt	1108	1103	680	684	4	0.6%	0.1	✓	✓
2594-1030	Twin Bridge Rbt N	2594	1030	733	729	-4	-0.6%	0.1	✓	✓
1024-1049	Twin Bridge Rbt S	1024	1049	1663	1501	-162	-9.7%	4.0	✓	✓
1206-1218	Bagshot Rd & Downshire Way	1206	1218	1572	1520	-52	-3.3%	1.3	✓	✓
1219-1191	Bagshot Rd & Downshire Way	1219	1191	713	679	-34	-4.8%	1.2	✓	✓
2533-1291	Met Office Rbt	2533	1291	721	750	29	4.0%	1.0	✓	✓
		7		**6989**	**6749**	**-240**	**-3.4%**	**2.8**	✓	✓
Motorway Counts										
1788-1815	M4, Junction 5 - 4b	1788	1815	5442	5479	37	0.7%	0.4	✓	✓
1815-1788	M4, Junction 5 - 4b	1815	1788	5146	5122	-24	-0.5%	0.3	✓	✓
841-2373	M4, Junction 6-7	841	2373	4559	4629	70	1.5%	1.0	✓	✓
2373-841	M4, Junction 6-7	2373	841	4822	4744	-78	-1.6%	1.1	✓	✓
389-1504	M4, Junction 8/9 - 10	389	1504	4575	4486	-89	-1.9%	1.3	✓	✓
1504-389	M4, Junction 8/9 - 10	1504	389	4833	4832	-1	0.0%	0.0	✓	✓
2334-2360	M3, Junction 5-6	2334	2360	2923	2919	-4	-0.2%	0.0	✓	✓
2360-2334	M3, Junction 5-6	2360	2334	4296	4324	28	0.7%	0.4	✓	✓
2360-2331	M3, Junction 5-4A	2360	2331	3416	3385	-31	-0.9%	0.5	✓	✓
2331-2360	M3, Junction 5-4A	2331	2360	3689	3713	24	0.7%	0.3	✓	✓
2331-2327	M3, Junction 4A-4	2331	2327	3835	3918	83	2.2%	1.3	✓	✓
2327-2331	M3, Junction 4A-4	2327	2331	4130	4142	12	0.3%	0.1	✓	✓
2327-2359	M3, Junction 4-3	2327	2359	3986	3999	13	0.3%	0.1	✓	✓
2359-2327	M3, Junction 4-3	2359	2327	4154	4349	195	4.7%	2.9	✓	✓
2359-1797	M3, Junction 3-2	2359	1797	4027	4031	4	0.1%	0.0	✓	✓
1797-2359	M3, Junction 3-2	1797	2359	4768	4667	-101	-2.1%	1.4	✓	✓
2326-1504	A404 N of M4 J8/9	2326	1504	2612	2702	90	3.5%	1.7	✓	✓
1504-2326	A404 N of M4 J8/9	1504	2326	2696	2635	-61	-2.2%	1.1	✓	✓
1504-2355	A308(M) bet A404 and A308	1504	2355	1113	1201	88	7.9%	2.5	✓	✓
2355-1504	A308(M) bet A404 and A308	2355	1504	1109	1086	-23	-2.1%	0.6	✓	✓
1814-1830	A30 bet A315 and B378	1814	1830	989	1011	22	2.2%	0.6	✓	✓
1830-1814	A30 bet A315 and B378	1830	1814	1267	1283	16	1.3%	0.4	✓	✓
		22		**78388**	**78657**	**269**	**0.3%**	**0.9**	✓	✓
Wokingham Counts										
541-548	Old Wokingham Road Northern End	541	548	713	821	108	15.2%	3.9	✓	✗
548-541	Old Wokingham Road Northern End	548	541	212	133	-79	-37.2%	6.0	✗	✓
438-10936	B3420 Nine Mile Ride, Crowthorne	438	10936	465	438	-27	-5.8%	1.2	✓	✓
10936-438	B3420 Nine Mile Ride, Crowthorne	10936	438	648	584	-64	-9.9%	2.5	✓	✓
428-11271	A321 Twyford Road, Wokingham	428	11271	498	520	22	4.4%	0.9	✓	✓
11271-428	A321 Twyford Road, Wokingham	11271	428	331	331	0	0.1%	0.0	✓	✓
11275-2371	A321 Wiltshire Rd, Wokingham	11275	2371	984	33	-951	-96.6%	42.1	✗	✗
11232-11277	U8269 Binfield Rd, Wokingham	11232	11277	87	135	48	55.1%	4.5	✓	✓
11277-11232	U8269 Binfield Rd, Wokingham	11277	11232	71	119	48	67.0%	4.8	✓	✓
11213-11333	B3270 Lower Earley Way North, Lwr Earley	11213	11333	1412	927	-485	-34.4%	14.1	✗	✗
11333-11213	B3270 Lower Earley Way North,	11333	11213	984	1089	105	10.6%	3.2	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
	Lwr Earley									
11262-11405	A327 Reading Rd, Arborfield	11262	11405	742	659	-83	-11.1%	3.1	✓	✓
11405-11262	A327 Reading Rd, Arborfield	11405	11262	776	741	-35	-4.5%	1.2	✓	✓
404-11439	A329 Shute End, Wokingham	404	11439	771	697	-74	-9.6%	2.7	✓	✓
11278-11447	C8701 Warren House Rd, Wokingham	11278	11447	445	327	-118	-26.4%	5.9	✗	✗
11447-11278	C8701 Warren House Rd, Wokingham	11447	11278	267	254	-13	-4.7%	0.7	✓	✓
11324-11484	A321 Finchampstead Rd, N Of B3017	11324	11484	671	804	133	19.8%	4.8	✓	✗
11484-11324	A321 Finchampstead Rd, N Of B3016	11484	11324	895	890	-5	-0.5%	0.1	✓	✓
11276-11504	A329 London Road, Wokingham	11276	11504	779	850	71	9.1%	2.4	✓	✓
11504-11276	A329 London Road, Wokingham	11504	11276	1314	1245	-69	-5.3%	1.9	✓	✓
446-11506	Peach Street, Wokingham	446	11506	1011	877	-134	-13.2%	4.3	✓	✓
440-11513	N60 Waterloo Rd, Wokingham	440	11513	190	203	13	7.0%	0.9	✓	✓
11513-440	N60 Waterloo Rd, Wokingham	11513	440	162	98	-64	-39.4%	5.5	✗	✓
2243-11523	N33 Easthampstead Rd, Wokingham	2243	11523	370	301	-69	-18.7%	3.7	✓	✓
11523-2243	N33 Easthampstead Rd, Wokingham	11523	2243	427	420	-7	-1.7%	0.3	✓	✓
388-11621	B3016 Eversley Cross, Eversley	388	11621	271	251	-20	-7.3%	1.2	✓	✓
11621-388	B3016 Eversley Cross, Eversley	11621	388	256	235	-21	-8.1%	1.3	✓	✓
11397-11638	A327 Reading Rd, Arborfield Gsn	11397	11638	526	575	49	9.3%	2.0	✓	✓
11638-11397	A327 Reading Rd, Arborfield Gsn	11638	11397	568	585	17	3.1%	0.7	✓	✓
11401-11702	Church Rd, W Of Hyde End Lane	11401	11702	406	444	38	9.2%	1.8	✓	✓
11702-11401	Church Rd, W Of Hyde End Lane	11702	11401	326	506	180	55.3%	8.8	✗	✗
11404-11704	Hyde End Road	11404	11704	382	337	-45	-11.7%	2.3	✓	✓
11704-11404	Hyde End Road	11704	11404	292	272	-20	-7.0%	1.2	✓	✓
11708-11710	Basingstoke Rd, S Of Church Rd	11708	11710	348	322	-26	-7.5%	1.4	✓	✓
11710-11708	Basingstoke Rd, S Of Church Rd	11710	11708	367	340	-27	-7.3%	1.4	✓	✓
11587-11801	A329 Under M4 Bridge, Reading	11587	11801	760	657	-103	-13.6%	3.8	✓	✓
11801-11587	A329 Under M4 Bridge, Reading	11801	11587	773	806	33	4.3%	1.1	✓	✓
132-11805	B3030 Robin Hood Lane, Reading	132	11805	355	331	-24	-6.6%	1.2	✓	✓
11805-132	B3030 Robin Hood Lane, Reading	11805	132	386	482	96	24.9%	4.6	✓	✓
11811-11813	B3270 Lower Earley Way South, Lwr Earley	11811	11813	1150	1191	41	3.6%	1.1	✓	✓
11813-11811	B3270 Lower Earley Way South, Lwr Earley	11813	11811	805	864	59	7.3%	2.0	✓	✓
11342-11817	A327 Shinfield Rd, Reading	11342	11817	723	710	-13	-1.8%	0.4	✓	✓
11817-11342	A327 Shinfield Rd, Reading	11817	11342	724	690	-34	-4.7%	1.2	✓	✓
11819-11821	Whitley Wood Lane, Reading	11819	11821	861	516	-345	-40.1%	13.1	✗	✗
11821-11819	Whitley Wood Lane, Reading	11821	11819	1073	975	-98	-9.1%	3.0	✓	✓
11403-11349	A327 Hollow Lane, Shinfield	11403	11349	1068	921	-147	-13.8%	4.6	✓	✓
11349-11403	A327 Hollow Lane, Shinfield	11349	11403	1182	1234	52	4.4%	1.4	✓	✓

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	8072	7822	-250	-3.1%	2.8	✓		8	7	7
2	RSI Screenline	Outbound	9273	8720	-553	-6.0%	5.8	✗		8	6	7
3	Inner Cordon	Inbound	8539	8392	-147	-1.7%	1.5	✓		12	11	10
4	Inner Cordon	Outbound	10057	9923	-134	-1.3%	1.3	✓		12	10	9
5	Railway Screenline	Northbound	2400	2162	-238	-9.9%	4.9	✗		6	5	5
6	Railway Screenline	Southbound	3418	3295	-123	-3.6%	2.1	✓		6	6	6
7	Outer Cordon	Inbound	8715	8743	28	0.3%	0.2	✓		10	10	10
8	Outer Cordon	Outbound	9744	10022	278	2.9%	2.8	✓		10	9	9
9	A329/ A322/ A3095	Clockwise	6482	6479	-3	0.0%	0.0	✓		7	7	7
10	A329/ A322/ A3096	Anti-clockwise	6989	6749	-240	-3.4%	2.8	✓		7	7	7
								8	screenline/cordon counts	86	78	77
								80%	motorway counts	22	22	22
									Wokingham counts	47	40	40
									total calibration counts	155	140	139
											90%	**90%**

Table C.4 – PM Peak Calibration Results – Heavy Vehicle

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
RSI										
Inbound										
748-878	RSI 1EB	748	878	124	97	-27	-21.8%	2.5	✓	✓
2606-991	RSI 2NB	2606	991	36	45	9	23.4%	1.3	✓	✓
10711-777	RSI 3NB	10711	777	124	174	50	40.8%	4.1	✓	✓
1608-10825	RSI 4WB	1608	10825	26	4	-22	-84.7%	5.7	✗	✓
1312-1306	RSI 5SB	1312	1306	4	8	4	100.0%	1.6	✓	✓
595-10560	RSI 6EB	595	10560	9	1	-8	-89.3%	3.6	✓	✓
100093-822	RSI 7NB EB	100093	822	25	9	-16	-64.4%	3.9	✓	✓
785-954	RSI 8SB	785	954	13	3	-10	-76.7%	3.5	✓	✓
		8		**362**	**341**	**-21**	**-5.7%**	**1.1**	✓	✓
Outbound										
877-756	RSI 1WB	877	756	135	163	28	20.9%	2.3	✓	✓
991-2606	RSI 2SB	991	2606	18	1	-17	-94.5%	5.5	✗	✓
1248-10673	RSI 3SB	1248	10673	78	94	16	21.3%	1.7	✓	✓
10825-1608	RSI 4EB	10825	1608	42	3	-39	-92.8%	8.1	✗	✓
1306-1312	RSI 5NB	1306	1312	3	5	2	71.1%	1.0	✓	✓
10560-595	RSI 6WB	10560	595	5	1	-4	-80.4%	2.3	✓	✓
822-100093	RSI 7SB WB	822	100093	12	6	-6	-51.3%	2.0	✓	✓
954-785	RSI 8NB	954	785	23	11	-12	-52.0%	2.8	✓	✓
		8		**315**	**284**	**-31**	**-9.9%**	**1.8**	✓	✓
Inner Cordon										
Inbound										
1086-1101	Western Rbt	1086	1101	3	6	3	100.0%	1.4	✓	✓
1080-1087	Western Rbt	1080	1087	10	14	4	40.0%	1.1	✓	✓
1028-1029	Twin Bridge Rbt N	1028	1029	8	1	-7	-86.8%	3.1	✓	✓
1003-1011	Twin Bridge Rbt N	1003	1011	4	1	-3	-76.9%	2.0	✓	✓
2522-993	Twin Bridge Rbt S	2522	993	13	7	-6	-46.1%	1.8	✓	✓
1211-1220	Bagshot Rd & Downshire Way	1211	1220	1	1	0	0.0%	0.0	✓	✓
100106-1234	Bagshot Rd & Downshire Way	100106	1234	75	174	99	132.0%	8.8	✗	✓
1244-1238	Bagshot Rd & Downshire Way	1244	1238	0	0	0	0.0%	0.0	✓	✓
1241-1237	Bagshot Rd & Downshire Way	1241	1237	4	4	0	0.0%	0.0	✓	✓
1315-1303	Met Office Rbt	1315	1303	7	4	-3	-42.9%	1.2	✓	✓
1319-1318	Met Office Rbt	1319	1318	0	3	3	0.0%	2.4	✓	✓
1306-1308	Met Office Rbt	1306	1308	4	8	4	100.0%	1.6	✓	✓
		12		**129**	**223**	**94**	**73.0%**	**7.0**	✗	✓
Outbound										
1091-1086	Western Rbt	1091	1086	1	2	1	100.0%	0.8	✓	✓
1088-1080	Western Rbt	1088	1080	9	0	-9	-100.0%	4.2	✓	✓
1017-1028	Twin Bridge Rbt N	1017	1028	9	8	-1	-7.7%	0.2	✓	✓
1007-1003	Twin Bridge Rbt N	1007	1003	11	6	-5	-44.6%	1.6	✓	✓
1006-980	Twin Bridge Rbt S	1006	980	22	13	-9	-40.0%	2.0	✓	✓
1232-1211	Bagshot Rd & Downshire Way	1232	1211	3	3	0	0.0%	0.0	✓	✓
1236-10672	Bagshot Rd & Downshire Way	1236	10672	61	94	33	54.1%	3.7	✓	✓
1239-1244	Bagshot Rd & Downshire Way	1239	1244	0	1	1	0.0%	1.4	✓	✓
1231-1241	Bagshot Rd & Downshire Way	1231	1241	0	5	5	0.0%	3.1	✓	✓
1311-2516	Met Office Rbt	1311	2516	19	13	-6	-31.6%	1.5	✓	✓
1316-1319	Met Office Rbt	1316	1319	1	3	2	200.0%	1.4	✓	✓
1296-1306	Met Office Rbt	1296	1306	0	5	5	0.0%	3.1	✓	✓
		12		**135**	**153**	**18**	**13.2%**	**1.4**	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
Railway Screenline										
Northbound										
541-11513	Waterloo Road, Bracknell	541	11513	0	0	0	-100.0%	0.8	✓	✓
1191-1187	Bagshot Road	1191	1187	14	8	-6	-41.6%	1.7	✓	✓
2562-1458	Ralphs Ride	2562	1458	9	2	-7	-77.0%	2.8	✓	✓
2570-2084	New Forst Ride	2570	2084	6	1	-5	-83.9%	2.7	✓	✓
1582-2515	Swinley Road	1582	2515	2	5	3	138.1%	1.5	✓	✓
1582-1609	Kings Ride	1582	1609	5	2	-3	-57.4%	1.4	✓	✓
		6		**36**	**18**	**-18**	**-49.7%**	**3.4**	✓	✓
Southbound										
11513-541	Waterloo Road, Bracknell	11513	541	2	1	-1	-50.0%	0.8	✓	✓
2534-2535	Bagshot Road	2534	2535	6	20	14	233.3%	3.8	✓	✓
1458-2562	Ralphs Ride	1458	2562	11	3	-8	-72.7%	3.0	✓	✓
2084-2570	New Forst Ride	2084	2570	3	5	2	72.4%	1.0	✓	✓
2515-1582	Swinley Road	2515	1582	1	15	14	1053.8%	4.7	✓	✓
1609-1582	Kings Ride	1609	1582	11	6	-5	-43.4%	1.5	✓	✓
		6		**34**	**50**	**16**	**47.9%**	**2.5**	✓	✓
Outer Cordon										
Inbound										
1280-2107	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	1280	2107	7	8	1	9.4%	0.2	✓	✓
873-10553	Forest Rd / Binfield Rd	873	10553	8	11	3	37.5%	0.9	✓	✓
526-561	Coppid Beech Rbt	526	561	18	6	-12	-67.4%	3.5	✓	✓
679-758	Entry from Peacock Lane	679	758	3	8	5	159.2%	2.0	✓	✓
822-836	Golden Retriever Rbt	822	836	7	9	2	28.6%	0.7	✓	✓
801-837	Golden Retriever Rbt	801	837	17	32	15	88.2%	3.0	✓	✓
152-1443	Coral Reef Rbt	152	1443	68	202	134	197.1%	11.5	✗	✗
2515-1574	Entry from Swinley Rd	2515	1574	3	5	2	66.7%	1.0	✓	✓
10825-1574	Entry from A329 E	10825	1574	5	4	-1	-20.0%	0.4	✓	✓
579-1565	Entry from B3017	579	1565	1	7	6	600.0%	3.0	✓	✓
		10		**138**	**292**	**154**	**111.9%**	**10.5**	✗	✓
Outbound										
2107-1280	Newell Green / Maidenhead Road/ Osborne Lane / Warfield St Junction	2107	1280	3	6	3	91.4%	1.3	✓	✓
10553-873	Forest Rd / Binfield Rd	10553	873	5	1	-4	-80.0%	2.3	✓	✓
561-530	Coppid Beech Rbt	561	530	11	1	-10	-90.8%	4.0	✓	✓
758-679	Exit to Peacock Lane	758	679	2	3	1	45.8%	0.5	✓	✓
834-822	Golden Retriever Rbt	834	822	5	6	1	20.0%	0.4	✓	✓
847-803	Golden Retriever Rbt	847	803	9	15	6	66.7%	1.7	✓	✓
1449-2518	Coral Reef Rbt	1449	2518	68	99	31	45.6%	3.3	✓	✓
1574-2515	Exit to Swinley Rd	1574	2515	1	15	14	1400.0%	4.9	✓	✓
1574-10825	Exit to A329 E	1574	10825	4	3	-1	-25.0%	0.5	✓	✓
1565-579	Exit to B3017	1565	579	3	1	-2	-66.7%	1.4	✓	✓
		10		111	150	39	35.1%	3.4	✓	✓
A329/ A322/ A3095										
Anti-Clockwise										
2530-1118	Western Rbt	2530	1118	7	0	-7	-100.0%	3.7	✓	✓
1108-1103	Western Rbt	1108	1103	2	8	6	300.0%	2.6	✓	✓
2594-1030	Twin Bridge Rbt N	2594	1030	5	0	-5	-100.0%	3.2	✓	✓
1024-1049	Twin Bridge Rbt S	1024	1049	64	86	22	34.6%	2.5	✓	✓
1206-1218	Bagshot Rd & Downshire Way	1206	1218	55	85	30	54.5%	3.5	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
1219-1191	Bagshot Rd & Downshire Way	1219	1191	10	9	-1	-10.0%	0.3	✓	✓
2533-1291	Met Office Rbt	2533	1291	5	7	2	40.0%	0.8	✓	✓
		7		**148**	**195**	**47**	**31.5%**	**3.5**	✓	✓
Clockwise										
1106-1166	Western Rbt	1106	1166	12	13	1	8.3%	0.2	✓	✓
2529-1094	Western Rbt	2529	1094	3	2	-1	-33.3%	0.6	✓	✓
1031-2525	Twin Bridge Rbt N	1031	2525	6	4	-2	-38.4%	1.0	✓	✓
1033-1013	Twin Bridge Rbt S	1033	1013	75	174	99	132.8%	8.9	✗	✓
1217-1206	Bagshot Rd & Downshire Way	1217	1206	67	172	105	156.7%	9.6	✗	✗
100105-1227	Bagshot Rd & Downshire Way	100105	1227	6	20	14	233.3%	3.8	✓	✓
1298-1252	Met Office Rbt	1298	1252	2	12	10	500.0%	3.7	✓	✓
		7		**171**	**397**	**226**	**131.9%**	**13.3**	✗	✓
Motorway Counts										
1788-1815	M4, Junction 5 - 4b	1788	1815	446	478	32	7.2%	1.4	✓	✓
1815-1788	M4, Junction 5 - 4b	1815	1788	490	450	-40	-8.2%	1.8	✓	✓
841-2373	M4, Junction 6-7	841	2373	422	385	-37	-8.7%	1.8	✓	✓
2373-841	M4, Junction 6-7	2373	841	374	331	-43	-11.4%	2.2	✓	✓
389-1504	M4, Junction 8/9 - 10	389	1504	385	356	-29	-7.5%	1.5	✓	✓
1504-389	M4, Junction 8/9 - 10	1504	389	390	334	-56	-14.3%	2.9	✓	✓
2334-2360	M3, Junction 5-6	2334	2360	272	274	2	0.9%	0.1	✓	✓
2360-2334	M3, Junction 5-6	2360	2334	452	419	-33	-7.3%	1.5	✓	✓
2360-2331	M3, Junction 5-4A	2360	2331	318	326	8	2.5%	0.4	✓	✓
2331-2360	M3, Junction 5-4A	2331	2360	359	378	19	5.2%	0.9	✓	✓
2331-2327	M3, Junction 4A-4	2331	2327	356	353	-3	-0.9%	0.1	✓	✓
2327-2331	M3, Junction 4A-4	2327	2331	435	388	-47	-10.7%	2.2	✓	✓
2327-2359	M3, Junction 4-3	2327	2359	370	361	-9	-2.3%	0.4	✓	✓
2359-2327	M3, Junction 4-3	2359	2327	470	476	6	1.2%	0.2	✓	✓
2359-1797	M3, Junction 3-2	2359	1797	404	420	16	4.0%	0.7	✓	✓
1797-2359	M3, Junction 3-2	1797	2359	502	521	19	3.8%	0.8	✓	✓
2326-1504	A404 N of M4 J8/9	2326	1504	114	124	10	8.5%	0.8	✓	✓
1504-2326	A404 N of M4 J8/9	1504	2326	119	119	0	-0.3%	0.0	✓	✓
1504-2355	A308(M) bet A404 and A308	1504	2355	49	50	1	2.6%	0.1	✓	✓
2355-1504	A308(M) bet A404 and A308	2355	1504	49	46	-3	-6.3%	0.4	✓	✓
1814-1830	A30 bet A315 and B378	1814	1830	74	57	-17	-22.8%	2.0	✓	✓
1830-1814	A30 bet A315 and B378	1830	1814	61	0	-61	-100.0%	11.0	✗	✓
		22		**6910**	**6646**	**-264**	**-3.8%**	**3.2**	✓	✓
Wokingham Counts										
541-548	Old Wokingham Road Northern End	541	548	17	2	-15	-88.4%	4.9	✓	✓
548-541	Old Wokingham Road Northern End	548	541	5	7	2	36.2%	0.7	✓	✓
438-10936	B3420 Nine Mile Ride, Crowthorne	438	10936	11	9	-2	-20.3%	0.7	✓	✓
10936-438	B3420 Nine Mile Ride, Crowthorne	10936	438	16	9	-7	-42.8%	1.9	✓	✓
428-11271	A321 Twyford Road, Wokingham	428	11271	12	10	-2	-17.2%	0.6	✓	✓
11271-428	A321 Twyford Road, Wokingham	11271	428	8	14	6	74.6%	1.8	✓	✓
11275-2371	A321 Wiltshire Rd, Wokingham	11275	2371	24	46	22	92.6%	3.7	✓	✓
11232-11277	U8269 Binfield Rd, Wokingham	11232	11277	2	5	3	136.7%	1.5	✓	✓
11277-11232	U8269 Binfield Rd, Wokingham	11277	11232	2	5	3	189.2%	1.7	✓	✓
11213-11333	B3270 Lower Earley Way North, Lwr Earley	11213	11333	34	15	-19	-56.2%	3.8	✓	✓
11333-11213	B3270 Lower Earley Way North,	11333	11213	24	34	10	42.4%	1.8	✓	✓

Count Ref	Road Name	A node	B node	Count (veh)	Model (veh)	Diff	% Diff	GEH	GEH*	Flow*
	Lwr Earley									
11262-11405	A327 Reading Rd, Arborfield	11262	11405	18	11	-7	-38.9%	1.8	✓	✓
11405-11262	A327 Reading Rd, Arborfield	11405	11262	19	23	4	22.1%	0.9	✓	✓
404-11439	A329 Shute End, Wokingham	404	11439	19	25	6	33.7%	1.3	✓	✓
11278-11447	C8701 Warren House Rd, Wokingham	11278	11447	11	7	-4	-35.1%	1.2	✓	✓
11447-11278	C8701 Warren House Rd, Wokingham	11447	11278	6	1	-5	-84.5%	2.8	✓	✓
11324-11484	A321 Finchampstead Rd, N Of B3017	11324	11484	16	19	3	16.7%	0.6	✓	✓
11484-11324	A321 Finchampstead Rd, N Of B3016	11484	11324	22	12	-10	-44.7%	2.3	✓	✓
11276-11504	A329 London Road, Wokingham	11276	11504	19	17	-2	-10.1%	0.4	✓	✓
11504-11276	A329 London Road, Wokingham	11504	11276	32	28	-4	-12.2%	0.7	✓	✓
446-11506	Peach Street, Wokingham	446	11506	25	45	20	83.5%	3.4	✓	✓
440-11513	N60 Waterloo Rd, Wokingham	440	11513	5	1	-4	-78.3%	2.1	✓	✓
11513-440	N60 Waterloo Rd, Wokingham	11513	440	4	0	-4	-100.0%	2.8	✓	✓
2243-11523	N33 Easthampstead Rd, Wokingham	2243	11523	9	14	5	55.8%	1.4	✓	✓
11523-2243	N33 Easthampstead Rd, Wokingham	11523	2243	10	25	15	141.2%	3.4	✓	✓
388-11621	B3016 Eversley Cross, Eversley	388	11621	7	6	-1	-8.7%	0.2	✓	✓
11621-388	B3016 Eversley Cross, Eversley	11621	388	6	7	1	12.9%	0.3	✓	✓
11397-11638	A327 Reading Rd, Arborfield Gsn	11397	11638	13	12	-1	-6.0%	0.2	✓	✓
11638-11397	A327 Reading Rd, Arborfield Gsn	11638	11397	14	30	16	117.9%	3.4	✓	✓
11401-11702	Church Rd, W Of Hyde End Lane	11401	11702	10	8	-2	-18.9%	0.6	✓	✓
11702-11401	Church Rd, W Of Hyde End Lane	11702	11401	8	17	9	115.1%	2.5	✓	✓
11404-11704	Hyde End Road	11404	11704	9	4	-5	-56.8%	2.0	✓	✓
11704-11404	Hyde End Road	11704	11404	7	7	0	-1.3%	0.0	✓	✓
11708-11710	Basingstoke Rd, S Of Church Rd	11708	11710	8	12	4	42.1%	1.1	✓	✓
11710-11708	Basingstoke Rd, S Of Church Rd	11710	11708	9	4	-5	-55.1%	1.9	✓	✓
11587-11801	A329 Under M4 Bridge, Reading	11587	11801	18	22	4	19.3%	0.7	✓	✓
11801-11587	A329 Under M4 Bridge, Reading	11801	11587	19	28	9	49.3%	1.9	✓	✓
132-11805	B3030 Robin Hood Lane, Reading	132	11805	9	18	9	109.3%	2.5	✓	✓
11805-132	B3030 Robin Hood Lane, Reading	11805	132	9	8	-1	-14.6%	0.4	✓	✓
11811-11813	B3270 Lower Earley Way South, Lwr Earley	11811	11813	28	11	-17	-60.6%	3.8	✓	✓
11813-11811	B3270 Lower Earley Way South, Lwr Earley	11813	11811	20	15	-5	-23.2%	1.0	✓	✓
11342-11817	A327 Shinfield Rd, Reading	11342	11817	18	12	-6	-31.6%	1.4	✓	✓
11817-11342	A327 Shinfield Rd, Reading	11817	11342	18	14	-4	-20.3%	0.8	✓	✓
11819-11821	Whitley Wood Lane, Reading	11819	11821	21	0	-21	-100.0%	6.4	x	✓
11821-11819	Whitley Wood Lane, Reading	11821	11819	26	20	-6	-23.2%	1.2	✓	✓
11403-11349	A327 Hollow Lane, Shinfield	11403	11349	26	6	-20	-76.8%	4.9	✓	✓
11349-11403	A327 Hollow Lane, Shinfield	11349	11403	29	31	2	8.1%	0.4	✓	✓

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	RSI Screenline	Inbound	362	341	-21	-5.7%	1.1	✓		8	6	6
2	RSI Screenline	Outbound	315	284	-31	-9.9%	1.8	✓		8	6	6
3	Inner Cordon	Inbound	129	223	94	73.0%	7.0	×		12	11	12
4	Inner Cordon	Outbound	135	153	18	13.2%	1.4	✓		12	12	12
5	Railway Screenline	Northbound	36	18	-18	-49.7%	3.4	✓		6	5	5
6	Railway Screenline	Southbound	34	50	16	47.9%	2.5	✓		6	6	6
7	Outer Cordon	Inbound	138	292	154	111.9%	10.5	×		10	10	10
8	Outer Cordon	Outbound	111	150	39	35.1%	3.4	✓		10	8	9
9	A329/ A322/ A3095	Clockwise	148	195	47	31.5%	3.5	✓		7	6	6
10	A329/ A322/ A3096	Anti-clockwise	171	397	226	131.9%	13.3	×		7	7	7
								7	screenline/cordon counts	86	74	74
								70%	motorway counts	22	22	22
									Wokingham counts	47	38	40
									total calibration counts	155	134	136
											86%	**88%**

Appendix D Assignment Model Validation

Assignment Model Validation

Tables D.1 and D.2 display the model validation results for the AM peak and PM peak respectively.

Table D.1 – AM Peak Validation Results – All Vehicles

Count Ref	Road Name	A node	B node	Count (VEH)	Model (VEH)	Diff	% Diff	GEH	GEH*	Flow*
Sandhurst/Crowthorne Cordon										
Inbound										
2250-2251	9 Miles Ride & Wokingham Rd	2250	2251	188	185	-3	-2.0%	0.2	✓	✓
450-456	C8633 Yateley Road, Sandhurst	450	456	561	483	-78	-14.0%	3.4	✓	✓
517-519	H66 Swan Lane	517	519	415	348	-67	-16.0%	3.4	✓	✓
2635-168	A321 Marshall Road, Sandhurst	2635	168	1004	1110	106	11.0%	3.3	✓	✓
2302-2292	C8662 Laundry Lane, Sandhurst	2302	2292	222	231	9	4.0%	0.6	✓	✓
2619-2258	D8631 Madgalene Road, Sandhurst	2619	2258	156	183	27	17.0%	2.1	✓	✓
802-180	A3095 Crowthorne Bypass	802	180	758	720	-38	-5.0%	1.4	✓	✓
754-160	Crowthorne B3348 Bracknell Road, N of Brookers Row	754	100075	622	644	22	4.0%	0.9	✓	✓
		8		**3926**	**3904**	**-22**	**-0.6%**	**0.4**	✓	✓
Outbound										
2251-2250	9 Miles Ride & Wokingham Rd	2251	2250	412	434	22	5.0%	1.1	✓	✓
456-450	C8633 Yateley Road, Sandhurst	456	450	377	315	-62	-16.0%	3.3	✓	✓
519-517	H66 Swan Lane	519	517	314	270	-44	-14.0%	2.6	✓	✓
168-2635	A321 Marshall Road, Sandhurst	168	2635	1007	1073	66	7.0%	2.0	✓	✓
2292-2302	C8662 Laundry Lane, Sandhurst	2292	2302	1100	1047	-53	-5.0%	1.6	✓	✓
2258-2619	D8631 Madgalene Road, Sandhurst	2258	2619	35	61	26	74.0%	3.8	✓	✓
180-802	A3095 Crowthorne Bypass	180	802	1035	1042	7	1.0%	0.2	✓	✓
160-754	Crowthorne B3348 Bracknell Road, N of Brookers Row	100075	754	651	698	47	7.0%	1.8	✓	✓
		8		**4931**	**4940**	**9**	**0.2%**	**0.1**	✓	✓
Northern Screenline										
Northbound										
635-647	B3018 Allanbay Park	635	647	502	400	-100	-20.0%	4.7	✓	✓
1154-1332	A3095 Jealotts Hill	1154	1332	959	966	7	1.0%	0.2	✓	✓
1556-1557	B3022 Maidens Green	1556	1557	459	424	-35	-8.0%	1.7	✓	✓
2514-11102	A332 Windsor Road	2514	11102	903	896	-7	-1.0%	0.2	✓	✓
		4		**2823**	**2686**	**-137**	**-4.9%**	**2.6**	✓	✓
Southbound										

Count Ref	Road Name	A node	B node	Count (VEH)	Model (VEH)	Diff	% Diff	GEH	GEH*	Flow*
647-635	B3018 Allanbay Park	647	635	403	394	-9	-2.0%	0.5	✓	✓
1332-1154	A3095 Jealotts Hill	1332	1154	777	606	-171	-22.0%	6.5	×	×
1557-1556	B3022 Maidens Green	1557	1556	381	546	165	43.0%	7.7	×	×
11102-2514	A332 Windsor Road	11102	2514	760	540	-220	-29.0%	8.6	×	×
		4		**2321**	**2086**	**-235**	**-10.1%**	**5.0**	×	✓
Central Screenline										
Northbound										
794-760	D8647 Doncastle Road, Bracknell	794	760	1329	1679	350	26.0%	9.0	×	×
1004-1007	Twin Bridge Rbt N	1004	1007	2791	2771	-20	-1.0%	0.4	✓	✓
1200-1202	The Ring / Mkt St / A3095	1200	1202	530	467	-63	-12.0%	2.8	✓	✓
2554-2200	C8653 Broad Lane, Bracknell	11867	2200	346	341	-5	-1.0%	0.3	✓	✓
1593-1588	A322 Swinley Road, Winkfield	1593	1588	1189	872	-317	-27.0%	9.9	×	×
		5		**6185**	**6130**	**-55**	**-0.9%**	**0.7**	✓	✓
Southbound										
760-794	D8647 Doncastle Road, Bracknell	760	794	1210	1346	136	11.0%	3.8	✓	✓
1030-1023	Twin Bridge Rbt N	1030	1023	1401	1461	60	4.0%	1.6	✓	✓
1212-1208	The Ring / Mkt St / A3095	1212	1208	161	112	-49	-30.0%	4.2	✓	✓
2200-2554	C8653 Broad Lane, Bracknell	2200	11867	387	469	82	21.0%	4.0	✓	✓
1588-1593	A322 Swinley Road, Winkfield	1588	1593	672	694	22	3.0%	0.8	✓	✓
		5		**3831**	**4082**	**251**	**6.5%**	**4.0**	✓	✓

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	Sandhurst/Crowthorne Screenline	Inbound	3926	3904	-22	-0.6%	0.4	✓		8	8	8
2	Sandhurst/Crowthorne Screenline	Outbound	4931	4940	9	0.2%	0.1	✓		8	8	8
3	Northern Screenline	Northbound	2823	2686	-137	-4.9%	2.6	✓		4	4	4
4	Northern Screenline	Southbound	2321	2086	-235	-10.1%	5.0	×		4	1	1
5	Central Screenline	Northbound	6185	6130	-55	-0.9%	0.7	✓		5	3	3
6	Central Screenline	Southbound	3831	4082	251	6.5%	4.0	✓		5	5	5
								5	screenline/cordon counts	34	34	29
								83%	total validation counts	38	34	29
											85%	**85%**

Table D.2 – PM Peak Validation Results – All Vehicles

Count Ref	Road Name	A node	B node	Count (VEH)	Model (VEH)	Diff	% Diff	GEH	GEH*	Flow*
Sandhurst/Crowthorne Cordon										
Inbound										
2250-2251	9 Miles Ride & Wokingham Rd	2250	2251	526	589	63	12.0%	2.6	✓	✓
450-456	C8633 Yateley Road, Sandhurst	450	456	485	398	-87	-17.9%	4.1	✓	✓
517-519	H66 Swan Lane	517	519	379	383	4	1.1%	0.2	✓	✓
2635-168	A321 Marshall Road, Sandhurst	2635	168	1346	1262	-84	-6.2%	2.3	✓	✓
2302-2292	C8662 Laundry Lane, Sandhurst	2302	2292	428	407	-21	-4.9%	1.0	✓	✓
2619-2258	D8631 Madgalene Road, Sandhurst	2619	2258	66	95	29	43.9%	3.2	✓	✓
802-180	A3095 Crowthorne Bypass Crowthorne	802	180	1330	1353	23	1.7%	0.6	✓	✓
754-160	B3348 Bracknell Road, N of Brookers Row	754	100075	648	623	-25	-3.9%	0.9	✓	✓
		8		**5208**	**5110**	**-98**	**-1.9%**	**1.3**	✓	✓
Outbound										
2251-2250	9 Miles Ride & Wokingham Rd	2251	2250	224	154	-70	-31.3%	5.0	✓	✓
456-450	C8633 Yateley Road, Sandhurst	456	450	485	409	-76	-15.7%	3.5	✓	✓
519-517	H66 Swan Lane	519	517	498	454	-44	-8.8%	2.0	✓	✓
168-2635	A321 Marshall Road, Sandhurst	168	2635	899	1031	132	14.7%	4.2	✓	✓
2292-2302	C8662 Laundry Lane, Sandhurst	2292	2302	623	607	-16	-2.6%	0.6	✓	✓
2258-2619	D8631 Madgalene Road, Sandhurst	2258	2619	149	110	-39	-26.2%	3.4	✓	✓
180-802	A3095 Crowthorne Bypass Crowthorne	180	802	711	730	19	2.7%	0.7	✓	✓
160-754	B3348 Bracknell Road, N of Brookers Row	100075	754	566	549	-17	-3.0%	0.7	✓	✓
		8		**4155**	**4044**	**-111**	**-2.7%**	**1.7**	✓	✓
Northern Screenline										
Northbound										
635-647	B3018 Allanbay Park	635	647	270	342	72	26.7%	4.1	✓	✓
1154-1332	A3095 Jealotts Hill	1154	1332	624	677	53	8.5%	2.0	✓	✓
1556-1557	B3022 Maidens Green	1556	1557	315	364	49	15.6%	2.6	✓	✓
2514-11102	A332 Windsor Road	2514	11102	681	645	-36	-5.3%	1.3	✓	✓

Count Ref	Road Name	A node	B node	Count (VEH)	Model (VEH)	Diff	% Diff	GEH	GEH*	Flow*
		4		**1890**	**2028**	**138**	**7.3%**	**3.1**	✓	✓
Southbound										
647-635	B3018 Allanbay Park	647	635	459	177	-282	-61.4%	15.8	✗	✗
1332-1154	A3095 Jealotts Hill	1332	1154	860	809	-51	-5.9%	1.7	✓	✓
1557-1556	B3022 Maidens Green	1557	1556	535	836	301	56.3%	11.4	✗	✗
11102-2514	A332 Windsor Road	11102	2514	978	864	-114	-11.6%	3.7	✓	✓
		4		**2832**	**2686**	**-146**	**-5.1%**	**2.7**	✓	✓
Central Screenline										
Northbound										
794-760	D8647 Doncastle Road, Bracknell	794	760	1167	1099	-68	-5.8%	2.0	✓	✓
1004-1007	Twin Bridge Rbt N	1004	1007	1363	1319	-44	-3.3%	1.2	✓	✓
1200-1202	The Ring / Mkt St / A3095	1200	1202	265	285	20	7.4%	1.1	✓	✓
2554-2200	C8653 Broad Lane, Bracknell	11867	2200	319	472	153	48.0%	7.6	✗	✗
1593-1588	A322 Swinley Road, Winkfield	1593	1588	681	619	-62	-9.1%	2.4	✓	✓
		5		**3796**	**3794**	**-2**	**0.0%**	**0.0**	✓	✓
Southbound										
760-794	D8647 Doncastle Road, Bracknell	760	794	1179	1095	-84	-7.1%	2.4	✓	✓
1030-1023	Twin Bridge Rbt N	1030	1023	2706	2580	-126	-4.7%	2.4	✓	✓
1212-1208	The Ring / Mkt St / A3095	1212	1208	466	411	-55	-11.8%	2.6	✓	✓
2200-2554	C8653 Broad Lane, Bracknell	2200	11867	264	204	-60	-22.7%	3.9	✓	✓
1588-1593	A322 Swinley Road, Winkfield	1588	1593	938	750	-188	-20.0%	6.4	✗	✗
		5		**5553**	**5040**	**-513**	**-9.2%**	**7.0**	✗	✓

	Cordon/ Screenline	Direction	Count	Model	Diff	% Diff	GEH	GEH		No. Counts	GEH < 5	Flow
1	Sandhurst/Crowthorne Screenline	Inbound	5208	5110	-98	-1.9%	1.3	✓		8	8	8
2	Sandhurst/Crowthorne Screenline	Outbound	4155	4044	-111	-2.7%	1.7	✓		8	8	8
3	Northern Screenline	Northbound	1890	2028	138	7.3%	3.1	✓		4	4	4
4	Northern Screenline	Southbound	2832	2686	-146	-5.1%	2.7	✓		4	2	2
5	Central Screenline	Northbound	3796	3794	-2	0.0%	0.0	✓		5	4	4
6	Central Screenline	Southbound	5553	5040	-513	-9.2%	7.0	✗		5	4	4
								5	screenline/cordon counts	34	34	30
								83%	total validation counts	38	34	30
											88%	**88%**

Appendix E Journey Time Validation

Journey Time Validation

Figures E.1 to E.10 show the car journey time validation for Routes A to E in the AM peak. PM peak validation is shown in Figures E.11 to E.20.

Figure E.1 – AM Peak Journey Time Validation – Route A Southbound

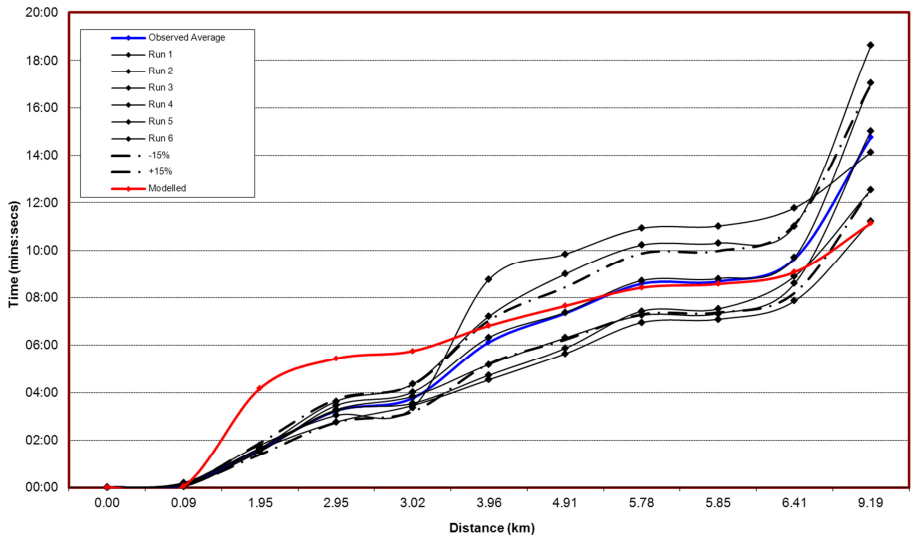


Figure E.2 – AM Peak Journey Time Validation – Route A Northbound

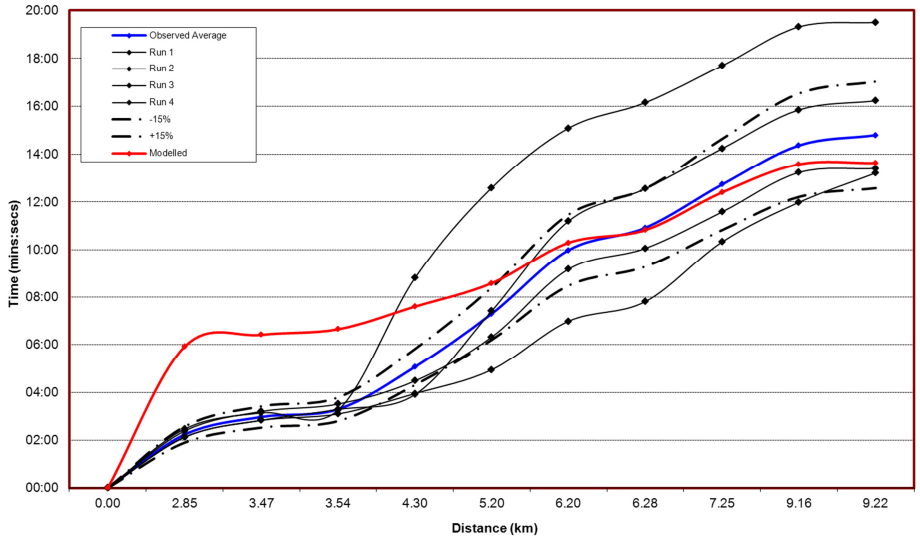


Figure E.3 – AM Peak Journey Time Validation – Route B Eastbound

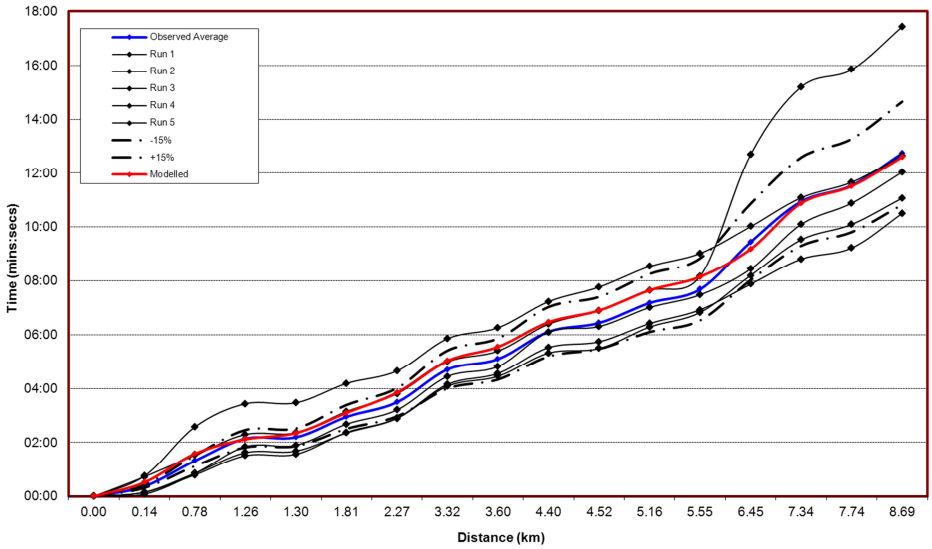


Figure E.4 – AM Peak Journey Time Validation – Route B Westbound

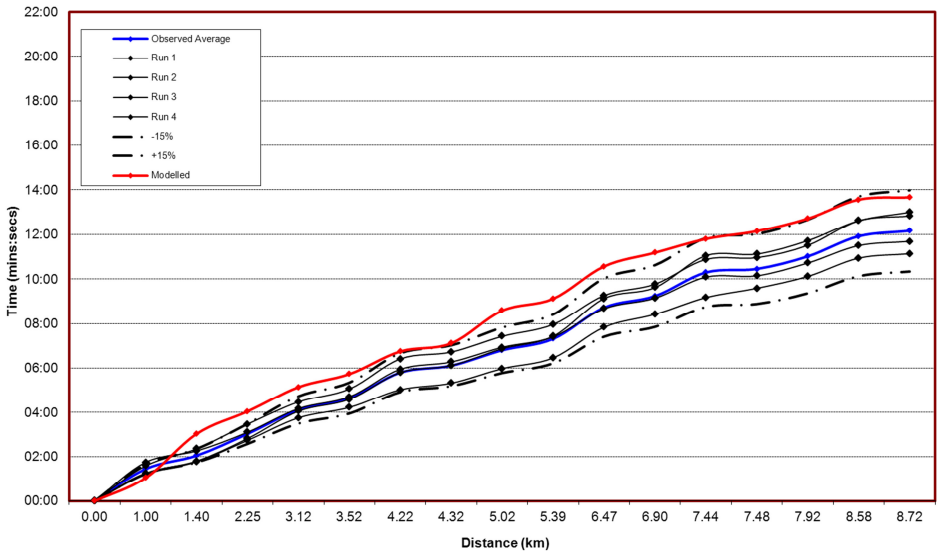


Figure E.5 – AM Peak Journey Time Validation – Route C Southbound

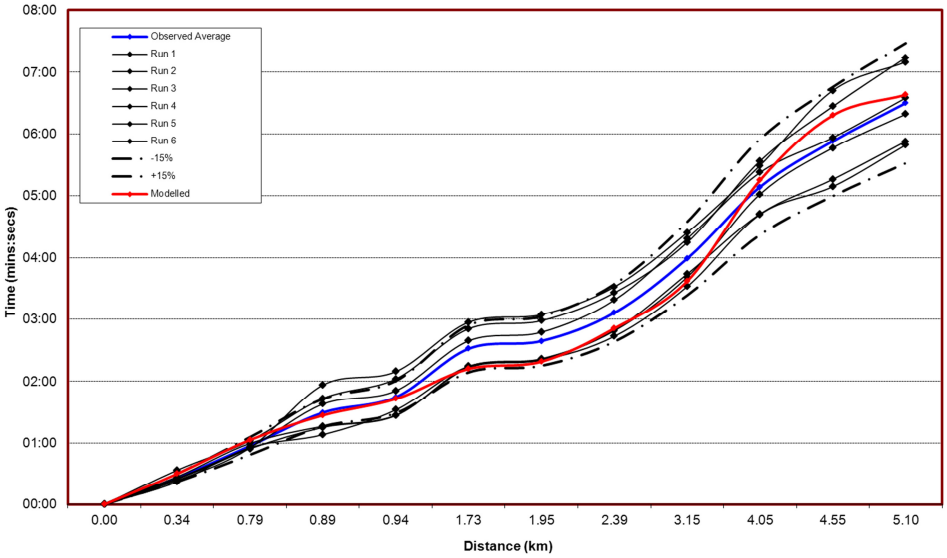


Figure E.6 – AM Peak Journey Time Validation – Route C Northbound

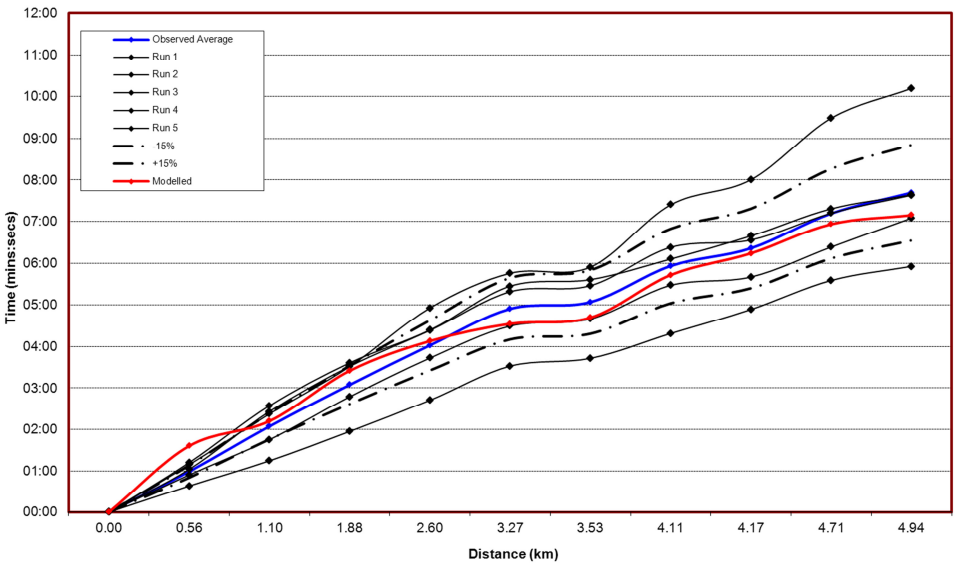


Figure E.7 – AM Peak Journey Time Validation – Route D Northbound

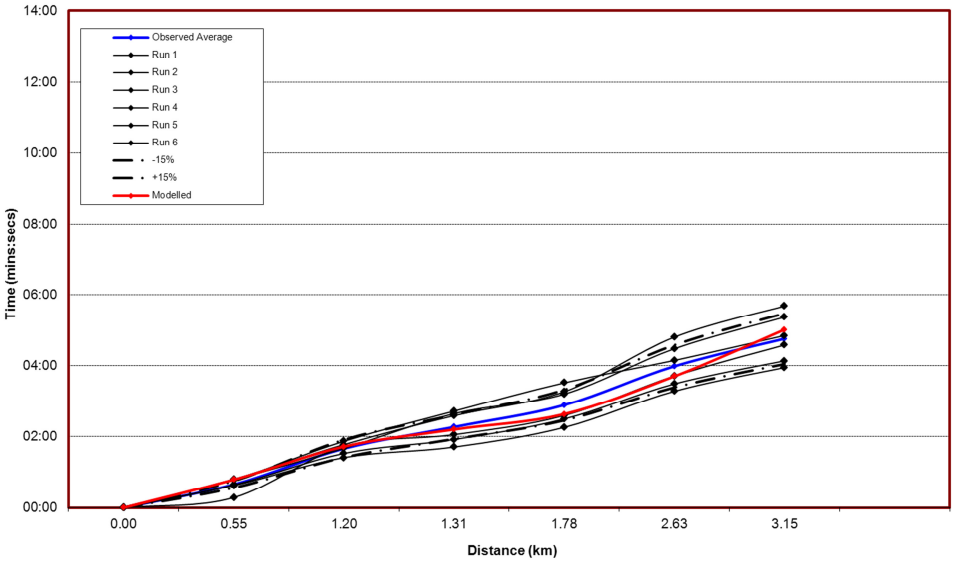


Figure E.8 – AM Peak Journey Time Validation – Route D Southbound

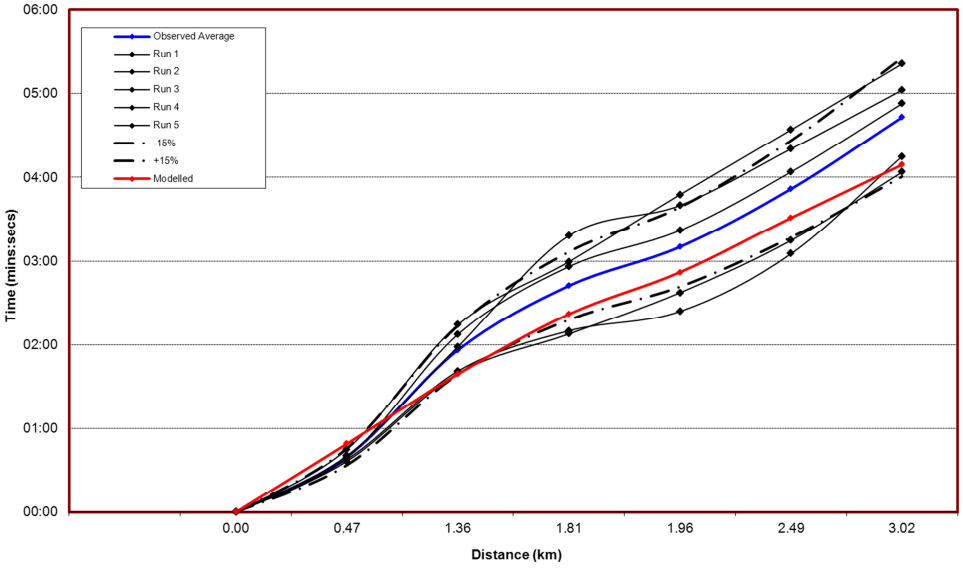


Figure E.9 – AM Peak Journey Time Validation – Route E Clockwise

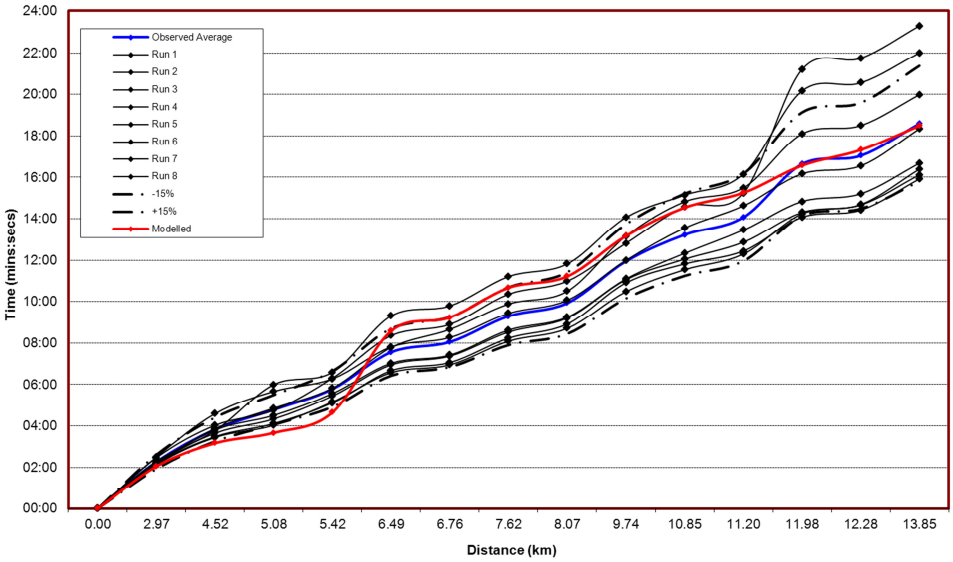


Figure E.10 – AM Peak Journey Time Validation – Route E Anti-Clockwise

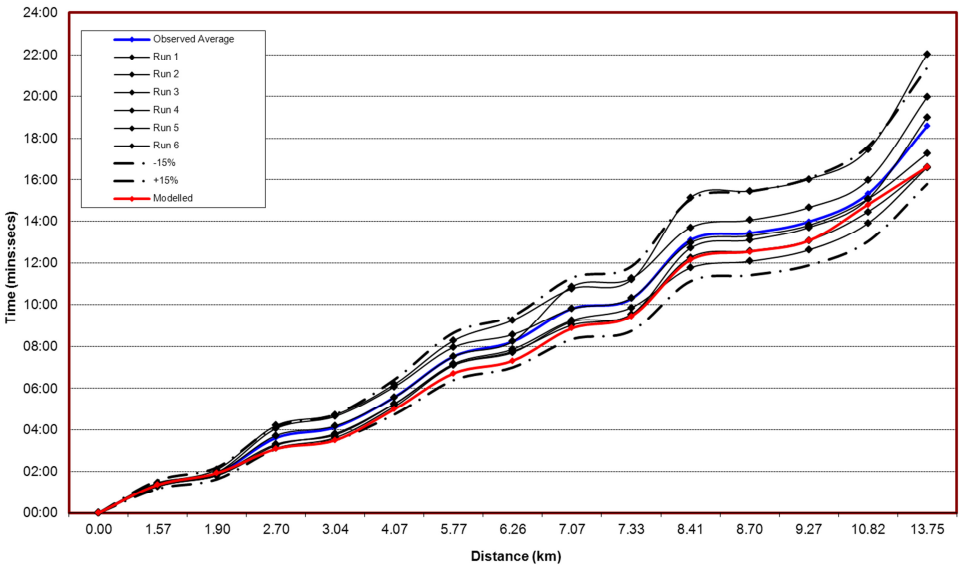


Figure E.11 – PM Peak Journey Time Validation – Route A Southbound

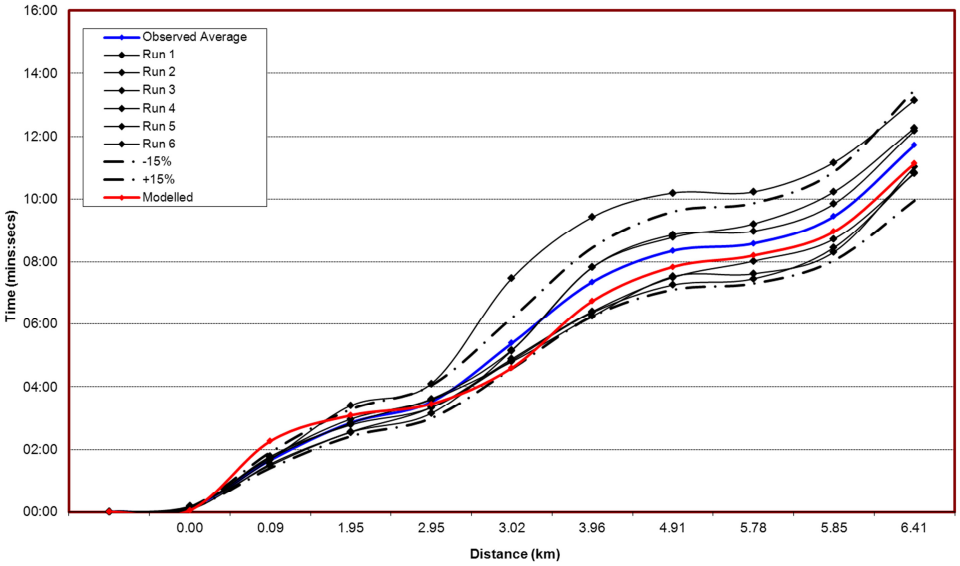


Figure E.12 – PM Peak Journey Time Validation – Route A Northbound

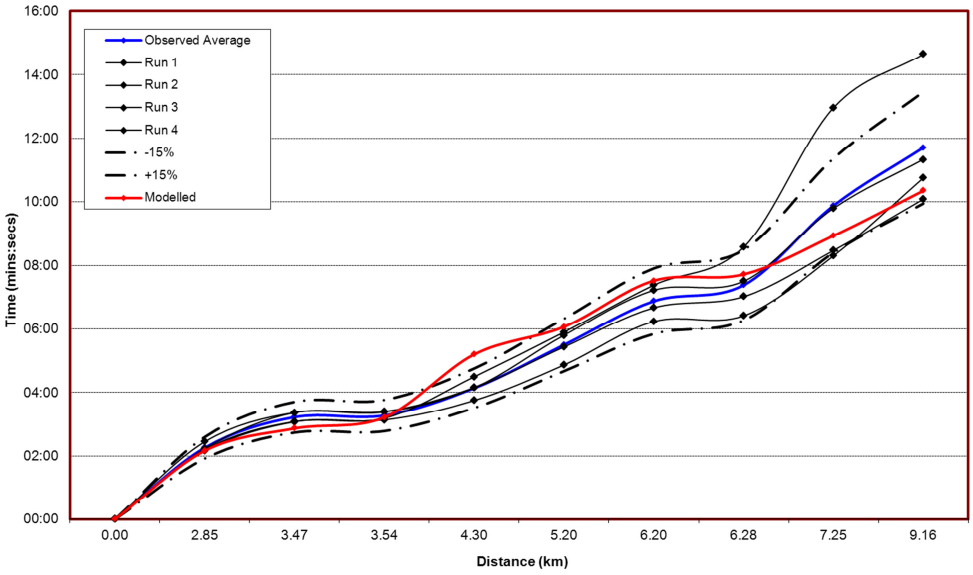


Figure E.13 – PM Peak Journey Time Validation – Route B Eastbound

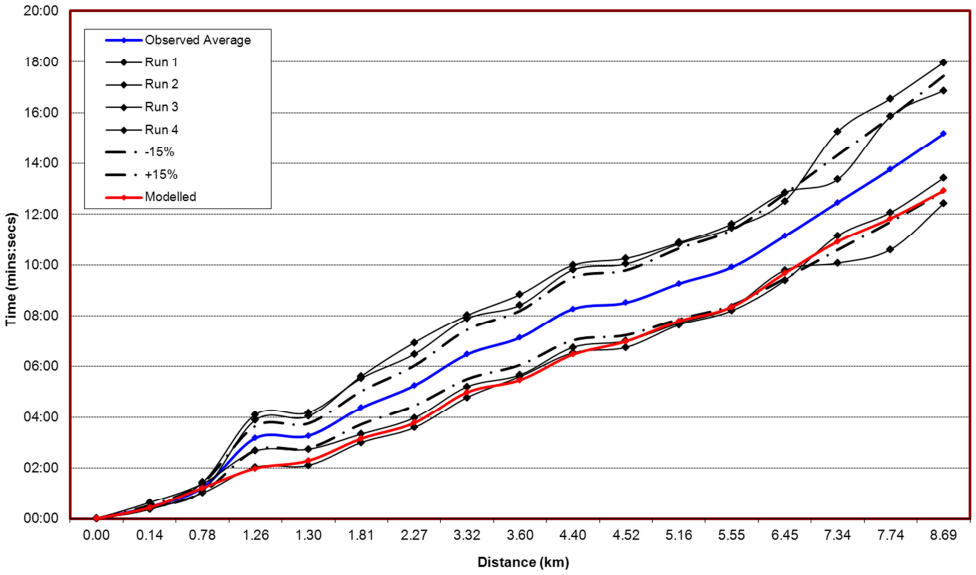


Figure E.14 – PM Peak Journey Time Validation – Route B Westbound

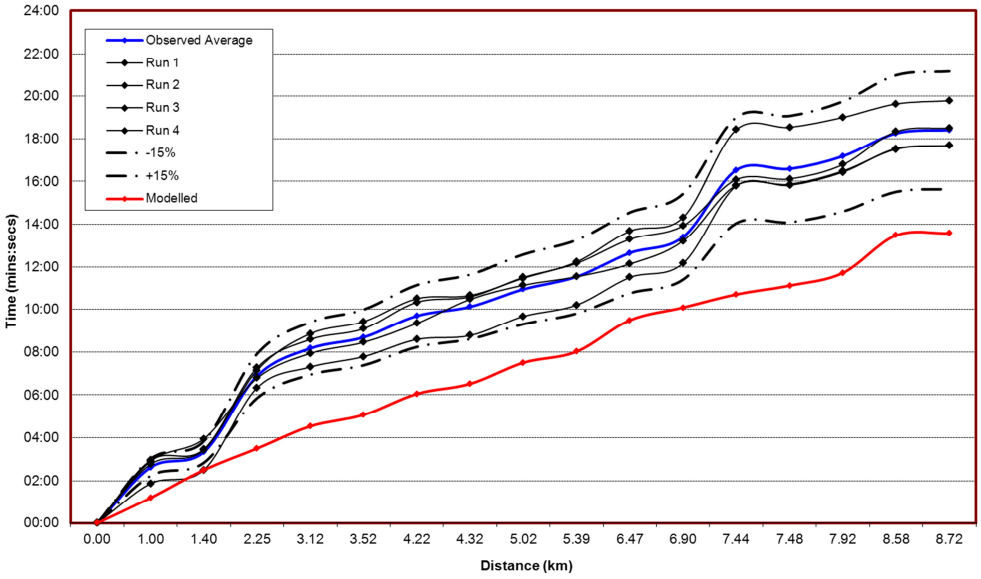


Figure E.15 – PM Peak Journey Time Validation – Route C Southbound

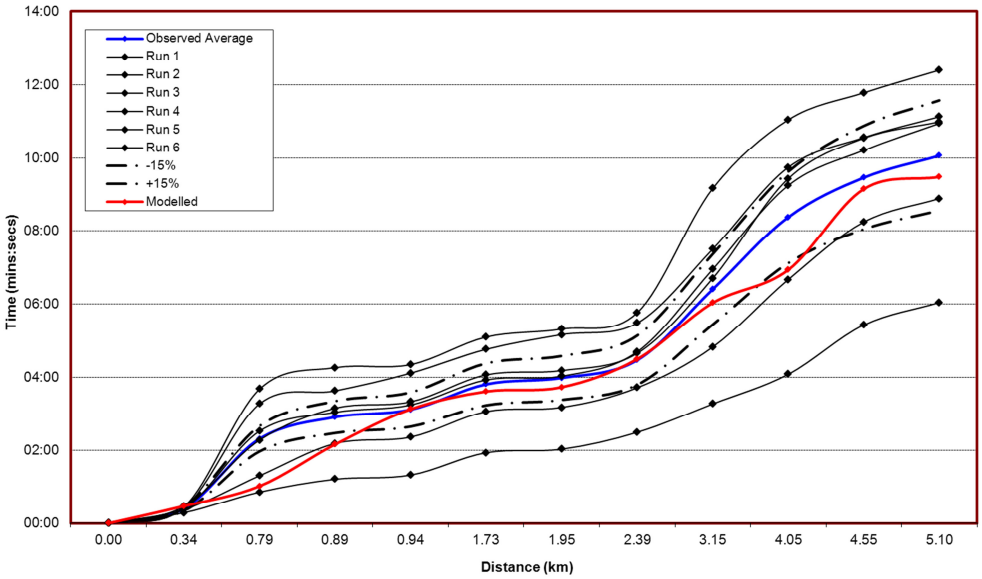


Figure E.16 – PM Peak Journey Time Validation – Route C Northbound

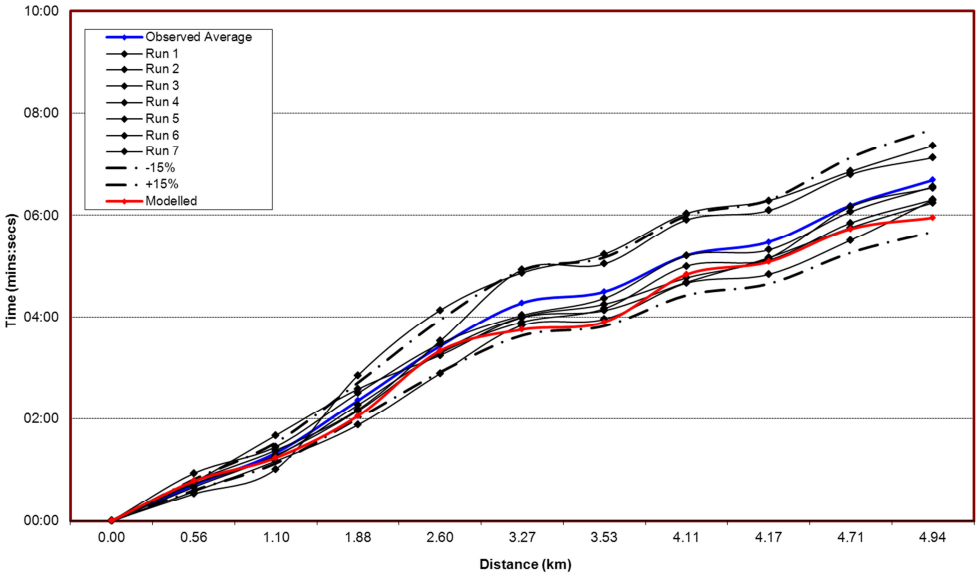


Figure E.17 – PM Peak Journey Time Validation – Route D Northbound

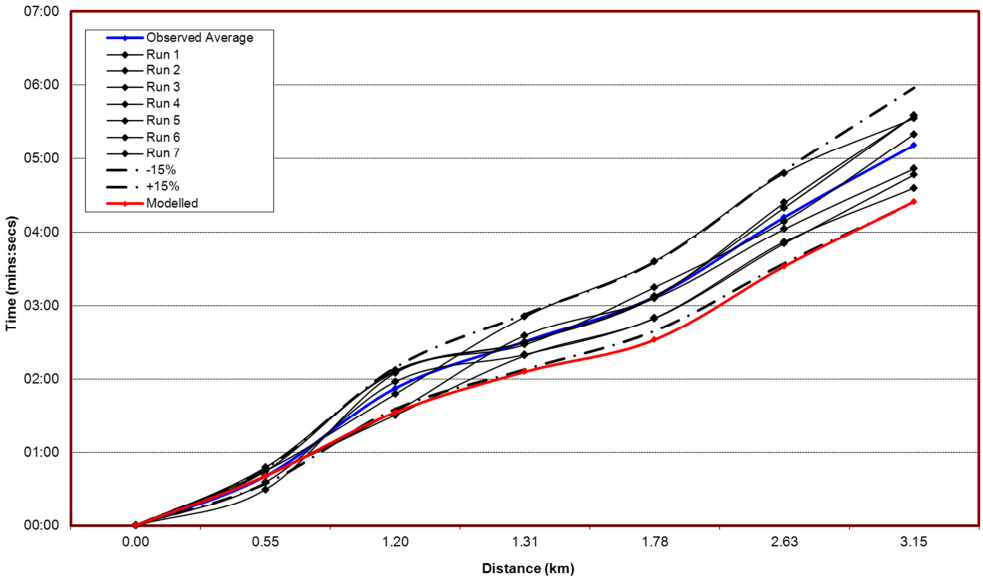


Figure E.18 – PM Peak Journey Time Validation – Route D Southbound

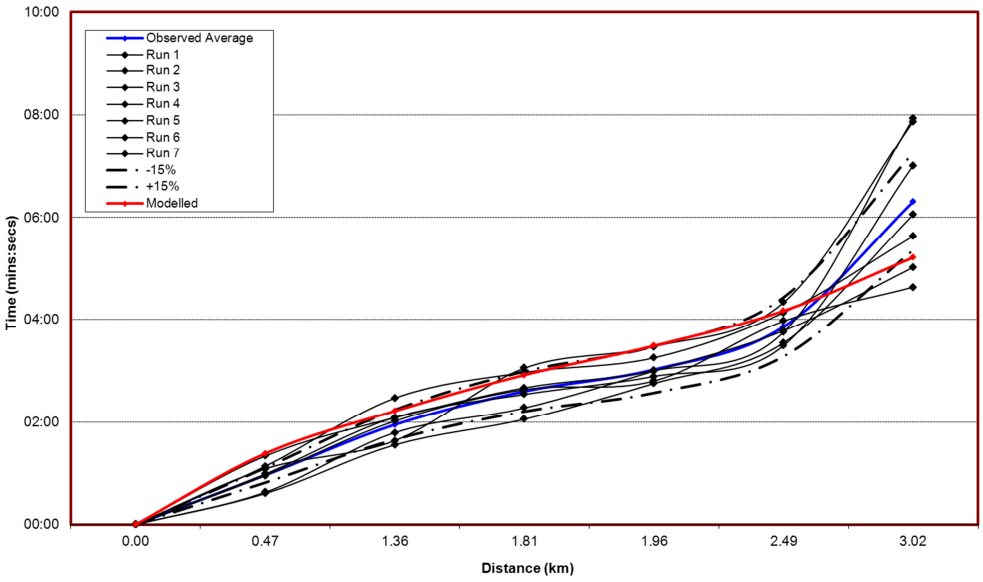


Figure E.19 – PM Peak Journey Time Validation – Route E Clockwise

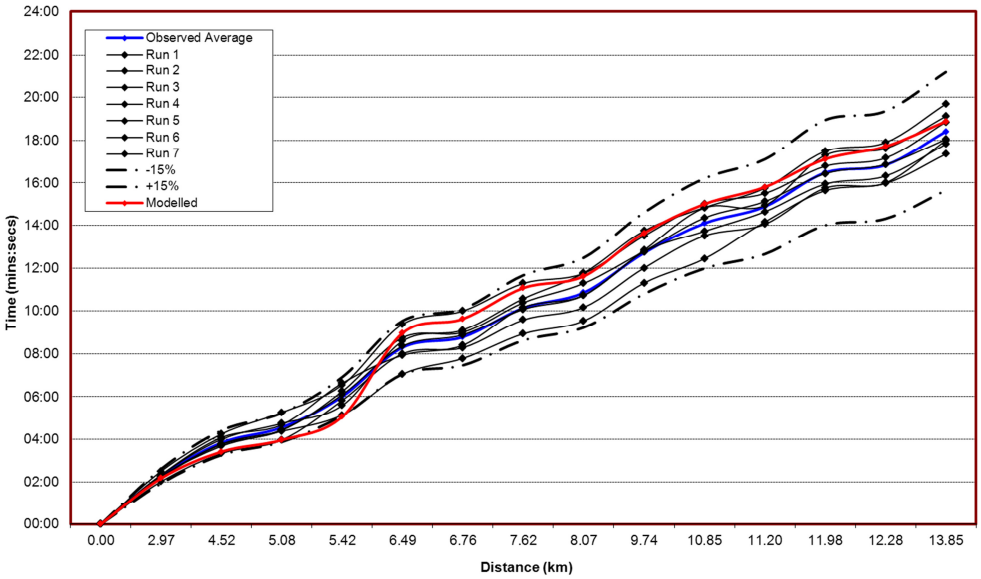
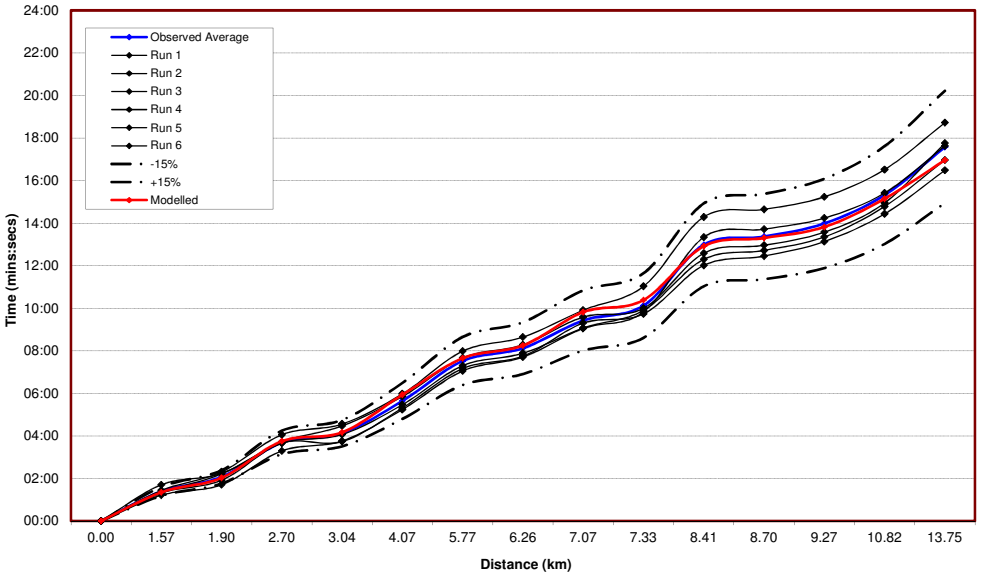


Figure E.20 – PM Peak Journey Time Validation – Route E Anti-Clockwise



Appendix F Aggregation Stages

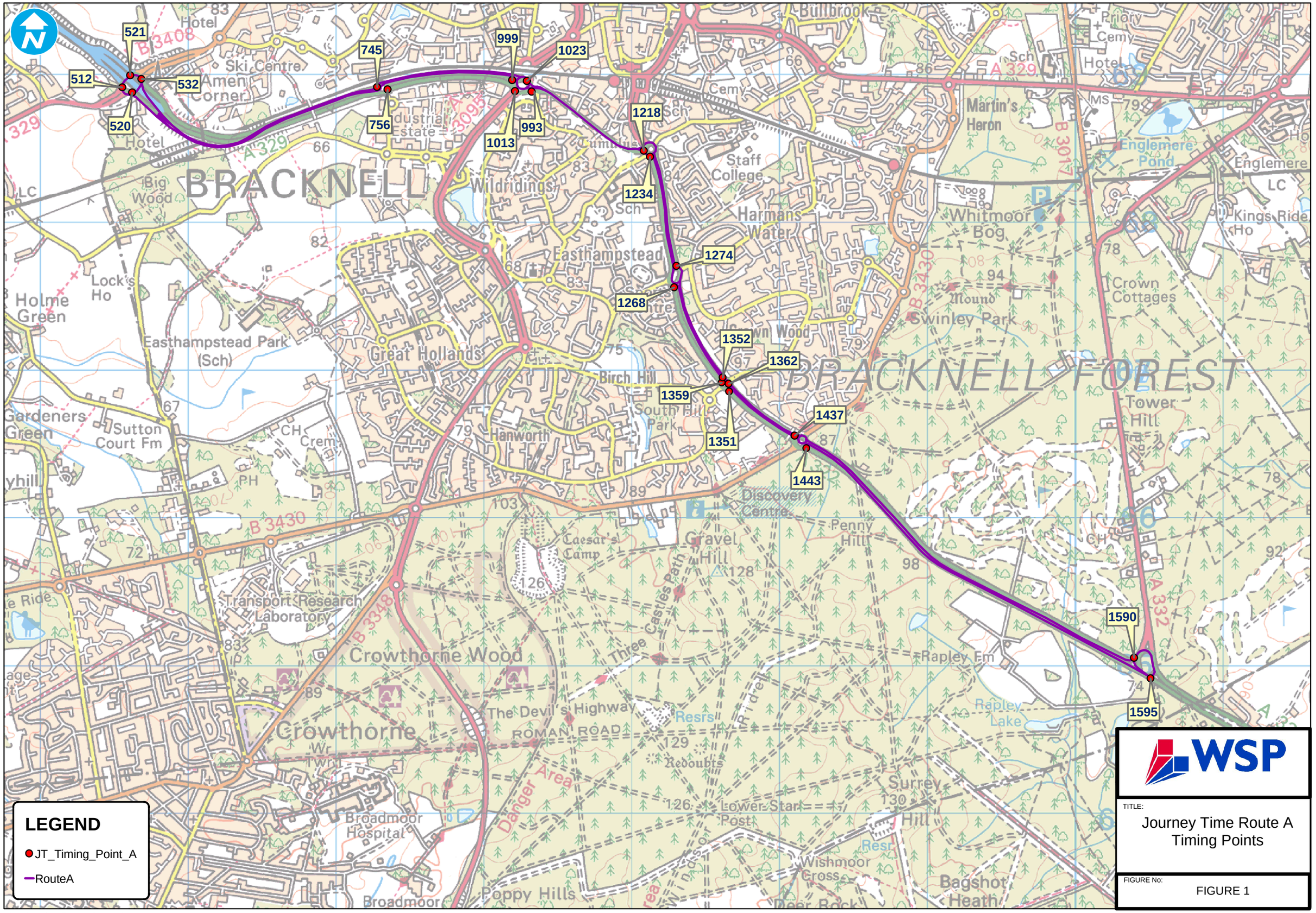
Table F.1 – Aggregation Stages

Trip Generation Vectors	Aggregation Prior to Mode Split	Mode Split Vectors	Distribution Vectors Home Based Trips	Distribution Vectors Non Home Based Trips
Purpose (5)	**Purpose (7)**	**Purpose (7)**	**Purpose (6)**	**Purpose (2)**
Home Based Work	HBW - High SeC	HBW - High SeC	HBW - High SeC	NHBEB
Home Based Employer's Business	HBW - Low SeC	HBW - Low SeC	HBW - Low SeC	NHBO
Home Based Education	HBEB - High SeC	HBEB - High SeC	HBEB - High SeC	
Home Based Shopping/Personal Business	HBEB - Low SeC	HBEB - Low SeC	HBEB - Low SeC	
Home Based Other	HBEd	Home Based Education	Home Based Education	
	HBSh	Home Based Shopping/Personal Business	Home Based Other	
	HBO	Home Based Other		
Person Type (7)	**Person Type (1)**	**Person Type (1)**	**Person Type (1)**	**Person Type (1)**
Children (0-15)				
Adults (16-64) in full-time emp (High SeC)				
Adults (16-64) in full-time emp (Low SeC)				
Adults (16-64) in part-time emp (High SeC)				
Adults (16-64) in part-time emp (Low SeC)				
Adults (16-64) non-employed				
Pensioners (65+)	No Longer Required	No Longer Required	No Longer Required	No Longer Required
Household Type (5)	**Household Type (3)**	**Household Type (3)**	**Household Type (1)**	**Household Type (1)**
1 adult/0 car	No Car	No Car		
2+adults/0 car				
2+ adults/1 car	Part Car	Part Car		
1 adult/1+ car	Full Car	Full Car		
2+ adults/2+ car			No Longer Required	No Longer Required
Trip Ends (2)	**Trip Ends (2)**	**Trip Ends (2)**	**Trip Ends (2)**	**Trip Ends (2)**
Productions: 5*7*5 = 175	Productions: 7*3 = 21	Productions	Productions	Productions
Attractions: 5 (purposes)	Attractions: 5 (purposes)	Attractions	Attractions	Attractions
		Mode Choice (3)	**Mode Choice (2)**	**Mode Choice (2)**
		Car	Car	Car
		PuT	PuT	PuT
350	42	Slow	No Longer Required	No Longer Required
Notes:				
Population and trip rate inputs generate 175 trip production and 175 trip attraction vectors.	Trips by different purpose/person type are aggregated into 7 purposes. Trips are also aggregated into 3 household types from the original 5, leaving 21 production and 21 attraction vectors.	Mode split stage divides the original 21 vectors by 3 modes, generating 63 production and 63 attraction vectors.	7 purposes reduced to 6, household type aggregated, 'slow' mode vectors removed from process. 63 original vectors reduced to 12 production and 12 attraction vectors for Home-Based trips ready for distribution stage.	2 NHB purposes and 2 modes creates 4 production and 4 attraction vectors for NHB trips ready for distribution stage.

Appendix G Journey Time Routes and Calibration/Validation Screenlines

Journey Time Routes and Calibration/Validation Screenlines

Measured journey time routes are displayed in Figures 1 to 5, calibration screenlines/cordons are shown in Figures 6 to 10 and validation screenlines/cordons are shown in Figures 11 to 13.



LEGEND

- JT_Timing_Point_A
- RouteA

WSP

TITLE:

Journey Time Route A Timing Points

FIGURE No:

FIGURE 1

0 0.25 0.5 Kilometers

SCALE: 1:22,524

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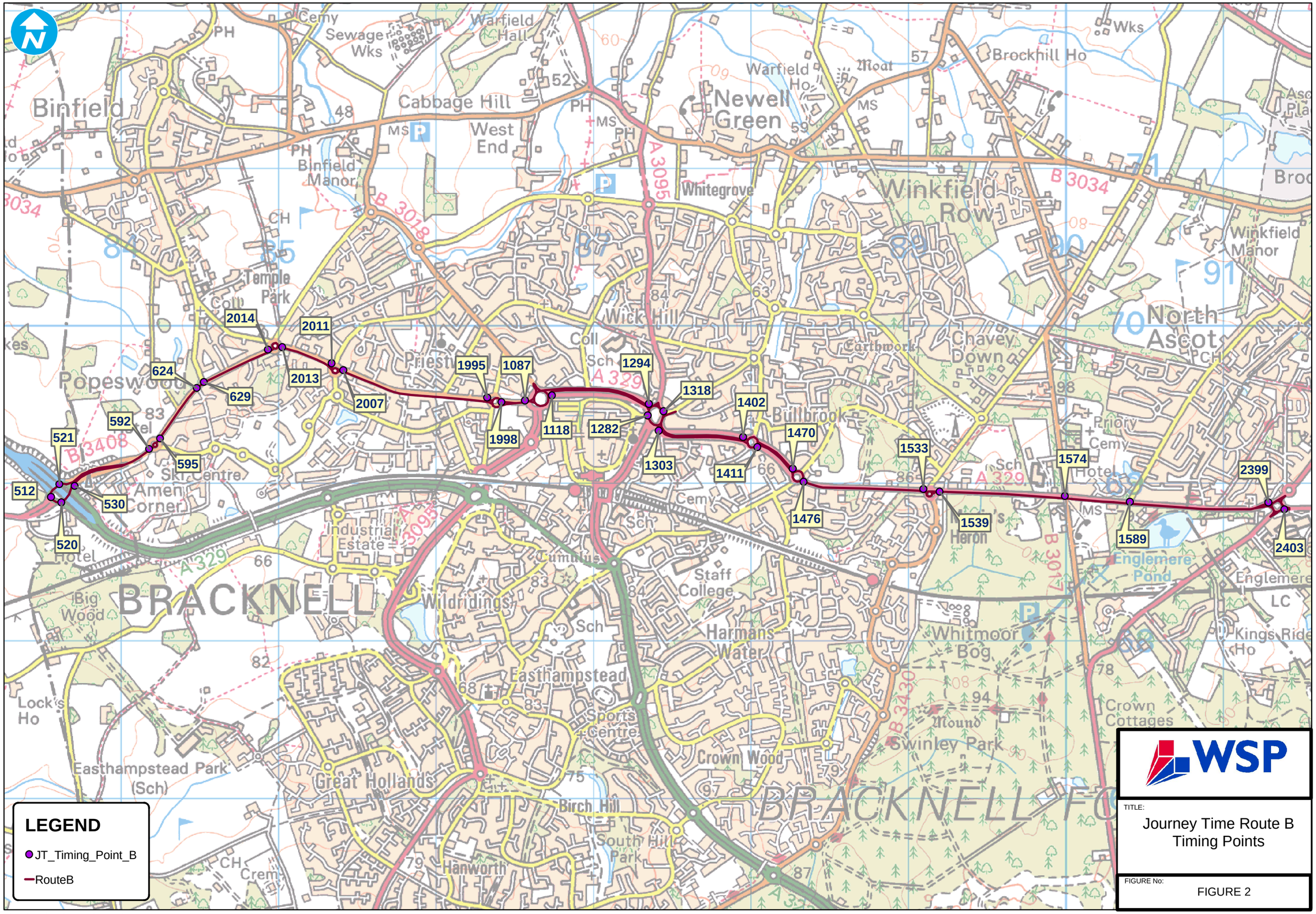

0 0.2 0.4 Kilometers

SCALE: 1:21,165

WSP

TITLE:

Journey Time Route B Timing Points

FIGURE No:

FIGURE 2

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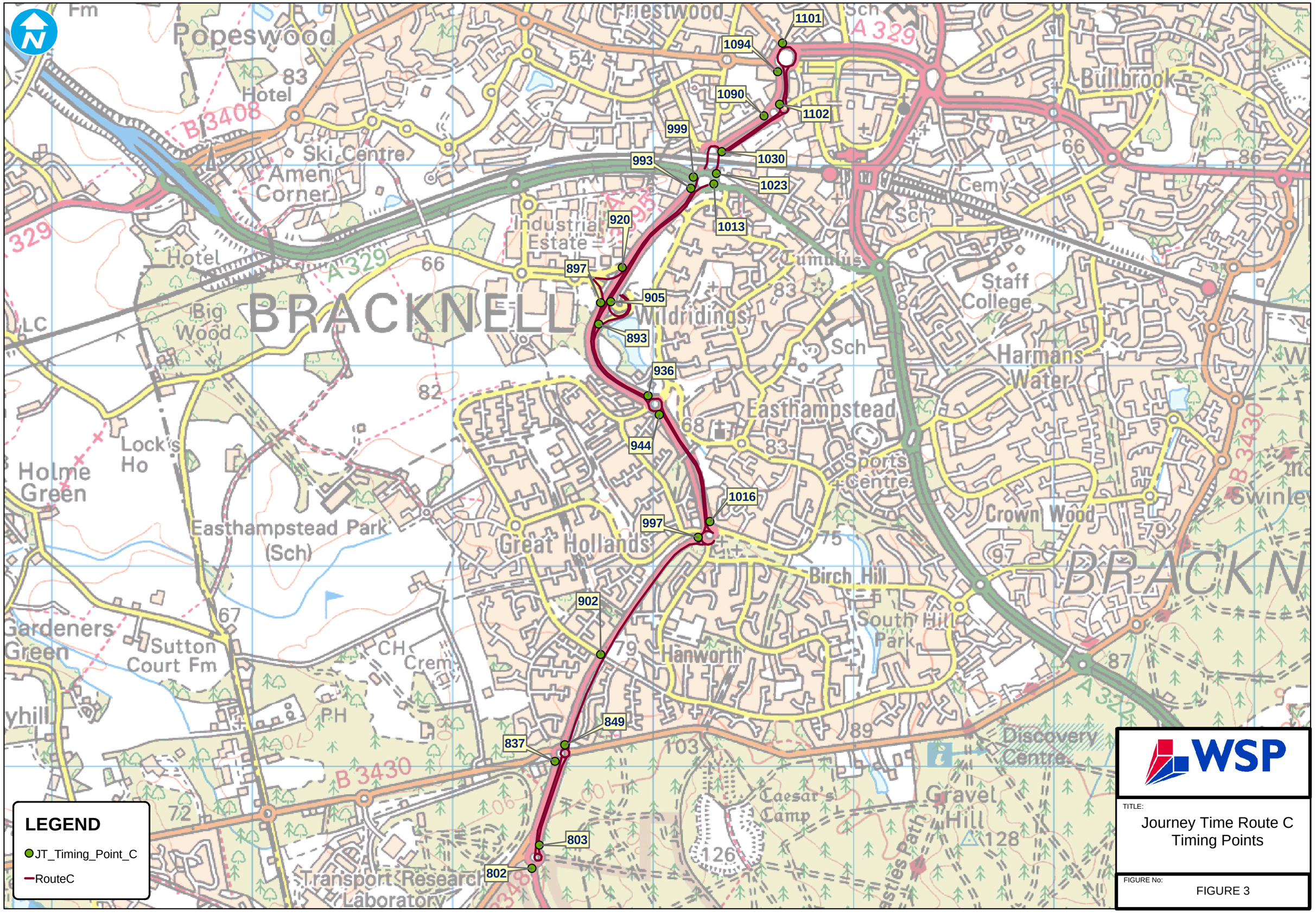

0 0.15 0.3 Kilometers

SCALE: 1:16,616

WSP

TITLE:

Journey Time Route C
Timing Points

FIGURE No:

FIGURE 3

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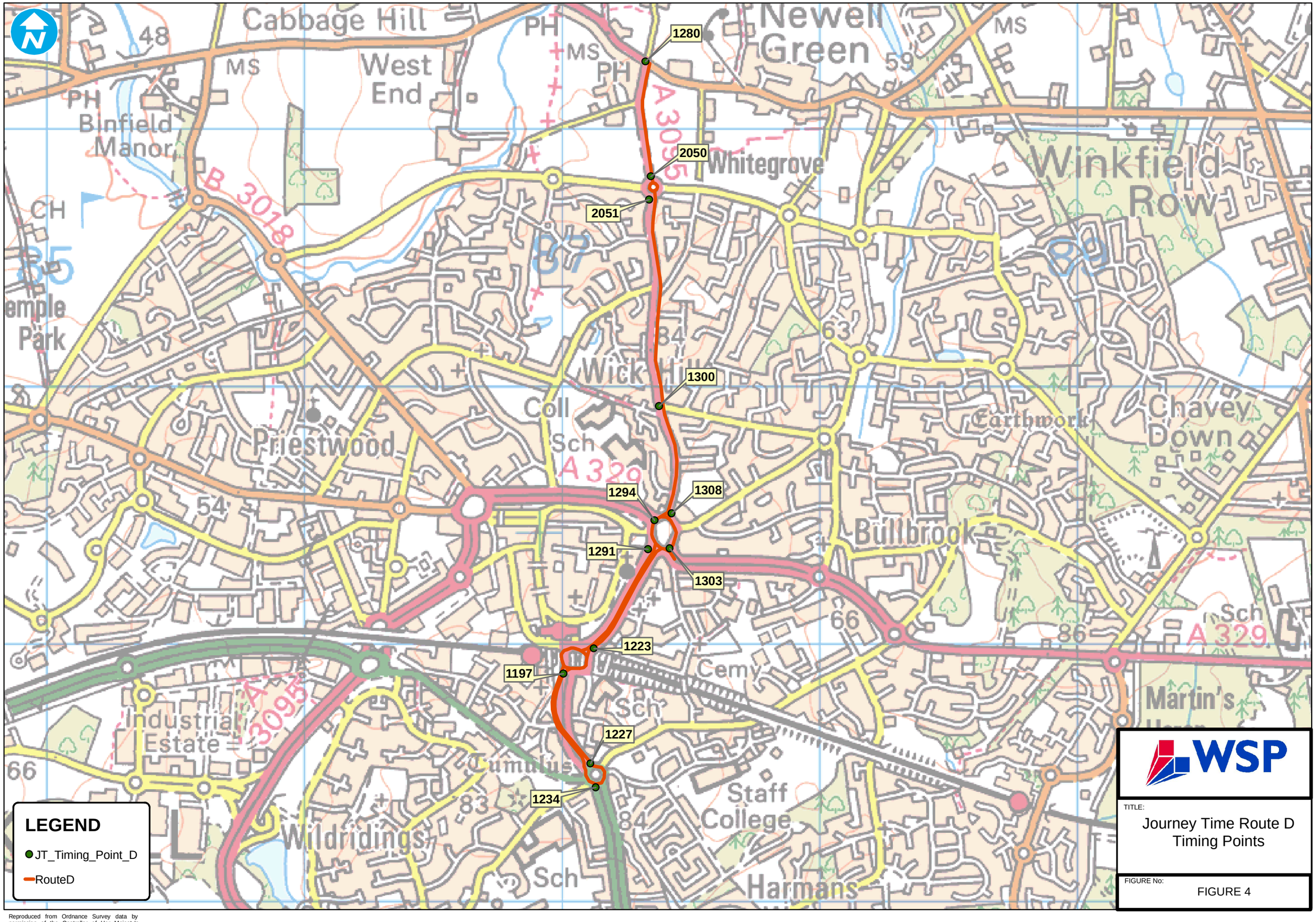

TITLE:

Journey Time Route D Timing Points

FIGURE No:

FIGURE 4

0 0.15 0.3 Kilometers

SCALE: 1:12,916

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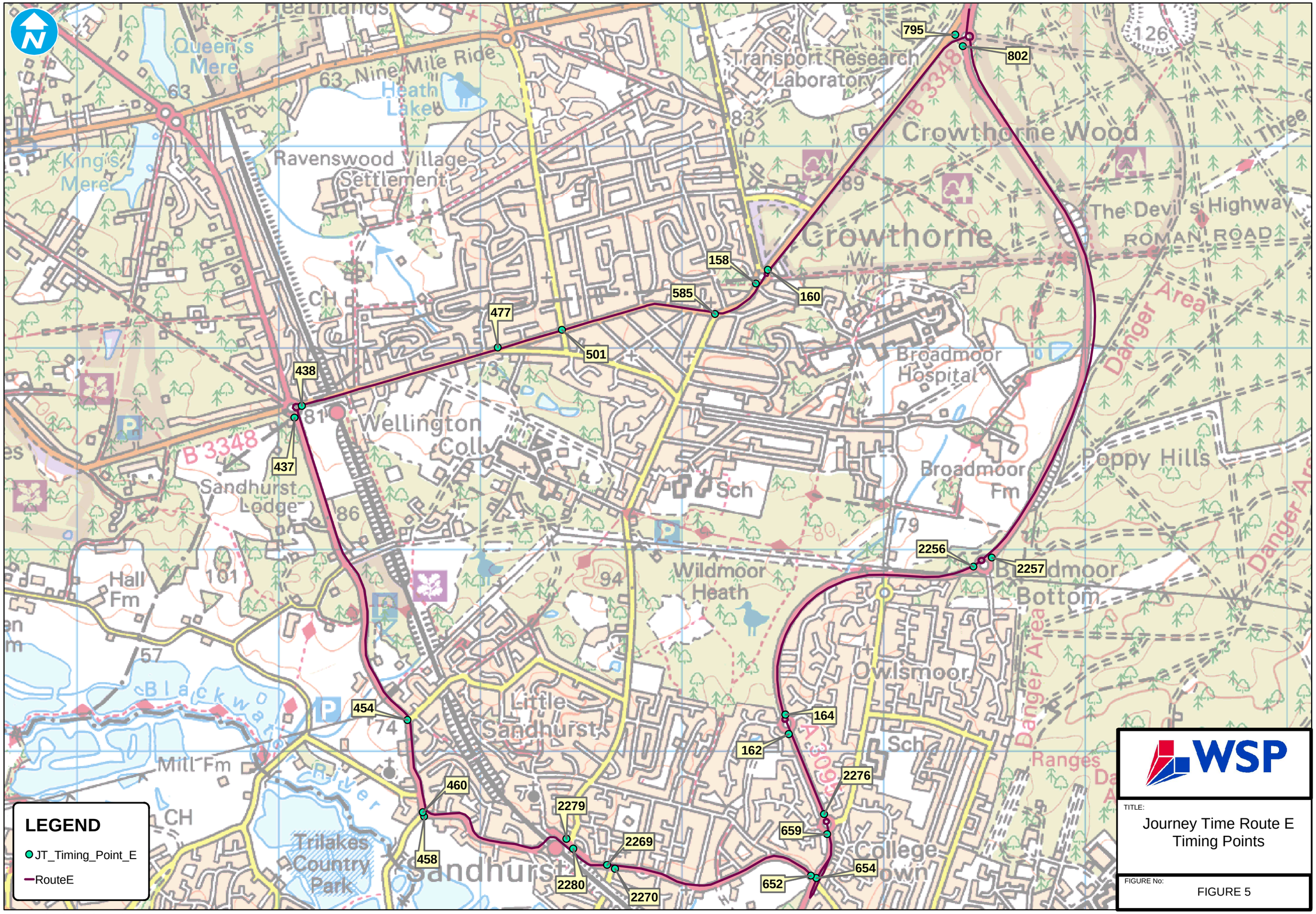

LEGEND

- JT_Timing_Point_E
- RouteE

WSP

TITLE:

Journey Time Route E Timing Points

FIGURE No:

FIGURE 5

0 0.2 0.4 Kilometers

SCALE: 1:16,530

Produced by WSP Group © Last Updated: October 16, 2007

Produced by WSP Group ©

Last Updated: December 7, 2006

Date Modified: 25/11/2008

Drawn By: ukmdj001

File: Q:\WSP_UK\WSP_DHolborn\Projects\Bracknell\ANALYSIS\GIS\Figure 6 - RSI Sites.mxd

Legend

RSI Sites

BRACKNELL

BRACKNELL FOR

Priestwood

Coll

Sch

A 329

Earthwork

Chavey Down

Bullbrook

Priory

Cemy

Hotel

Ski Centre

Amen Corner

Industrial Estate

A 3095

Cumulus

Staff College

Martin's Heron

B 3017

MS

Wildridings

Harmans Water

Whitmoor Bog

Easthampstead

Sports Centre

Crown Wood

Swinley Park

Mound

Great Hollands

Birch Hill

South Hill Park

Hanworth

CH

Crem

PH

A 322

Discovery Centre

Penny Hill

Gravel Hill

Caesar's Camp

B 3430

hampstead Park (Sch)

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0 0.2 0.4 0.6 0.8 1 Kilometres

WSP

TITLE:

CALIBRATION - RSI SITES

FIGURE No:

FIGURE 6

Date Modified: 25/11/2008

Drawn By: ukmdj001

Legend

- Railway Screenline
- Selected Links for Railway Screenline

BRACKNELL

BRACKNELL FOR

Binfield Manor
Whitegrove
Temple Park
Stokes Fm
Popeswood
Priestwood
Wick Hill
Earthwork
Chavey Down
Bullbrook
Priory
Hotel
Ski Centre
Amen Corner
Industrial Estate
Martin's Heron
Cumulus
Staff College
Wildridings
Harmans Water
Whitmoor Bog
Easthampstead
Sports Centre
Crown Wood
Swinley Park
Holme Green
Lock's Ho
Easthampstead Park (Sch)
Great Hollands
Birch Hill
South Hill Park
Hanworth
Sutton Court Fm
Discovery Centre
Caesar's Camp
Gravel Hill
Penny Hill
Big Wood

A329
A3095
B3408
B3018
B3017
B3430
A322

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0 0.2 0.4 0.6 0.8 1 Kilometres

WSP

TITLE:

CALIBRATION - RAILWAY SCREENLINE

FIGURE No:

FIGURE 7

File: Q:\WSP_UK\WSP_D\Holborn\Projects\Bracknell\ANALYSIS\GIS\Figure 7 - Railway Screenline.mxd

Date Modified: 25/11/2008

Drawn By: ukmdj001

File: Q:\WSP_UK\WSP_D\Holborn\Projects\Bracknell\ANALYSIS\GIS\Figure 8 - A329 A322 A3095.mxd

Legend

- A329/A322/A3095 Screenline
- A329/A322/A3095 Screenline Selected Links

0 0.1 0.2 0.3 0.4 0.5 Kilometres

WSP

TITLE:

CALIBRATION - A329 / A322 / A3095

FIGURE No:

FIGURE 8

Date Modified: 25/11/2008

Drawn By: ukmdj001

File: Q:\WSP_UK\WSP_DiHolborn\Projects\Bracknell\ANALYSIS\GIS\Figure 9 - Inner Cordon.mxd

Legend

- Inner Cordon
- Inner Cordon Selected Links

Priestwood

A329

A3095

Cemetery

Tumulus

0 0.1 0.2 0.3 0.4 0.5 Kilometres

WSP

TITLE:

CALIBRATION - INNER CORDON

FIGURE No:

FIGURE 9

Date Modified: 25/11/2008

Drawn By: ukmdj001

Legend

- Outer Cordon
- Outer Cordon Selected Links

BRACKNELL

BRACKNELL FOREST

Binfield
Marchfield Ho
Kingscote
Rushton's Fm
Stokes Fm
Popeswood
Hotel
Ski Centre
Amen Corner
Cabbage Hill
West End
Binfield Manor
Temple Park
Priestwood
Wick Hill
Newell Green
Warfield Ho
Moat
Brockhill
Whitegrove
Winkfield Row
Winkfield Manor
Brookside
North Ascot
Chavey Down
Earthwork
Bullbrook
Priory
Martin's Heron
Englemere Pond
Englemere
Kings Ride Ho
Whitmoor Bog
Crown Cottages
Swinley Park
Crown Wood
Tower Hill
Discovery
Penny Hill
Gravel Hill
Camp
Castles Path
Three
Rapley Fm
Industrial Estate
Cumulus
Staff College
Harmans Water
Wildridings
Sch
Easthampstead
Sports Centre
Great Hollands
Birch Hill
South Hill Park
Hanworth
Crowthorne Wood
Big Wood
Wood's Fm
Lock's Ho
Holme Green
Easthampstead Park (Sch)
Gardeners Green
Sutton Court Fm
Honeyhill
Transport Research Laboratory
Nine Mile Ride
Heath
Coll
Sch
Cemy
Hotel
Hospl
PH
CH
Crem
LC
A 329
A 329 (M)
A 3095
B 3018
B 3034
B 3408
B 3430
B 3348

0 0.4 0.8 1.2 1.6 2 Kilometres

WSP

TITLE:

CALIBRATION - OUTER CORDON

FIGURE No:

FIGURE 10

File: Q:\WSP_UK\WSP_DIHolborn\Projects\Bracknell\ANALYSIS\GIS\Figure 10 - Outer Cordon.mxd

Date Modified: 25/11/2008

Drawn By: ukmdj001

File: Q:\WSP_UK\WSP_D\Holborn\Projects\Bracknell\ANALYSIS\GIS\Figure 10 - Outer Cordon.mxd

Legend

- Sandhurst Crowthorne Cordon
- Sandhurst Crowthorne Cordon Selected Links

0 0.4 0.8 1.2 1.6 2 Kilometres

WSP

TITLE:

VALIDATION - SANDHURST / CROWTHORNE CORDON

FIGURE No:

FIGURE 11

Date Modified: 25/11/2008

Drawn By: ukmdj001

File: Q:\WSP_UK\WSP_DiHolborn\Projects\Bracknell\ANALYSIS\GIS\Figure 11 - Sandhurst Crowthorne Cordon.mxd

Legend

- Northern Screenline
- Northern Screenline Selected Links

0 0.4 0.8 1.2 1.6 2 Kilometres

WSP

TITLE:

VALIDATION - NORTHERN SCREENLINE

FIGURE No:

FIGURE 12

Date Modified: 25/11/2008

Drawn By: ukmdj001

File: Q:\WSP_UK\WSP_DlHolborn\Projects\Bracknell\ANALYSIS\GIS\Figure 13 - Central Screenline.mxd

Legend

- Central Screenline
- Central Screenline Selected Links

BRACKNELL FOREST

Bullbrook
A 329
Martin's Heron
Englemere Pond
Englemere
Whitmoor Bog
Swinley Park
Crown Cottages
Kings Ride Ho
Industrial Estate
A 3095
Cemy
Sch
Cumulus
Staff College
Harmans Water
Wildridings
Sch
Easthampstead
Sports Centre
Crown Wood
Great Hollands
Birch Hill
South Hill Park
Hanworth
A 322
Discovery Centre
Penny Hill
Gravel Hill
Caesar's Camp
Castles
Three
Rapley Fm
B 3348
B 3430
B 3017
Tower Hill

0 0.4 0.8 1.2 1.6 2 Kilometres

WSP

TITLE:

VALIDATION - CENTRAL SCREENLINE

FIGURE No:

FIGURE 13