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HIGHWAYS AGENCY PINCH POINT SCHEMES
A1(M) JUNCTION 6 & JUNCTION 7

Local Model Validation Report

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Highways Agency Pinch Point Schemes
A1(M) Junction 6 & Junction 7

Local Model Validation Report

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Appendices

1 Introduction

1.1 Foreword

1.1.1 WSP has been commissioned by the Highways Agency (HA) to prepare a transport model of the A1(m) Junction 6 at Welwyn Garden City and Junction 7 at Stevenage, to support the economic analysis of proposed improvement schemes to the junctions. This report details the development of a single model that covers both junctions. It can then be used for the separate analysis of each scheme or junction to feed into an economic appraisal. The proposed schemes form part of the Area 8 Pinch Point appraisals.

1.1.2 The location of the A1(m) junctions is shown on Figure 1. Junction 6 is the junction of the A1(m) at Welwyn and the A1000 and is located to the north-west of Welwyn Garden City. Junction 7 is located at southern Stevenage where it meets the A602.

1.2 Scoping Report

1.2.1 WSP issued a Transport Modelling Methodology Note to the HA on 28th March 2012, which together with subsequent correspondence forms the agreed methodology for the assessment of the Area 8 Pinch Point Schemes. The methodology report sets out the scope, methodology and assumptions to be used in the traffic modelling process that will subsequently be used to assess the impact of the proposed schemes.

1.2.2 The model development and this report are consistent with the methodology set out within the agreed methodology report.

1.3 Report Purpose and Structure

1.3.1 This report provides the Local Model Validation Report (LMVR) for the transport model which is to provide the basis for the future scheme assessment. It demonstrates the ability of the model to replicate observed traffic conditions and its suitability to be used as a forecasting tool for the assessment of the potential improvement schemes.

1.3.2 The model's performance is assessed against the range of criteria set out in the Design Manual for Roads and Bridges (DMRB) Volume 12, Section 2 – Traffic Appraisal in Urban Areas.

1.3.3 This LMVR is structured as follows:

- Section 2 describes the data collected for use in the model;
- Section 3 describes the development of the base traffic network in the model;
- Section 4 describes the development of the traffic flow matrices used in the model;
- Section 5 describes the calibration of the model against observed data;
- Section 6 describes the validation of the model against observed data; and
- Section 7 provides a summary of the main conclusions of the LMVR and an overall conclusion as to the suitability of the model for use in the future option testing.

2 Data Collection

2.1 Introduction

2.1.1 For the purpose of network matrix construction, model calibration and validation a wide variety of traffic data has been collected through the following survey methods:

- Traffic count surveys;
- Queue surveys;
- Automatic number plate recognition (ANPR); and
- Journey time surveys.

2.1.2 The traffic data collection was commissioned by URS on behalf of the HA and all the above data was collected by Sky High - Count on Us (Sky High) on Wednesday 22 May 2012. The data that was collected is described in more detail below.

2.2 Traffic Count Surveys

2.2.1 Automatic traffic count (ATC) data was collected at each location that represents an entry or exit point from the model during the week commencing 21 May 2012. This was included in the data collection exercise to establish a cordon around the model area to ensure the correct order of trips were included in the matrix. The following locations were surveyed:

- Great North Road;
- Church Street;
- # A1000 Welwyn Bypass Road – North of Lockleys Drive
- A1000 Hertford Road southbound
- A1000 between Hertford Road roundabout and northbound off slip roundabout
- # A1000 Hertford Road northbound
- Parkside
- Maran Avenue
- B197 Welwyn Bypass Road
- # A1072 Gunnelswood Road, south of Leyden Road
- A602 Broadhall Way
- A1072 Gunnelswood Road, Glaxo Smithkline

(# these sites collected incomplete ATC data but other survey data was available for these model entry points)

2.2.2 Manual classified turning counts were undertaken using video cameras at the following locations and are illustrated on Figure 2 of Appendix A:

- A1 Junction 6, B197, A1000 Welwyn Bypass roundabout;
- A1000 / Hertford Road roundabout;
- B656 Link Road / A1000 / B197 roundabout;
- A1 Junction 7 / A602 Broadhall Way roundabout;

- A602 Broadhall Way / A1072 Gunnelswood Road.

2.2.3 The traffic count data was collected for the following time periods:

- Morning peak period (06:00 – 10:00); and
- Evening peak period (16:00 – 20:00).

2.2.4 The following vehicle classes were counted

- Cars and motorcycles;
- Light Goods Vehicles (LGV);
- Other Goods Vehicles (OGV1, OGV2);
- Public Service Vehicles (PSV).

2.2.5 The number of pedal cycles passing through the junction was also counted; however the volume of pedal cycles was insignificant.

2.3 Queue Surveys

2.3.1 Queue surveys were undertaken at the five MCC sites identified above. The queues were recorded using video cameras and in each lane on the approaches to the junction.

2.3.2 The queue data was collected in terms of maximum queue length in metres in each lane in each five minute time interval between:

- Morning peak period (06:00 – 10:00)
- Evening peak period (16:00 – 20:00)

2.4 Journey Time Surveys

2.4.1 Journey time surveys were undertaken 22 May 2012. The data was collected for the following time periods:

- Morning peak period 06:00 – 10:00; and
- Evening peak period 16:00 – 20:00.

2.4.2 The journey times were measured by survey vehicles driving along nine survey routes, which are shown on Figure 3 of Appendix A. All the survey vehicles carried a GPS receiver that recorded the position and speed of that vehicle at approximately one second intervals. The journey time on each section has been obtained from these GPS records.

2.5 ANPR Data

2.5.1 Automatic number plate recognition cameras were set up at five locations in the model area, as shown on Figure 4 of Appendix A. These locations are as follows:

- A1(m) Junction 5 main carriageway northbound and southbound
- A1(m) Junction 6 northbound off-slip;
- A1(m) Junction 6 northbound on-slip;

- A1(m Junction 8 main carriageway northbound and southbound;
- A1(m) Junction 7 eastbound and westbound on A602.

2.5.2 The ANPR cameras were located to identify the frequency of traffic using the local roads as an alternative route to the A1(m) at junction 6 when the main carriageway is congested, particularly during the evening peak period.

2.6 Other Data

2.6.1 The traffic signals at the Junction 7 currently operate under SCOOT control. The SCOOT datasets, signal controller data and the SCOOT controller logs, were obtained from Hertfordshire County Council and were used in the model as fixed times to replicate the observed signal timings.

2.6.2 The traffic signal operation for the junction of A1000 Hertford Road / Welwyn Bypass Road have also been obtained from Hertfordshire County Council and included in the model appropriately.

2.6.3 Bus route information for bus services in the vicinity of the junction was obtained from the Traveline website. The bus timetable/ map information was included in the model acordingly.

2.6.4 The base mapping for the model development is based on Ordnance Survey 1:1250 scale mapping. Road markings have been added based on information received from CarillionWSP, as built drawings of the junction and from the aerial / street view photographs available on Google supplemented with information recorded from site visits.

3 Network Development

3.1 Introduction

3.1.1 This section sets out the methodology and processes used for the development of the S-Paramics model network. The development of the trip matrices used within the model is described in section 4.

3.2 Study Area

3.2.1 The study area of the model is defined based on the following items:

- Local knowledge with regard to network performance;
- Discussions with HA;
- Scale of proposed improvement scheme; and
- Interaction of local junctions.

3.2.2 The approximate extents of the model are shown on Figure 5 of Appendix A.

3.3 Time Periods

3.3.1 The model has been developed for the morning and evening peak periods. This enables loading of vehicles prior to the assessment period and the completion of trips post the assessment period. The modelled periods are:

- 06:00 – 10:00; and
- 16:00 – 20:00

3.3.2 The first and last half hour time periods of the models are warm-up / cool-down periods to ensure that the model has sufficient traffic in the assessment periods. The hours for detailed assessment and model validation are:

- AM Peak 07:30 – 08:30;
- AM Period 06:30 – 09:30;
- PM Peak 17:00 – 18:00; and
- PM Period 16:30 – 19:30.

3.3.3 The peak hours have been identified by summing the total observed traffic movements within the study area for each 15 minute period and identifying the highest combined flow of four consecutive 15 minute periods.

3.4 Road Network Development

3.4.1 The road network within S-Paramics has been constructed using:

- detailed 1:1250 mapping provided by the HA for the entire study area;
- site visits;
- video surveys of the junctions;
- as built drawings for junctions (where available); and

- aerial photography and “Streetview” photographs from Google Maps
- detailed knowledge ascertained from site visits.

3.4.2 The links have been categorised as either highway or urban and using their designated speed limit in the model network. The geometry of the junctions and the stoplines has also been replicated in the model to ensure vehicles are stopping on the junction approaches and travelling through the junctions as observed in reality.

3.5 Signal Timings

3.5.1 The signal timings for the SCOOT controlled Junction 7 have been replicated in the model using observed average signal timings from the survey day. The as built drawings were used to replicate the positions of the loops and a signal plan was written which changes the signal timings depending on the time of day and the traffic conditions.

3.5.2 The part time signal timings for the A1000 / Welwyn Bypass Road have been included in the model along with the positioning of the loop detectors. A ‘plans’ file has been created which alters the signal timings depending on the time of day and the traffic conditions to ensure the signals perform in the same way as they do on the ground.

3.6 Public Transport Services

3.6.1 The bus routes have been included directly in the model using the bus routes editor rather than having a separate matrix for these vehicles. The service frequencies and times have been taken directly from the timetables of the relevant bus services. The bus routes that have been included are as follows:

- 797 – Stevenage / Hitchin to London
- 314 – Hitchin to Welwyn Garden City
- 300/301 – Stevenage to Hemel Hempstead
- 5/50 – Stevenage local circular route
- 4/40 – Stevenage local circular route.

3.6.2 These were the routes which had frequent service times which fell within the four hour modelled periods. All journeys were included in the model within the relevant time periods.

3.7 Differences Between the AM and PM Models

3.7.1 The network construction and node and link positioning within both the AM and PM models are identical. However, it was necessary to split the models due to the tidal nature of the flows through the model network. This meant that aggressive behaviour accepting low levels of gap acceptance was observed in one period at certain junction approaches but the same characteristics were not required at the junction in the other time period.

4 Matrix Development

4.1 Introduction

4.1.1 Section 2 described the data collection sources and details of the data collected. This section describes how this data has been used to develop the trip matrices used in the S-Paramics model, including the development of the prior matrix from the observed traffic counts, the estimation of additional traffic demand from the queue data and the suitability of the estimated matrix for use in the 2012 validation models.

4.2 Prior Matrix Structure

4.2.1 The S-Paramics model comprises sixteen zones, as shown on Figure 6 of Appendix A, namely:

- Zone 2 A1(m) Junction 8 main carriageway north and south bound;
- Zone 3 A602 Broadhall Way;
- Zone 4 Glaxo-SmithKline entry/exit;
- Zone 5 A1072 Gunnelswood Road
- Zone 6 Whittle Way (inbound only)
- Zone 7 Glaxo-SmithKline entry from Junction 7 roundabout (inbound only)
- Zone 8 Knebwoth House / Novotel
- Zone 9 B197 Great North Road
- Zone 10 B656 Church Street
- Zone 11 Parkside
- Zone 12 A1000 Hertford Road (outbound only)
- Zone 13 A1000 Welwyn Bypass Road (inbound only)
- Zone 14 Maran Avenue
- Zone 15 B197 Welwyn Bypass Road
- Zone 16 A1(m) north of junction 5 northbound (outbound only)
- Zone 17 A1(m) south of junction 7 southbound (inbound only)

4.2.2 These zones represent the entry/ exit points from the model network. Matrices have been developed for the four vehicle classes in fifteen minute intervals for the two four-hour model periods. The following vehicle classes have been used:

- Cars (and motorcycles);
- LGV;
- OGV1;
- OGV2.

4.2.3 PSV does not have a separate matrix because these have been included directly in the model as bus routes connected to the bus stops.

4.2.4 The matrices have been identified for the following time periods, which have been further broken down through the development of a 'profiles' file:

- 06:00 – 10:00
- 16:00 – 20:00.

4.3 Prior Matrix

4.3.1 The prior matrix is fully based on the observed traffic movements at the junctions which have traffic data collected for the turn counts, taken from the traffic count data. Where the data is not directly known from the turn counts some of the remaining cells in the matrix have been completed by using the ANPR data. Where ANPR data and turn count data is not available the turning proportions have been used to provide a prior matrix.

4.4 Matrix Development Methodology

4.4.1 The matrix has been developed in a number of stages making best use of the data available, with the most reliable data having the highest priority. The list below sets out a summary of the development process of the trip matrices, which is considered in detail with the remainder of this section:

- Identify zone arrival and departure targets;
- Identify all known movements;
- Add ANPR data;
- Add proportional traffic count data;
- Furness matrix; and
- Add additional demand.

4.5 Zone Arrival and Departure Targets

4.5.1 MCC data has been used to identify arrival and departures targets for each of the zones within the model.

4.5.2 The observed traffic flow data has some minor inconsistencies between adjacent junctions. Where this has been identified (with no intermediate junction), the traffic flows have been balanced to ensure consistent data is used within the model.

4.5.3 Inconsistent traffic movements cannot be replicated in a model which uses origin destination (OD) pairings and data inconsistencies should be resolved prior to the use of the data.

4.5.4 For the purpose of this study, there were no significant inconsistencies in the data between the junctions.

4.5.5 Once this process was completed, the arrivals and departures have been balanced to ensure the entry and exit flows within the model are equal.

4.6 Known Movements

4.6.1 All known zone to zone movements directly observed within the study area are directly input to the matrices as fixed values which cannot be changed.

4.6.2 Additionally, all movements known to be impossible or illogical are set to a 0 value which cannot be changed in the furness process.

4.7 ANPR Data

4.7.1 The ANPR data has been used to identify the proportional distribution of trips for each OD pairing within the model where the data is available.

4.7.2 This proportion is then applied to the observed departure trip target, with the known movements removed.

4.8 Proportional Traffic Data

4.8.1 For any remaining OD pair without a value, observed turning count data has been portioned, assuming that the origin of the trip does not influence the destination. This enables a % distribution for each destination from each origin to be identified.

4.9 Furness

4.9.1 The ANPR data and proportional traffic data use the departure flows for the distribution of trips. Due to this process, although all matrix departure targets would be met, the arrival targets do not exactly match the target values. To balance the matrix, and apply equal weight to both observed origin and destination totals, a furness process has been used.

4.9.2 Firstly all known movements have been removed from the matrix and targets as these should not be changed through the process. The furness process then used an iterative technique to balance origin and destination flows using the proportional size of the pairings.

4.9.3 Once this process was completed, the known movements were added back into the matrix.

4.10 Additional Demand

4.10.1 Following the process identified above, an initial matrix was completed which replicated all of the observed movements from the traffic data. It does not incorporate the additional demand that may not have been captured through queued traffic on an entry zone to the model. It does not affect internal junctions.

4.10.2 The turning movements counted in each fifteen minute time segment are only the traffic that passed through the junction during that time period. The traffic counts do not include any demand that could not pass through the junction in a time segment due to queuing. For example, if the length of a queue extends during a 15 minute time segment, this means that the traffic demand is higher than observed in the traffic counts, with a lower demand than observed if the queue length reduces.

4.10.3 This suppressed demand therefore needs to be added into the matrix to ensure that queue lengths can be more easily replicated in the model. The additional traffic demand has therefore been estimated based on the change in queue length observed in the queue surveys, as follows:

- The observed queue length on an arm at the start of a time period is subtracted from the observed queue length at the end of a time period;
- The difference in queue length is then divided by a vehicle factor to convert the queue from metres into vehicles;
- The queue demand is proportioned across the movements in each time period; and
- The queue demand is then added to the prior matrix.

4.11 Matrix Rounding

4.11.1 The matrix process introduced a number of proportional trips of less than 1 which cannot be used within the micro-simulation model. The matrix was therefore converted to an integer matrix, with a rounding factor applied to ensure the total number of trip remains constant.

4.12 Analysis of Final Matrix

4.12.1 The final matrix is the addition of the prior matrix known movements, the furnessed matrix and the additional demand. As described within this section, the matrices are fully based on the observed turning count data, with minor adjustments to represent the traffic demand that was suppressed due to queuing. As a result it is considered that the matrices adequately represent the observed traffic conditions as they are entirely based upon directly observed values.

Table 4-1 - Summary of AM Peak Matrix

AM Period	Total
Cars	32,591
LGV	5,858
OGV1	1,033
OGV2	834
Total	40,316

4.12.2 This compares with a total number of trips entering the network in the four hour morning peak period, taken from the observed data, being 40,496 trips for the equivalent vehicle types (excludes PSV).

Table 4-2 - Summary of PM Peak Matrix

PM Period	Total
Cars	35,280
LGV	4,544
OGV1	372
OGV2	477
Total	40,673

4.12.3 In the PM peak four hour model matrix, the equivalent total number of trips observed in the surveys was 40,724, which is well represented by the final matrix. The row and column totals match well against the observed counts from the traffic surveys.

4.13 Matrix Profiles

4.13.1 15 minute matrices for each vehicle type were created to provide fully profiled model demand which gives a more accurate release of the demand into the network. Profiles of demand releases into the network for each origin-destination pairing have been created for each vehicle type with the result that 484 profiles have been created and assigned to the appropriate model zones and vehicle types.

5 Calibration

5.1 Model Calibration Process

5.1.1 Calibration of the S-Paramics model involves ensuring that it represents the on-site observed traffic conditions by adjusting model inputs and parameters. This process involves examination of the model network, checking for errors and improving the performance of the model in terms of comparisons with observed data. The adjustments that have been made included the following:

- Adjustment to stoplines and use of next lanes / stay in lane functions as necessary to achieve the required driver behaviour;
- Iterative adjustments to the trip matrices to adjust the model traffic demand to match the observed traffic conditions;
- Adjustments to the default signposted lane changes distances on nodes to better reflect lane changing and vehicle interaction;
- Adjustments to default driving behaviour parameters (headway time) to better reflect on-site behaviour;
- Adjustments to the characteristics through the link editor including: visibility; lane cross; lane merge; and path cross parameters on roundabout approach links to achieve the desired behaviour on the approach to roundabouts.

5.2 Traffic Assignment

5.2.1 Traffic is introduced to the network using the “dynamic assignment” feature of S-Paramics, rather than static routing. Vehicles are loaded onto the network in the form of a matrix specific to a vehicle type and 15-minute time period.

5.2.2 In dynamic routing, each individual vehicle calculates its own route between its given origin and destination zone and this has been used in this model to reflect the route choice that is available around junction 6. A feedback interval of 5 minutes has been assumed.

5.3 Turning Count Calibration

5.3.1 All of the available observed turning count data was used in the process of developing the trip matrices for the S-Paramics model to improve the quality of the matrix developed. As result no turning count data remained independent for model validation. Instead all turning count data is reported as part of the calibration process against DMRB validation criteria. The DMRB criteria is set out below, each test must be satisfied in 85% of cases:

1. Individual link flows within 15% for flows between 700 and 2,700 vehicles;
2. Individual link flows within 100 vehicles per hour for flows < 700 vehicles per hour;
3. Individual link flows within 400 vehicles per hour for flows >2,700 vehicles per hour; and
4. GEH statistic for individual flows < 5.

5.3.2 Table 5.1 below sets out the link flow statistics for tests 1-3 in all time periods assessed.

Table 5.1 Link flow calibration statistics (3 hour and 1 hour)

Period	Flow < 700			700 < Flow < 2700			Flow > 2700		
	Total	Pass	%	Total	Pass	%	Total	Pass	%
07:30-08:30	66	64	97%	8	8	100%	0	0	n/a
06:30-09:30	54	54	100%	15	14	93%	5	5	100%
17:00-18:00	62	62	100%	12	12	100%	0	0	n/a
16:30-19:30	56	56	100%	12	12	100%	3	3	100%

5.3.3 Table 5.1 demonstrates that for the all of the time periods assessed, the DRMB requirement of 85% or more passes is significantly exceeded, with many periods achieving a 100% pass rate. Table 5.2 below provides the corresponding statistics for the GEH criteria:

Table 5.2 GEH calibration statistics

Time Period	Total No.	Pass	GEH < 5
07:30-08:30	74	71	95.9%
06:30-09:30	74	71	95.9%
17:00-18:00	74	74	100%
16:30-19:30	74	73	98.6%

5.3.4 Table 5.2 demonstrates that for all time periods assessed, the DRMB requirement of 85% or more passes is significantly exceeded with all periods achieving close to a 100% pass rate. It is therefore considered that the traffic data within the model is representative of the observed traffic conditions.

5.3.5 Appendix B of this report provides full turning count calibrations statistics on a link by link basis, including observed flow, modelled flow, difference, % difference and GEH statistic.

5.4 Queue Length Calibration

5.4.1 It is recommended in DMRB that queue levels should not be calibrated against observed data in terms of values, but rather in terms of the fit of the profile and magnitude over the course of the modelled period. In addition, the modelled queue lengths are based on an average maximum queue across 10 model runs which has a natural smoothing of reported queues as individual assessment peaks are averaged across a number of runs.

5.4.2 However, queue lengths still provide a useful calibration tool when used appropriately. The model has been calibrated using queue length surveys for the three hour periods of assessment in both the morning and evening peak period. Where required adjustments have been made to headway and gap acceptance parameters to replicate observed queuing behaviour.

5.4.3 Excess demand recorded within observed queues has been added to the corresponding time periods within the matrix build process. This is because observed turning counts only record the traffic that passes through the junction, not the total demand. Without this modification queues within the model would not replicate those observed without inappropriate changes to model parameters.

5.4.4 Of particular note in the morning peak period, the video survey showed that an incident occurred on the southbound carriageway at junction 7 before the merge and therefore the queue at this location should be discounted from the analysis.

5.4.5 Appendix C contains the charts that show plots of the observed and modelled queue lengths on the junctions where queue data was collected in the morning and evening peak periods. The graphs show that the modelled queues generally seem to be representative of the observed data. The queue data comparison is used as a guideline for the model performance and the turn counts and journey time comparisons provide a more easily tested goodness of fit for the model, because detailed guidance on how these should be compared and assessed is available from DMRB.

5.4.6 The queue comparison is therefore used as an additional check for the overall model performance and used to highlight specific potential areas where the model needs to be looked at in greater detail. Where the queues differ significantly in the model from those that were observed, the specific area of the model has been interrogated and amended to better reflect the queues, but only to a point where the impact on the other model statistics (turn counts and journey times) still meet the required standards. Where the shortfall appears significant, reasons for this have been checked and sought from the collected survey data (eg, video surveys to highlight unusual activity). Notably this occurred on the A1(m) southbound section at junction 7 before the merge.

5.4.7 In the morning peak, the modelled queues reflect the observed queues very well, except for the observed queue on the southbound carriageway at junction 7. Also the observed queue at the Gunnelswood Road / Broadhall Way roundabout approach from the east the modelled queue exceeds the observed queue. However, since the turn counts meet GEH requirements this is not considered significant. The path cross, lane merge and path cross link modifiers have been tested and changed to get the best throughput at this location. The survey data does show that the maximum queue was not recorded where the graph line flattens at its peak, so it could be expected that the queue extent was longer than that recorded. Similarly at the A1000 Hertford Road from the north in the AM and from the south in the PM the observed line on the graph flattens at its peak indicating that the full extent of the queue could no longer be observed. It can therefore be reasonably assumed that the queue was longer than that recorded.

5.4.8 In the evening peak, the queues are generally of the right order and build-up profile, with no significant variations.

5.5 Calibration Summary

5.5.1 The analysis contained within this section has set out the assignment process used by the model, identified strong model against turning count calibration (in excess of DMRB requirements) and good performance against observed queue surveys.

5.5.2 The modifications made to model parameters to achieve the level of calibration identified have been set out in detail, with all changes necessary to replicate observed data recorded.

5.5.3 All parameters have the same values in both the morning and evening peak periods.

6 Validation

6.1 Introduction

6.1.1 Observed turning count data has been used during matrix development and observed queue data has been used to undertake model calibration. As a result the only remaining independent data that can be used for model validation is the journey time surveys.

6.1.2 Journey time surveys represent the best data for micro-simulation model validation, as to replicate observed journey times, vehicle quantities in the model, queue lengths and delay must all be adequately represented.

6.1.3 For all of the assessments within this section, 10 model runs of each model have been undertaken using different random seeds.

6.2 Methodology

6.2.1 The DMRB requires that 85% or more of all journey time survey routes in each peak period should be within 15% of observed (or 1 minute if higher). To demonstrate performance against DMRB the performance of the model has been assessed against these exact criteria in the following sections.

6.2.2 In addition, as many of the survey routes in the model are quite short and the DMRB guidelines are designed for larger strategic models, a comparison has also been made against the confidence intervals for the observed journey times.

6.2.3 Confidence intervals take into account the variation in observed measurements recorded. Results are presented against the guidelines set out in section 11.4 of the Traffic Appraisal Manual which report whether the modelled journey times fall with 10% of the confidence interval for the observed dataset.

6.2.4 In total 32 partial journey time survey routes have been generated from the 9 observed routes. The full routes are illustrated on Figure 3 and the intermediate timing points are illustrated on Figures 7-15 of Appendix A for routes 1 to 9 respectively. The routes covered are:

- Route 1 – Southbound A1(m)
- Route 2 – Northbound A1(m)
- Route 3 – Southbound A1(m) to Braodhall Way
- Route 4 – Broadhall Way to Northbound A1(m)
- Route 5 – Southbound from Gunnelswood Road to A1(m)
- Route 6 – Northbound A1(m) to Gunnelswood Road (via Welwyn Bypass Road)
- Route 7 – Northbound from Digswell Hill to Great North Road
- Route 8 – Southbound from Great North Road to Digswell Hill
- Route 9 – Church Street to A1(m) Junction 6 southbound off-slip roundabout and return

6.2.5 Route 9 is only included in the results as a partial route because the whole route (including a section which loops around junction 6 southbound off-slip) is not included in the model network. In the AM peak route 1 and route 3 have been discounted from the assessment because they are influenced by an incident which occurred on the southbound mainline at junction 7.

6.2.6 The validation has been completed for both the 3 hour period, and the identified peak hour within the period for both the complete routes and partial routes for both the morning and evening periods. In total 4 sets of validation statistics are provided for each time period as set out below:

- 3 hour complete routes;
- 3 hour partial routes;
- Peak hour complete routes; and
- Peak hour partial routes.

6.3 AM Peak Validation

6.3.1 Performance of the model against DMRB validation criteria are set out in Table 6.1 below:

Table 6-1 - AM Peak Journey Time Validation

Time Interval	Scenario	Within Confidence Interval	Within 15%	Within 60 Seconds	Pass DMRB
06:30-09:30	Full Route	88%	58%	96%	96%
06:30-09:30	Partial Route	84%	56%	94%	94%
07:30-08:30	Full Route	80%	80%	80%	80%
07:30-08:30	Partial Route	100%	71%	100%	100%

6.3.2 Table 6.1 demonstrates that in the 3 hour period between 96% and 94% DMRB pass rate is achieved for the full and partial routes. Further, 88% and 84% of routes are within the confidence interval for the full and partial routes respectively.

6.3.3 For the peak hour of the period, DMRB criteria is satisfied for the partial routes, but fails for the full route assessment. 80% represents 1 route failing which is route 5.

6.3.4 The model performs well against the confidence interval assessments for all time periods assessed and reflects the variability in journey times identified within the observed data.

6.3.5 Appendix D of this report provides tables illustrating a detailed breakdown of the performance of each partial and full routes.

6.4 PM Peak Validation

6.4.1 Performance of the model against DMRB validation criteria are set out in Table 6.2 below:

Table 6-2 - PM Peak Journey Time Validation

Time Interval	Scenario	Within Confidence Interval	Within 15%	Within 60 Seconds	Pass DMRB
16:30-19:30	Full Route	84%	66%	91%	91%
16:30-19:30	Partial Route	88%	69%	97%	97%
17:00-18:00	Full Route	75%	50%	88%	88%
17:00-18:00	Partial Route	88%	75%	88%	88%

6.4.2 Table 6.2 demonstrates that for the 3 hour peak period a 91% DMRB pass rate is achieved for the full routes and for the partial routes a 97% pass rate is achieved. For the PM peak hour, 88% of the full and partial routes pass DMRB requirements.

6.4.3 For the confidence interval tests, although the full routes are less than 85%, further examination of the detailed data identifies that of the routes which fail they are generally within seconds of passing the required tests.

6.4.4 Appendix E of this report provides tables illustrating a detailed breakdown of the performance of each partial and full routes.

6.5 Summary

6.5.1 The analysis provided within this section demonstrates that the model performs well against DMRB journey time validation criteria against observed data. Despite in some time periods failing to achieve full DMRB compliance, further investigation of the data indicates this is by a matter of seconds on the failing of routes.

6.5.2 The model will therefore adequately be able to assess proposed mitigation schemes at the A1(m) junction 6 and Junction 7.

7 Summary and Conclusions

7.1 Summary

7.1.1 This report has set out the methodology and assumptions in developing the validation model to be used as a forecasting tool to assess the proposed Pinch Point Scheme at the A1(m) junction 6 and junction 7 roundabout.

7.1.2 The model has been developed to be consistent with Transport Modelling Methodology Note Issued to the HA on 28th March 2012, which together with subsequent correspondence forms the agreed methodology for the assessment of the Area 8 Pinch Point Schemes.

7.1.3 Detailed model output has been provided within this report to demonstrate the performance of the model against observed traffic behaviour. This has been assessed against the requirements set out within the DMRB for transport models.

7.2 Conclusions

7.2.1 The model has been assessed across 4 time periods in terms of turning counts, queue lengths and journey time surveys.

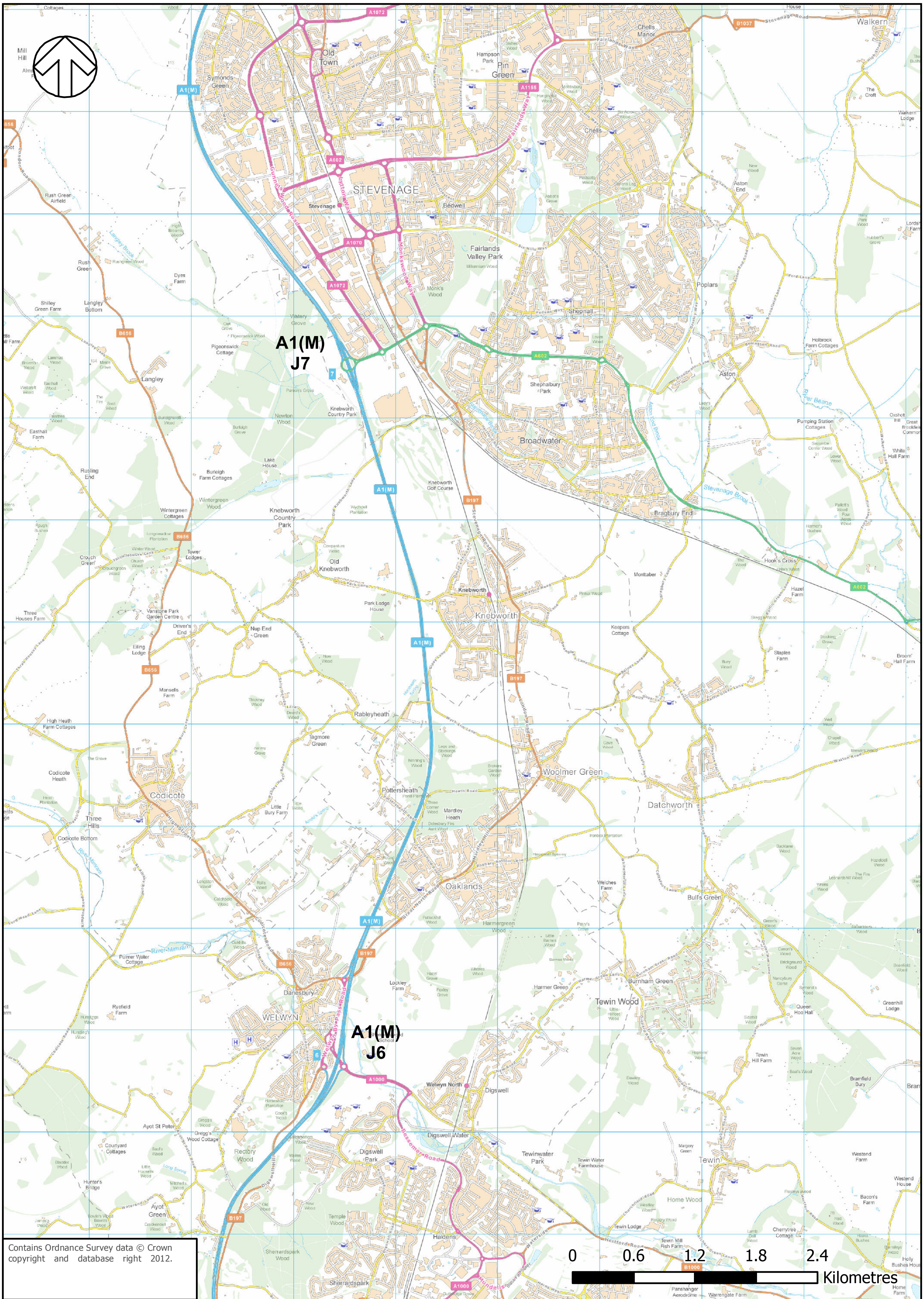
7.2.2 Turning count calibration has demonstrated that the model significantly exceeds DMRB criteria in all of the periods assessed for both link flow and GEH criteria.

7.2.3 Modelled queues typically represent the observed data very well, particularly in respect of the key routes in the model area.

7.2.4 Journey times have also been assessed against DMRB criteria and the confidence intervals of the survey data, which would be desired to also be above an 85% pass rate. In one case this has not been achieved (3 hour period AM full route). Where routes do fail any of the tests it is mainly by only a matter of seconds and not therefore not considered to be significant on the ability of the model to assess the proposed scheme.

7.2.5 The model has been demonstrated to be suitable for the assessment of the impact of the proposed development scheme on the highway network within the study area. The model is therefore deemed 'fit for purpose' to undertake an economic analysis of the impact of the proposed improvement scheme at the A1(m) Junction 6 and Junction 7.

APPENDIX A
Figures



WSP

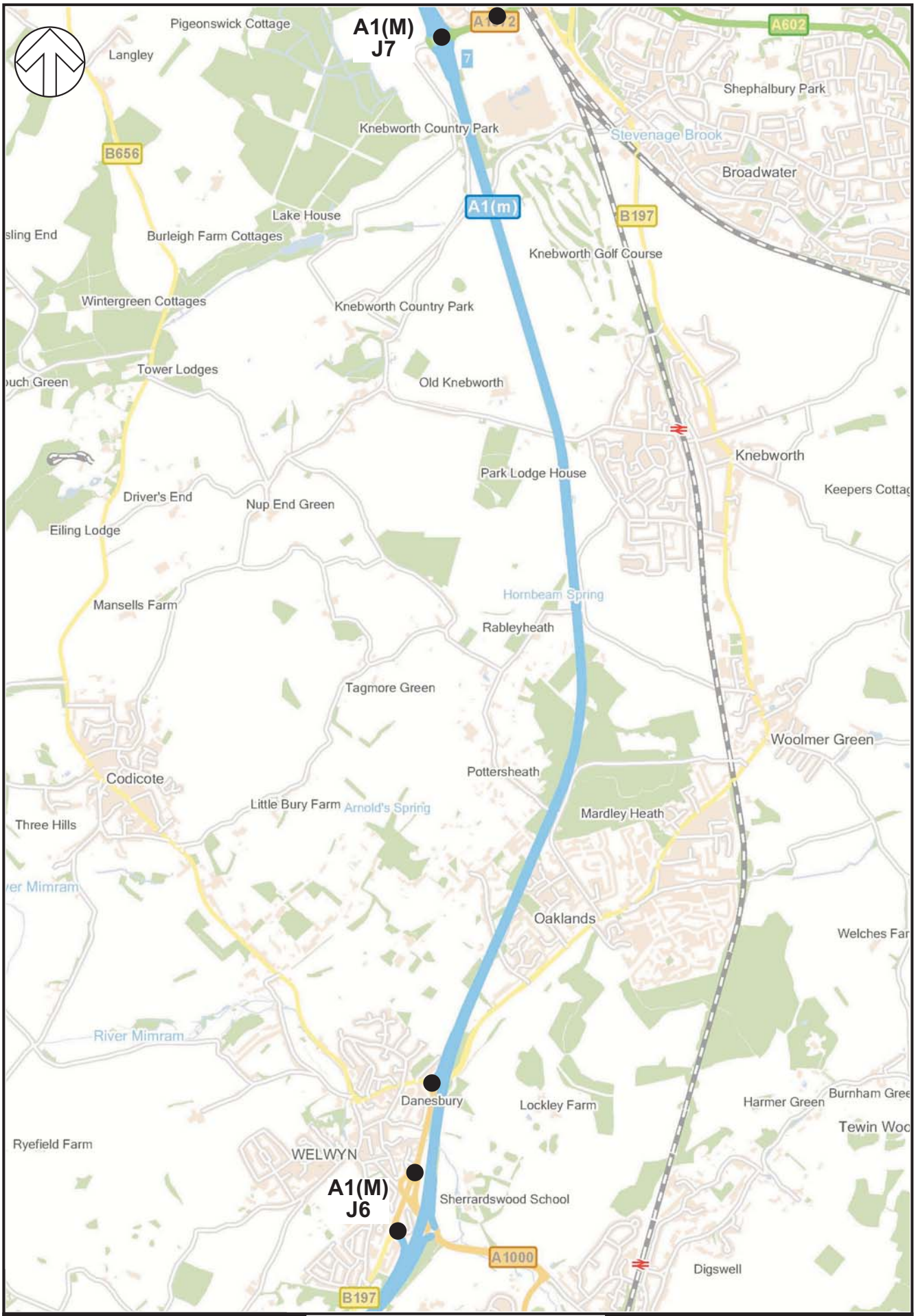
TITLE:

LOCATION PLAN

FIGURE No:

FIGURE 1

File: Q:\WSP_UK\WSP_D\Hertford\HA Pinch Point Modelling\A1M J6 and J7\Location Plan.mxd Drawn By: ukpxp057 Date Modified: 01/10/2012



WSP

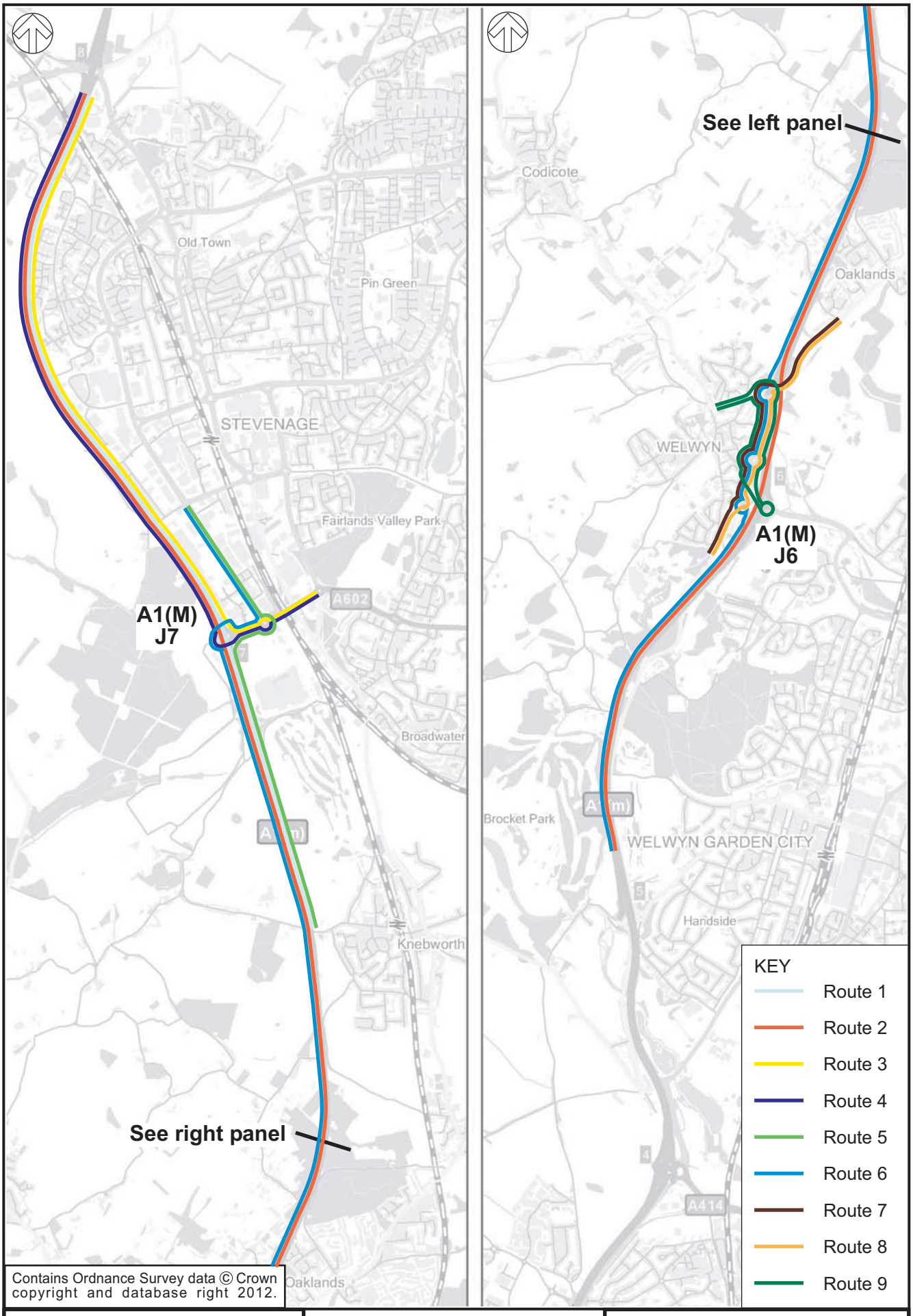
TITLE

MCC LOCATIONS

FIGURE No:

FIGURE 2

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 MCC.FH11



WSP

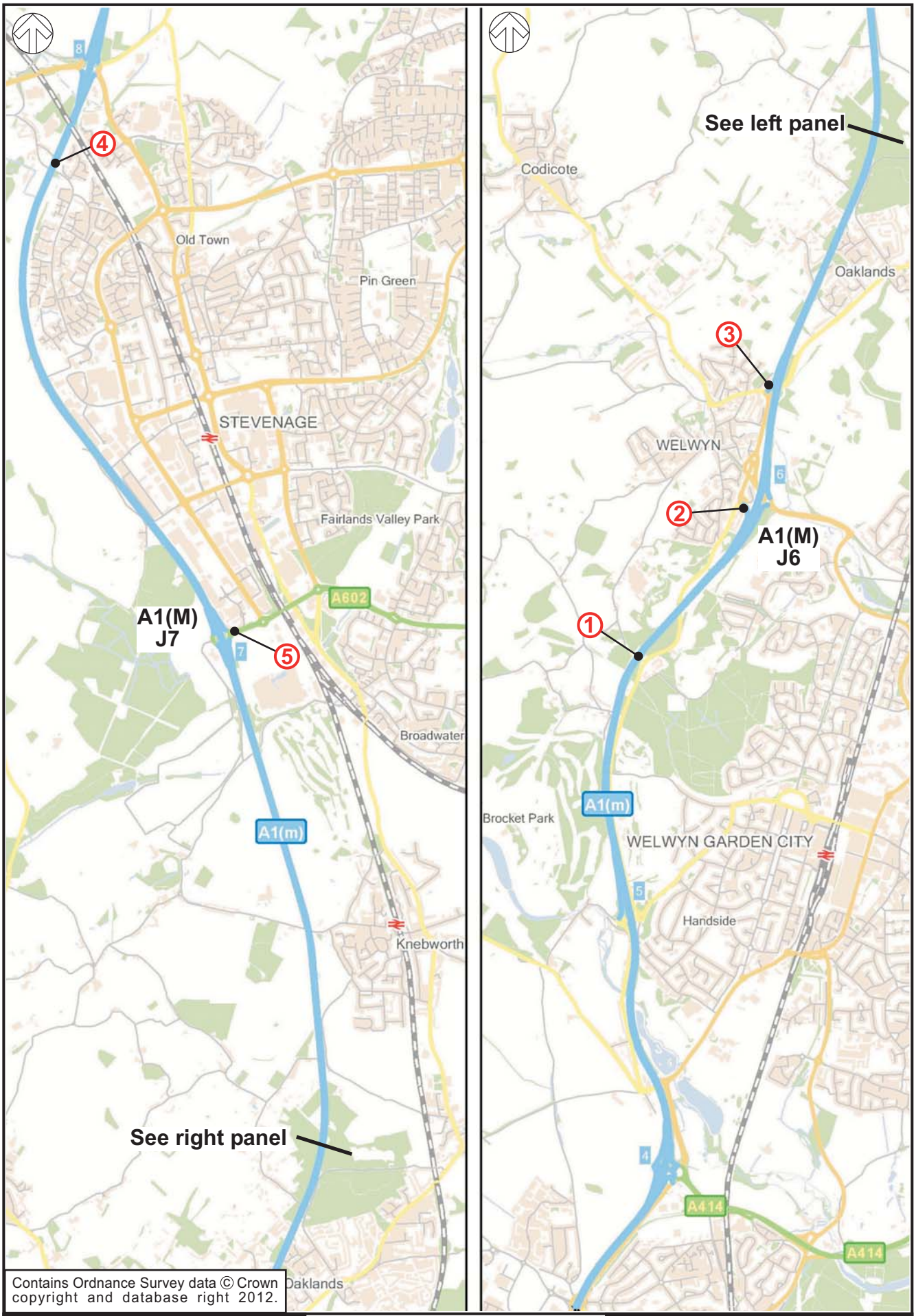
TITLE

JOURNEY TIME SPECIFICATION ALL ROUTES

FIGURE No:

FIGURE 3

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 JTS.FH11



WSP

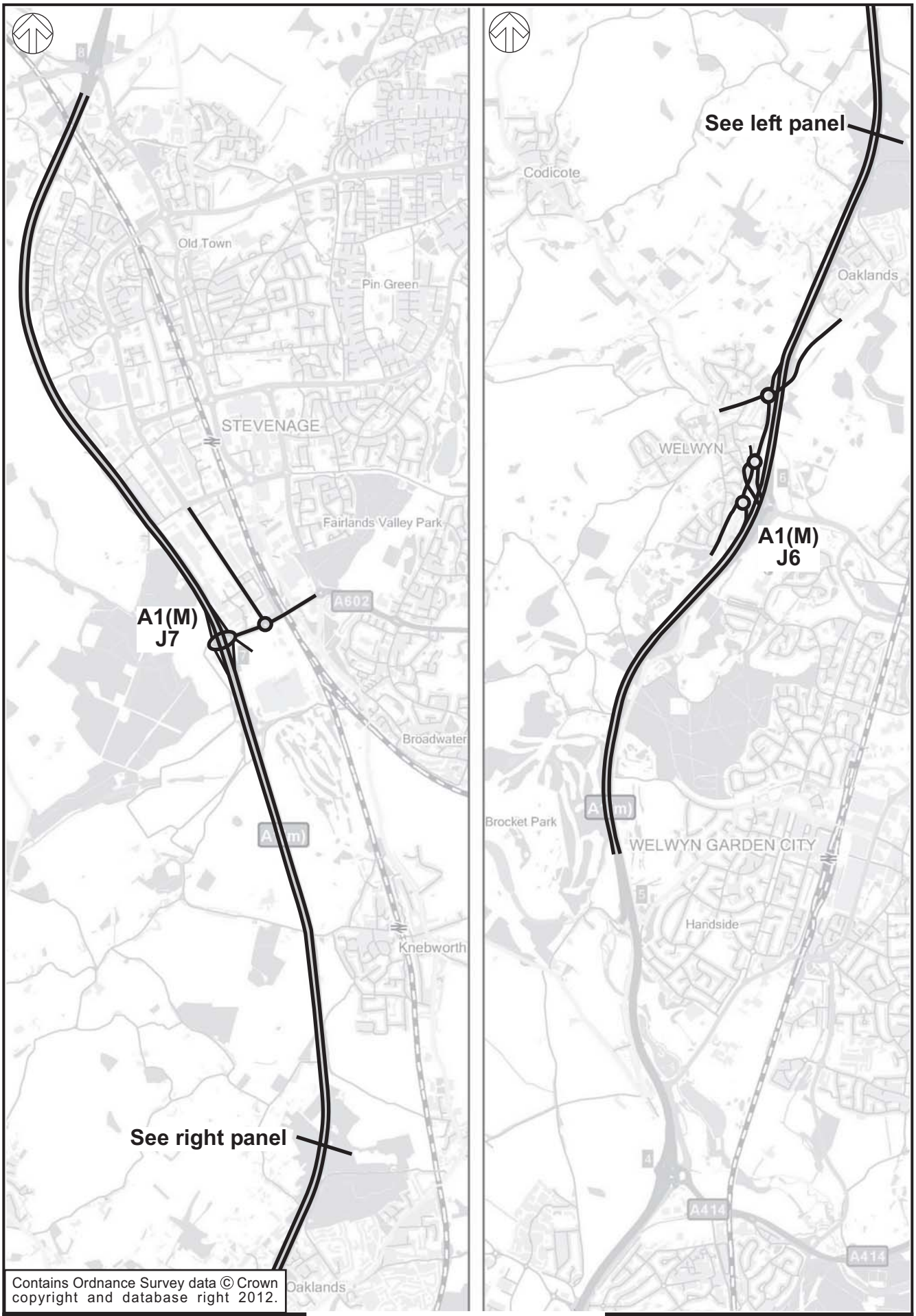
TITLE

ANPR CAMERA LOCATIONS

FIGURE No:

FIGURE 4

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 ANPR.FH11



WSP

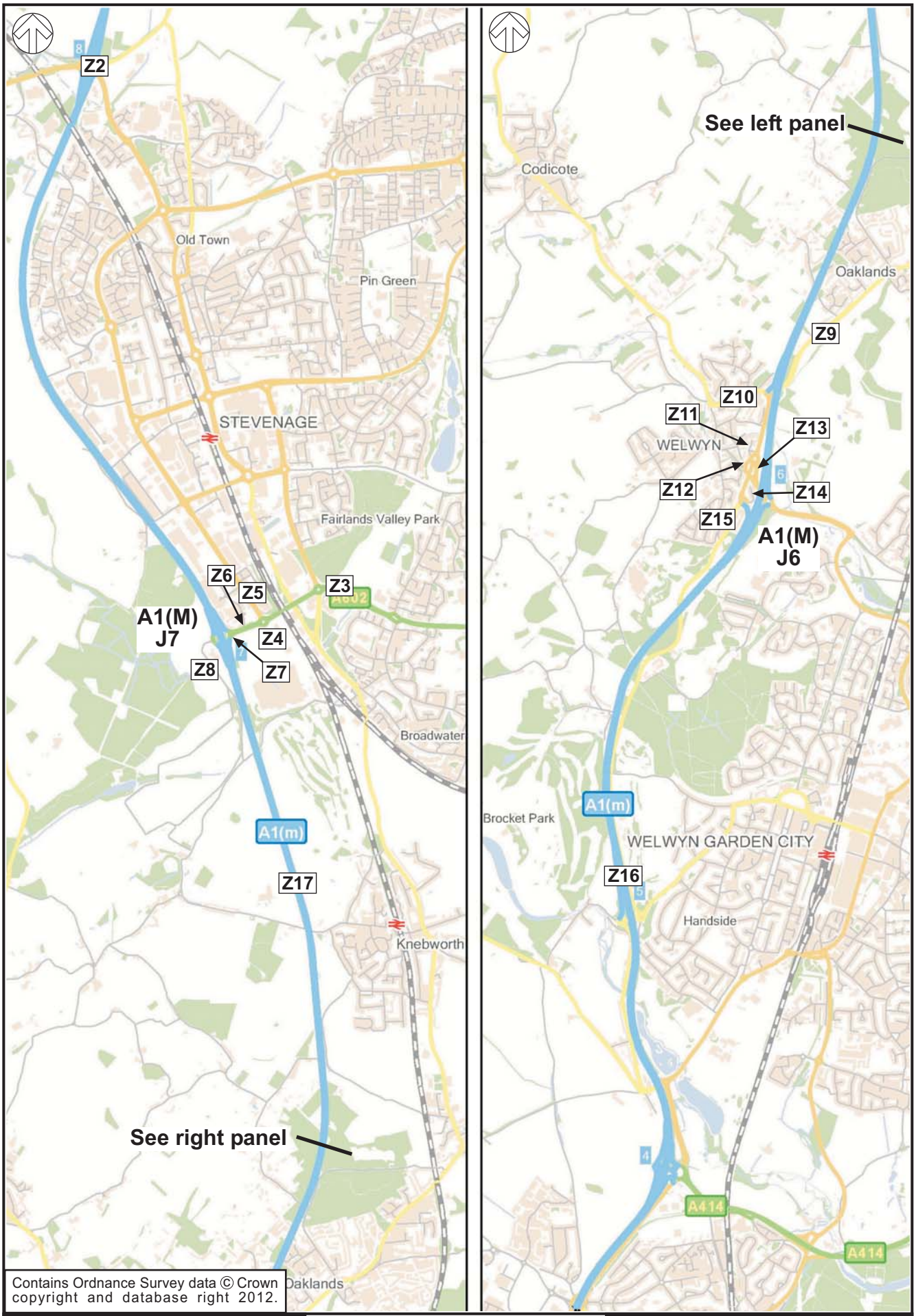
TITLE

MODEL NETWORK

FIGURE No:

FIGURE 5

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Model Network.FH11



WSP

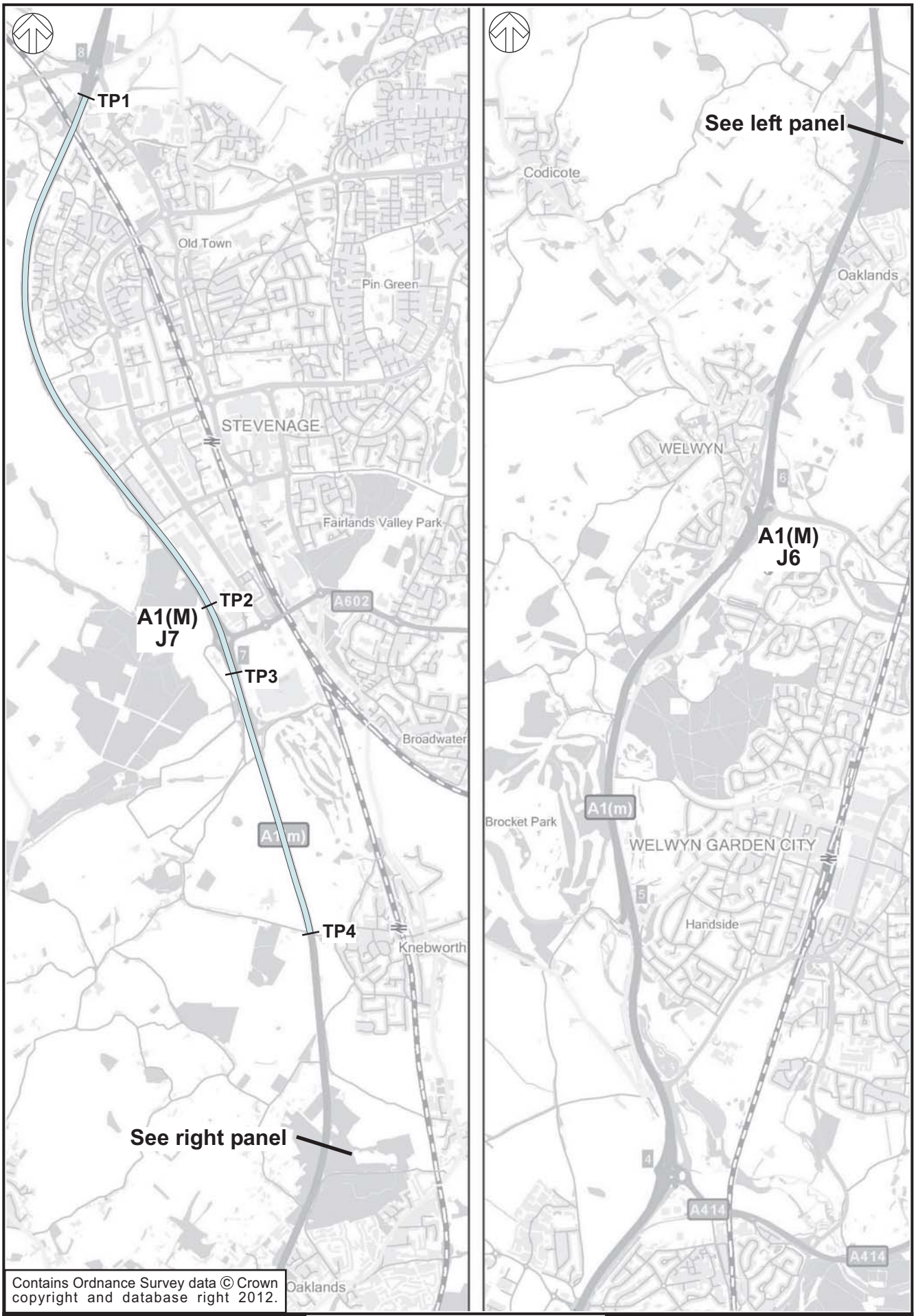
TITLE

ZONE PLAN

FIGURE No:

FIGURE 6

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Zone Plan.FH11



WSP

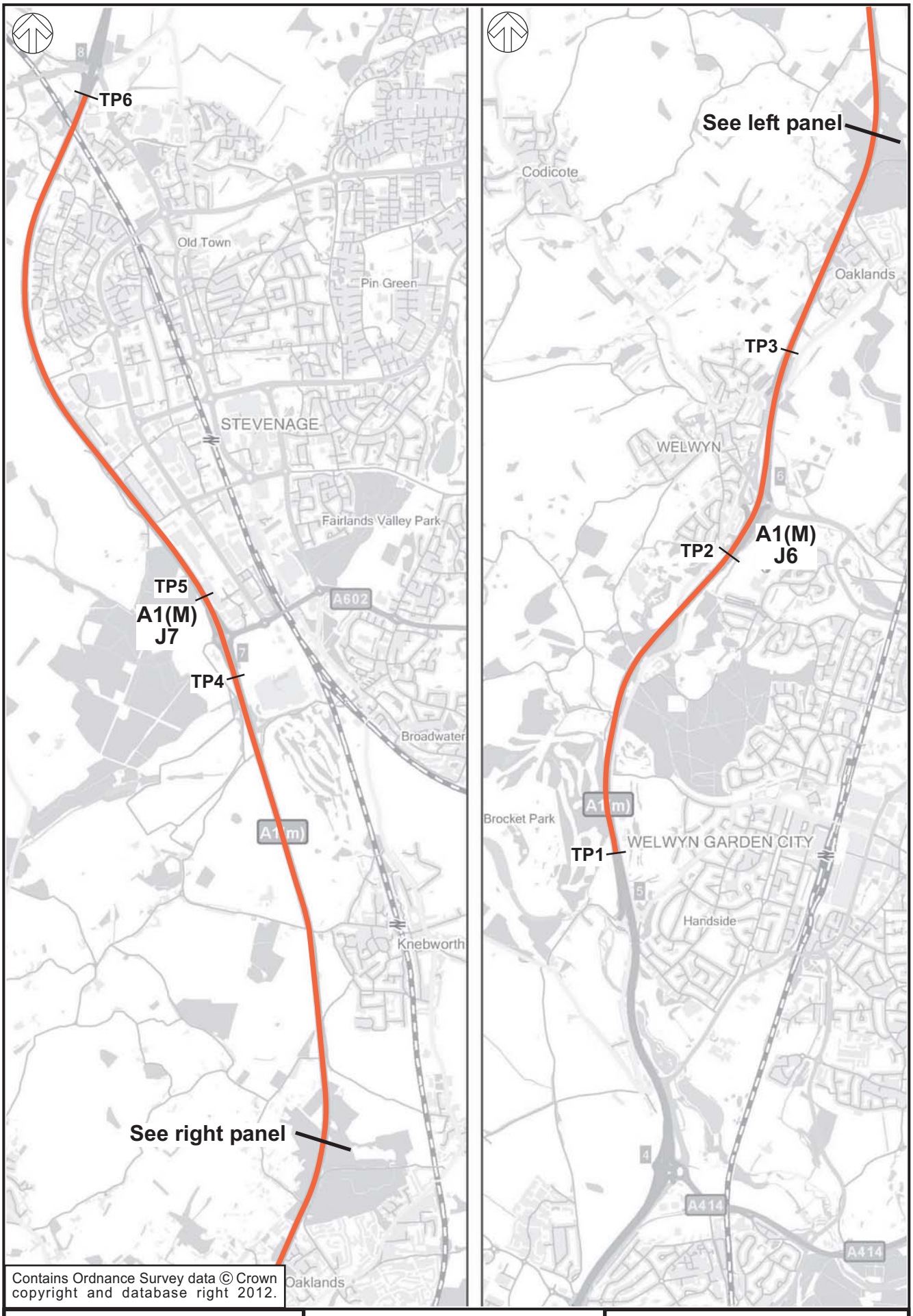
TITLE

JOURNEY TIME SPECIFICATION ROUTE 1

FIGURE No:

FIGURE 7

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 1.FH11



WSP

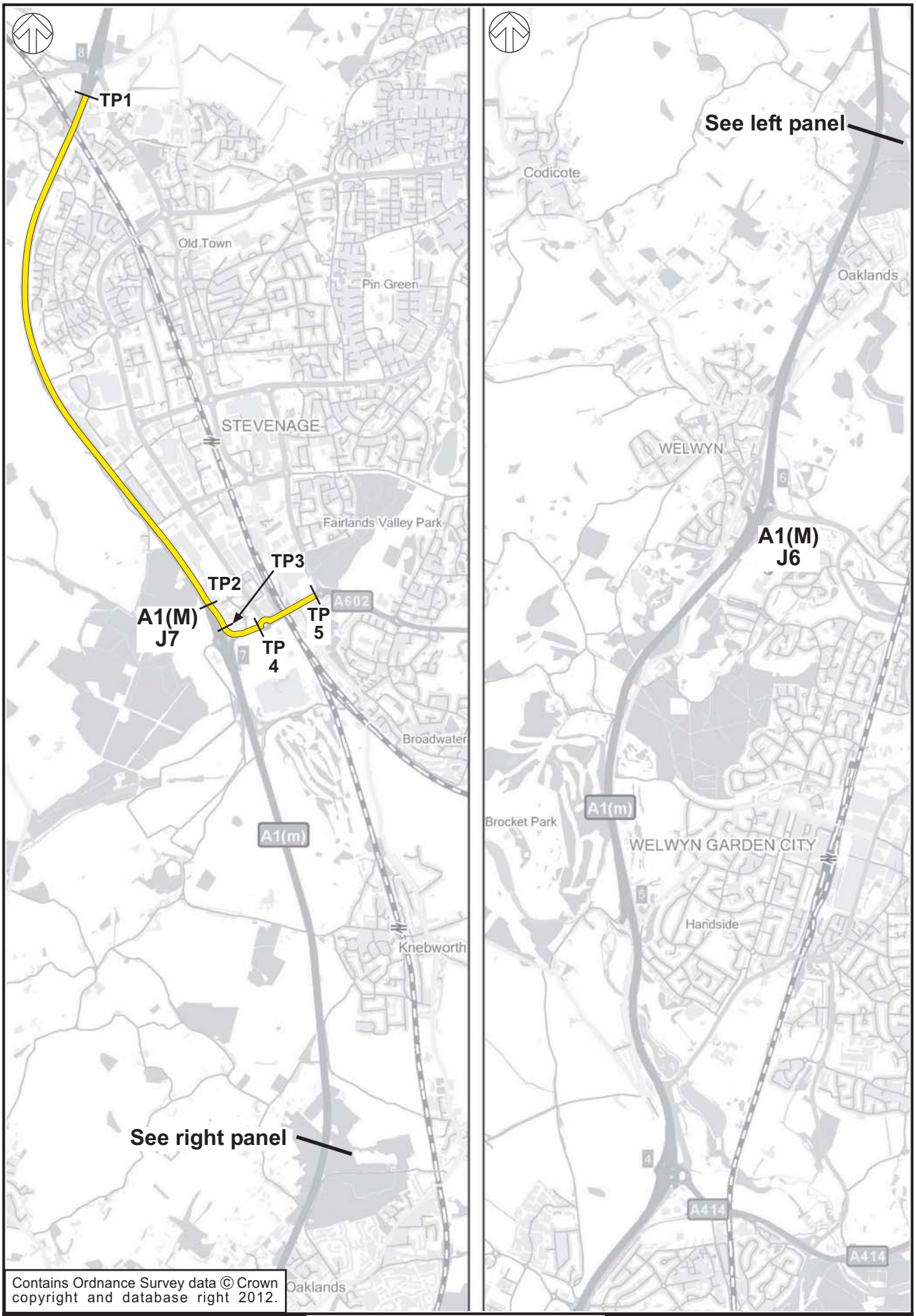
TITLE

JOURNEY TIME SPECIFICATION ROUTE 2

FIGURE No:

FIGURE 8

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 2.FH11



WSP

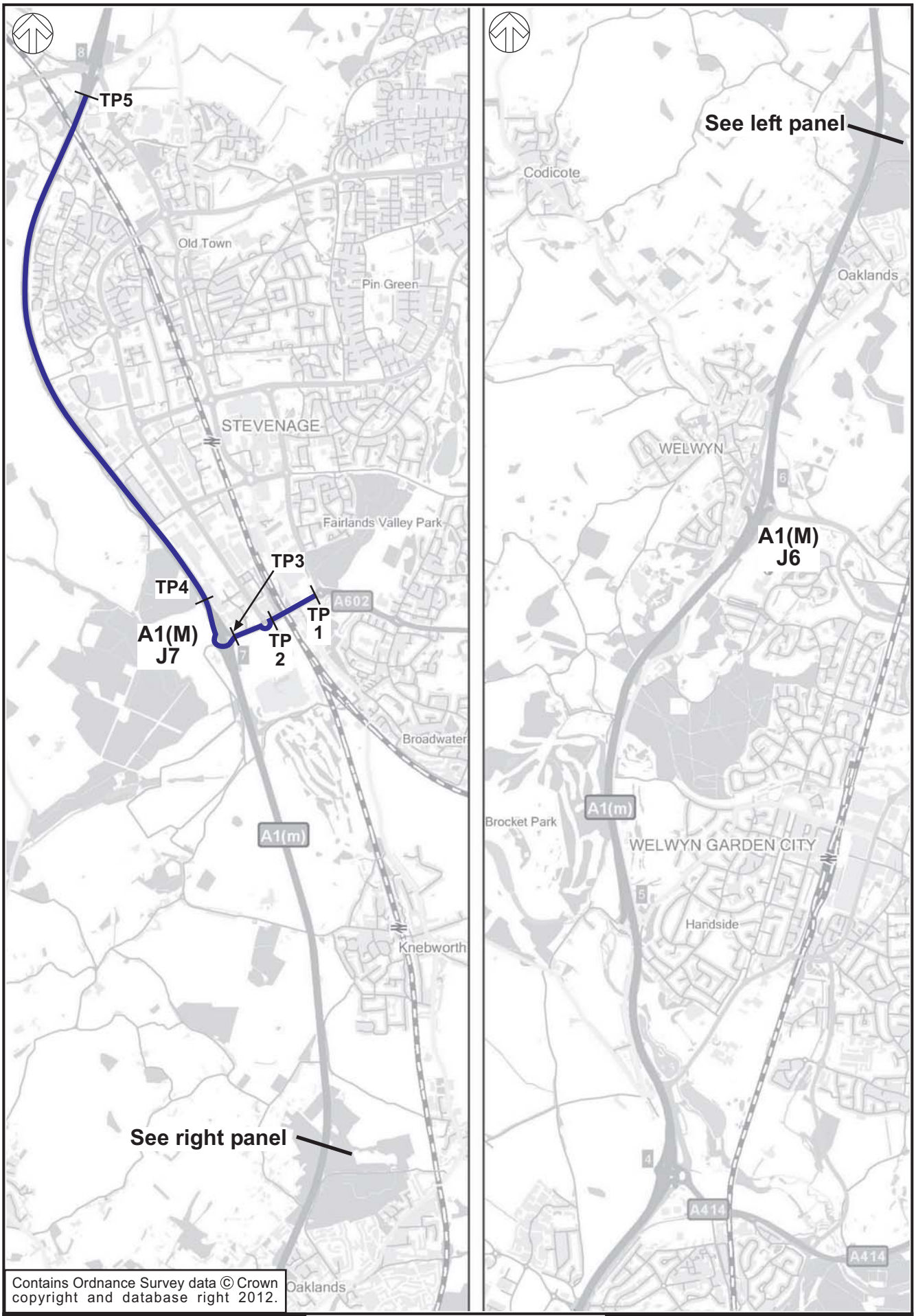
TITLE

JOURNEY TIME SPECIFICATION ROUTE 3

FIGURE No:

FIGURE 9

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 3.FH11



WSP

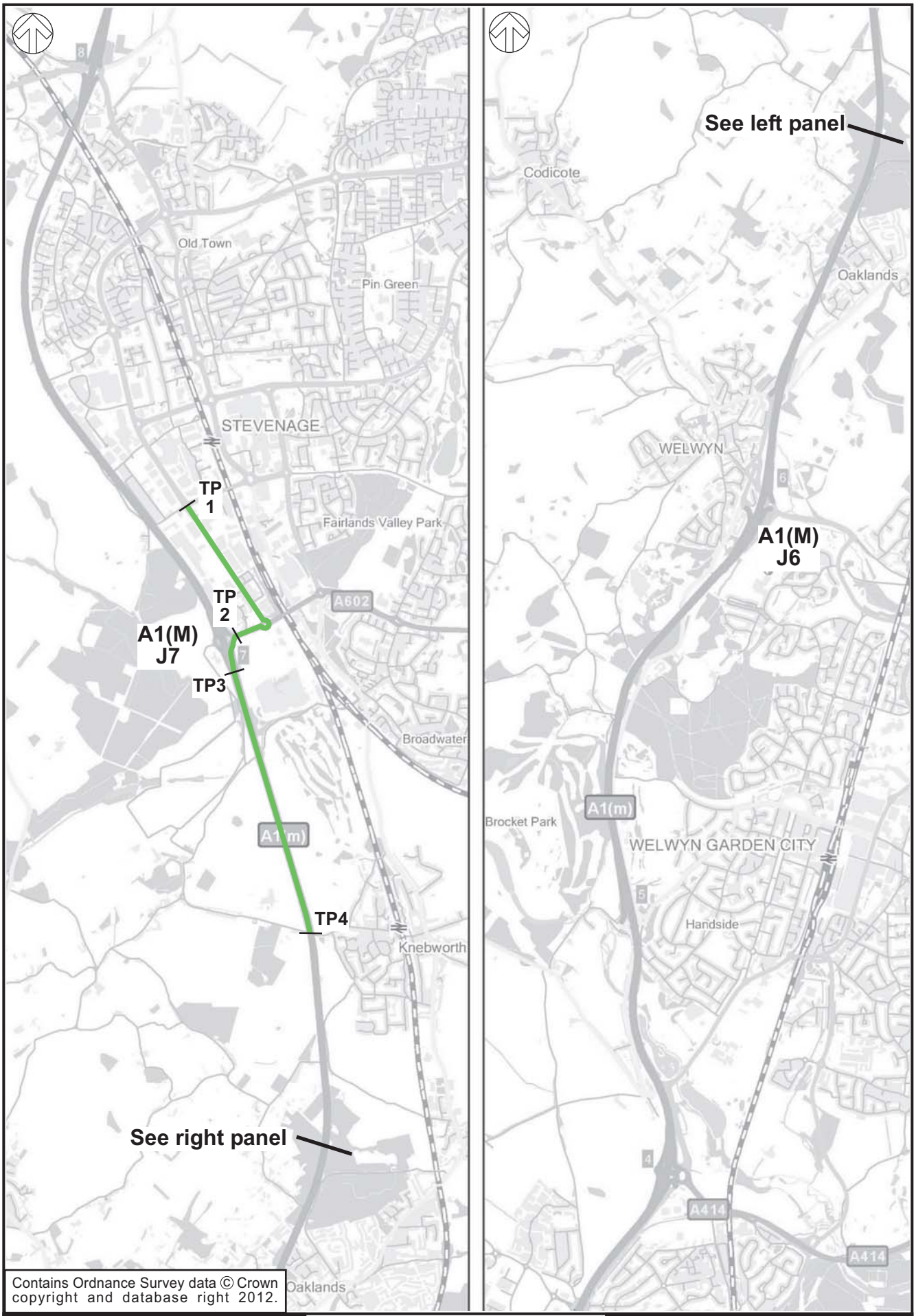
TITLE

JOURNEY TIME SPECIFICATION ROUTE 4

FIGURE No:

FIGURE 10

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 4.FH11



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TITLE

JOURNEY TIME SPECIFICATION ROUTE 5

FIGURE No:

FIGURE 11

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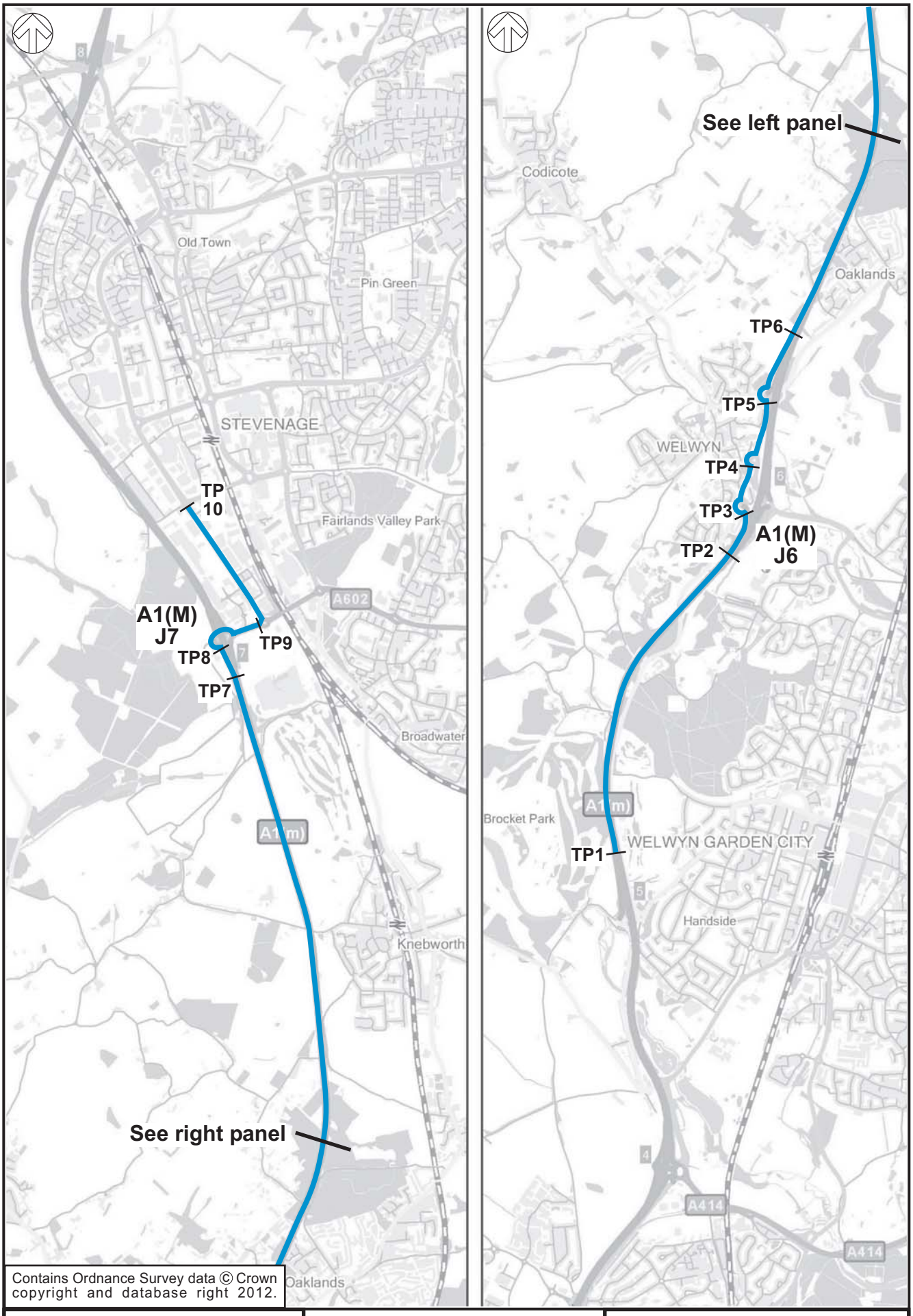


WSP

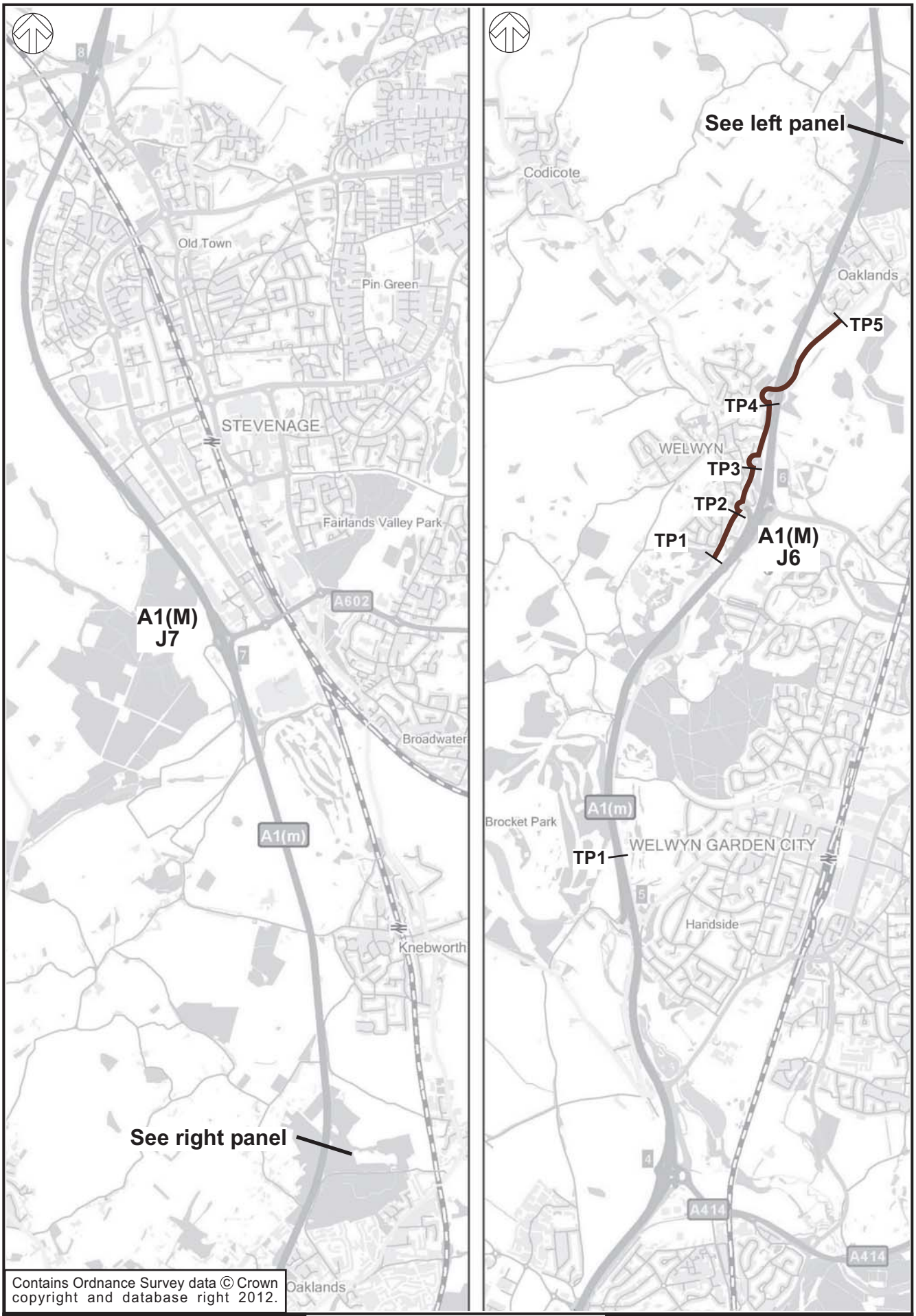
TITLE

JOURNEY TIME SPECIFICATION ROUTE 6

FIGURE No:

FIGURE 12

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 6.FH11



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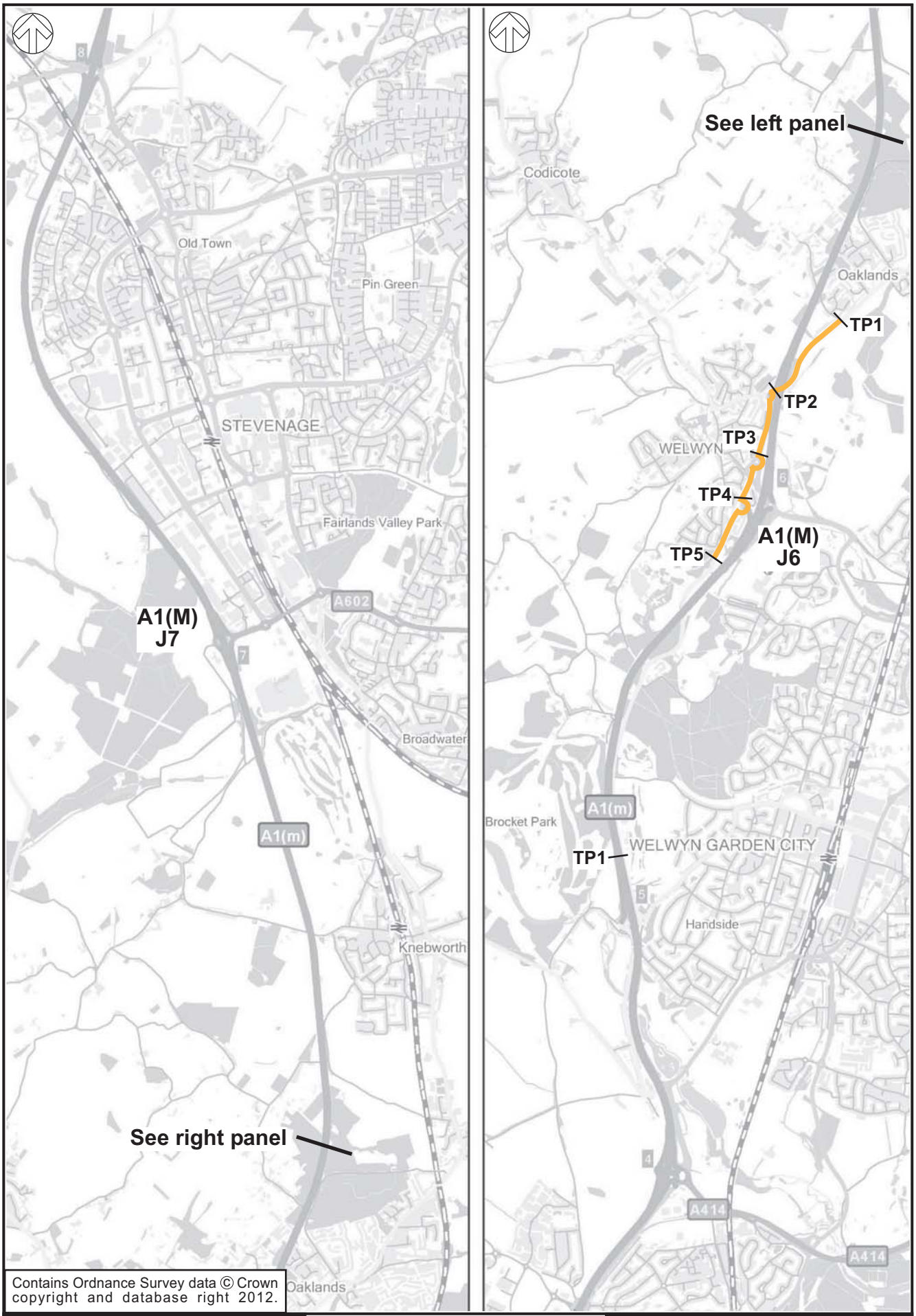
TITLE

JOURNEY TIME SPECIFICATION ROUTE 7

FIGURE No:

FIGURE 13

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 7.FH11



WSP

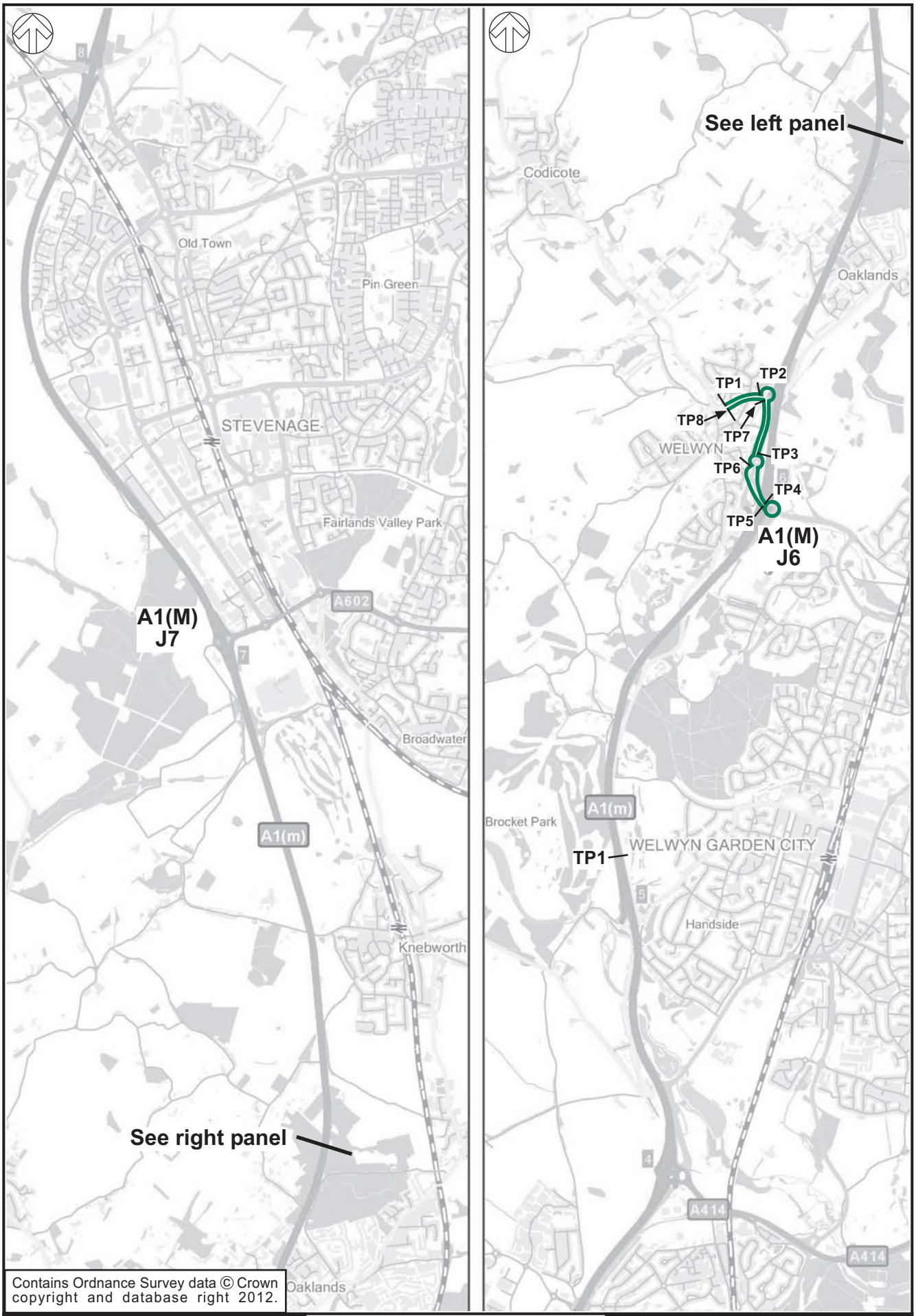
TITLE

JOURNEY TIME SPECIFICATION ROUTE 8

FIGURE No:

FIGURE 14

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 8.FH11



WSP

TITLE

JOURNEY TIME SPECIFICATION ROUTE 9

FIGURE No:

FIGURE 15

N:\HA Pinchpoint Modelling\Drgs\FH\A1(M) J6 & J7 Route 8.FH11

APPENDIX B

Turning Count Calibration Statistics

GEH Stats AM (1 Hour)

	Index		Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference	G.E.H
RBT	1	A1(m) Junction 7	NORTH	EAST	28:148	149:56	28:148:149:56	333	336	3	0.90%	0.16
	2		NORTH	East (for GSK)	28:148	166:194z	28:148:166:194z	2	2	0	0.00%	0.00
	3		NORTH	SOUTH	28:148	143:24	28:148:143:24	0	11	11	#DIV/0!	4.69
	4		NORTH	WEST	28:148	145:26	28:148:145:26	22	21	-1	-4.55%	0.22
	5		NORTH	NORTH	28:148	147:27	28:148:147:27	0	0	0	#DIV/0!	0.00
	6		EAST	East (for GSK)	55:142	166:194z	55:142:166:194z	0	0	0	#DIV/0!	0.00
	7		EAST	SOUTH	55:142	143:24	55:142:143:24	1681	1541	-140	-8.33%	3.49
	8		EAST	WEST	55:142	145:26	55:142:145:26	23	20	-3	-13.04%	0.65
	9		EAST	NORTH	55:142	147:27	55:142:147:27	481	433	-48	-9.98%	2.25
	10		EAST	EAST	55:142	149:56	55:142:149:56	0	0	0	#DIV/0!	0.00
	11		SOUTH	WEST	163:144	145:26	163:144:145:26	12	10	-2	-16.67%	0.60
	12		SOUTH	NORTH	163:144	147:27	163:144:147:27	2	0	-2	-100.00%	2.00
	13		SOUTH	EAST	163:144	149:56	163:144:149:56	1460	1342	-118	-8.08%	3.15
	14		SOUTH	East (for GSK)	163:144	166:194z	163:144:166:194z	10	8	-2	-20.00%	0.67
	15		SOUTH	SOUTH	163:144	143:24	163:144:143:24	4	0	-4	-100.00%	2.83
	16		WEST	NORTH	26:146	147:27	26:146:147:27	9	9	0	0.00%	0.00
	17		WEST	EAST	26:146	149:56	26:146:149:56	17	18	1	5.88%	0.24
	18		WEST	East (for GSK)	26:146	166:194z	26:146:166:194z	0	0	0	#DIV/0!	0.00
	19		WEST	SOUTH	26:146	143:24	26:146:143:24	10	10	0	0.00%	0.00
RBT	20	Broadhall Way / Gunnels Wood Road	NORTH	EAST	193:20	20:209y	193:20:20:209y	236	229	-7	-2.97%	0.46
	21		NORTH	SOUTH	212z:14g	167:16	212z:14g:167:16	206	199	-7	-3.40%	0.49
	22		NORTH	WEST	212z:14g	14d:17	212z:14g:14d:17	1522	1500	-22	-1.45%	0.57
	23		NORTH	NORTH	212z:14g	14f:19	212z:14g:14f:19	0	0	0	#DIV/0!	0.00
	24		EAST	SOUTH	29:214z	214z:16	29:214z:214z:16	173	112	-61	-35.26%	5.11
	25		EAST	WEST	213z:14b	14d:17	213z:14b:14d:17	651	491	-160	-24.58%	6.70
	26		EAST	NORTH	213z:14b	14f:19	213z:14b:14f:19	372	213	-159	-42.74%	9.30
	27		EAST	EAST	213z:14b	14a:13	213z:14b:14a:13	0	0	0	#DIV/0!	0.00
	28		SOUTH	WEST	171:17	17:172	171:17:17:172	12	10	-2	-16.67%	0.60
	29		SOUTH	NORTH	16:14c	14f:19	16:14c:14f:19	16	12	-4	-25.00%	1.07
	30		SOUTH	EAST	16:14c	14a:13	16:14c:14a:13	13	13	0	0.00%	0.00
	31		SOUTH	SOUTH	16:14c	167:16	16:14c:167:16	0	0	0	#DIV/0!	0.00
	32		WEST	NORTH	21:18	18:221	21:18:18:221	1093	995	-98	-8.97%	3.03
	33		WEST	EAST	220z:14e	14a:13	220z:14e:14a:13	495	496	1	0.20%	0.04
	34		WEST	SOUTH	220z:14e	167:16	220z:14e:167:16	194	178	-16	-8.25%	1.17
	35		WEST	WEST	220z:14e	14d:17	220z:14e:14d:17	0	0	0	#DIV/0!	0.00
RBT	36	Welwyn by-pass road (Hertford Road A1000)	EAST	SOUTH	96:87c	87d:89	96:87c:87d:89	1156	1143	-13	-1.12%	0.38
	37		EAST	WEST	96:87c	87f:91	96:87c:87f:91	207	199	-8	-3.86%	0.56
	38		EAST	NORTH	96:87c	87a:186	96:87c:87a:186	63	64	1	1.59%	0.13
	39		EAST	EAST	96:87c	87b:97	96:87c:87b:97	0	0	0	#DIV/0!	0.00
	40		SOUTH	WEST	183:87e	87f:91	183:87e:87f:91	142	136	-6	-4.23%	0.51
	41		SOUTH	NORTH	183:87e	87a:186	183:87e:87a:186	580	587	7	1.21%	0.29
	42		SOUTH	EAST	183:87e	87b:97	183:87e:87b:97	292	285	-7	-2.40%	0.41
	43		SOUTH	SOUTH	183:87e	87d:89	183:87e:87d:89	0	0	0	#DIV/0!	0.00
	44		WEST	NORTH	92:87g	87a:186	92:87g:87a:186	88	83	-5	-5.68%	0.54
	45		WEST	EAST	92:87g	87b:97	92:87g:87b:97	111	100	-11	-9.91%	1.07
	46		WEST	SOUTH	92:87g	87d:89	92:87g:87d:89	700	652	-48	-6.86%	1.85
	47		WEST	WEST	92:87g	87f:91	92:87g:87f:91	2	0	-2	-100.00%	2.00
RBT	48	Welwyn by-pass road (Hertford Road A1000)	NORTH	SOUTH (Hertford Road for A1(m))	74:67b	67c:78	74:67b:67c:78	1314	1320	6	0.46%	0.17
	49		NORTH	SOUTH (A1000)	74:67b	67d:73	74:67b:67d:73	469	469	0	0.00%	0.00
	50		NORTH	WEST	74:67b	67g:70	74:67b:67g:70	3	1	-2	-66.67%	1.41
	51		NORTH	NORTH	74:67b	67a:75	74:67b:67a:75	0	0	0	#DIV/0!	0.00
	52		SOUTH (A1000)	WEST	72:67e	67g:70	72:67e:67g:70	1	1	0	0.00%	0.00
	53		SOUTH (A1000)	NORTH	72:67e	67a:75	72:67e:67a:75	320	305	-15	-4.69%	0.85
	54		SOUTH (A1000)	SOUTH (Hertford Road for A1(m))	72:67e	67c:78	72:67e:67c:78	331	296	-35	-10.57%	1.98
	55		SOUTH (A1000)	SOUTH (A1000)	72:67e	67d:73	72:67e:67d:73	0	0	0	#DIV/0!	0.00
	56		SOUTH (Hertford Road for A1(m))	WEST	68:67f	67g:70	68:67f:67g:70	2	2	0	0.00%	0.00
	57		SOUTH (Hertford Road for A1(m))	NORTH	68:67f	67a:75	68:67f:67a:75	710	704	-6	-0.85%	0.23
	58		SOUTH (Hertford Road for A1(m))	SOUTH (Hertford Road for A1(m))	68:67f	67c:78	68:67f:67c:78	252	247	-5	-1.98%	0.32
	59		SOUTH (Hertford Road for A1(m))	SOUTH (A1000)	68:67f	67d:73	68:67f:67d:73	70	62	-8	-11.43%	0.98
	60		WEST	NORTH	70:67g	67a:75	70:67g:67a:75	6	5	-1	-16.67%	0.43
	61		WEST	SOUTH (Hertford Road for A1(m))	70:67g	67c:78	70:67g:67c:78	6	6	0	0.00%	0.00
	62		WEST	SOUTH (A1000)	70:67g	67d:73	70:67g:67d:73	5	5	0	0.00%	0.00
RBT	63	Welwyn by-pass road (B197)	NORTH	EAST	39:34zf	168:40	39:34zf:168:40	0	0	0	#DIV/0!	0.00
	64		NORTH	WEST	39:34zf	34zc:37	39:34zf:34zc:37	539	535	-4	-0.74%	0.17
	65		NORTH	NORTH	39:34zf	34ze:38	39:34zf:34ze:38	0	0	0	#DIV/0!	0.00
	66		EAST	WEST	40:34za	34zc:37	40:34za:34zc:37	7	7	0	0.00%	0.00
	67		EAST	NORTH	40:34za	34ze:38	40:34za:34ze:38	1	1	0	0.00%	0.00
	68		EAST	EAST	40:34za	168:40	40:34za:168:40	0	0	0	#DIV/0!	0.00
	69		SOUTH	WEST	35:34zb	34zc:37	35:34zb:34zc:37	38	37	-1	-2.63%	0.16
	70		SOUTH	NORTH	35:34zb	34ze:38	35:34zb:34ze:38	412	367	-45	-10.92%	2.28
	71		SOUTH	EAST	35:34zb	168:40	35:34zb:168:40	1	1	0	0.00%	0.00
	72		WEST	NORTH	185:34zd	34ze:38	185:34zd:34ze:38	240	235	-5	-2.08%	0.32
	73		WEST	EAST	185:34zd	168:40	185:34zd:168:40	0	0	0	#DIV/0!	0.00
	74		WEST	WEST	185:34zd	34zc:37	185:34zd:34zc:37	0	0	0	#DIV/0!	0.00

	GEH < 5		GEH < 6		GEH < 7		GEg < 8	
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	71	95.9%	72	97.3%	73	98.6%	73	98.6%

Flow < 700			700 < Flow < 2700			Flow > 2700 Pass		
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
66	64	97.0%	8	8	100.0%	0	0	#DIV/0!

GEH Stats PM (1 Hour)

	Index	ction	Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference
	1		NORTH	EAST	28:148	149:56	28:148:149:56	680	663	-17	-2.50%
	2		NORTH	East (for GSK)	28:148	166:194z	28:148:166:194z	0	0	0	#DIV/0!
	3		NORTH	SOUTH	28:148	143:24	28:148:143:24	0	0	0	#DIV/0!
	4		NORTH	WEST	28:148	145:26	28:148:145:26	7	8	1	14.29%
	5		NORTH	NORTH	28:148	147:27	28:148:147:27	0	0	0	#DIV/0!
	6		EAST	East (for GSK)	55:142	166:194z	55:142:166:194z	2	0	-2	-100.00%
	7		EAST	SOUTH	55:142	143:24	55:142:143:24	1261	1272	11	0.87%
	8		EAST	WEST	55:142	145:26	55:142:145:26	41	41	0	0.00%
	9		EAST	NORTH	55:142	147:27	55:142:147:27	964	954	-10	-1.04%
RBT	10	A1(m) Junction 7	EAST	EAST	55:142	149:56	55:142:149:56	0	0	0	#DIV/0!
	11		SOUTH	WEST	163:144	145:26	163:144:145:26	10	11	1	10.00%
	12		SOUTH	NORTH	163:144	147:27	163:144:147:27	2	0	-2	-100.00%
	13		SOUTH	EAST	163:144	149:56	163:144:149:56	1244	1224	-20	-1.61%
	14		SOUTH	East (for GSK)	163:144	166:194z	163:144:166:194z	0	0	0	#DIV/0!
	15		SOUTH	SOUTH	163:144	143:24	163:144:143:24	2	0	-2	-100.00%
	16		WEST	NORTH	26:146	147:27	26:146:147:27	10	10	0	0.00%
	17		WEST	EAST	26:146	149:56	26:146:149:56	14	13	-1	-7.14%
	18		WEST	East (for GSK)	26:146	166:194z	26:146:166:194z	0	0	0	#DIV/0!
	19		WEST	SOUTH	26:146	143:24	26:146:143:24	7	7	0	0.00%
	20		NORTH	EAST	193:20	20:209y	193:20:20:209y	461	460	-1	-0.22%
	21		NORTH	SOUTH	212z:14g	167:16	212z:14g:167:16	9	4	-5	-55.56%
	22		NORTH	WEST	212z:14g	14d:17	212z:14g:14d:17	1176	1183	7	0.60%
	23		NORTH	NORTH	212z:14g	14f:19	212z:14g:14f:19	0	0	0	#DIV/0!
	24		EAST	SOUTH	29:214z	214z:16	29:214z:214z:16	8	8	0	0.00%
	25		EAST	WEST	213z:14b	14d:17	213z:14b:14d:17	789	788	-1	-0.13%
	26		EAST	NORTH	213z:14b	14f:19	213z:14b:14f:19	253	249	-4	-1.58%
RBT	27	Broadhall Way / Gunnels Wood Road	EAST	EAST	213z:14b	14a:13	213z:14b:14a:13	0	0	0	#DIV/0!
	28		SOUTH	WEST	171:17	17:172	171:17:17:172	300	296	-4	-1.33%
	29		SOUTH	NORTH	16:14c	14f:19	16:14c:14f:19	116	115	-1	-0.86%
	30		SOUTH	EAST	16:14c	14a:13	16:14c:14a:13	113	111	-2	-1.77%
	31		SOUTH	SOUTH	16:14c	167:16	16:14c:167:16	0	0	0	#DIV/0!
	32		WEST	NORTH	21:18	18:221	21:18:18:221	762	713	-49	-6.43%
	33		WEST	EAST	220z:14e	14a:13	220z:14e:14a:13	1176	1155	-21	-1.79%
	34		WEST	SOUTH	220z:14e	167:16	220z:14e:167:16	8	8	0	0.00%
	35		WEST	WEST	220z:14e	14d:17	220z:14e:14d:17	0	0	0	#DIV/0!
	36		EAST	SOUTH	96:87c	87d:89	96:87c:87d:89	378	376	-2	-0.53%
	37		EAST	WEST	96:87c	87f:91	96:87c:87f:91	102	102	0	0.00%
	38		EAST	NORTH	96:87c	87a:186	96:87c:87a:186	19	16	-3	-15.79%
	39		EAST	EAST	96:87c	87b:97	96:87c:87b:97	0	0	0	#DIV/0!
	40		SOUTH	WEST	183:87e	87f:91	183:87e:87f:91	380	372	-8	-2.11%
RBT	41	Welwyn by-pass road (Hertford Road A1000)	SOUTH	NORTH	183:87e	87a:186	183:87e:87a:186	1187	1144	-43	-3.62%
	42		SOUTH	EAST	183:87e	87b:97	183:87e:87b:97	1184	1145	-39	-3.29%
	43		SOUTH	SOUTH	183:87e	87d:89	183:87e:87d:89	0	0	0	#DIV/0!
	44		WEST	NORTH	92:87g	87a:186	92:87g:87a:186	40	40	0	0.00%
	45		WEST	EAST	92:87g	87b:97	92:87g:87b:97	138	134	-4	-2.90%
	46		WEST	SOUTH	92:87g	87d:89	92:87g:87d:89	200	188	-12	-6.00%
	47		WEST	WEST	92:87g	87f:91	92:87g:87f:91	0	0	0	#DIV/0!
	48		NORTH	SOUTH (Hertford Road for A1(m))	74:67b	67c:78	74:67b:67c:78	392	381	-11	-2.81%
	49		NORTH	SOUTH (A1000)	74:67b	67d:73	74:67b:67d:73	179	176	-3	-1.68%
	50		NORTH	WEST	74:67b	67g:70	74:67b:67g:70	3	3	0	0.00%
	51		NORTH	NORTH	74:67b	67a:75	74:67b:67a:75	0	0	0	#DIV/0!
	52		SOUTH (A1000)	WEST	72:67e	67g:70	72:67e:67g:70	1	1	0	0.00%
	53		SOUTH (A1000)	NORTH	72:67e	67a:75	72:67e:67a:75	1468	1377	-91	-6.20%
	54		SOUTH (A1000)	SOUTH (Hertford Road for A1(m))	72:67e	67c:78	72:67e:67c:78	144	147	3	2.08%
RBT	55	Welwyn by-pass road (Hertford Road A1000)	SOUTH (A1000)	SOUTH (A1000)	72:67e	67d:73	72:67e:67d:73	0	0	0	#DIV/0!
	56		SOUTH (Hertford Road for A1(m))	WEST	68:67f	67g:70	68:67f:67g:70	8	8	0	0.00%
	57		SOUTH (Hertford Road for A1(m))	NORTH	68:67f	67a:75	68:67f:67a:75	1336	1332	-4	-0.30%
	58		SOUTH (Hertford Road for A1(m))	SOUTH (Hertford Road for A1(m))	68:67f	67c:78	68:67f:67c:78	154	153	-1	-0.65%
	59		SOUTH (Hertford Road for A1(m))	SOUTH (A1000)	68:67f	67d:73	68:67f:67d:73	62	61	-1	-1.61%
	60		WEST	NORTH	70:67g	67a:75	70:67g:67a:75	5	3	-2	-40.00%
	61		WEST	SOUTH (Hertford Road for A1(m))	70:67g	67c:78	70:67g:67c:78	2	2	0	0.00%
	62		WEST	SOUTH (A1000)	70:67g	67d:73	70:67g:67d:73	1	1	0	0.00%
	63		NORTH	EAST	39:34zf	168:40	39:34zf:168:40	1	1	0	0.00%
	64		NORTH	WEST	39:34zf	34zc:37	39:34zf:34zc:37	239	237	-2	-0.84%
	65		NORTH	NORTH	39:34zf	34ze:38	39:34zf:34ze:38	0	0	0	#DIV/0!
	66		EAST	WEST	40:34za	34zc:37	40:34za:34zc:37	3	3	0	0.00%
	67		EAST	NORTH	40:34za	34ze:38	40:34za:34ze:38	1	0	-1	-100.00%
RBT	68	Welwyn by-pass road (B197)	EAST	EAST	40:34za	168:40	40:34za:168:40	0	0	0	#DIV/0!
	69		SOUTH	WEST	35:34zb	34zc:37	35:34zb:34zc:37	211	211	0	0.00%
	70		SOUTH	NORTH	35:34zb	34ze:38	35:34zb:34ze:38	1027	973	-54	-5.26%
	71		SOUTH	EAST	35:34zb	168:40	35:34zb:168:40	0	0	0	#DIV/0!
	72		WEST	NORTH	185:34zd	34ze:38	185:34zd:34ze:38	581	576	-5	-0.86%
	73		WEST	EAST	185:34zd	168:40	185:34zd:168:40	6	6	0	0.00%
	74		WEST	WEST	185:34zd	34zc:37	185:34zd:34zc:37	0	0	0	#DIV/0!

	GEH < 5		GEH < 6		GEH < 7		GEi < 8	
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	74	100.0%	74	100.0%	74	100.0%	74	100.0%

Flow < 700			700 < Flow < 2700			Flow > 2700 Pass		
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
62	62	100.0%	12	12	100.0%	0	0	#DIV/0!

GEH Stats AM (3 Hour)

	Index		Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference	G.E.H
	1		NORTH	EAST	28:148	149:56	28:148:149:56	1344	1308	-36	-2.68%	0.99
	2		NORTH	East (for GSK)	28:148	166:194z	28:148:166:194z	4	4	0	0.00%	0.00
	3		NORTH	SOUTH	28:148	143:24	28:148:143:24	0	13	13	#DIV/0!	5.10
	4		NORTH	WEST	28:148	145:26	28:148:145:26	62	61	-1	-1.61%	0.13
	5		NORTH	NORTH	28:148	147:27	28:148:147:27	0	0	0	#DIV/0!	0.00
	6		EAST	East (for GSK)	55:142	166:194z	55:142:166:194z	2	2	0	0.00%	0.00
	7		EAST	SOUTH	55:142	143:24	55:142:143:24	4263	4136	-127	-2.98%	1.96
	8		EAST	WEST	55:142	145:26	55:142:145:26	80	70	-10	-12.50%	1.15
	9		EAST	NORTH	55:142	147:27	55:142:147:27	1415	1281	-134	-9.47%	3.65
RBT	10	A1(m) Junction 7	EAST	EAST	55:142	149:56	55:142:149:56	0	0	0	#DIV/0!	0.00
	11		SOUTH	WEST	163:144	145:26	163:144:145:26	27	25	-2	-7.41%	0.39
	12		SOUTH	NORTH	163:144	147:27	163:144:147:27	3	0	-3	-100.00%	2.45
	13		SOUTH	EAST	163:144	149:56	163:144:149:56	3497	3457	-40	-1.14%	0.68
	14		SOUTH	East (for GSK)	163:144	166:194z	163:144:166:194z	23	21	-2	-8.70%	0.43
	15		SOUTH	SOUTH	163:144	143:24	163:144:143:24	12	0	-12	-100.00%	4.90
	16		WEST	NORTH	26:146	147:27	26:146:147:27	20	20	0	0.00%	0.00
	17		WEST	EAST	26:146	149:56	26:146:149:56	49	50	1	2.04%	0.14
	18		WEST	East (for GSK)	26:146	166:194z	26:146:166:194z	1	1	0	0.00%	0.00
	19		WEST	SOUTH	26:146	143:24	26:146:143:24	29	29	0	0.00%	0.00
	20		NORTH	EAST	193:20	20:209y	193:20:20:209y	582	567	-15	-2.58%	0.63
	21		NORTH	SOUTH	212z:14g	167:16	212z:14g:167:16	374	361	-13	-3.48%	0.68
	22		NORTH	WEST	212z:14g	14d:17	212z:14g:14d:17	3495	3469	-26	-0.74%	0.44
	23		NORTH	NORTH	212z:14g	14f:19	212z:14g:14f:19	0	0	0	#DIV/0!	0.00
	24		EAST	SOUTH	29:214z	214z:16	29:214z:214z:16	381	304	-77	-20.21%	4.16
	25		EAST	WEST	213z:14b	14d:17	213z:14b:14d:17	2237	2004	-233	-10.42%	5.06
	26		EAST	NORTH	213z:14b	14f:19	213z:14b:14f:19	1081	866	-215	-19.89%	6.89
RBT	27	Broadhall Way / Gunnels Wood Road	EAST	EAST	213z:14b	14a:13	213z:14b:14a:13	0	0	0	#DIV/0!	0.00
	28		SOUTH	WEST	171:17	17:172	171:17:17:172	31	29	-2	-6.45%	0.37
	29		SOUTH	NORTH	16:14c	14f:19	16:14c:14f:19	38	31	-7	-18.42%	1.19
	30		SOUTH	EAST	16:14c	14a:13	16:14c:14a:13	24	23	-1	-4.17%	0.21
	31		SOUTH	SOUTH	16:14c	167:16	16:14c:167:16	0	0	0	#DIV/0!	0.00
	32		WEST	NORTH	21:18	18:221	21:18:18:221	2710	2646	-64	-2.36%	1.24
	33		WEST	EAST	220z:14e	14a:13	220z:14e:14a:13	1639	1602	-37	-2.26%	0.92
	34		WEST	SOUTH	220z:14e	167:16	220z:14e:167:16	508	493	-15	-2.95%	0.67
	35		WEST	WEST	220z:14e	14d:17	220z:14e:14d:17	0	0	0	#DIV/0!	0.00
	36		EAST	SOUTH	96:87c	87d:89	96:87c:87d:89	2631	2577	-54	-2.05%	1.06
	37		EAST	WEST	96:87c	87f:91	96:87c:87f:91	432	424	-8	-1.85%	0.39
	38		EAST	NORTH	96:87c	87a:186	96:87c:87a:186	124	145	21	16.94%	1.81
	39		EAST	EAST	96:87c	87b:97	96:87c:87b:97	0	0	0	#DIV/0!	0.00
	40		SOUTH	WEST	183:87e	87f:91	183:87e:87f:91	363	361	-2	-0.55%	0.11
RBT	41	Welwyn by-pass road (Hertford Road A1000)	SOUTH	NORTH	183:87e	87a:186	183:87e:87a:186	1260	1292	32	2.54%	0.90
	42		SOUTH	EAST	183:87e	87b:97	183:87e:87b:97	791	775	-16	-2.02%	0.57
	43		SOUTH	SOUTH	183:87e	87d:89	183:87e:87d:89	0	0	0	#DIV/0!	0.00
	44		WEST	NORTH	92:87g	87a:186	92:87g:87a:186	218	251	33	15.14%	2.15
	45		WEST	EAST	92:87g	87b:97	92:87g:87b:97	264	259	-5	-1.89%	0.31
	46		WEST	SOUTH	92:87g	87d:89	92:87g:87d:89	1656	1584	-72	-4.35%	1.79
	47		WEST	WEST	92:87g	87f:91	92:87g:87f:91	4	0	-4	-100.00%	2.83
	48		NORTH	SOUTH (Hertford Road for A1(m))	74:67b	67c:78	74:67b:67c:78	3009	3104	95	3.16%	1.72
	49		NORTH	SOUTH (A1000)	74:67b	67d:73	74:67b:67d:73	1027	1047	20	1.95%	0.62
	50		NORTH	WEST	74:67b	67g:70	74:67b:67g:70	4	2	-2	-50.00%	1.15
	51		NORTH	NORTH	74:67b	67a:75	74:67b:67a:75	0	0	0	#DIV/0!	0.00
	52		SOUTH (A1000)	WEST	72:67e	67g:70	72:67e:67g:70	4	3	-1	-25.00%	0.53
	53		SOUTH (A1000)	NORTH	72:67e	67a:75	72:67e:67a:75	791	775	-16	-2.02%	0.57
RBT	54	Welwyn by-pass road (Hertford Road A1000)	SOUTH (A1000)	SOUTH (Hertford Road for A1(m))	72:67e	67c:78	72:67e:67c:78	703	607	-96	-13.66%	3.75
	55		SOUTH (A1000)	SOUTH (A1000)	72:67e	67d:73	72:67e:67d:73	0	0	0	#DIV/0!	0.00
	56		SOUTH (Hertford Road for A1(m))	WEST	68:67f	67g:70	68:67f:67g:70	4	4	0	0.00%	0.00
	57		SOUTH (Hertford Road for A1(m))	NORTH	68:67f	67a:75	68:67f:67a:75	1646	1648	2	0.12%	0.05
	58		SOUTH (Hertford Road for A1(m))	SOUTH (Hertford Road for A1(m))	68:67f	67c:78	68:67f:67c:78	629	620	-9	-1.43%	0.36
	59		SOUTH (Hertford Road for A1(m))	SOUTH (A1000)	68:67f	67d:73	68:67f:67d:73	211	187	-24	-11.37%	1.70
	60		WEST	NORTH	70:67g	67a:75	70:67g:67a:75	11	11	0	0.00%	0.00
	61		WEST	SOUTH (Hertford Road for A1(m))	70:67g	67c:78	70:67g:67c:78	12	12	0	0.00%	0.00
	62		WEST	SOUTH (A1000)	70:67g	67d:73	70:67g:67d:73	8	7	-1	-12.50%	0.37
	63		NORTH	EAST	39:34zf	168:40	39:34zf:168:40	1	0	-1	-100.00%	1.41
	64		NORTH	WEST	39:34zf	34zc:37	39:34zf:34zc:37	1241	1239	-2	-0.16%	0.06
	65		NORTH	NORTH	39:34zf	34ze:38	39:34zf:34ze:38	0	0	0	#DIV/0!	0.00
	66		EAST	WEST	40:34za	34zc:37	40:34za:34zc:37	21	21	0	0.00%	0.00
	67		EAST	NORTH	40:34za	34ze:38	40:34za:34ze:38	4	2	-2	-50.00%	1.15
RBT	68	Welwyn by-pass road (B197)	EAST	EAST	40:34za	168:40	40:34za:168:40	0	0	0	#DIV/0!	0.00
	69		SOUTH	WEST	35:34zb	34zc:37	35:34zb:34zc:37	83	81	-2	-2.41%	0.22
	70		SOUTH	NORTH	35:34zb	34ze:38	35:34zb:34ze:38	920	813	-107	-11.63%	3.63
	71		SOUTH	EAST	35:34zb	168:40	35:34zb:168:40	3	3	0	0.00%	0.00
	72		WEST	NORTH	185:34zd	34ze:38	185:34zd:34ze:38	585	575	-10	-1.71%	0.42
	73		WEST	EAST	185:34zd	168:40	185:34zd:168:40	2	2	0	0.00%	0.00
	74		WEST	WEST	185:34zd	34zc:37	185:34zd:34zc:37	0	0	0	#DIV/0!	0.00

	GEH < 5		GEH < 6		GEH < 7		GEH < 8	
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	71	95.9%	73	98.6%	74	100.0%	74	100.0%

Flow < 700			700 < Flow < 2700			Flow > 2700 Pass		
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
54	54	100.0%	15	14	93.3%	5	5	100.0%

GEH Stats PM (3 Hour)

	Index	ction	Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference	G.E.H
	1		NORTH	EAST	28:148	149:56	28:148:149:56	1697	1668	-29	-1.71%	0.71
	2		NORTH	East (for GSK)	28:148	166:194z	28:148:166:194z	0	0	0	#DIV/0!	0.00
	3		NORTH	SOUTH	28:148	143:24	28:148:143:24	0	0	0	#DIV/0!	0.00
	4		NORTH	WEST	28:148	145:26	28:148:145:26	25	25	0	0.00%	0.00
	5		NORTH	NORTH	28:148	147:27	28:148:147:27	0	0	0	#DIV/0!	0.00
	6		EAST	East (for GSK)	55:142	166:194z	55:142:166:194z	4	2	-2	-50.00%	1.15
	7		EAST	SOUTH	55:142	143:24	55:142:143:24	2914	2943	29	1.00%	0.54
	8		EAST	WEST	55:142	145:26	55:142:145:26	102	101	-1	-0.98%	0.10
	9		EAST	NORTH	55:142	147:27	55:142:147:27	2280	2263	-17	-0.75%	0.36
RBT	10	A1(m) Junction 7	EAST	EAST	55:142	149:56	55:142:149:56	0	0	0	#DIV/0!	0.00
	11		SOUTH	WEST	163:144	145:26	163:144:145:26	41	40	-1	-2.44%	0.16
	12		SOUTH	NORTH	163:144	147:27	163:144:147:27	4	0	-4	-100.00%	2.83
	13		SOUTH	EAST	163:144	149:56	163:144:149:56	3436	3555	119	3.46%	2.01
	14		SOUTH	East (for GSK)	163:144	166:194z	163:144:166:194z	1	1	0	0.00%	0.00
	15		SOUTH	SOUTH	163:144	143:24	163:144:143:24	15	0	-15	-100.00%	5.48
	16		WEST	NORTH	26:146	147:27	26:146:147:27	47	47	0	0.00%	0.00
	17		WEST	EAST	26:146	149:56	26:146:149:56	38	38	0	0.00%	0.00
	18		WEST	East (for GSK)	26:146	166:194z	26:146:166:194z	0	0	0	#DIV/0!	0.00
	19		WEST	SOUTH	26:146	143:24	26:146:143:24	19	19	0	0.00%	0.00
	20		NORTH	EAST	193:20	20:209y	193:20:20:209y	958	964	6	0.63%	0.19
	21		NORTH	SOUTH	212z:14g	167:16	212z:14g:167:16	19	9	-10	-52.63%	2.67
	22		NORTH	WEST	212z:14g	14d:17	212z:14g:14d:17	2645	2657	12	0.45%	0.23
	23		NORTH	NORTH	212z:14g	14f:19	212z:14g:14f:19	0	0	0	#DIV/0!	0.00
	24		EAST	SOUTH	29:214z	214z:16	29:214z:214z:16	19	19	0	0.00%	0.00
	25		EAST	WEST	213z:14b	14d:17	213z:14b:14d:17	2101	2093	-8	-0.38%	0.17
	26		EAST	NORTH	213z:14b	14f:19	213z:14b:14f:19	662	654	-8	-1.21%	0.31
RBT	27	Broadhall Way / Gunnels Wood Road	EAST	EAST	213z:14b	14a:13	213z:14b:14a:13	0	0	0	#DIV/0!	0.00
	28		SOUTH	WEST	171:17	17:172	171:17:17:172	555	553	-2	-0.36%	0.08
	29		SOUTH	NORTH	16:14c	14f:19	16:14c:14f:19	252	249	-3	-1.19%	0.19
	30		SOUTH	EAST	16:14c	14a:13	16:14c:14a:13	212	208	-4	-1.89%	0.28
	31		SOUTH	SOUTH	16:14c	167:16	16:14c:167:16	0	0	0	#DIV/0!	0.00
	32		WEST	NORTH	21:18	18:221	21:18:18:221	1962	1985	23	1.17%	0.52
	33		WEST	EAST	220z:14e	14a:13	220z:14e:14a:13	3191	3221	30	0.94%	0.53
	34		WEST	SOUTH	220z:14e	167:16	220z:14e:167:16	21	21	0	0.00%	0.00
	35		WEST	WEST	220z:14e	14d:17	220z:14e:14d:17	0	0	0	#DIV/0!	0.00
	36		EAST	SOUTH	96:87c	87d:89	96:87c:87d:89	1095	1092	-3	-0.27%	0.09
	37		EAST	WEST	96:87c	87f:91	96:87c:87f:91	279	278	-1	-0.36%	0.06
	38		EAST	NORTH	96:87c	87a:186	96:87c:87a:186	61	54	-7	-11.48%	0.92
	39		EAST	EAST	96:87c	87b:97	96:87c:87b:97	0	0	0	#DIV/0!	0.00
	40		SOUTH	WEST	183:87e	87f:91	183:87e:87f:91	921	921	0	0.00%	0.00
RBT	41	Welwyn by-pass road (Hertford Road A1000)	SOUTH	NORTH	183:87e	87a:186	183:87e:87a:186	2433	2605	172	7.07%	3.43
	42		SOUTH	EAST	183:87e	87b:97	183:87e:87b:97	2730	2740	10	0.37%	0.19
	43		SOUTH	SOUTH	183:87e	87d:89	183:87e:87d:89	0	0	0	#DIV/0!	0.00
	44		WEST	NORTH	92:87g	87a:186	92:87g:87a:186	129	124	-5	-3.88%	0.44
	45		WEST	EAST	92:87g	87b:97	92:87g:87b:97	382	379	-3	-0.79%	0.15
	46		WEST	SOUTH	92:87g	87d:89	92:87g:87d:89	602	594	-8	-1.33%	0.33
	47		WEST	WEST	92:87g	87f:91	92:87g:87f:91	2	0	-2	-100.00%	2.00
	48		NORTH	SOUTH (Hertford Road for A1(m))	74:67b	67c:78	74:67b:67c:78	1183	1167	-16	-1.35%	0.47
	49		NORTH	SOUTH (A1000)	74:67b	67d:73	74:67b:67d:73	510	511	1	0.20%	0.04
	50		NORTH	WEST	74:67b	67g:70	74:67b:67g:70	9	9	0	0.00%	0.00
	51		NORTH	NORTH	74:67b	67a:75	74:67b:67a:75	0	0	0	#DIV/0!	0.00
	52		SOUTH (A1000)	WEST	72:67e	67g:70	72:67e:67g:70	3	4	1	33.33%	0.53
	53		SOUTH (A1000)	NORTH	72:67e	67a:75	72:67e:67a:75	3029	3088	59	1.95%	1.07
RBT	54	Welwyn by-pass road (Hertford Road A1000)	SOUTH (A1000)	SOUTH (Hertford Road for A1(m))	72:67e	67c:78	72:67e:67c:78	414	428	14	3.38%	0.68
	55		SOUTH (A1000)	SOUTH (A1000)	72:67e	67d:73	72:67e:67d:73	0	0	0	#DIV/0!	0.00
	56		SOUTH (Hertford Road for A1(m))	WEST	68:67f	67g:70	68:67f:67g:70	25	25	0	0.00%	0.00
	57		SOUTH (Hertford Road for A1(m))	NORTH	68:67f	67a:75	68:67f:67a:75	3171	3163	-8	-0.25%	0.14
	58		SOUTH (Hertford Road for A1(m))	SOUTH (Hertford Road for A1(m))	68:67f	67c:78	68:67f:67c:78	368	368	0	0.00%	0.00
	59		SOUTH (Hertford Road for A1(m))	SOUTH (A1000)	68:67f	67d:73	68:67f:67d:73	179	184	5	2.79%	0.37
	60		WEST	NORTH	70:67g	67a:75	70:67g:67a:75	10	7	-3	-30.00%	1.03
	61		WEST	SOUTH (Hertford Road for A1(m))	70:67g	67c:78	70:67g:67c:78	9	9	0	0.00%	0.00
	62		WEST	SOUTH (A1000)	70:67g	67d:73	70:67g:67d:73	5	5	0	0.00%	0.00
	63		NORTH	EAST	39:34zf	168:40	39:34zf:168:40	6	4	-2	-33.33%	0.89
	64		NORTH	WEST	39:34zf	34zc:37	39:34zf:34zc:37	690	697	7	1.01%	0.27
	65		NORTH	NORTH	39:34zf	34ze:38	39:34zf:34ze:38	0	0	0	#DIV/0!	0.00
	66		EAST	WEST	40:34za	34zc:37	40:34za:34zc:37	14	14	0	0.00%	0.00
	67		EAST	NORTH	40:34za	34ze:38	40:34za:34ze:38	3	1	-2	-66.67%	1.41
RBT	68	Welwyn by-pass road (B197)	EAST	EAST	40:34za	168:40	40:34za:168:40	0	0	0	#DIV/0!	0.00
	69		SOUTH	WEST	35:34zb	34zc:37	35:34zb:34zc:37	344	346	2	0.58%	0.11
	70		SOUTH	NORTH	35:34zb	34ze:38	35:34zb:34ze:38	2125	2199	74	3.48%	1.59
	71		SOUTH	EAST	35:34zb	168:40	35:34zb:168:40	1	1	0	0.00%	0.00
	72		WEST	NORTH	185:34zd	34ze:38	185:34zd:34ze:38	1313	1317	4	0.30%	0.11
	73		WEST	EAST	185:34zd	168:40	185:34zd:168:40	16	16	0	0.00%	0.00
	74		WEST	WEST	185:34zd	34zc:37	185:34zd:34zc:37	0	0	0	#DIV/0!	0.00

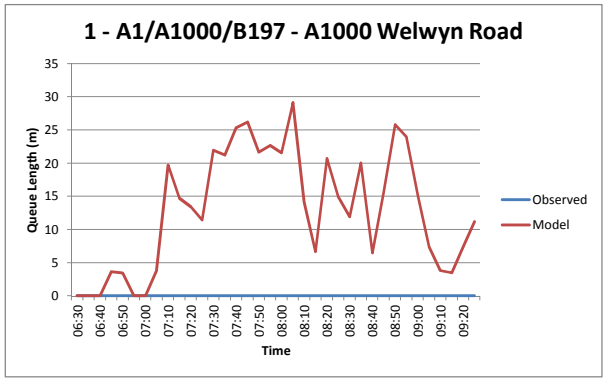
	GEH < 5		GEH < 6		GEH < 7		GEi < 8	
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	73	98.6%	74	100.0%	74	100.0%	74	100.0%

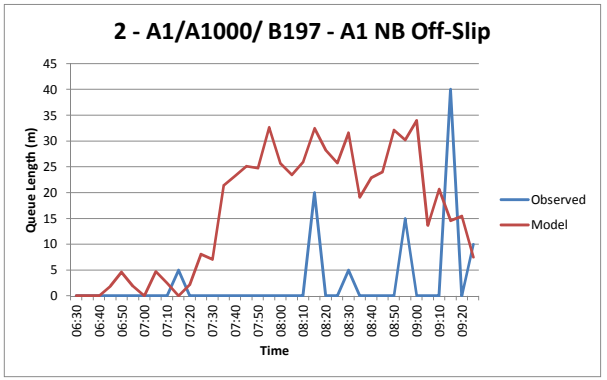
Flow < 700			700 < Flow < 2700			Flow > 2700 Pass		
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
56	56	100.0%	12	12	100.0%	6	6	100.0%

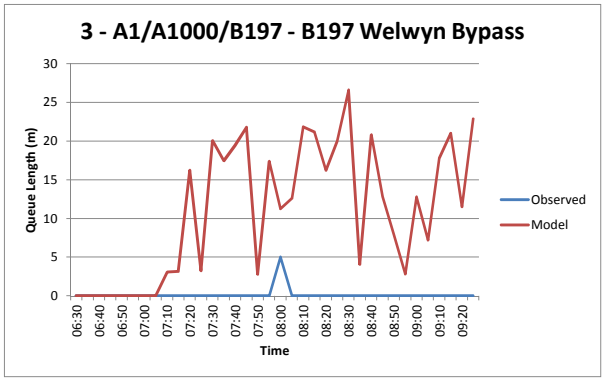
APPENDIX C

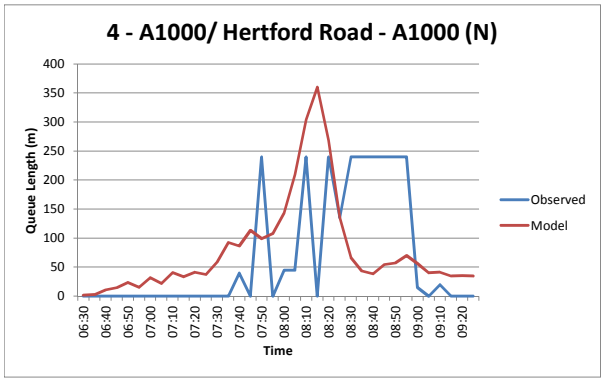
Queue Length Calibration Statistics

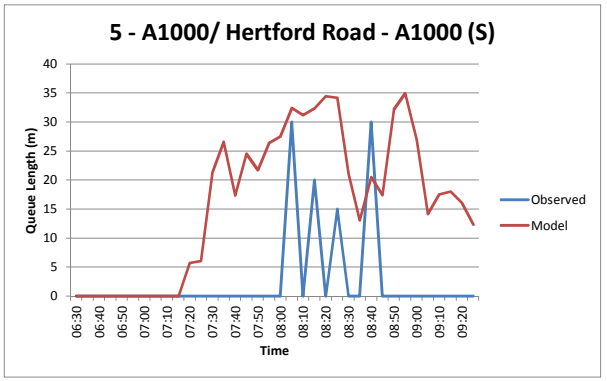
Queue Graphs - 06:30-09:30

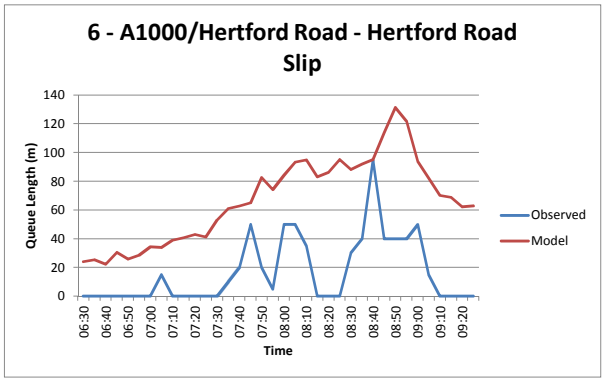


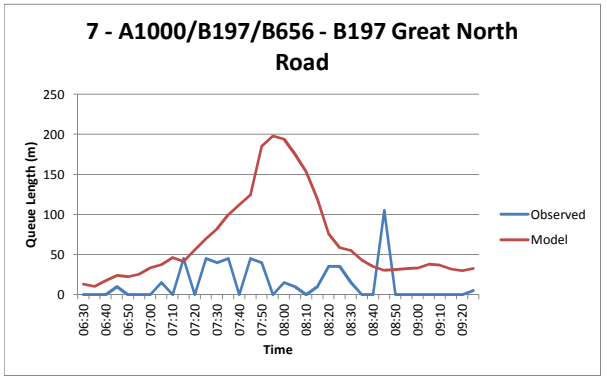


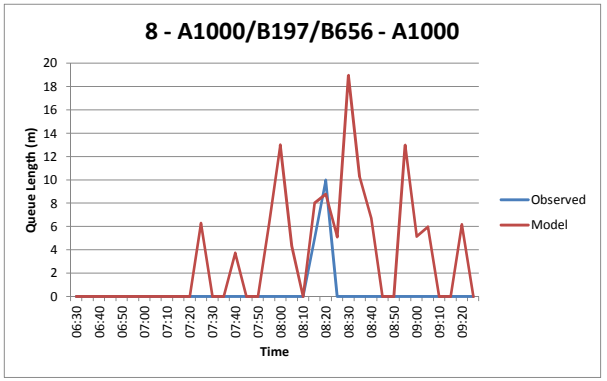


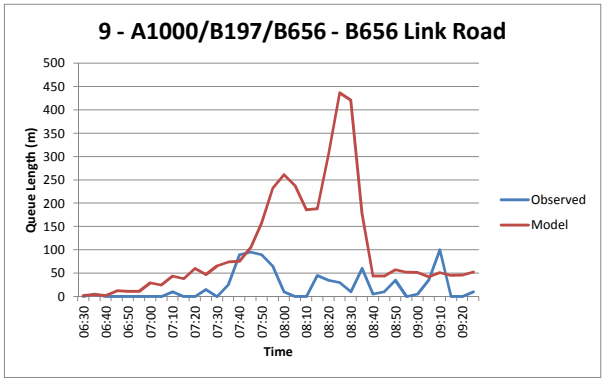




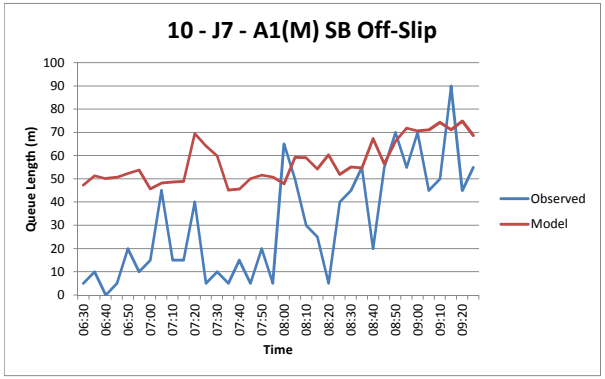


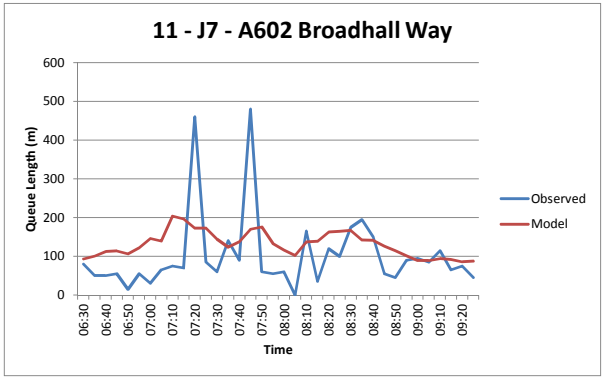


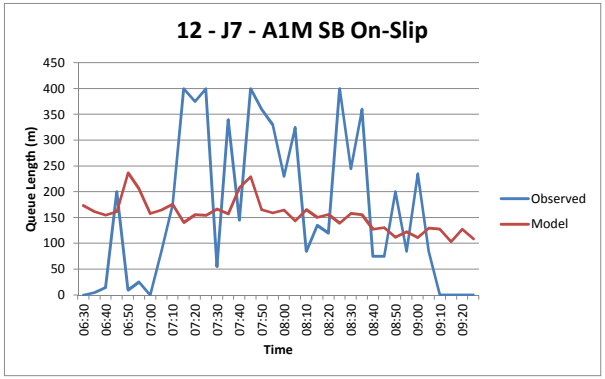


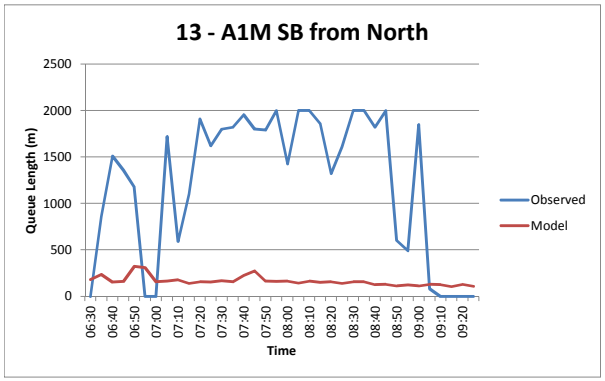


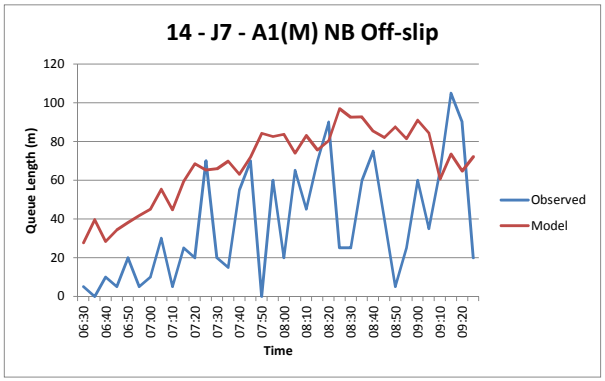
Queue Graphs - 06:30-09:30

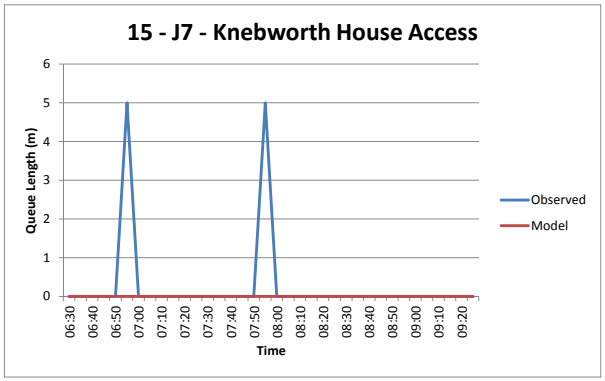


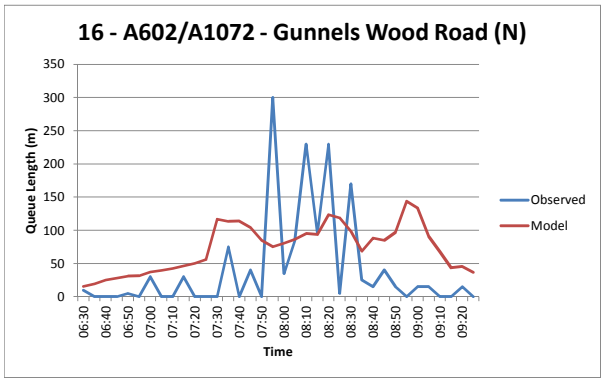


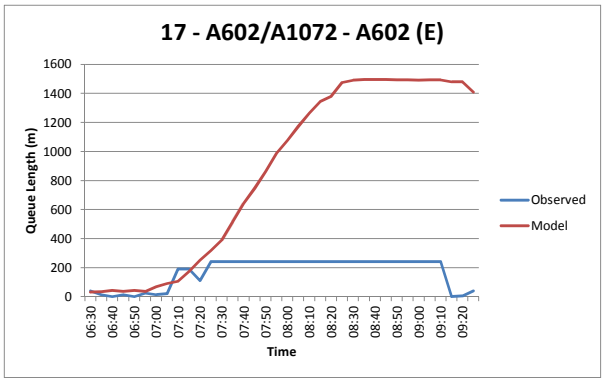


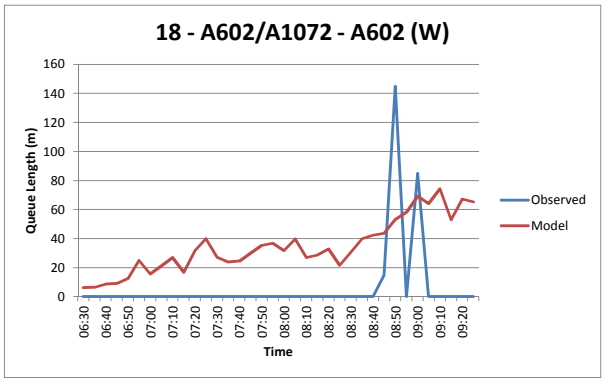




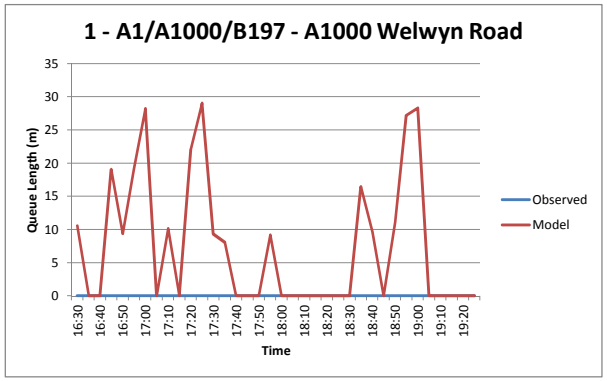


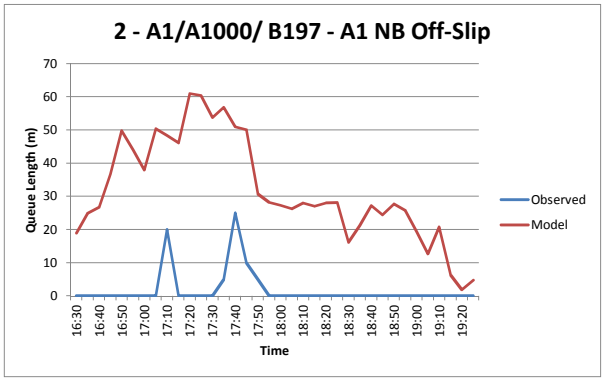


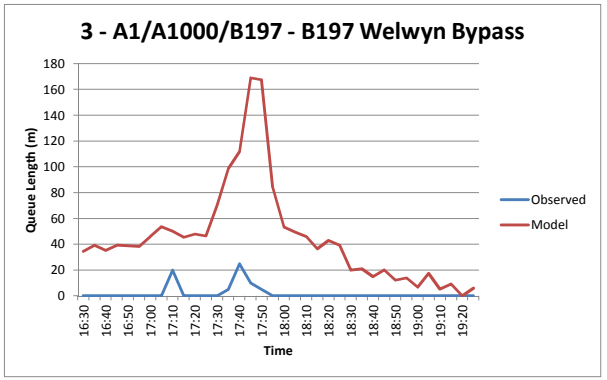


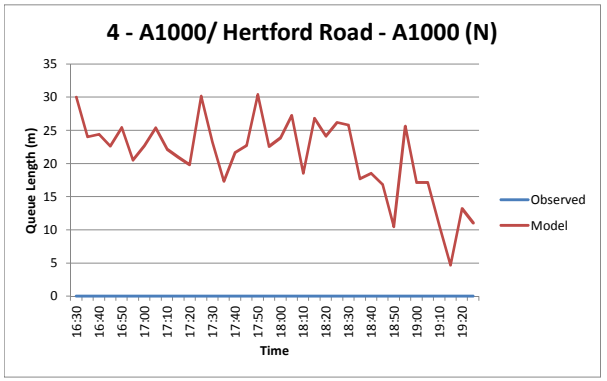


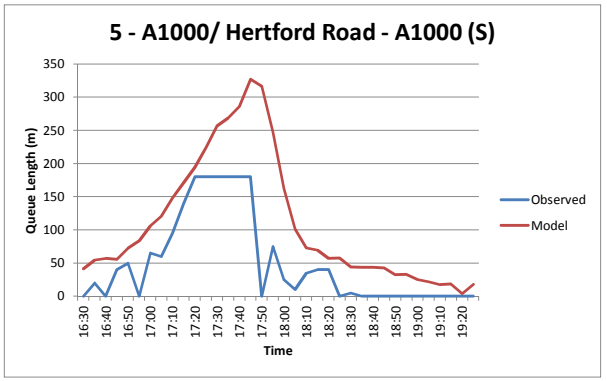
Queue Graphs - 16:30-19:30

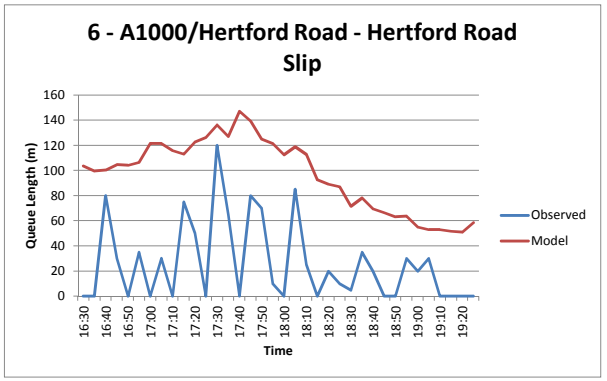


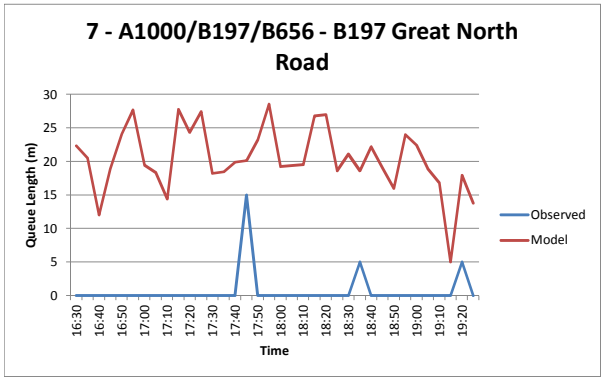


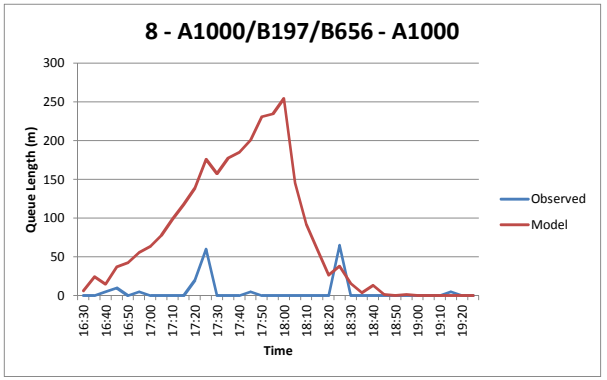


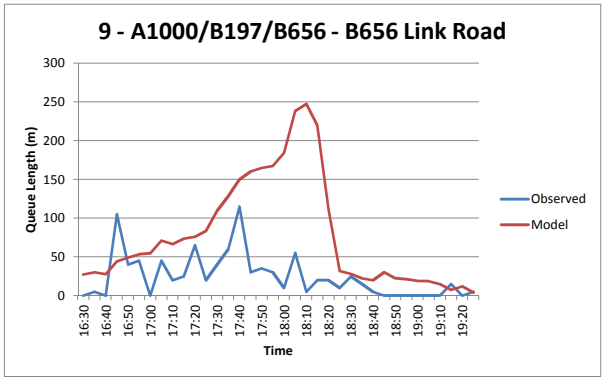




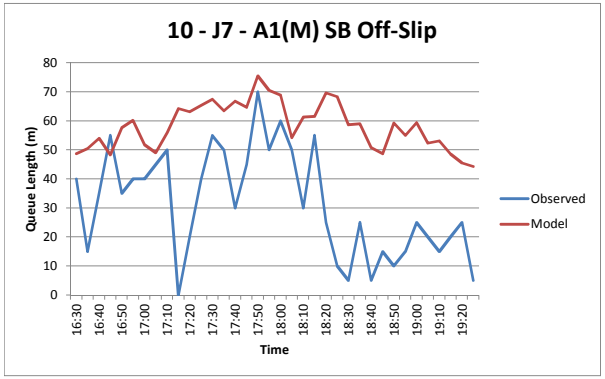


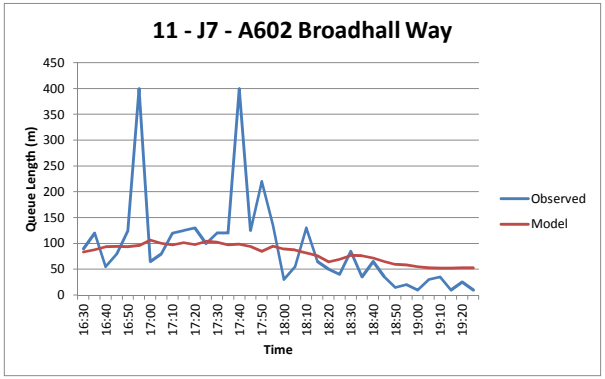


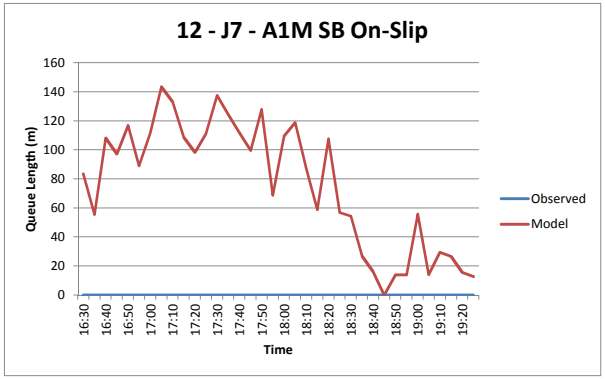


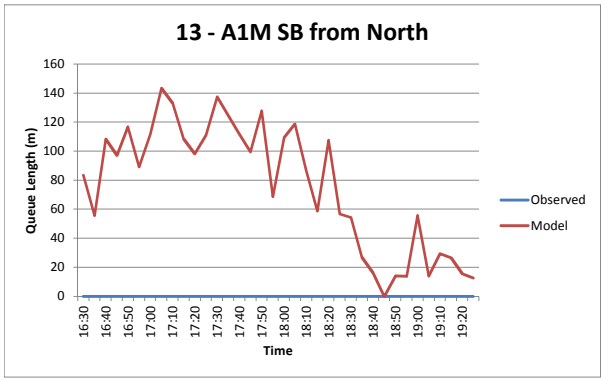


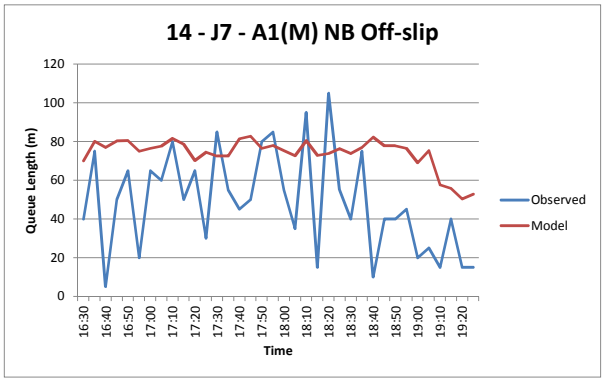
Queue Graphs - 16:30-19:30

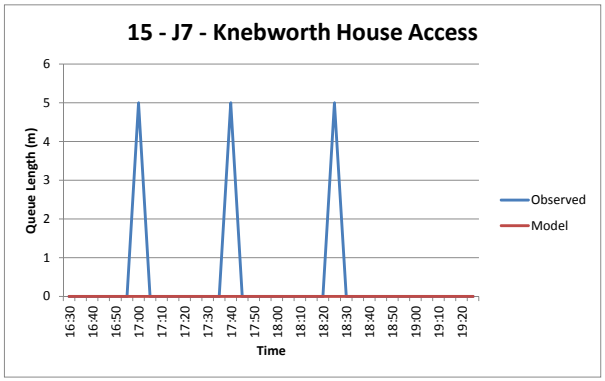


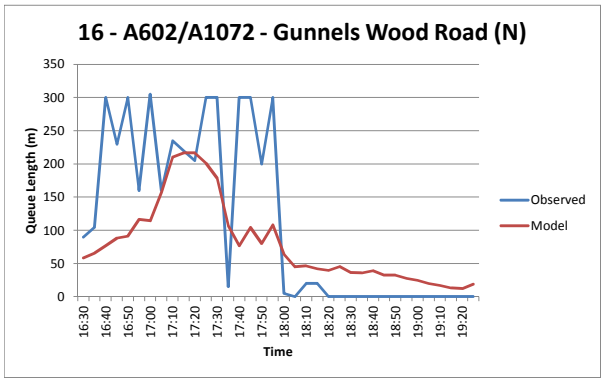


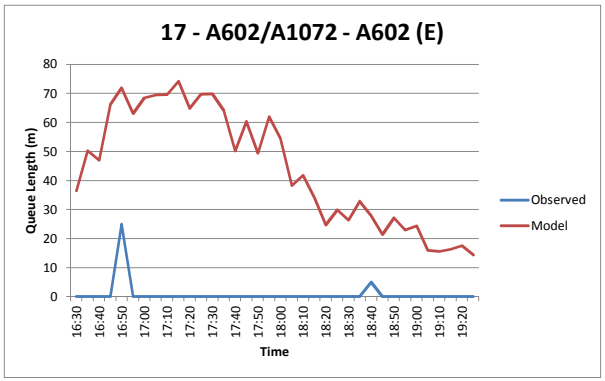


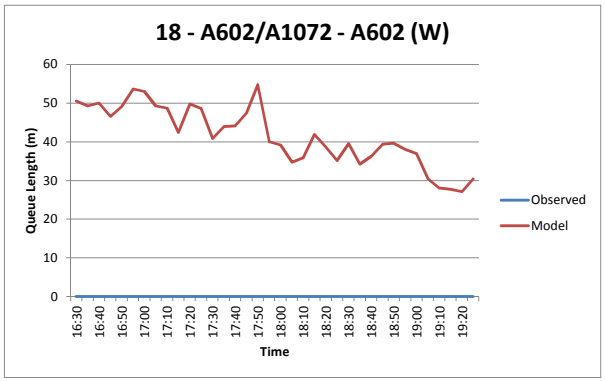












APPENDIX D

AM Peak Validation Journey Times

Journey Time Summary Stats
AM Peak

Central Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed	St. Dev	Confidence	Confidence+1	Low	High						
1 (Total)												
2 (Total)	424.5	25.1	20.1	62.5	362.0	487.0	382.0	-10.0%	Y	Y	Y	Y
3 (Total)												
4 (Total)	249.7	33.0	26.4	51.4	198.3	301.1	264.5	6.0%	Y	Y	Y	Y
5 (Total)	356.1	36.3	26.9	62.5	293.6	418.7	289.3	-18.8%	N	N	N	N
7 (Total)	167.5	23.3	32.3	49.1	118.4	216.6	150.8	-10.0%	Y	Y	Y	Y
8 (Total)	264.6	150.9	104.5	131.0	133.6	395.6	227.8	-13.9%	Y	Y	Y	Y
								TRUE	4	4	4	4
								FALSE	1	1	1	1
								% True	80%	80%	80%	80%

Three Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed Mean	St. Dev	Confidence	Confidence+10%	Low	High						
1 (Total)	345	103	76	111	235	456	311	-9.8%	Y	Y	Y	Y
2 (Total)	415	31	14	56	359	470	387	-6.5%	Y	Y	Y	Y
3 (Total)	263	61	45	72	192	335	223	-15.2%	Y	N	Y	Y
4 (Total)	259	27	12	38	221	298	258	-0.6%	Y	Y	Y	Y
5 (Total)	319	63	30	62	257	381	280	-12.3%	Y	Y	Y	Y
7 (Total)	153	15	9	24	128	177	148	-3.2%	Y	Y	Y	Y
8 (Total)	224	112	55	77	147	302	186	-16.8%	Y	N	Y	Y
								TRUE	7	5	7	7
								FALSE	0	2	0	0
								% True	100%	71%	100%	100%

Three Hour

Journey Time Summary Stats
AM Peak

Central Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed	St. Dev	Confidence	Confidence+1	Low	High						
1a												0
1b												0
1c												0
2a	226.7	14.1	11.3	34.0	192.7	260.6	211	-7.0%	Y	Y	Y	Y
2b	20.7	1.5	1.2	3.3	17.4	23.9	18	-11.4%	Y	Y	Y	Y
2c	177.2	11.7	9.3	27.0	150.1	204.2	166	-6.5%	Y	Y	Y	Y
3a												0
3b												0
3c												0
4a	41.3	12.8	10.2	14.4	27.0	55.7	48	15.9%	Y	N	Y	Y
4b	38.3	6.3	5.0	8.8	29.5	47.2	41	7.4%	Y	Y	Y	Y
4c	170.0	23.5	18.8	35.8	134.2	205.8	166	-2.5%	Y	Y	Y	Y
5a	97.0	12.5	9.3	19.0	78.0	116.0	82	-15.0%	Y	Y	Y	Y
5b	48.9	10.7	7.9	12.8	36.1	61.7	53	7.8%	Y	Y	Y	Y
5c	68.4	19.4	14.4	21.2	47.2	89.6	46	-33.4%	N	N	Y	Y
5d	141.9	8.1	6.0	20.1	121.7	162.0	95	-33.1%	N	N	Y	Y
6a	73.0	1.4	2.0	9.3	63.7	82.3	77	5.6%	Y	Y	Y	Y
6b	188.0	131.5	182.3	201.1	-13.1	389.1	98	-47.9%	Y	N	N	N
6c	350.0	39.6	54.9	89.9	260.1	439.9	402	14.7%	Y	Y	Y	Y
7a	27.0	1.4	2.0	4.7	22.3	31.7	25	-8.2%	Y	Y	Y	Y
7b	29.0	7.1	9.8	12.7	16.3	41.7	33	12.7%	Y	Y	Y	Y
7c	46.5	9.2	12.7	17.4	29.1	63.9	34	-26.7%	Y	N	Y	Y
7d	65.0	8.5	11.8	18.3	46.7	83.3	50	-23.7%	Y	N	Y	Y
8a	85.9	34.0	23.5	32.1	53.7	118.0	87	1.5%	Y	Y	Y	Y
8b	96.1	145.0	100.5	110.1	-14.0	206.2	68	-29.3%	Y	N	Y	Y
8c	42.3	21.3	14.8	19.0	23.2	61.3	28	-32.7%	Y	N	Y	Y
8d	40.4	2.1	1.4	5.5	34.9	45.8	36	-10.6%	Y	Y	Y	Y
9a	89.6	30.4	21.0	30.0	59.6	119.6	107	19.6%	Y	N	Y	Y
9b	58.6	13.2	9.2	15.0	43.6	73.7	72	22.8%	Y	N	Y	Y
9e	45.8	11.4	7.9	12.5	33.3	58.2	40	-12.8%	Y	Y	Y	Y
9f	42.1	3.5	2.4	6.7	35.5	48.8	34	-19.0%	N	N	Y	Y
9g	31.0	0.9	0.6	3.7	27.3	34.7	28	-9.3%	Y	Y	Y	Y
								TRUE	23	15	25	25
								FALSE	3	11	1	1
								% True	88%	58%	96%	96%

Journey Time Summary Stats
AM Peak

Three Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed Mean	St. Dev	Confidence	Confidence+10%	Low	High						
1a	215.0	75.2	55.7	77.2	137.8	292.2	174	-18.9%	Y	N	Y	Y
1b	29.1	13.0	9.7	12.6	16.6	41.7	47	62.0%	N	N	Y	Y
1c	101.0	25.3	18.8	28.9	72.1	129.9	95	-6.0%	Y	Y	Y	Y
2a	220.1	15.8	7.5	29.5	190.5	249.6	216	-1.9%	Y	Y	Y	Y
2b	19.9	1.8	0.9	2.9	17.1	22.8	18	-7.7%	Y	Y	Y	Y
2c	174.5	14.8	7.0	24.5	150.0	199.0	165	-5.6%	Y	Y	Y	Y
3a	202.0	69.2	51.3	71.5	130.5	273.5	170	-15.6%	Y	N	Y	Y
3b	36.3	13.8	10.2	13.8	22.5	50.1	29	-20.4%	Y	N	Y	Y
3c	24.9	2.0	1.5	4.0	20.9	28.9	22	-12.2%	Y	Y	Y	Y
4a	40.3	13.0	5.9	9.9	30.4	50.2	46	14.3%	Y	Y	Y	Y
4b	41.8	13.9	6.2	10.4	31.4	52.3	40	-5.1%	Y	Y	Y	Y
4c	177.3	21.8	9.8	27.6	149.8	204.9	165	-7.1%	Y	Y	Y	Y
5a	90.1	15.6	7.4	16.4	73.6	106.5	77	-14.4%	Y	Y	Y	Y
5b	47.5	12.7	6.0	10.8	36.7	58.2	52	8.7%	Y	Y	Y	Y
5c	51.6	26.3	12.5	17.7	34.0	69.3	45	-11.9%	Y	Y	Y	Y
5d	129.9	30.7	14.6	27.6	102.3	157.6	95	-27.0%	N	N	Y	Y
6a	73.0	1.4	2.0	9.3	63.7	82.3	76	3.9%	Y	Y	Y	Y
6b	188.0	131.5	182.3	201.1	-13.1	389.1	75	-59.9%	Y	N	N	N
6c	350.0	39.6	54.9	89.9	260.1	439.9	77	-78.1%	N	N	N	N
7a	29.1	10.7	6.3	9.2	19.9	38.3	25	-15.6%	Y	N	Y	Y
7b	24.4	3.5	2.1	4.5	19.9	28.9	32	31.7%	N	N	Y	Y
7c	41.5	9.5	5.6	9.7	31.8	51.3	33	-20.1%	Y	N	Y	Y
7d	57.7	5.1	3.0	8.8	48.9	66.5	50	-14.1%	Y	Y	Y	Y
8a	81.3	28.8	14.1	22.2	59.1	103.5	66	-18.9%	Y	N	Y	Y
8b	64.9	104.2	51.1	57.6	7.4	122.5	46	-29.7%	Y	N	Y	Y
8c	37.4	15.6	7.6	11.4	26.0	48.7	28	-24.7%	Y	N	Y	Y
8d	40.6	4.7	2.3	6.4	34.3	47.0	36	-11.2%	Y	Y	Y	Y
9a	76.1	25.7	12.6	20.2	55.8	96.3	68	-10.0%	Y	Y	Y	Y
9b	57.8	29.9	14.6	20.4	37.4	78.2	50	-13.2%	Y	Y	Y	Y
9e	41.1	9.4	4.6	8.7	32.4	49.8	40	-1.8%	Y	Y	Y	Y
9f	41.6	3.3	1.6	5.8	35.8	47.4	33	-20.2%	N	N	Y	Y
9g	31.2	1.4	0.7	3.8	27.4	35.0	28	-9.7%	Y	Y	Y	Y
								TRUE	27	18	30	30
								FALSE	5	14	2	2
								% True	84%	56%	94%	94%

APPENDIX E

PM Peak Validation Journey Times

Journey Time Summary Stats
PM Peak

Central Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed	St. Dev	Confidence	Confidence+1	Low	High						
1 (Total)	277.6	20.6	15.2	43.0	234.6	320.6	254.2	-8.4%	Y	Y	Y	Y
2 (Total)	474.0	42.7	31.6	79.0	395.0	553.0	462.9	-2.3%	Y	Y	Y	Y
3 (Total)	258.7	36.9	25.6	51.4	207.3	310.2	207.1	-19.9%	N	N	Y	Y
4 (Total)	288.4	21.6	16.0	44.8	243.6	333.3	265.3	-8.0%	Y	Y	Y	Y
5 (Total)	283.6	44.0	30.5	58.9	224.8	342.5	249.2	-12.2%	Y	Y	Y	Y
6 (Total)	725.3	27.1	16.8	89.3	636.0	814.6	254.2	-65.0%	N	N	N	N
7 (Total)	265	49.3	39.5	66.0	199.2	331	324	22.3%	Y	N	Y	Y
8 (Total)	179.5	32.6	31.9	49.9	129.6	229.4	150.7	-16.0%	Y	N	Y	Y
								TRUE	6	4	7	7
								FALSE	2	4	1	1
Three Hour								% True	75%	50%	88%	88%

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed Mean	St. Dev	Confidence	Confidence+1 0%	Low	High						
1 (Total)	272.7	27.4	12.3	39.6	233.1	312.3	249.82	-8.4%	Y	Y	Y	Y
2 (Total)	476.9	41.6	19.8	67.5	409.4	544.4	437.208	-8.3%	Y	Y	Y	Y
3 (Total)	239.7	32.3	14.9	38.9	200.9	278.6	204.144	-14.8%	Y	Y	Y	Y
4 (Total)	273.2	29.5	14.0	41.3	231.9	314.6	257.404	-5.8%	Y	Y	Y	Y
5 (Total)	263.9	53.8	26.4	52.8	211.2	316.7	223.469	-15.3%	Y	N	Y	Y
6 (Total)	748.6	40.1	17.1	92.0	656.6	840.6	149.888	-80.0%	N	N	N	N
7 (Total)	205.5	57.0	27.9	48.5	157.0	254.0	236.086	14.9%	Y	Y	Y	Y
8 (Total)	165.7	23.5	12.8	29.3	136.4	195.0	150.317	-9.3%	Y	Y	Y	Y
								TRUE	7	6	7	7
								FALSE	1	2	1	1
Three Hour								% True	88%	75%	88%	88%

Journey Time Summary Stats
PM Peak

Central Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed	St. Dev	Confidence	Confidence+1	Low	High						
1a	176.0	12.4	9.2	26.8	149.2	202.8	158	-10.0%	Y	Y	Y	Y
1b	20.6	2.0	1.5	3.5	17.0	24.1	20	-4.9%	Y	Y	Y	Y
1c	81.0	7.5	5.6	13.7	67.3	94.7	80	-1.4%	Y	Y	Y	Y
2a	265.7	22.6	16.8	43.3	222.4	309.1	296	11.4%	Y	Y	Y	Y
2b	21.6	4.8	3.5	5.7	15.9	27.3	19	-11.5%	Y	Y	Y	Y
2c	186.7	19.3	14.3	33.0	153.7	219.7	175	-6.3%	Y	Y	Y	Y
3a	203.2	23.6	16.4	36.7	166.5	240.0	158	-22.1%	N	N	Y	Y
3b	30.6	17.5	12.1	15.2	15.4	45.8	27	-10.2%	Y	Y	Y	Y
3c	24.9	2.3	1.6	4.1	20.8	29.0	21	-14.8%	Y	Y	Y	Y
4a	38.1	10.0	7.4	11.2	26.9	49.4	34	-11.1%	Y	Y	Y	Y
4b	51.6	11.2	8.3	13.5	38.1	65.0	44	-15.0%	Y	Y	Y	Y
4c	198.7	24.4	18.1	37.9	160.8	236.6	175	-11.9%	Y	Y	Y	Y
5a	134.5	37.1	25.7	39.1	95.4	173.6	111	-17.8%	Y	N	Y	Y
5b	49.4	17.7	12.3	17.2	32.2	66.6	37	-25.2%	Y	N	Y	Y
5c	15.6	1.4	1.0	2.5	13.1	18.2	14	-11.3%	Y	Y	Y	Y
5d	84.1	8.7	6.0	14.4	69.7	98.5	80	-5.1%	Y	Y	Y	Y
6a	96.3	16.6	10.3	19.9	76.4	116.2	158	64.6%	N	N	N	N
6b	141.1	42.5	26.4	40.5	100.6	181.6	20	-86.1%	N	N	N	N
6c	487.9	35.8	22.2	71.0	416.9	558.9	80	-83.6%	N	N	N	N
7a	45.0	15.9	12.7	17.2	27.8	62.2	49	9.9%	Y	Y	Y	Y
7b	98.0	29.7	23.8	33.6	64.4	131.6	122	25.0%	Y	N	Y	Y
7c	66.3	15.0	12.0	18.7	47.7	85.0	63	-4.5%	Y	Y	Y	Y
7d	55.8	2.0	1.6	7.2	48.6	63.0	50	-10.4%	Y	Y	Y	Y
8a	82.3	31.9	31.2	39.4	42.8	121.7	49	-41.0%	Y	N	Y	Y
8b	28.8	2.6	2.6	5.5	23.3	34.2	29	-0.5%	Y	Y	Y	Y
8c	30.7	5.9	5.7	8.8	21.9	39.6	27	-11.7%	Y	Y	Y	Y
8d	37.8	2.5	2.4	6.2	31.5	44.0	36	-4.9%	Y	Y	Y	Y
9a	129.3	50.7	37.6	50.5	78.8	179.8	162	25.6%	Y	N	Y	Y
9b	42.0	2.4	1.8	6.0	36.0	48.0	34	-18.4%	N	N	Y	Y
9e	66.3	21.7	16.1	22.7	43.6	89.0	55	-16.9%	Y	N	Y	Y
9f	56.6	11.8	8.7	14.4	42.2	71.0	63	12.0%	Y	Y	Y	Y
9g	29.9	2.5	1.8	4.8	25.0	34.7	28	-6.1%	Y	Y	Y	Y
								TRUE	27	21	29	29
								FALSE	5	11	3	3
								% True	84%	66%	91%	91%

Journey Time Summary Stats
PM Peak

Three Hour

Journey Path	Observed						Modelled Mean	% Difference	In Interval	<15%	<60s	DMRB
	Observed Mean	St. Dev	Confidence	Confidence+10%	Low	High						
1a	170.9	17.1	7.7	24.8	146.1	195.7	157	-8.2%	Y	Y	Y	Y
1b	20.0	2.4	1.1	3.1	16.9	23.1	19	-3.4%	Y	Y	Y	Y
1c	81.8	10.6	4.8	12.9	68.8	94.7	77	-6.0%	Y	Y	Y	Y
2a	271.8	38.7	18.4	45.6	226.3	317.4	269	-1.2%	Y	Y	Y	Y
2b	21.1	3.3	1.6	3.7	17.4	24.7	19	-11.4%	Y	Y	Y	Y
2c	184.0	14.5	6.9	25.3	158.7	209.3	171	-6.9%	Y	Y	Y	Y
3a	184.9	29.7	13.7	32.2	152.7	217.1	157	-15.3%	Y	N	Y	Y
3b	27.4	17.0	7.9	10.6	16.8	38.0	28	0.7%	Y	Y	Y	Y
3c	27.4	8.1	3.8	6.5	20.9	33.9	20	-26.7%	N	N	Y	Y
4a	35.2	9.5	4.5	8.0	27.2	43.3	31	-11.1%	Y	Y	Y	Y
4b	49.3	11.3	5.4	10.3	39.0	59.6	44	-11.4%	Y	Y	Y	Y
4c	188.7	25.4	12.1	30.9	157.8	219.6	171	-9.2%	Y	Y	Y	Y
5a	124.9	47.9	23.4	35.9	89.0	160.9	89	-28.4%	Y	N	Y	Y
5b	41.4	15.2	7.4	11.6	29.8	53.0	35	-15.6%	Y	N	Y	Y
5c	15.3	1.2	0.6	2.1	13.1	17.4	14	-10.3%	Y	Y	Y	Y
5d	82.4	7.8	3.8	12.0	70.3	94.4	77	-6.6%	Y	Y	Y	Y
6a	94.9	20.3	8.7	18.2	76.7	113.1	126	33.3%	N	N	Y	Y
6b	147.0	44.1	18.8	33.5	113.4	180.5	123	-16.3%	Y	N	Y	Y
6c	506.7	56.4	24.1	74.8	431.9	581.5	140	-72.4%	N	N	N	N
7a	34.0	13.1	6.4	9.8	24.2	43.8	37	9.0%	Y	Y	Y	Y
7b	59.0	36.2	17.7	23.6	35.4	82.6	77	31.1%	Y	N	Y	Y
7c	56.4	15.9	7.8	13.5	43.0	69.9	49	-13.0%	Y	Y	Y	Y
7d	56.1	2.4	1.2	6.8	49.3	62.8	50	-11.0%	Y	Y	Y	Y
8a	66.2	23.9	13.0	19.6	46.5	85.8	48	-26.9%	Y	N	Y	Y
8b	31.5	3.5	1.9	5.1	26.4	36.5	28	-9.6%	Y	Y	Y	Y
8c	30.2	3.6	1.9	5.0	25.2	35.1	27	-9.8%	Y	Y	Y	Y
8d	37.9	3.5	1.9	5.7	32.2	43.6	36	-5.5%	Y	Y	Y	Y
9a	93.8	48.7	21.9	31.3	62.5	125.1	107	13.6%	Y	Y	Y	Y
9b	52.5	17.1	7.7	13.0	39.6	65.5	34	-35.1%	N	N	Y	Y
9e	51.6	19.0	8.6	13.7	37.9	65.3	48	-7.5%	Y	Y	Y	Y
9f	46.2	11.1	5.0	9.6	36.6	55.8	49	6.4%	Y	Y	Y	Y
9g	29.9	2.1	0.9	3.9	26.0	33.9	28	-6.5%	Y	Y	Y	Y
								TRUE	28	22	31	31
								FALSE	4	10	1	1
								% True	88%	69%	97%	97%

APPENDIX F
Final Matrices

Prior Matrix Structure before Furnessing

Zone-zone movement not possible
Zone-zone movement known from traffic count
Zone-zone movment not known from traffic count
Estimated Zero Movement
ANPR

Cars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																

AM Peak Matrix (06.00-10.00)

CAR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	427	148	746	16	4	67	0	0	0	0	0	0	0	0	7341	
3	492	0	396	1055	0	1	28	0	0	0	0	0	0	0	0	1633	
4	6	24	0	33	0	0	0	0	0	0	0	0	0	0	0	19	
5	748	475	356	0	0	2	42	0	0	0	0	0	0	0	0	2481	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	20	16	6	28	1	2	0	0	0	0	0	0	0	0	0	33	
9	80	19	7	33	1	0	0	0	402	2	0	1975	0	677	0	0	
10	143	34	12	59	1	1	1	251	0	1	0	1173	0	402	0	0	
11	4	1	0	2	0	0	0	2	1	0	0	13	0	9	0	0	
12	611	144	50	251	5	3	3	382	178	4	0	610	0	167	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	1	0	0	0	0	0	0	0	0	0	0	2	0	19	0	0	
15	131	31	11	54	1	1	1	82	38	1	0	259	1	0	0	0	
16	3890	916	318	1600	34	21	19	278	130	1	0	318	0	73	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32591

LGV	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	175	6	98	5	0	11	0	0	0	0	0	0	0	0	1700	
3	142	0	17	177	0	0	10	0	0	0	0	0	0	0	0	444	
4	1	2	0	11	0	0	0	0	0	0	0	0	0	0	0	2	
5	153	158	20	0	0	0	11	0	0	0	0	0	0	0	0	481	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	4	6	0	3	0	0	0	0	0	0	0	0	0	0	0	3	
9	10	3	0	2	0	0	0	0	55	2	0	259	1	67	0	0	
10	14	4	0	2	0	0	0	48	0	1	0	163	1	42	0	0	
11	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	
12	99	30	1	17	1	0	1	84	39	0	0	78	0	29	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	1	0	6	0	0	
15	18	5	0	3	0	0	0	15	7	1	0	22	1	0	0	0	
16	596	181	7	101	5	1	6	75	35	2	0	52	3	18	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5858

OGV1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	41	4	26	1	0	2	0	0	0	0	0	0	0	0	295	
3	15	0	1	26	0	0	1	0	0	0	0	0	0	0	0	27	
4	2	3	0	1	0	0	0	0	0	0	0	0	0	0	0	4	
5	29	27	3	0	0	0	2	0	0	0	0	0	0	0	0	52	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
9	4	1	0	0	0	0	0	0	9	0	0	16	0	4	0	0	
10	8	1	0	1	0	0	0	2	0	0	0	21	0	5	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	29	4	0	3	0	0	0	2	1	0	0	5	0	4	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
15	6	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	
16	239	34	4	22	1	0	1	17	10	0	0	5	0	3	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1033

OGV2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	35	1	19	2	0	0	0	0	0	0	0	0	0	0	341	
3	39	0	0	4	0	0	0	0	0	0	0	0	0	0	0	28	
4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
5	22	5	0	0	0	0	0	0	0	0	0	0	0	0	0	16	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
10	5	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	2	0	0	0	0	0	0	10	9	0	0	1	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
16	226	21	0	11	1	0	0	2	2	0	0	12	0	1	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	834

40316

PM Peak Matrix (16.00-20.00)

CAR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	1185	8	688	9	0	25	0	0	0	0	0	0	0	0	5341	
3	958	0	21	689	0	2	40	0	0	0	0	0	0	0	0	1307	
4	266	252	0	303	0	1	11	0	0	0	0	0	0	0	0	362	
5	1262	1084	11	0	0	3	53	0	0	0	0	0	0	0	0	1723	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	41	24	0	14	0	0	0	0	0	0	0	0	0	0	0	18	
9	40	12	0	7	0	0	0	0	349	10	0	902	5	382	0	0	
10	106	32	0	18	0	0	1	429	0	5	0	500	3	212	0	0	
11	3	1	0	1	0	0	0	3	1	0	0	13	0	7	0	0	
12	1269	378	2	219	3	0	7	1273	428	27	0	419	3	191	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	1	0	0	0	0	0	0	1	0	0	0	0	0	17	0	0	
15	446	133	1	77	1	0	2	447	150	3	0	182	18	0	0	0	
16	5778	1720	11	998	13	1	32	1241	417	4	0	268	1	355	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35280

LGV	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	140	1	86	3	0	4	0	0	0	0	0	0	0	0	718	
3	181	0	1	138	0	1	11	0	0	0	0	0	0	0	0	141	
4	4	6	0	12	0	0	0	0	0	0	0	0	0	0	0	3	
5	116	118	0	0	0	0	7	0	0	0	0	0	0	0	0	90	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	9	4	0	3	0	0	0	0	0	0	0	0	0	0	0	4	
9	15	5	0	3	0	0	0	0	26	1	0	94	0	20	0	0	
10	6	2	0	1	0	0	0	40	0	0	0	60	0	13	0	0	
11	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	
12	88	30	0	19	1	0	1	93	40	2	0	34	1	23	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	
15	25	9	0	5	0	0	0	26	12	0	0	25	5	0	0	0	
16	1058	362	2	222	8	0	5	144	63	0	0	84	0	63	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4544

OGV1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	6	0	11	1	0	1	0	0	0	0	0	0	0	0	88	
3	14	0	0	9	0	0	1	0	0	0	0	0	0	0	0	8	
4	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
5	15	4	1	0	0	0	1	0	0	0	0	0	0	0	0	9	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
9	1	0	0	0	0	0	0	0	1	0	0	12	0	1	0	0	
10	0	0	0	0	0	0	0	1	0	0	0	5	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	8	1	0	1	0	0	0	1	1	0	0	2	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	3	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
16	105	10	1	18	2	0	1	9	6	0	0	4	0	1	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	372

OGV2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	14	1	7	1	0	0	0	0	0	0	0	0	0	0	182	
3	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	19	
4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
10	2	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
16	194	11	0	6	0	0	0	2	6	0	0	3	0	0	0	0	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	477

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