

# **Cherwell Street, Banbury BSIP, Detailed Design Modelling**

VISSIM Modelling

January 2025

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# Issue and Revision Record

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1A	17/01/2025	YC	TE/NO	SA	Initial Draft

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# 1 Introduction

Mott MacDonald (MM) has been requested by Oxfordshire County Council (OCC) to develop a traffic model in PTV VISSIM to test the Detailed Design developed for the Cherwell Street Bus Service Improvement Scheme as part of the implementation of the Oxfordshire Bus Service Improvement Plan. The model has been updated from the previous model developed as part of the Feasibility Study by MM. The purpose of the report is to outline the updates to the base and forecast models and display the calibration & validation, and forecast scenario results.

VISSIM is a microscopic traffic flow simulation software based on car following and lane change logic. VISSIM can analyse vehicular traffic including bus/tram, pedestrian, and bicycle operations under constraints such as lane change configuration, traffic composition, traffic signals and bus/tram stops. VISSIM does not follow the conventional link/node modelling system but utilises a link/connector system that enables complex geometry to be modelled. The link/connector system also permits different traffic controls (signal, give way or stop) to be utilised anywhere in the model.

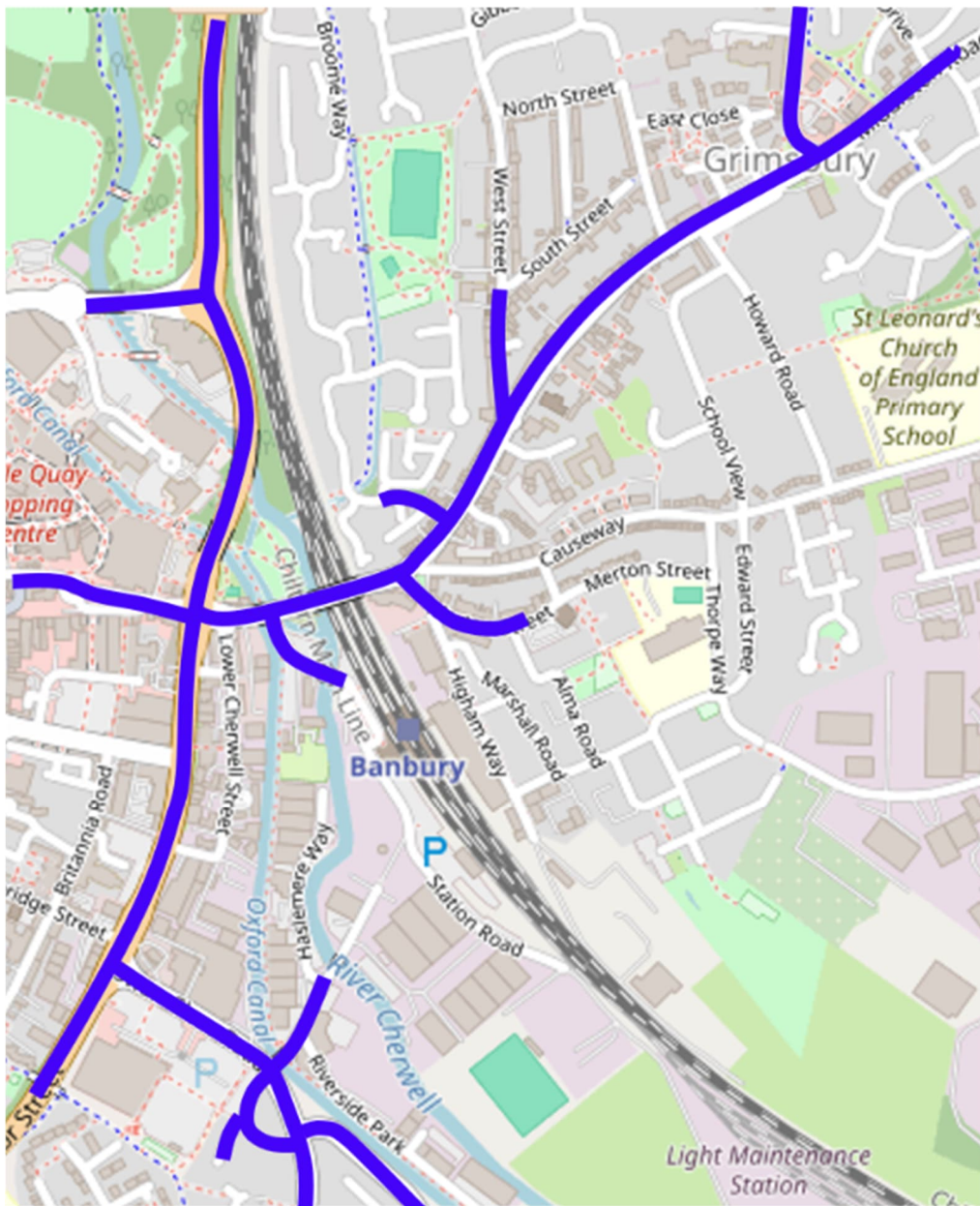
## 1.1 Model Extent

The model extents are shown in Figure 1.1. The model covers the following junctions:

- A4260 Concord Avenue, Bridge Street and A4260 Cherwell Street
- Bridge Street and Station Road
- A4260 Cherwell Street, A4260 Windsor Street and George Street
- A4260 Upper Windsor Street, Swan Close Road and Gatteridge Street
- Castle Roundabout
- Middleton Road, Merton Street and Bridge Street
- Middleton Road and Waterloo Drive
- Middleton Road and West Street
- Middleton Road and Daventry Road
- Bridge Street / Market Place & High Street
- Tramway Road, Hightown Road, Lambs Crescent and Swan Close Road



**Figure 1.1 – Model Extents**



Source: Openstreetmap.org, 2024

## 1.2 Existing Models

### 1.2.1 Base

The base model was originally provided by OCC and then updated by MM and rebased to 2023.

### 1.2.2 Forecast

The existing forecast models were developed by MM, based off the base model, for the following years:

- 2023
- 2031
- 2040

The forecast scenarios comprise a DM and 6 option test scenarios. The Tramway Road Scheme and signals are included in all forecast scenarios.

## 1.3 Report Structure

The report is structured as follows:

- 1 – Introduction
- 2 – Data Collection
- 3 – Base Model Updates
- 4 – VISSIM Model Calibration and Validation
- 5 – Forecast Models
- 6 – Summary and Conclusions
- 7 - Appendices

## 2 Data Collection

The purpose of this section is to summarise the data inputs that have been used to update the model.

### 2.1 Manual Classified Turning Counts

As shown in Figure 2.1 below, the Manually Classified Turning Counts (MCTCs) were provided for the following locations:

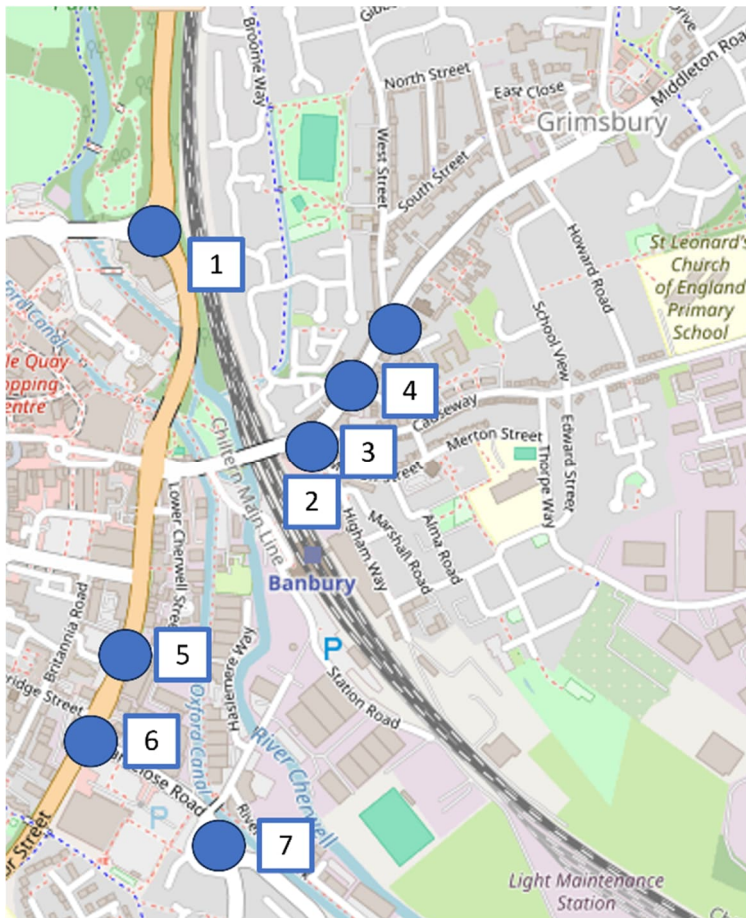
1. Castle Roundabout
2. Bridge Street and Merton Street
3. Middleton Road and Waterloo Drive
4. Middleton Road and West Street
5. Windsor Street / Windsor Street car park and Canal Street
6. Upper Windsor Street / Windsor Street & Swan Close Road
7. Swan Close Road / Tramway Road / Hightown Road / Lambs Crescent

MCTCs were undertaken over two days in September 2024:

- 21/09/2024 - covering 10:00 - 16:00
- 24/09/2024 - covering 07:00 - 10:00 & 16:00 - 19:00

The surveys were conducted in 15-min intervals.

**Figure 2.1 – MCTC Locations**



Source: Openstreetmap.org, 2024

## 2.2 SCOOT Data

Observed SCOOT data was provided for the following two junctions:

- Cherwell Street & Bridge Street
- Cherwell Street & George Street

Data was provided from 17/09/2024 to 19/09/2024 for 8-9AM and 5-6PM. The timings were provided as average timings in 15 min periods for each day.

## 2.3 Bus Data

The bus data provided covers bus journeys within the modelled area. The data includes stop arrival time, stop to stop travel time & dwell time duration per stop for each service. Observed data for the following bus routes were included:

- S4/X4
- B9
- B5
- B4
- B3
- 500
- 200
- 488/489

### 3 Base Model Updates

The existing model developed by MM was developed in PTV VISSIM 2023 Service Package (SP) 05. The same VISSIM version and SP have been used for the detailed design model updates and runs.

The existing model has been adjusted and re-calibrated to 2024 flows. The existing modelled time periods are retained: 07:45-08:45 and 16:45-17:45 hourly evaluations, with 30 mins warm up and cool down periods before and after the evaluation. The models have been run 10 times with random seeds to replicate day-to-day variance - the average of these runs has been used to summarise hourly intervals within each peak with outliers removed where appropriate.

#### 3.1 Model Extension

The model extents are seen above in Figure 1.1. The existing model was extended to include full coding of the following junctions:

- Middleton Road & West Street
- Middleton Road & Daventry Road
- Bridge Street / Market Place & High Street

#### 3.2 Signal Updates

There are five signalised junctions within the network:

- Cherwell Street & George Street
- Bridge Street, Merton Street, Waterloo Drive & Middleton Road
- Middleton Road & Daventry Road
- Upper Windsor Street & Swan Close Road

The table below summarises the updates to each signalised junction in the model, from the feasibility study:

Junction	Update from Feasibility Study
Cherwell St & Bridge St	Updated with September 2024 average scoot timings, adjusted for calibration
Cherwell St & George St	Updated with September 2024 average scoot timings, adjusted for calibration
Bridge St, Merton St, Waterloo Dr & Middleton Rd	Vehicle actuated max times used from feasibility study, adjusted for calibration
Upper Windsor St & Swan Close Rd	Vehicle actuated max times used from feasibility study
Middleton Rd & Daventry Rd	Set up fixed timings suited to the profile of modelled flows at the junction

#### 3.3 Public Transport Lines

Model entry times for Public Transport (PT) lines have been adjusted to match the observed data mentioned in Section 2.3. Bus journey times have been validated against the observed data previously mentioned.

## 4 VISSIM Model Calibration and Validation

### 4.1 Parameters to calibrate the model

To confirm that the model is fit for purpose of the evaluation of the forecast scheme and to provide credibility to the results, it is necessary to calibrate and validate the model. The calibration process involves changing the network set up and behavioural characteristics to achieve a good match between observed and modelled data. Parameters such as link behaviour types, reduced speed areas and signal timings have been adjusted for model calibration.

### 4.2 Traffic Flow Calibration

The Geoffrey E. Havers (GEH) statistic is a standard way of comparing observed and modelled flows as defined in the Design Manual for Roads and Bridges (DMRB) Volume 12, Chapter 4. It is used to remove the bias that exists when comparing flows of different magnitudes using percentages. For example, a difference of 10 in a flow of 100 vehicles per hour (VPH) is less significant (GEH = 3.0) than a difference of 100 in a 1000 VPH flow (GEH = 11.5), even though they both show a percentage difference of 10%.

The GEH statistic is calculated as follows:

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

Where:

GEH.....is the GEH statistic;

M.....is the modelled flow; and,

C.....is the observed flow.

Department for Transport (DfT) sets out the criteria in Table 4.1 for the Link Flow and Turning Movement Validation Criteria and Acceptability Guidelines:

**Table 4.1: Flow validation criteria**

Criteria	Description of Criteria	Acceptability Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	>85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	>85% of cases
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	>85% of cases
2	GEH <5 for individual flows	>85% of cases

Modelled flows for turning movements have been assessed against TAG validation criteria. Table 4.2 below shows the percentage of movements which meet GEH, flow, and GEH or flow criteria for the AM and PM peaks. Full turning count information can be found in Appendices A-F.

**Table 4.2: Flow Validation Summary**

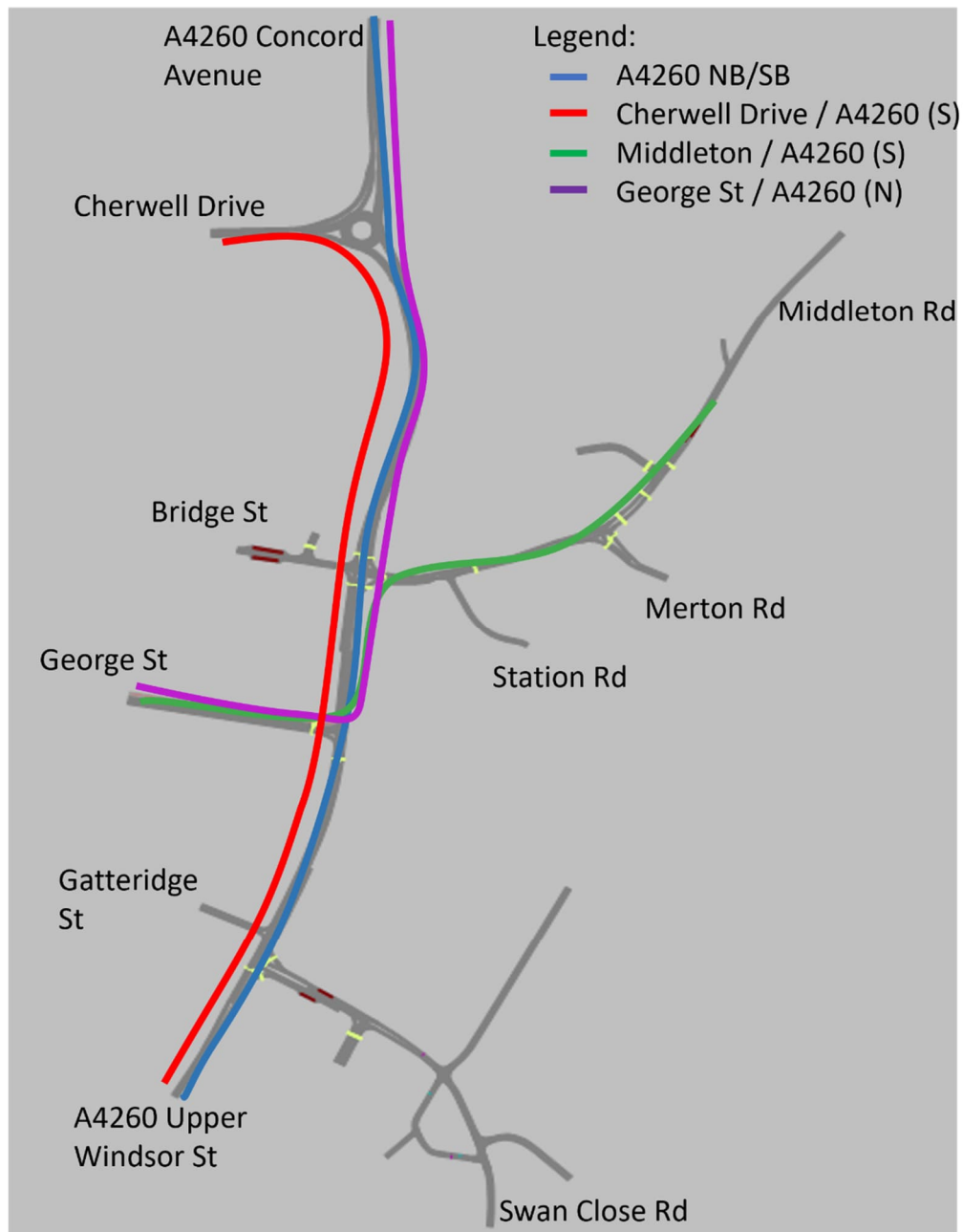
Peak Period	Vehicle Class	GEH	Flow	GEH or Flow
AM	Car	95%	97%	97%
	LGV	97%	100%	100%
	HGV	100%	100%	100%
PM	Car	93%	95%	95%
	LGV	96%	100%	100%
	HGV	100%	100%	100%

## 4.3 Journey Time Validation

The modelled journey times are compared to the observed journey times, excluding any outliers from the observed journey times. For journey time validation, the modelled times are satisfactory if they are within 15% of the observed times as defined in Transport Analysis Guidance (TAG) Unit 3.1 section 3.3.15. The journey time routes for validation are displayed below in Figure 4.1. The modelled and observed journey times for the total of each route for the AM and PM peaks are shown below in Table 4.3 and Table 4.4 respectively.



**Figure 4.1: Journey time routes for validation**



Source: VISSIM Model



**Table 4.3: AM Peak journey time validation results**

Routes	Time Observed (sec)	Time Modelled (sec)	Difference (sec)	Difference (%)	Within 15%	Within 60s
A4260 SB	327	299	-28	-9%	Yes	Yes
A4260 NB	267	241	-25	-9%	Yes	Yes
Cherwell Dr to A4260 (S)	272	293	21	8%	Yes	Yes
A4260 (S) to Cherwell Dr	253	224	-30	-12%	Yes	Yes
Middleton to A4260 (S)	222	272	50	22%	No	Yes
A4260 (S) to Middleton	385	327	-58	-15%	Yes	Yes
George St to A4260 (N)	179	202	23	13%	Yes	Yes
A4260 (N) to George St	310	268	-42	-14%	Yes	Yes

In the AM peak 88% of routes are within 15% of the observed data and 100% of routes are within 60 seconds of the observed data.

**Table 4.4: PM Peak journey time validation results**

Routes	Time Observed (sec)	Time Modelled (sec)	Difference (sec)	Difference (%)	Within 15%	Within 60s
A4260 SB	335	292	-44	-13%	Yes	Yes
A4260 NB	255	247	-8	-3%	Yes	Yes
Cherwell Dr to A4260 (S)	279	290	11	4%	Yes	Yes
A4260 (S) to Cherwell Dr	238	225	-14	-6%	Yes	Yes
Middleton to A4260 (S)	451	386	-64	-14%	Yes	Yes
A4260 (S) to Middleton	339	304	-35	-10%	Yes	Yes
George St to A4260 (N)	209	239	30	14%	Yes	Yes
A4260 (N) to George St	324	257	-67	-21%	No	No

In the PM peak 88% of routes are within 15% of the observed data and 88% of routes are within 60 seconds of the observed data.

### 4.3.1 Bus Journey Time Validation

The bus journey times have been validated against the observed data. The journey time validation results can be seen in Table 4.5 and Table 4.6 below for AM and PM respectively.

In the AM & PM Peaks 55% of routes meet the validation criteria. It should be noted that the Christchurch Court / George Street junction is not modelled - so delays associated with this junction, for buses leaving the George Street bus stop, will not be captured. This affects the three routes from George Street.

Whilst bus validation is not optimal, as there are no bus lanes beyond the facility on George Street, and general traffic journey time validation within the rest of the model is good, it is assessed that the model is still fit for the purposes of assessing the design. Additionally, observed data for bus journey times only includes a limited/small sample size of vehicles so the confidence and variability in these values is uncertain.

**Table 4.5 AM Peak Bus Journey Time Validation Results**

Journey Time Route	Bus Route	Modelled	Observed	Within 15%
Bankside to Bridge St	B3 IN	319	276	No
Bus Station to Tesco	B9 IN	223	243	Yes
Bus station to Tesco	500 OUT	442	481	Yes
Bus station to Tesco	200 OUT	175	222	No
George St to Bus station	B9 IN S	57	110	No
George St to Bridge St	B4 IN	62	140	No
George St to Bridge St	B5 IN	67	108	No
Tesco to Bridge St	B9 OUT	773	795	Yes
Tesco to Bridge St	500 IN	162	186	Yes
Tesco to Bridge St	200 IN	278	277	Yes
Bridge St to Bankside	B3 OUT	662	715	Yes
Bus Station to Calthorpe St	X4 / S4 IN	Observed Journey Time Route not covered by model extents		
Bridge St to Bolton Rd	B4 OUT	Observed Journey Time Route not covered by model extents		
Bus Station to Calthorpe St	488/489 Out	Observed Journey Time Route not covered by model extents		
George St to Bus Station	488/489 In	No observed journey times within peak periods		

**Table 4.6 PM Peak Bus Journey Time Validation Results**

Journey Time Route	Bus Route	Modelled	Observed	Within 15%
Bankside to Bridge St	B3 IN	211	208	Yes
Bus Station to Tesco	B9 IN	329	243	No
Bus station to Tesco	500 OUT	327	179	No
Bus station to Tesco	200 OUT	330	335	Yes
George St to Bus station	B9 IN S	67	63	Yes
George St to Bridge St	B4 IN	80	133	No
George St to Bridge St	B5 IN	65	116	No
Tesco to Bridge St	B9 OUT	776	681	Yes
Tesco to Bridge St	500 IN	207	235	Yes
Tesco to Bridge St	200 IN	305	259	No
Bridge St to Bankside	B3 OUT	408	446	Yes
Bus Station to Calthorpe St	X4 / S4 IN	Observed Journey Time Route not covered by model extents		
Bridge St to Bolton Rd	B4 OUT	Observed Journey Time Route not covered by model extents		
Bus Station to Calthorpe St	488/489 Out	Observed Journey Time Route not covered by model extents		
George St to Bus Station	488/489 In	No observed journey times within peak periods		

## 5 Forecast Models

The existing DM models have been adjusted to include model updates and calibration and validation changes from the base model. Three forecast years have been modelled: 2024, 2031 & 2040. The Option 5+ model from the Feasibility study has been used as the basis for Do Something (DS) models. Design changes from the detailed design have been incorporated as well as associated signal changes. DS mode shift scenarios have also been developed.

### 5.1 Model Scenarios

The following model scenarios have been run and compared, for 2024, 2031 & 2040:

- DM – Taken from existing Feasibility modelling. Includes the Tramway Road Scheme and associated signals. Incorporates changes to the base model for Detailed Design Modelling
- Option 5+ - Taken from existing Feasibility modelling. Incorporates changes to the base model for Detailed Design Modelling. Includes updated design at Cherwell St / Bridge St
- Option 5+ (75% ('1 in 4')) – As Option 5+ above, includes 25% reduction in car trips – with modal shift assumed to be accommodated within existing public transport capacity
- Option 5+ (95% ('Decide & Provide')) - As Option 5+ above, includes 5% reduction in car trips – with modal shift assumed to be accommodated within existing public transport capacity

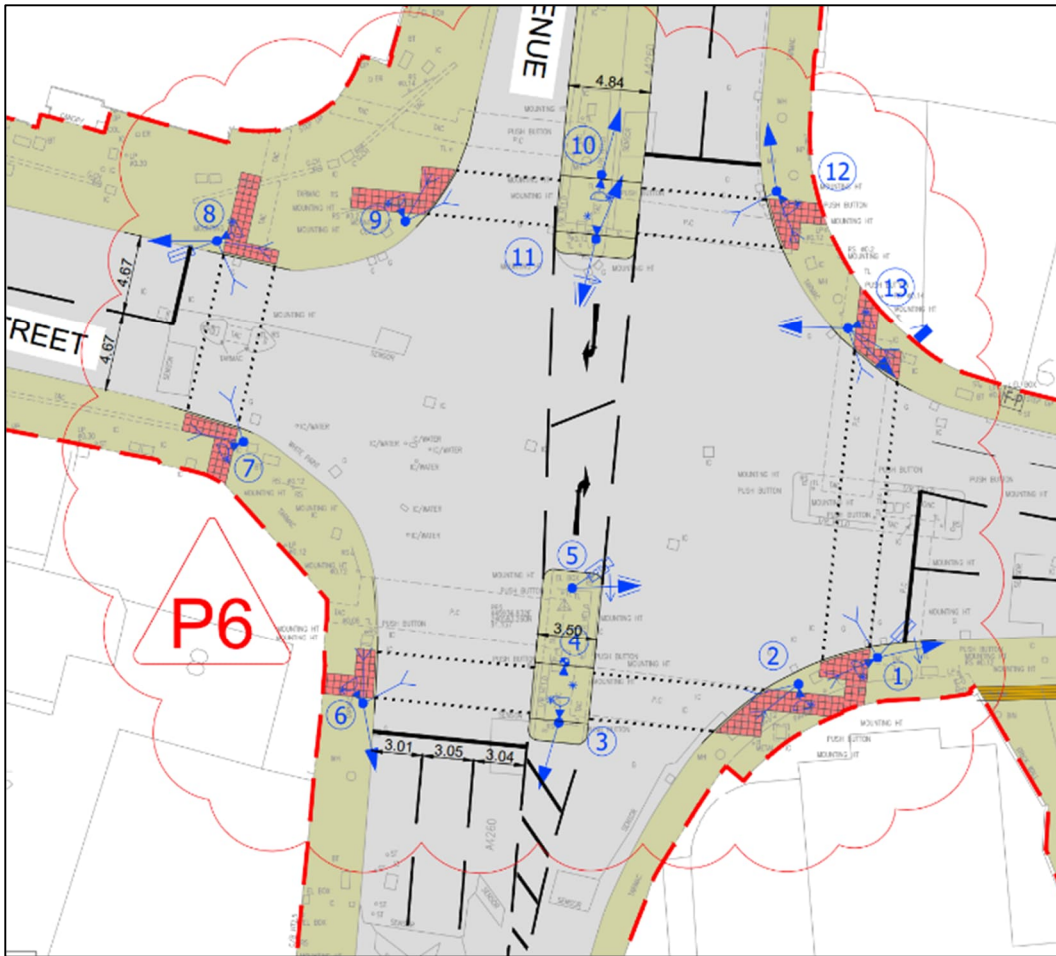
### 5.2 Option 5+ Detailed Design Updates

The following updates have been applied in the model at the Cherwell Street / Bridge Street junction as part of the detailed design updates:

- Crossing across the southern arm of the junction converted to “straight across”, i.e. staggered operation removed
- Permitted northbound right turn allowed – was previously a protected turn only, i.e. the northbound right turn phase is active alongside the southbound phase with the right turners giving way
- Intergreens updated to accommodate changes above
- Signal timing optimisation

The updated design as used in VISSIM is seen in Figure 5.1 below:

**Figure 5.1 Cherwell St / Bridge St Junction Detailed Design**



Source: Mott MacDonald Ltd

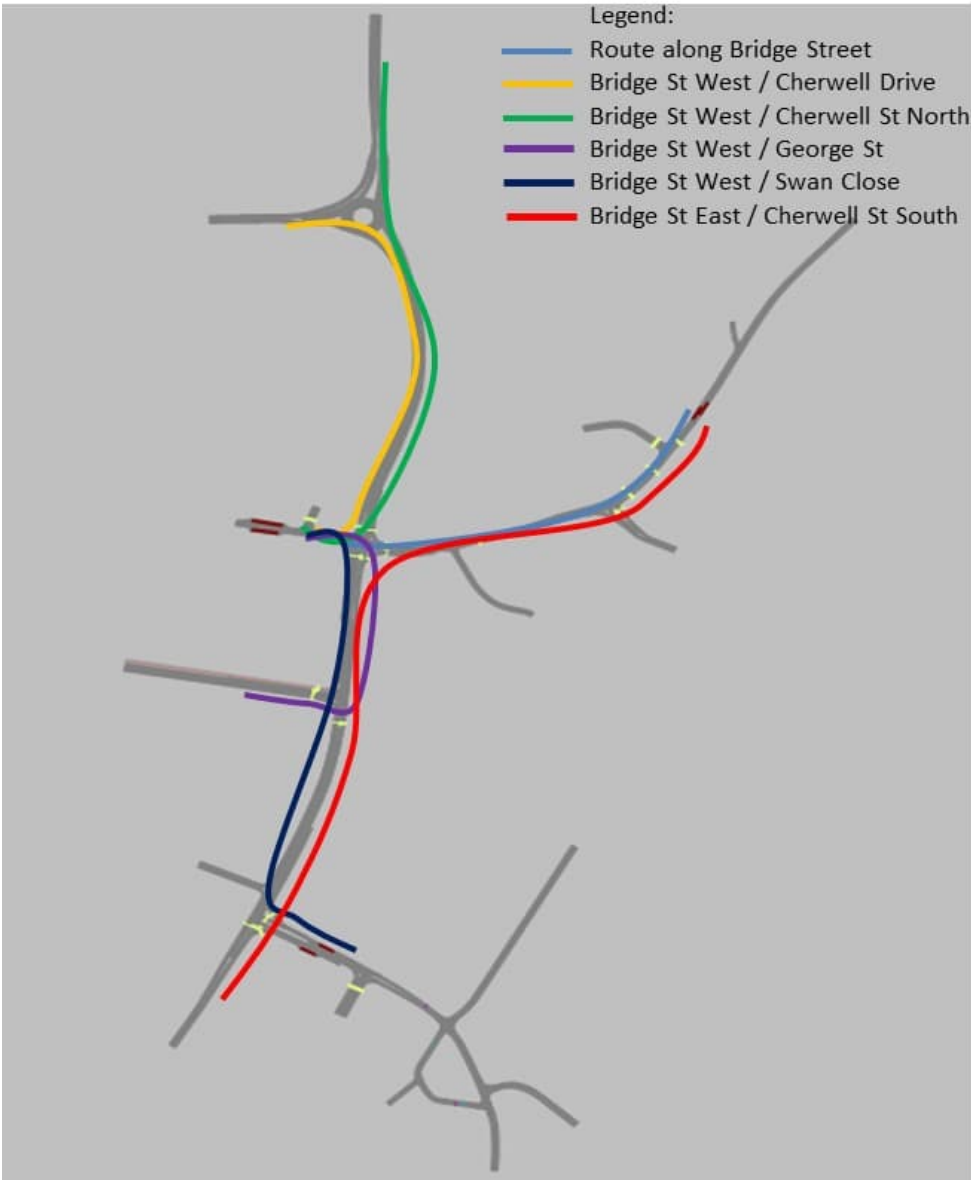
### 5.3 Model Results

The journey times, public transport journey times, junction performance and network performance are presented in this section. The models have been run for 10 random seeds and the average of these is presented in this section. A comparison is provided against the DM scenarios.

### 5.4 Journey Times

The journey times for all options are shown below for the AM and PM peaks. The reported journey time routes for buses can be seen in Figure 5.2 below. The journey time routes for general traffic are seen in Figure 4.1 above.

Figure 5.2 Bus Journey Time Routes



## 5.4.1 Public Transport Journey Times

For testing the impacts on public transport journeys due to the proposed scheme changes, all the bus routes within the model are separated into 9 sections as shown in the tables below. For sections without any bus lanes (segregated facilities), general vehicle journey times are used as a proxy. Where dedicated bus lanes are available, bus journey times are considered.

### 5.4.1.1 AM Peak

Option 5+ has similar journey times to the base / DM in all years. However, routes from Bridge Street East experience a worsening in Option 5+ across all three years – this is an unavoidable consequence of the need to provide an improved and safe pedestrian environment at the junction with improved crossings and a removal of unsafe and sub-standard traffic lane widths. The routes from George Street to Bridge Street West and Swan Close to Bridge Street West show an improvement in Option 5+. The largest improvement is seen in 2031 from Swan Close to Bridge Street West (100s).

The 25% mode shift scenario shows an improvement across almost all sections compared to Base / DM. The largest improvement is seen in 2040 from Swan Close to Bridge Street West (250s), which includes the heavily used bus section between the George Street and Bridge Street junctions.

The 5% mode shift scenario has similar results to the Option 5+ core scenario, with nominal improvements across most routes.

**Table 5.1 2024 AM Peak Public Transport Journey Time Comparison**

Main Bus Sections	Bus Routes	Route Count	Base	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - Base	Op5+ (75%) - Base	Op5+ (95%) - Base
Bridge St West to Bridge St East	B7A OB,200-O,500-O,B9 OB_2	4	153	176	132	159	23	-21	6
Bridge St West to Cherwell Dr	B4 OB,B8 OB,B9 IB_2,MRT1 OB_3,76 OB,76X OB	6	117	140	125	138	23	8	20
Bridge St West to Concord Avenue	77B OB	1	66	61	59	61	-5	-7	-5
Bridge St West to George St	B5-O,75 OB,488-O,S4-O,X4 OB	5	68	65	54	62	-3	-15	-6
Bridge St West to Swan Close	B3-O	1	87	82	67	78	-5	-20	-9
Bridge St East to Bridge St West	200-I,500-I,B9 IB_1,B7A IB	4	195	226	151	203	31	-45	8
Bridge St East to Cherwell St South	MRT1 OB_1	1	272	338	236	313	66	-36	40
George St to Bridge St West	76 IB,76X IB,488-I,B4 IB,B8 IB,B9 OB_1,S4-I,75A IB,B1 IB,B5 IB	10	63	55	53	57	-8	-10	-6
Swan Close to Bridge St West	B3-I,MRT1 OB_2	2	248	206	157	199	-42	-91	-49

**Table 5.2 2031 AM Peak Public Transport Journey Time Comparison**

Main Bus Sections	Bus Routes	Route Count	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Bridge St West to Bridge St East	B7A OB,200-O,500-O,B9 OB_2	4	170	180	152	170	10	-17	1
Bridge St West to Cherwell Dr	B4 OB,B8 OB,B9 IB_2,MRT1 OB_3,76 OB,76X OB	6	154	168	151	161	15	-3	7
Bridge St West to Concord Avenue	77B OB	1	96	73	65	71	-23	-30	-24
Bridge St West to George St	B5-O,75 OB,488-O,S4-O,X4 OB	5	67	66	63	70	-1	-4	3
Bridge St West to Swan Close	B3-O	1	91	86	81	90	-4	-9	-1
Bridge St East to Bridge St West	200-I,500-I,B9 IB_1,B7A IB	4	294	314	200	298	20	-94	4
Bridge St East to Cherwell St South	MRT1 OB_1	1	344	439	306	420	95	-38	76
George St to Bridge St West	76 IB,76X IB,488-I,B4 IB,B8 IB,B9 OB_1,S4-I,75A IB,B1 IB,B5 IB	10	150	68	61	66	-81	-88	-83
Swan Close to Bridge St West	B3-I,MRT1 OB_2	2	360	260	159	213	-100	-201	-147



**Table 5.3 2040 AM Peak Public Transport Journey Time Comparison**

Main Bus Sections	Bus Routes	Route Count	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Bridge St West to Bridge St East	B7A OB,200-O,500-O,B9 OB_2	4	195	189	162	194	-6	-33	-1
Bridge St West to Cherwell Dr	B4 OB,B8 OB,B9 IB_2,MRT1 OB_3,76 OB,76X OB	6	191	170	146	173	-21	-46	-19
Bridge St West to Concord Avenue	77B OB	1	97	79	67	79	-18	-30	-19
Bridge St West to George St	B5-O,75 OB,488-O,S4-O,X4 OB	5	80	68	66	66	-11	-14	-14
Bridge St West to Swan Close	B3-O	1	106	90	84	86	-17	-22	-20
Bridge St East to Bridge St West	200-I,500-I,B9 IB_1,B7A IB	4	313	334	271	327	21	-42	14
Bridge St East to Cherwell St South	MRT1 OB_1	1	418	452	374	436	34	-44	18
George St to Bridge St West	76 IB,76X IB,488-I,B4 IB,B8 IB,B9 OB_1,S4-I,75A IB,B1 IB,B5 IB	10	121	73	60	75	-49	-62	-46
Swan Close to Bridge St West	B3-I,MRT1 OB_2	2	418	324	168	289	-94	-250	-129

#### 5.4.1.2 PM Peak

Option 5+ generally shows a worsening against the Base / DM for the 2024 and 2031 years. The largest journey time increases are seen on the following routes (2024,2031): Bridge Street East to Cherwell Street South (125s, 137s), Bridge Street East to Bridge Street West (47s, 80s) & Swan Close to Bridge Street West (19s,113s). For 2040, the Option 5+ and DM journey times are closer – this shows an increasing benefit of the scheme (compared to DM) over time as general background traffic increases - however, there is still a worsening on routes from Bridge Street East due to the pedestrian environment and safety improvements discussed previously.

The 25% mode shift scenario shows an improvement in journey times across almost all sections. The largest improvements are seen on Bridge Street East to Bridge Street West (154s in 2024) and Swan Close to Bridge Street West (250s in 2040).

The 5% mode shift scenario shows some nominal improvements over the Option 5+ core scenario, the largest differences can be seen at Swan Close to Bridge Street West, where there is a 19s increase against the Base in 2024 for Option 5+. This is changed to a 20 second improvement against the Base with the 5% mode shift. Additionally, in 2031, Option 5+ shows a 113 second worsening against the DM, this is reduced to a 35 second worsening with 5% mode shift.

**Table 5.4 2024 PM Peak Public Transport Journey Time Comparison**

Main Bus Sections	Bus Routes	Route Count	Base	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - Base	Op5+ (75%) - Base	Op5+ (95%) - Base
Bridge St West to Bridge St East	B7A OB,200-O,500-O,B9 OB_2	4	209	160	141	164	-49	-68	-45
Bridge St West to Cherwell Dr	B4 OB,B8 OB,B9 IB_2,MRT1 OB_3,76 OB,76X OB	6	217	175	127	171	-42	-91	-46
Bridge St West to Concord Avenue	77B OB	1	97	82	62	84	-15	-35	-13
Bridge St West to George St	B5-O,75 OB,488-O,S4-O,X4 OB	5	66	91	83	91	26	17	25
Bridge St West to Swan Close	B3-O	1	85	111	100	110	26	15	25
Bridge St East to Bridge St West	200-I,500-I,B9 IB_1,B7A IB	4	326	373	172	355	47	-154	29
Bridge St East to Cherwell St South	MRT1 OB_1	1	387	512	291	492	125	-96	105
George St to Bridge St West	76 IB,76X IB,488-I,B4 IB,B8 IB,B9 OB_1,S4-I,75A IB,B1 IB,B5 IB	10	70	76	65	73	6	-5	3
Swan Close to Bridge St West	B3-I,MRT1 OB_2	2	206	226	167	186	19	-39	-20

**Table 5.5 2031 PM Peak Public Transport Journey Time Comparison**

Main Bus Sections	Bus Routes	Route Count	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Bridge St West to Bridge St East	B7A OB,200-O,500-O,B9 OB_2	4	209	185	154	185	-24	-55	-23
Bridge St West to Cherwell Dr	B4 OB,B8 OB,B9 IB_2,MRT1 OB_3,76 OB,76X OB	6	204	190	157	176	-14	-48	-28
Bridge St West to Concord Avenue	77B OB	1	90	74	65	74	-16	-25	-16
Bridge St West to George St	B5-O,75 OB,488-O,S4-O,X4 OB	5	48	79	73	80	31	26	33
Bridge St West to Swan Close	B3-O	1	66	98	90	99	32	24	33
Bridge St East to Bridge St West	200-I,500-I,B9 IB_1,B7A IB	4	195	276	152	290	80	-43	94
Bridge St East to Cherwell St South	MRT1 OB_1	1	258	395	249	407	137	-8	149
George St to Bridge St West	76 IB,76X IB,488-I,B4 IB,B8 IB,B9 OB_1,S4-I,75A IB,B1 IB,B5 IB	10	76	77	68	76	2	-8	1
Swan Close to Bridge St West	B3-I,MRT1 OB_2	2	237	350	182	272	113	-55	35

**Table 5.6 2040 PM Peak Public Transport Journey Time Comparison**

Main Bus Sections	Bus Routes	Route Count	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Bridge St West to Bridge St East	B7A OB,200-O,500-O,B9 OB_2	4	231	200	174	192	-32	-58	-40
Bridge St West to Cherwell Dr	B4 OB,B8 OB,B9 IB_2,MRT1 OB_3,76 OB,76X OB	6	198	205	175	198	8	-22	1
Bridge St West to Concord Avenue	77B OB	1	94	77	74	76	-16	-19	-17
Bridge St West to George St	B5-O,75 OB,488-O,S4-O,X4 OB	5	88	85	80	88	-3	-8	0
Bridge St West to Swan Close	B3-O	1	108	105	98	107	-3	-11	-1
Bridge St East to Bridge St West	200-I,500-I,B9 IB_1,B7A IB	4	276	341	219	338	65	-57	62
Bridge St East to Cherwell St South	MRT1 OB_1	1	408	463	330	463	55	-78	55
George St to Bridge St West	76 IB,76X IB,488-I,B4 IB,B8 IB,B9 OB_1,S4-I,75A IB,B1 IB,B5 IB	10	99	83	75	84	-15	-24	-15
Swan Close to Bridge St West	B3-I,MRT1 OB_2	2	405	426	224	374	21	-180	-30

## 5.4.2 General Traffic Journey Times

### 5.4.2.1 AM Peak

Option 5+ compared to the Base / DM shows large increases in journey time for the southbound routes due to the reduced capacity at the junction (lane reduction southbound and increased intergreen and pedestrian times). Improvements are seen in the northbound direction, likely due to improved signal co-ordination and timings and the incorporation of the permissive northbound right turn.

The 25% mode shift scenario shows improvements against the Base / DM across almost all routes, with the largest improvements seen on the northbound routes (Cherwell NB and Swan Close to Cherwell Drive).

The 5% mode shift scenario shows similar results to the Option 5+ core scenario, with nominal improvements over all routes.

**Table 5.7 2024 AM Peak Journey Time Comparison**

Route	Base Time (sec)	Op5+ Time (sec)	Op5+ (75%) Time (sec)	Op5+ (95%) Time (sec)	Op5+ - Base	Op5+ (75%) - Base	Op5+ (95%) - Base
Cherwell SB	299	429	236	384	129	-64	85
Cherwell NB	241	212	190	208	-29	-51	-34
Cherwell Dr to Swan Close	285	397	229	357	112	-56	72
Swan Close to Cherwell Dr	333	265	216	259	-68	-116	-73
George St to Bridge St East	153	139	121	133	-14	-32	-20
Bridge St East to George St	379	397	258	353	18	-121	-25

**Table 5.8 2031 AM Peak Journey Time Comparison**

Route	DM Time (sec)	Op5+ Time (sec)	Op5+ (75%) Time (sec)	Op5+ (95%) Time (sec)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Cherwell SB	276	458	259	427	182	-18	150
Cherwell NB	419	286	193	255	-133	-226	-164
Cherwell Dr to Swan Close	271	455	263	424	184	-8	154
Swan Close to Cherwell Dr	487	334	226	287	-153	-261	-200
George St to Bridge St East	221	223	213	219	3	-7	-2
Bridge St East to George St	434	492	326	456	58	-108	21

**Table 5.9 2040 AM Peak Journey Time Comparison**

Route	DM Time (sec)	Op5+ Time (sec)	Op5+ (75%) Time (sec)	Op5+ (95%) Time (sec)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Cherwell SB	277	514	295	443	237	18	167
Cherwell NB	475	339	203	321	-136	-272	-154
Cherwell Dr to Swan Close	269	487	296	428	218	27	158
Swan Close to Cherwell Dr	590	409	236	365	-181	-353	-225
George St to Bridge St East	190	233	217	231	43	27	42
Bridge St East to George St	535	497	401	487	-38	-134	-48

#### 5.4.2.2 PM Peak

Option 5+ in all 3 years shows a worsening compared to the Base / DM across almost all routes, due to the reduced capacity at the Bridge Street / Cherwell Street junction.

The 25% mode shift scenario shows improvements against the Base / DM across most routes, however, for 2031 and 2040 the southbound routes show a worsening. The largest worsening is Cherwell Drive to Swan Close (136s in 2031), whilst the greatest improvement is Swan Close to Cherwell Drive (273s in 2040).

The 5% mode shift scenario follows a similar pattern to the Option 5+ scenario with some nominal improvements. The greatest improvement over the Option 5+ core scenario is seen at Swan Close to Cherwell Drive which reduces from an 85 second worsening to a 9 second worsening.

**Table 5.10 2024 PM Peak Journey Time Comparison**

Route	Base Time (sec)	Op5+ Time (sec)	Op5+ (75%) Time (sec)	Op5+ (95%) Time (sec)	Op5+ - Base	Op5+ (75%) - Base	Op5+ (95%) - Base
Cherwell SB	292	440	243	399	148	-48	107
Cherwell NB	247	261	195	240	14	-52	-7
Cherwell Dr to Swan Close	280	430	249	395	151	-31	116
Swan Close to Cherwell Dr	302	315	225	281	13	-77	-21
George St to Bridge St East	165	143	125	139	-22	-40	-26
Bridge St East to George St	487	563	304	533	76	-183	45

**Table 5.11 2031 PM Peak Journey Time Comparison**

Route	DM Time (sec)	Op5+ Time (sec)	Op5+ (75%) Time (sec)	Op5+ (95%) Time (sec)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Cherwell SB	231	617	357	580	386	126	349
Cherwell NB	255	309	210	283	54	-45	29
Cherwell Dr to Swan Close	234	641	370	603	407	136	369
Swan Close to Cherwell Dr	336	421	243	345	85	-93	9
George St to Bridge St East	133	237	157	233	103	24	100
Bridge St East to George St	371	456	281	467	85	-90	96

Table 5.12 2040 PM Peak Journey Time Comparison

Route	DM Time (sec)	Op5+ Time (sec)	Op5+ (75%) Time (sec)	Op5+ (95%) Time (sec)	Op5+ - DM	Op5+ (75%) - DM	Op5+ (95%) - DM
Cherwell SB	306	724	457	702	418	151	396
Cherwell NB	352	348	242	335	-4	-111	-17
Cherwell Dr to Swan Close	307	747	474	724	440	167	418
Swan Close to Cherwell Dr	556	533	283	488	-23	-273	-68
George St to Bridge St East	176	242	176	241	66	0	65
Bridge St East to George St	545	533	373	536	-12	-173	-9

### 5.4.3 Junction Performance

The results for junction performance for the AM Peak are presented below.

#### 5.4.3.1 AM Peak

Bridge Street operates at LOS E for the Base / DM scenarios in all 3 years. For the Option 5+ scenario, it remains at LOS E in 2024 but worsens to LOS F for 2031 and 2040. With the 25% mode shift scenario the junction operates at LOS D in all 3 years and operates at LOS E in all 3 years in the 5% mode shift scenario.

George Street operates at LOS D across all scenarios in 2024 and LOS E across all scenarios in 2031 and 2040. The Swan Close junction operates at LOS C in all scenarios in 2024, in 2031 it operates at LOS D for all scenarios except the 25% mode shift scenario where it operates with LOS C. In 2040, the Swan Close junction operates with LOS E in the DM, LOS D for Option 5+ and 5% mode shift scenarios, and operates with LOS C for the 25% mode shift scenario.

Table 5.13: 2024 AM junction performance comparison

Junction	Base		Option 5+		Option 5+ (75%)		Option 5+ (95%)	
	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS
A4260 Concord Avenue/Bridge St/A4260 Cherwell St	58	E	57	E	25	D	49	E
Bridge St/Station Rd	11	B	20	C	3	A	16	B
A4260 Cherwell St/A4260 Windsor St/George St	26	D	31	D	21	D	29	D
A4260 Upper Windsor St/Swan Close Rd/Gatteridge St	31	C	25	C	15	C	23	C
Castle Roundabout	6	A	5	B	1	A	3	A
Middleton Rd/Merton St/Bridge St	26	E	26	E	10	C	22	D
Tramway Rd/Hightown Rd/Lambs Crescent/Swan Close Rd	5	B	4	A	3	A	4	A

Table 5.14: 2031 AM junction performance comparison

Junction	DM		Option 5+		Option 5+ (75%)		Option 5+ (95%)	
	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS
A4260 Concord Avenue/Bridge St/A4260 Cherwell St	55	E	66	F	28	D	59	E
Bridge St/Station Rd	23	C	34	C	15	C	31	C
A4260 Cherwell St/A4260 Windsor St/George St	52	E	67	E	57	E	66	E
A4260 Upper Windsor St/Swan Close Rd/Gatteridge St	44	D	36	D	18	C	30	D
Castle Roundabout	28	B	7	C	2	A	6	B
Middleton Rd/Merton St/Bridge St	41	E	46	F	20	D	43	F
Tramway Rd/Hightown Rd/Lambs Crescent/Swan Close Rd	14	C	10	C	4	A	7	B



**Table 5.15: 2040 AM junction performance comparison**

Junction	DM		Option 5+		Option 5+ (75%)		Option 5+ (95%)	
	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS
A4260 Concord Avenue/Bridge St/A4260 Cherwell St	54	E	70	F	37	D	63	E
Bridge St/Station Rd	28	C	35	C	26	C	34	C
A4260 Cherwell St/A4260 Windsor St/George St	52	E	70	E	59	E	68	E
A4260 Upper Windsor St/Swan Close Rd/Gatteridge St	52	E	45	D	21	C	40	D
Castle Roundabout	30	B	17	D	3	A	14	C
Middleton Rd/Merton St/Bridge St	51	F	49	F	33	E	48	F
Tramway Rd/Hightown Rd/Lambs Crescent/Swan Close Rd	16	D	13	C	5	B	9	C

#### 5.4.3.2 PM Peak

Bridge Street operates with LOS E for the Base / DM scenarios across all years. This worsens to a LOS F across all years for Option 5+ and Option 5+ with 5% mode shift. With 75% mode shift Bridge Street operates with LOS D, E & F in 2024, 2031 and 2040 respectively.

George Street operates at LOS D across all scenarios in 2024 and in the DM and 25% mode shift scenarios in 2031 and 2040. For the Option 5+ and 5% mode shift scenario in 2031 and 2040 it operates with LOS E. Swan Close Road operates with LOS C in all 2024 scenarios, it operates with LOS D for all scenarios in 2031 and 2040 except for the 25% mode shift scenarios in which it operates with LOS C.

Table 5.16: 2024 PM junction performance comparison

Junction	Base		Option 5+		Option 5+ (75%)		Option 5+ (95%)	
	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS
A4260 Concord Avenue/Bridge St/A4260 Cherwell St	62	E	71	F	26	D	59	F
Bridge St/Station Rd	46	D	34	D	8	B	32	D
A4260 Cherwell St/A4260 Windsor St/George St	29	D	42	D	27	D	38	D
A4260 Upper Windsor St/Swan Close Rd/Gatteridge St	26	C	21	C	12	C	18	C
Castle Roundabout	23	B	16	B	3	A	17	B
Middleton Rd/Merton St/Bridge St	41	F	45	F	15	D	42	F
Tramway Rd/Hightown Rd/Lambs Crescent/Swan Close Rd	2	A	9	C	3	A	7	B

Table 5.17: 2031 PM junction performance comparison

Junction	DM		Option 5+		Option 5+ (75%)		Option 5+ (95%)	
	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS
A4260 Concord Avenue/Bridge St/A4260 Cherwell St	47	E	85	F	46	E	82	F
Bridge St/Station Rd	13	B	29	C	7	A	31	C
A4260 Cherwell St/A4260 Windsor St/George St	29	D	66	E	32	D	61	E
A4260 Upper Windsor St/Swan Close Rd/Gatteridge St	31	D	34	D	16	C	28	D
Castle Roundabout	22	B	19	E	3	A	14	D
Middleton Rd/Merton St/Bridge St	35	E	44	F	16	D	43	F
Tramway Rd/Hightown Rd/Lambs Crescent/Swan Close Rd	24	D	29	E	6	B	20	D

**Table 5.18: 2040 PM junction performance comparison**

Junction	DM		Option 5+		Option 5+ (75%)		Option 5+ (95%)	
	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS	Average Queue (m)	LOS
A4260 Concord Avenue/Bridge St/A4260 Cherwell St	62	E	95	F	67	F	94	F
Bridge St/Station Rd	30	C	36	C	19	C	36	C
A4260 Cherwell St/A4260 Windsor St/George St	42	D	72	E	41	D	70	E
A4260 Upper Windsor St/Swan Close Rd/Gatteridge St	42	D	41	D	18	C	37	D
Castle Roundabout	25	B	32	F	8	A	26	F
Middleton Rd/Merton St/Bridge St	52	F	53	F	28	E	52	F
Tramway Rd/Hightown Rd/Lambs Crescent/Swan Close Rd	34	F	35	F	8	C	31	E

## 5.4.4 Network Performance Comparison

### 5.4.4.1 AM Peak

The network performance summary shows average delay increases and number of processed vehicles decreases in the Option 5+ scenario compared to Base / DM across all years.

The 25% mode shift scenario shows improvements in delay across all years and the 5% mode shift scenario shows similar values of delay compared to Base / DM for all years.

**Table 5.19: 2024 AM Network Performance Comparison**

Measure	Base	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - Base	Op5+(75%) - Base	Op5+(95%) - Base
Latent Demand (vehs)	124	40	1	21	-84	-124	-103
Remaining Vehicles in Network	383	391	189	334	8	-194	-49
Processed Vehicles	4140	3879	3268	3790	-261	-872	-350
Average Delay Time (sec)	129	135	79	119	6	-50	-10
Average Network Speed (mph)	9	9	13	10	0	3	0

**Table 5.20: 2031 AM Network Performance Comparison**

Measure	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+(75%) - DM	Op5+(95%) - DM
Latent Demand (vehs)	87	265	42	189	178	-45	102
Remaining Vehicles in Network	356	426	191	381	70	-165	25
Processed Vehicles	4567	4320	3738	4214	-247	-829	-353
Average Delay Time (sec)	175	207	107	179	32	-68	4
Average Network Speed (mph)	8	7	11	7	-1	3	0

**Table 5.21: 2040 AM Network Performance Comparison**

Measure	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+(75%) - DM	Op5+(95%) - DM
Latent Demand (vehs)	281	448	88	320	167	-193	39
Remaining Vehicles in Network	458	513	256	450	55	-202	-8
Processed Vehicles	4577	4386	3897	4352	-191	-680	-225
Average Delay Time (sec)	210	230	128	206	20	-82	-4
Average Network Speed (mph)	7	6	9	7	-1	3	0

#### 5.4.4.2 PM Peak

The network performance summary shows average delay increases and number of processed vehicles decreases in the Option 5+ and 5% mode shift scenarios compared to Base / DM across all years.

The 25% mode shift scenario shows improvements in delay across all years and the 5% mode shift scenario shows similar values of delay compared to Base / DM for all years.

**Table 5.22: 2024 PM Network Performance Comparison**

Measure	Base	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - Base	Op5+(75%) - Base	Op5+(95%) - Base
Latent Demand (vehs)	10	25	1	12	15	-9	2
Remaining Vehicles in Network	246	328	131	288	82	-115	42
Processed Vehicles	4606	4087	3357	3958	-519	-1249	-648
Average Delay Time (sec)	146	183	88	161	37	-58	15
Average Network Speed (mph)	9	7	12	8	-2	3	-1

**Table 5.23: 2031 PM Network Performance Comparison**

Measure	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+(75%) - DM	Op5+(95%) - DM
Latent Demand (vehs)	12	168	0	79	156	-12	67
Remaining Vehicles in Network	392	608	202	518	216	-190	126
Processed Vehicles	4932	4574	3980	4508	-358	-952	-424
Average Delay Time (sec)	146	246	103	214	100	-43	68
Average Network Speed (mph)	9	6	11	6	-3	2	-2

**Table 5.24: 2040 PM Network Performance Comparison**

Measure	DM	Op5+	Op5+ (75%)	Op5+ (95%)	Op5+ - DM	Op5+(75%) - DM	Op5+(95%) - DM
Latent Demand (vehs)	326	492	1	314	166	-325	-12
Remaining Vehicles in Network	580	670	260	645	90	-320	65
Processed Vehicles	4775	4510	4181	4468	-265	-594	-307
Average Delay Time (sec)	233	315	142	297	83	-90	64
Average Network Speed (mph)	6	5	9	5	-1	3	-1

## 6 Summary and Conclusions

MM has been commissioned by OCC to develop a traffic model in PTV VISSIM to test the Detailed Design developed for the Cherwell Street Bus Service Improvement Scheme. The existing model developed for the Feasibility study has been taken and extended to include four additional junctions on the boundary of the model. Signal timings have been updated to match observed SCOOT data from September 2024. Bus routes in the model have been updated to include observed entry times.

The model has been recalibrated / validated against observed data. The calibration / validation results show:

- Car, LGV & HGV volumes validate well against observed data
- 88% of general traffic journey times routes are within 15% of the observed data for AM and PM
- 55% of bus journey time routes are with 15% of the observed data for AM and PM - whilst this is not optimal, as there are no bus lanes beyond the facility on George Street, and general traffic journey time validation within the rest of the model is good, it is assessed that the model is still fit for the purposes of assessing the design.

The existing DM models have been adjusted to include model updates and calibration and validation changes from the base model. Three forecast years have been modelled: 2024, 2031 & 2040. The Option 5+ model from the Feasibility study has been used as the basis for Do Something (DS) models. Design changes from the detailed design have been incorporated as well as associated signal changes. DS mode shift scenarios have also been developed for 25% reduction to car trips and 5% reduction to car trips. The forecast results comparisons show:

- Improved results for Detailed Design Modelling compared to Feasibility - due to better reflection of signal optimisation within the model and better reflection of the wider network feeding into the model
- A positive impact for buses travelling between George Street and Bridge Street West (the main bus movement in focus). There is a negative impact on buses from Bridge Street East due to the need to improve the existing layout from a pedestrian and safety perspective, but this impact is less severe than it was when modelled as part of the Feasibility study
- There is an overall negative impact to general traffic due to increased pedestrian provision - this is less severe than previously modelled and some benefits are seen for the northbound movement
- Improvements seen in the scheme (against DM) generally increase as background traffic increases, highlighting the junction will become more overcapacity over time without any intervention, leading to increasing delays to buses and general traffic alike
- The sensitivity test of reducing car trips by 25% to account for aspired mode shift shows great improvements to both bus and general traffic journey times
- The sensitivity test of reducing car trips by 5% as a "Decide and Provide" scenario showed nominal improvements over the core DS scenario

## 7 Appendices

## **A. Appendix A – Traffic Flow Calibration Car AM**



Description		Volume				
		Model	Count	Mod-Cnt	GEH	Flow Criteria
A4260 Concord Avenue / Bridge Street / A4260 Cherwell Street	A4260 Concord Avenue to Bridge Street (E)	222	217	5	0.3	✓
	A4260 Concord Avenue to Cherwell Street (S)	313	333	-20	1.1	✓
	A4260 Concord Avenue to Bridge Street (W)	0	9	-9	4.2	✓
	Bridge Street (E) to A4260 Concord Avenue	94	115	-21	2.1	✓
	Bridge Street (E) to Cherwell Street (S)	395	395	0	0.0	✓
	Bridge Street (E) to Bridge Street (W)	16	13	3	0.8	✓
	Cherwell Street (S) to A4260 Concord Avenue	337	431	-94	4.8	✓
	Cherwell Street (S) to Bridge Street (E)	349	337	12	0.6	✓
	Cherwell Street (S) to Bridge Street (W)	23	33	-10	1.9	✓
	Bridge Street (W) to A4260 Concord Avenue	31	19	12	2.4	✓
	Bridge Street (W) to Bridge Street (E)	15	15	0	0.0	✓
	Bridge Street (W) to Cherwell Street (S)	3	12	-9	3.3	✓
		1796	1929			
Bridge Street / Unnamed Road	Bridge Street (E) to Unnamed Road (S)	14	13	1	0.3	✓
	Bridge Street (E) to Bridge Street (W)	434	443	-9	0.4	✓
	Unnamed Road (S) to Bridge Street (E)	19	15	4	1.0	✓
	Unnamed Road (S) to Bridge Street (W)	67	79	-12	1.4	✓
	Bridge Street (W) to Bridge Street (E)	480	447	33	1.5	✓
	Bridge Street (W) to Unnamed Road (S)	105	113	-8	0.8	✓
A4260 Cherwell Street / A4260 Windsor Street / George Street	A4260 Cherwell Street (N) to A4260 Windsor Street (S)	569	560	9	0.4	✓
	A4260 Cherwell Street (N) to George Street (W)	151	164	-13	1.0	✓
	A4260 Windsor Street (S) to A4260 Cherwell Street (N)	575	628	-53	2.2	✓
	A4260 Windsor Street (S) to George Street (W)	10	14	-4	1.2	✓
	George Street (W) to A4260 Cherwell Street (N)	140	178	-38	3.0	✓
	George Street (W) to A4260 Windsor Street (S)	82	117	-35	3.5	✓
A4260 Upper Windsor Street / Swan Close Road / Gatteridge Street	A4260 Upper Windsor Street (N) to Swan Close Road (E)	405	424	-19	0.9	✓
	A4260 Upper Windsor Street (N) to A4260 Upper Windsor Street (S)	241	249	-8	0.5	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (N)	326	359	-33	1.8	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (S)	21	50	-29	4.9	✓
	Swan Close Road (E) to Gatteridge Street (W)	86	108	-22	2.2	✓
	A4260 Upper Windsor Street (S) to A4260 Upper Windsor Street (N)	274	241	33	2.1	✓
	A4260 Upper Windsor Street (S) to Swan Close Road (E)	46	64	-18	2.4	✓
	A4260 Upper Windsor Street (S) to Gatteridge Street (W)	7	17	-10	2.9	✓
	Gatteridge Street (W) to A4260 Upper Windsor Street (N)	28	45	-17	2.8	✓
Castle Roundabout	A4260 Concord Avenue (N) to Concord Avenue (S)	422	406	16	0.8	✓
	A4260 Concord Avenue (N) to Cherwell Drive (W)	308	346	-38	2.1	✓
	Concord Avenue (S) to A4260 Concord Avenue (N)	369	473	-104	5.1	✗
	Concord Avenue (S) to Cherwell Drive (W)	91	118	-27	2.6	✓
	Cherwell Drive (W) to A4260 Concord Avenue (N)	230	258	-28	1.8	✓
	Cherwell Drive (W) to Concord Avenue (S)	174	202	-28	2.0	✓
Middleton Road / Merton Street / Bridge Street	Middleton Road (E) to Merton Street (S)	53	51	2	0.3	✓
	Middleton Road (E) to Bridge Street (W)	347	347	0	0.0	✓
	Merton Street (S) to Middleton Road (E)	49	42	7	1.0	✓
	Merton Street (S) to Bridge Street (W)	103	126	-23	2.1	✓
	Bridge Street (W) to Middleton Road (E)	353	383	-30	1.6	✓
	Bridge Street (W) to Merton Street (S)	138	172	-34	2.7	✓
Tramway Road / Hightown Road / Lambs Crescent / Swan Close Road	Tramway Road (NE) to Hightown Road (SE)	26	25	1	0.2	✓
	Tramway Road (NE) to Lambs Crescent (SW)	4	0	4	2.8	✓
	Tramway Road (NE) to Swan Close Road (NW)	33	29	4	0.7	✓
	Hightown Road (SE) to Tramway Road (NE)	49	52	-3	0.4	✓
	Hightown Road (SE) to Lambs Crescent (SW)	0	1	-1	1.4	✓
	Hightown Road (SE) to Swan Close Road (NW)	322	479	-157	7.8	✗
	Lambs Crescent (SW) to Tramway Road (NE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Hightown Road (SE)	1	0	1	1.4	✓
	Lambs Crescent (SW) to Swan Close Road (NW)	0	2	-2	2.0	✓
	Swan Close Road (NW) to Tramway Road (NE)	94	75	19	2.1	✓
	Swan Close Road (NW) to Hightown Road (SE)	306	382	-76	4.1	✓
	Swan Close Road (NW) to Lambs Crescent (SW)	1	1	0	0.0	✓
West Street	Middleton Road (E) to Middleton Road (W)	341	275	66	3.8	✓
	Middleton Road (E) to West Street (N)	29	3	26	6.5	✓
	Middleton Road (W) to Middleton Road (E)	368	409	-41	2.1	✓
	Middleton Road (W) to West Street (N)	34	29	5	0.9	✓
	West Street (N) to Middleton Road (E)	4	24	-20	5.3	✓
Canal Street	West Street (N) to Middleton Road (W)	44	56	-12	1.7	✓
	A4260 (N) to A4260 (S)	630	680	-50	2.0	✓
	A4260 (N) to Canal Street (E)	19	20	-1	0.2	✓
	A4260 (S) to A4260 (N)	586	626	-40	1.6	✓
	A4260 (S) to Canal Street (E)	29	19	10	2.0	✓
Car Park	Canal Street (E) to A4260 (N)	7	3	4	1.8	✓
	Canal Street (E) to A4260 (S)	18	13	5	1.3	✓
	A4260 (N) to A4260 (S)	645	680	-35	1.4	✓
	A4260 (N) to Car Park (W)	4	0	4	2.8	✓
	A4260 (S) to A4260 (N)	611	626	-15	0.6	✓
	A4260 (S) to Car Park (W)	4	2	2	1.2	✓
	Car Park (W) to A4260 (N)	8	1	7	3.3	✓
	Car Park (W) to A4260 (S)	3	0	3	2.4	✓

## **B. Appendix B - Traffic Flow Calibration LGV AM**

Description		Volume				
		Model	Count	Mod-Cnt	GEH	Flow Criteria
A4260 Concord Avenue / Bridge Street / A4260 Cherwell Street	A4260 Concord Avenue to Bridge Street (E)	23	22	1	0.2	✓
	A4260 Concord Avenue to Cherwell Street (S)	70	78	-8	0.9	✓
	A4260 Concord Avenue to Bridge Street (W)	4	7	-3	1.3	✓
	Bridge Street (E) to A4260 Concord Avenue	24	10	14	3.4	✓
	Bridge Street (E) to Cherwell Street (S)	76	60	16	1.9	✓
	Bridge Street (E) to Bridge Street (W)	1	1	0	0.0	✓
	Cherwell Street (S) to A4260 Concord Avenue	73	43	30	3.9	✓
	Cherwell Street (S) to Bridge Street (E)	56	27	29	4.5	✓
	Cherwell Street (S) to Bridge Street (W)	7	6	1	0.4	✓
	Bridge Street (W) to A4260 Concord Avenue	11	3	8	3.0	✓
	Bridge Street (W) to Bridge Street (E)	0	1	-1	1.4	✓
	Bridge Street (W) to Cherwell Street (S)	2	2	0	0.0	✓
	Bridge Street (E) to Unnamed Road (S)	2	0	2	2.0	✓
	Bridge Street (E) to Bridge Street (W)	96	68	28	3.1	✓
Bridge Street / Unnamed Road	Unnamed Road (S) to Bridge Street (E)	3	5	-2	1.0	✓
	Unnamed Road (S) to Bridge Street (W)	7	6	1	0.4	✓
	Bridge Street (W) to Bridge Street (E)	68	49	19	2.5	✓
	Bridge Street (W) to Unnamed Road (S)	10	2	8	3.3	✓
	A4260 Cherwell Street (N) to A4260 Windsor Street (S)	112	99	13	1.3	✓
	A4260 Cherwell Street (N) to George Street (W)	38	35	3	0.5	✓
A4260 Cherwell Street / A4260 Windsor Street / George Street	A4260 Windsor Street (S) to A4260 Cherwell Street (N)	106	51	55	6.2	✓
	A4260 Windsor Street (S) to George Street (W)	0	3	-3	2.4	✓
	George Street (W) to A4260 Cherwell Street (N)	32	23	9	1.7	✓
	George Street (W) to A4260 Windsor Street (S)	18	20	-2	0.5	✓
	A4260 Upper Windsor Street (N) to Swan Close Road (E)	76	62	14	1.7	✓
	A4260 Upper Windsor Street (N) to A4260 Upper Windsor Street (S)	50	39	11	1.6	✓
A4260 Upper Windsor Street / Swan Close Road / Gatteridge Street	Swan Close Road (E) to A4260 Upper Windsor Street (N)	67	44	23	3.1	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (S)	6	6	0	0.0	✓
	Swan Close Road (E) to Gatteridge Street (W)	18	9	9	2.4	✓
	A4260 Upper Windsor Street (S) to A4260 Upper Windsor Street (N)	45	19	26	4.6	✓
	A4260 Upper Windsor Street (S) to Swan Close Road (E)	8	12	-4	1.3	✓
	A4260 Upper Windsor Street (S) to Gatteridge Street (W)	11	4	7	2.6	✓
	Gatteridge Street (W) to A4260 Upper Windsor Street (N)	0	11	-11	4.7	✓
	A4260 Concord Avenue (N) to Concord Avenue (S)	87	76	11	1.2	✓
	A4260 Concord Avenue (N) to Cherwell Drive (W)	34	50	-16	2.5	✓
	Concord Avenue (S) to A4260 Concord Avenue (N)	83	55	28	3.4	✓
Castle Roundabout	Concord Avenue (S) to Cherwell Drive (W)	24	15	9	2.0	✓
	Cherwell Drive (W) to A4260 Concord Avenue (N)	25	18	7	1.5	✓
	Cherwell Drive (W) to Concord Avenue (S)	14	23	-9	2.1	✓
	Middleton Road (E) to Merton Street (S)	8	7	1	0.4	✓
	Middleton Road (E) to Bridge Street (W)	91	57	34	4.0	✓
Middleton Road / Merton Street / Bridge Street	Merton Street (S) to Middleton Road (E)	3	5	-2	1.0	✓
	Merton Street (S) to Bridge Street (W)	7	2	5	2.4	✓
	Bridge Street (W) to Middleton Road (E)	63	48	15	2.0	✓
	Bridge Street (W) to Merton Street (S)	7	11	-4	1.3	✓
	Tramway Road (NE) to Hightown Road (SE)	4	10	-6	2.3	✓
	Tramway Road (NE) to Lambs Crescent (SW)	6	0	6	3.5	✓
	Tramway Road (NE) to Swan Close Road (NW)	9	15	-6	1.7	✓
Tramway Road / Hightown Road / Lambs Crescent / Swan Close Road	Hightown Road (SE) to Tramway Road (NE)	10	6	4	1.4	✓
	Hightown Road (SE) to Lambs Crescent (SW)	0	0	0	0.0	✓
	Hightown Road (SE) to Swan Close Road (NW)	102	40	62	7.4	✓
	Lambs Crescent (SW) to Tramway Road (NE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Hightown Road (SE)	1	0	1	1.4	✓
	Lambs Crescent (SW) to Swan Close Road (NW)	0	0	0	0.0	✓
	Swan Close Road (NW) to Tramway Road (NE)	18	12	6	1.5	✓
	Swan Close Road (NW) to Hightown Road (SE)	54	51	3	0.4	✓
	Swan Close Road (NW) to Lambs Crescent (SW)	3	0	3	2.4	✓
	Middleton Road (E) to Middleton Road (W)	88	65	23	2.6	✓
	Middleton Road (E) to West Street (N)	0	1	-1	1.4	✓
West Street	Middleton Road (W) to Middleton Road (E)	60	53	7	0.9	✓
	Middleton Road (W) to West Street (N)	5	2	3	1.6	✓
	West Street (N) to Middleton Road (E)	0	0	0	0.0	✓
	West Street (N) to Middleton Road (W)	12	1	11	4.3	✓
	A4260 (N) to A4260 (S)	125	96	29	2.8	✓
Canal Street	A4260 (N) to Canal Street (E)	5	1	4	2.3	✓
	A4260 (S) to A4260 (N)	108	73	35	3.7	✓
	A4260 (S) to Canal Street (E)	1	3	-2	1.4	✓
	Canal Street (E) to A4260 (N)	1	1	0	0.0	✓
	Canal Street (E) to A4260 (S)	2	4	-2	1.2	✓
Car Park	A4260 (N) to A4260 (S)	126	96	30	2.8	✓
	A4260 (N) to Car Park (W)	2	0	2	2.0	✓
	A4260 (S) to A4260 (N)	109	73	36	3.8	✓
	A4260 (S) to Car Park (W)	0	0	0	0.0	✓
	Car Park (W) to A4260 (N)	2	1	1	0.8	✓
	Car Park (W) to A4260 (S)	0	0	0	0.0	✓

## **C. Appendix C - Traffic Flow Calibration HGV AM**

Description		Volume				
		Model	Count	Mod-Cnt	GEH	Flow Criteria
A4260 Concord Avenue / Bridge Street / A4260 Cherwell Street	A4260 Concord Avenue to Bridge Street (E)	9	4	5	2.0	✓
	A4260 Concord Avenue to Cherwell Street (S)	20	16	4	0.9	✓
	A4260 Concord Avenue to Bridge Street (W)	0	0	0	0.0	✓
	Bridge Street (E) to A4260 Concord Avenue	7	5	2	0.8	✓
	Bridge Street (E) to Cherwell Street (S)	1	2	-1	0.8	✓
	Bridge Street (E) to Bridge Street (W)	0	0	0	0.0	✓
	Cherwell Street (S) to A4260 Concord Avenue	19	14	5	1.2	✓
	Cherwell Street (S) to Bridge Street (E)	3	1	2	1.4	✓
	Cherwell Street (S) to Bridge Street (W)	2	1	1	0.8	✓
	Bridge Street (W) to A4260 Concord Avenue	0	0	0	0.0	✓
	Bridge Street (W) to Bridge Street (E)	0	0	0	0.0	✓
	Bridge Street (W) to Cherwell Street (S)	0	0	0	0.0	✓
	Bridge Street (E) to Unnamed Road (S)	0	0	0	0.0	✓
	Bridge Street (E) to Bridge Street (W)	9	7	2	0.7	✓
Bridge Street / Unnamed Road	Unnamed Road (S) to Bridge Street (E)	0	0	0	0.0	✓
	Unnamed Road (S) to Bridge Street (W)	0	0	0	0.0	✓
	Bridge Street (W) to Bridge Street (E)	11	5	6	2.1	✓
	Bridge Street (W) to Unnamed Road (S)	0	0	0	0.0	✓
	A4260 Cherwell Street (N) to A4260 Windsor Street (S)	21	16	5	1.2	✓
	A4260 Cherwell Street (N) to George Street (W)	1	1	0	0.0	✓
A4260 Cherwell Street / A4260 Windsor Street / George Street	A4260 Windsor Street (S) to A4260 Cherwell Street (N)	20	10	10	2.6	✓
	A4260 Windsor Street (S) to George Street (W)	0	0	0	0.0	✓
	George Street (W) to A4260 Cherwell Street (N)	5	4	1	0.5	✓
	George Street (W) to A4260 Windsor Street (S)	0	0	0	0.0	✓
	A4260 Upper Windsor Street (N) to Swan Close Road (E)	8	3	5	2.1	✓
	A4260 Upper Windsor Street (N) to A4260 Upper Windsor Street (S)	12	4	8	2.8	✓
A4260 Upper Windsor Street / Swan Close Road / Gatteridge Street	Swan Close Road (E) to A4260 Upper Windsor Street (N)	8	5	3	1.2	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (S)	0	1	-1	1.4	✓
	Swan Close Road (E) to Gatteridge Street (W)	0	1	-1	1.4	✓
	A4260 Upper Windsor Street (S) to A4260 Upper Windsor Street (N)	13	8	5	1.5	✓
	A4260 Upper Windsor Street (S) to Swan Close Road (E)	3	0	3	2.4	✓
	A4260 Upper Windsor Street (S) to Gatteridge Street (W)	0	0	0	0.0	✓
	Gatteridge Street (W) to A4260 Upper Windsor Street (N)	0	1	-1	1.4	✓
	A4260 Concord Avenue (N) to Concord Avenue (S)	22	12	10	2.4	✓
	A4260 Concord Avenue (N) to Cherwell Drive (W)	0	9	-9	4.2	✓
	Concord Avenue (S) to A4260 Concord Avenue (N)	22	19	3	0.7	✓
Castle Roundabout	Concord Avenue (S) to Cherwell Drive (W)	2	1	1	0.8	✓
	Cherwell Drive (W) to A4260 Concord Avenue (N)	5	5	0	0.0	✓
	Cherwell Drive (W) to Concord Avenue (S)	11	1	10	4.1	✓
	Middleton Road (E) to Merton Street (S)	2	0	2	2.0	✓
	Middleton Road (E) to Bridge Street (W)	7	1	6	3.0	✓
	Merton Street (S) to Middleton Road (E)	0	0	0	0.0	✓
Middleton Road / Merton Street / Bridge Street	Merton Street (S) to Bridge Street (W)	2	1	1	0.8	✓
	Bridge Street (W) to Middleton Road (E)	9	1	8	3.6	✓
	Bridge Street (W) to Merton Street (S)	3	3	0	0.0	✓
	Tramway Road (NE) to Hightown Road (SE)	0	1	-1	1.4	✓
	Tramway Road (NE) to Lambs Crescent (SW)	2	0	2	2.0	✓
	Tramway Road (NE) to Swan Close Road (NW)	4	6	-2	0.9	✓
Tramway Road / Hightown Road / Lambs Crescent / Swan Close Road	Hightown Road (SE) to Tramway Road (NE)	0	1	-1	1.4	✓
	Hightown Road (SE) to Lambs Crescent (SW)	0	0	0	0.0	✓
	Hightown Road (SE) to Swan Close Road (NW)	2	1	1	0.8	✓
	Lambs Crescent (SW) to Tramway Road (NE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Hightown Road (SE)	1	0	1	1.4	✓
	Lambs Crescent (SW) to Swan Close Road (NW)	0	0	0	0.0	✓
	Swan Close Road (NW) to Tramway Road (NE)	8	2	6	2.7	✓
	Swan Close Road (NW) to Hightown Road (SE)	3	1	2	1.4	✓
	Swan Close Road (NW) to Lambs Crescent (SW)	0	0	0	0.0	✓
	Middleton Road (E) to Middleton Road (W)	9	0	9	4.2	✓
	Middleton Road (E) to West Street (N)	2	0	2	2.0	✓
	Middleton Road (W) to Middleton Road (E)	8	1	7	3.3	✓
West Street	Middleton Road (W) to West Street (N)	1	0	1	1.4	✓
	West Street (N) to Middleton Road (E)	0	0	0	0.0	✓
	West Street (N) to Middleton Road (W)	1	0	1	1.4	✓
	A4260 (N) to A4260 (S)	20	7	13	3.5	✓
	A4260 (N) to Canal Street (E)	1	0	1	1.4	✓
	A4260 (S) to A4260 (N)	20	14	6	1.5	✓
Canal Street	A4260 (S) to Canal Street (E)	0	1	-1	1.4	✓
	Canal Street (E) to A4260 (N)	0	0	0	0.0	✓
	Canal Street (E) to A4260 (S)	0	0	0	0.0	✓
	A4260 (N) to Car Park (S)	20	7	13	3.5	✓
	A4260 (N) to Car Park (W)	0	0	0	0.0	✓
	A4260 (S) to A4260 (N)	20	14	6	1.5	✓
Car Park	A4260 (S) to Car Park (W)	0	0	0	0.0	✓
	Car Park (W) to A4260 (N)	0	0	0	0.0	✓
	Car Park (W) to A4260 (S)	0	0	0	0.0	✓

## **D. Appendix D– Traffic Flow Calibration Car PM**

Description		Volume				
		Model	Count	Mod-Cnt	GEH	Flow Criteria
A4260 Concord Avenue / Bridge Street / A4260 Cherwell Street	A4260 Concord Avenue to Bridge Street (E)	275	233	42	2.6	✓
	A4260 Concord Avenue to Cherwell Street (S)	411	458	-47	2.3	✓
	A4260 Concord Avenue to Bridge Street (W)	33	30	3	0.5	✓
	Bridge Street (E) to A4260 Concord Avenue	113	120	-7	0.6	✓
	Bridge Street (E) to Cherwell Street (S)	423	365	58	2.9	✓
	Bridge Street (E) to Bridge Street (W)	18	30	-12	2.4	✓
	Cherwell Street (S) to A4260 Concord Avenue	401	461	-60	2.9	✓
	Cherwell Street (S) to Bridge Street (E)	306	285	21	1.2	✓
	Cherwell Street (S) to Bridge Street (W)	59	65	-6	0.8	✓
	Bridge Street (W) to A4260 Concord Avenue	30	52	-22	3.4	✓
	Bridge Street (W) to Bridge Street (E)	18	29	-11	2.3	✓
	Bridge Street (W) to Cherwell Street (S)	48	51	-3	0.4	✓
	Bridge Street (E) to Unnamed Road (S)	13	10	3	0.9	✓
	Bridge Street (E) to Bridge Street (W)	428	390	38	1.9	✓
Bridge Street / Unnamed Road	Unnamed Road (S) to Bridge Street (E)	10	30	-20	4.5	✓
	Unnamed Road (S) to Bridge Street (W)	142	108	34	3.0	✓
	Bridge Street (W) to Bridge Street (E)	529	443	86	3.9	✓
	Bridge Street (W) to Unnamed Road (S)	70	110	-40	4.2	✓
A4260 Cherwell Street / A4260 Windsor Street / George Street	A4260 Cherwell Street (N) to A4260 Windsor Street (S)	654	669	-15	0.6	✓
	A4260 Cherwell Street (N) to George Street (W)	220	217	3	0.2	✓
	A4260 Windsor Street (S) to A4260 Cherwell Street (N)	611	591	20	0.8	✓
	A4260 Windsor Street (S) to George Street (W)	32	19	13	2.6	✓
	George Street (W) to A4260 Cherwell Street (N)	162	213	-51	3.7	✓
	George Street (W) to A4260 Windsor Street (S)	134	124	10	0.9	✓
A4260 Upper Windsor Street / Swan Close Road / Gatteridge Street	A4260 Upper Windsor Street (N) to Swan Close Road (E)	472	522	-50	2.2	✓
	A4260 Upper Windsor Street (N) to A4260 Upper Windsor Street (S)	319	215	104	6.4	✗
	Swan Close Road (E) to A4260 Upper Windsor Street (N)	308	313	-5	0.3	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (S)	103	86	17	1.7	✓
	Swan Close Road (E) to Gatteridge Street (W)	107	125	-18	1.7	✓
	A4260 Upper Windsor Street (S) to A4260 Upper Windsor Street (N)	290	233	57	3.5	✓
	A4260 Upper Windsor Street (S) to Swan Close Road (E)	71	69	2	0.2	✓
	A4260 Upper Windsor Street (S) to Gatteridge Street (W)	30	30	0	0.0	✓
	Gatteridge Street (W) to A4260 Upper Windsor Street (N)	38	48	-10	1.5	✓
Castle Roundabout	A4260 Concord Avenue (N) to Concord Avenue (S)	532	544	-12	0.5	✓
	A4260 Concord Avenue (N) to Cherwell Drive (W)	516	555	-39	1.7	✓
	Concord Avenue (S) to A4260 Concord Avenue (N)	452	496	-44	2.0	✓
	Concord Avenue (S) to Cherwell Drive (W)	90	256	-166	12.6	✗
	Cherwell Drive (W) to A4260 Concord Avenue (N)	286	255	31	1.9	✓
	Cherwell Drive (W) to Concord Avenue (S)	191	166	25	1.9	✓
Middleton Road / Merton Street / Bridge Street	Middleton Road (E) to Merton Street (S)	30	26	4	0.8	✓
	Middleton Road (E) to Bridge Street (W)	320	282	38	2.2	✓
	Merton Street (S) to Middleton Road (E)	62	48	14	1.9	✓
	Merton Street (S) to Bridge Street (W)	131	134	-3	0.3	✓
	Bridge Street (W) to Middleton Road (E)	433	398	35	1.7	✓
	Bridge Street (W) to Merton Street (S)	95	110	-15	1.5	✓
Tramway Road / Hightown Road / Lambs Crescent / Swan Close Road	Tramway Road (NE) to Hightown Road (SE)	88	52	36	4.3	✓
	Tramway Road (NE) to Lambs Crescent (SW)	37	0	37	8.6	✓
	Tramway Road (NE) to Swan Close Road (NW)	88	80	8	0.9	✓
	Hightown Road (SE) to Tramway Road (NE)	16	33	-17	3.4	✓
	Hightown Road (SE) to Lambs Crescent (SW)	0	1	-1	1.4	✓
	Hightown Road (SE) to Swan Close Road (NW)	318	352	-34	1.9	✓
	Lambs Crescent (SW) to Tramway Road (NE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Hightown Road (SE)	5	0	5	3.2	✓
	Lambs Crescent (SW) to Swan Close Road (NW)	14	5	9	2.9	✓
	Swan Close Road (NW) to Tramway Road (NE)	39	70	-31	4.2	✓
	Swan Close Road (NW) to Hightown Road (SE)	390	507	-117	5.5	✗
	Swan Close Road (NW) to Lambs Crescent (SW)	7	3	4	1.8	✓
West Street	Middleton Road (E) to Middleton Road (W)	257	245	12	0.8	✓
	Middleton Road (E) to West Street (N)	9	16	-7	2.0	✓
	Middleton Road (W) to Middleton Road (E)	402	350	52	2.7	✓
	Middleton Road (W) to West Street (N)	89	65	24	2.7	✓
	West Street (N) to Middleton Road (E)	13	18	-5	1.3	✓
	West Street (N) to Middleton Road (W)	40	36	4	0.6	✓
Canal Street	A4260 (N) to A4260 (S)	773	726	47	1.7	✓
	A4260 (N) to Canal Street (E)	14	13	1	0.3	✓
	A4260 (S) to A4260 (N)	612	574	38	1.6	✓
	A4260 (S) to Canal Street (E)	26	14	12	2.7	✓
	Canal Street (E) to A4260 (N)	29	22	7	1.4	✓
Car Park	Canal Street (E) to A4260 (S)	34	31	3	0.5	✓
	A4260 (N) to A4260 (S)	796	726	70	2.5	✓
	A4260 (N) to Car Park (W)	9	2	7	3.0	✓
	A4260 (S) to A4260 (N)	626	574	52	2.1	✓
	A4260 (S) to Car Park (W)	8	4	4	1.6	✓
	Car Park (W) to A4260 (N)	12	4	8	2.8	✓
	Car Park (W) to A4260 (S)	2	4	-2	1.2	✓

## **E. Appendix E - Traffic Flow Calibration LGV PM**



Description		Volume				
		Model	Count	Mod-Cnt	GEH	Flow Criteria
A4260 Concord Avenue / Bridge Street / A4260 Cherwell Street	A4260 Concord Avenue to Bridge Street (E)	33	29	4	0.7	✓
	A4260 Concord Avenue to Cherwell Street (S)	39	47	-8	1.2	✓
	A4260 Concord Avenue to Bridge Street (W)	6	1	5	2.7	✓
	Bridge Street (E) to A4260 Concord Avenue	6	8	-2	0.8	✓
	Bridge Street (E) to Cherwell Street (S)	42	26	16	2.7	✓
	Bridge Street (E) to Bridge Street (W)	3	1	2	1.4	✓
	Cherwell Street (S) to A4260 Concord Avenue	67	35	32	4.5	✓
	Cherwell Street (S) to Bridge Street (E)	45	34	11	1.8	✓
	Cherwell Street (S) to Bridge Street (W)	9	4	5	2.0	✓
	Bridge Street (W) to A4260 Concord Avenue	3	0	3	2.4	✓
	Bridge Street (W) to Bridge Street (E)	4	1	3	1.9	✓
	Bridge Street (W) to Cherwell Street (S)	0	1	-1	1.4	✓
	Bridge Street (E) to Unnamed Road (S)	0	1	-1	1.4	✓
	Bridge Street (E) to Bridge Street (W)	48	34	14	2.2	✓
Bridge Street / Unnamed Road	Unnamed Road (S) to Bridge Street (E)	5	4	1	0.5	✓
	Unnamed Road (S) to Bridge Street (W)	5	3	2	1.0	✓
	Bridge Street (W) to Bridge Street (E)	80	59	21	2.5	✓
	Bridge Street (W) to Unnamed Road (S)	2	6	-4	2.0	✓
A4260 Cherwell Street / A4260 Windsor Street / George Street	A4260 Cherwell Street (N) to A4260 Windsor Street (S)	55	55	0	0.0	✓
	A4260 Cherwell Street (N) to George Street (W)	25	17	8	1.7	✓
	A4260 Windsor Street (S) to A4260 Cherwell Street (N)	103	58	45	5.0	✓
	A4260 Windsor Street (S) to George Street (W)	0	3	-3	2.4	✓
	George Street (W) to A4260 Cherwell Street (N)	20	19	1	0.2	✓
	George Street (W) to A4260 Windsor Street (S)	3	10	-7	2.7	✓
A4260 Upper Windsor Street / Swan Close Road / Gatteridge Street	A4260 Upper Windsor Street (N) to Swan Close Road (E)	42	66	-24	3.3	✓
	A4260 Upper Windsor Street (N) to A4260 Upper Windsor Street (S)	15	19	-4	1.0	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (N)	37	25	12	2.2	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (S)	1	6	-5	2.7	✓
	Swan Close Road (E) to Gatteridge Street (W)	0	15	-15	5.5	✓
	A4260 Upper Windsor Street (S) to A4260 Upper Windsor Street (N)	64	31	33	4.8	✓
	A4260 Upper Windsor Street (S) to Swan Close Road (E)	6	5	1	0.4	✓
	A4260 Upper Windsor Street (S) to Gatteridge Street (W)	0	5	-5	3.2	✓
	Gatteridge Street (W) to A4260 Upper Windsor Street (N)	0	9	-9	4.2	✓
Castle Roundabout	A4260 Concord Avenue (N) to Concord Avenue (S)	44	67	-23	3.1	✓
	A4260 Concord Avenue (N) to Cherwell Drive (W)	49	62	-13	1.7	✓
	Concord Avenue (S) to A4260 Concord Avenue (N)	72	49	23	3.0	✓
	Concord Avenue (S) to Cherwell Drive (W)	4	13	-9	3.1	✓
	Cherwell Drive (W) to A4260 Concord Avenue (N)	11	17	-6	1.6	✓
	Cherwell Drive (W) to Concord Avenue (S)	34	21	13	2.5	✓
Middleton Road / Merton Street / Bridge Street	Middleton Road (E) to Merton Street (S)	10	4	6	2.3	✓
	Middleton Road (E) to Bridge Street (W)	41	39	2	0.3	✓
	Merton Street (S) to Middleton Road (E)	2	5	-3	1.6	✓
	Merton Street (S) to Bridge Street (W)	7	9	-2	0.7	✓
	Bridge Street (W) to Middleton Road (E)	64	50	14	1.9	✓
	Bridge Street (W) to Merton Street (S)	21	26	-5	1.0	✓
Tramway Road / Hightown Road / Lambs Crescent / Swan Close Road	Tramway Road (NE) to Hightown Road (SE)	0	2	-2	2.0	✓
	Tramway Road (NE) to Lambs Crescent (SW)	0	1	-1	1.4	✓
	Tramway Road (NE) to Swan Close Road (NW)	5	6	-1	0.4	✓
	Hightown Road (SE) to Tramway Road (NE)	7	6	1	0.4	✓
	Hightown Road (SE) to Lambs Crescent (SW)	0	1	-1	1.4	✓
	Hightown Road (SE) to Swan Close Road (NW)	24	28	-4	0.8	✓
	Lambs Crescent (SW) to Tramway Road (NE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Hightown Road (SE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Swan Close Road (NW)	0	0	0	0.0	✓
	Swan Close Road (NW) to Tramway Road (NE)	0	6	-6	3.5	✓
	Swan Close Road (NW) to Hightown Road (SE)	43	53	-10	1.4	✓
	Swan Close Road (NW) to Lambs Crescent (SW)	0	0	0	0.0	✓
West Street	Middleton Road (E) to Middleton Road (W)	45	36	9	1.4	✓
	Middleton Road (E) to West Street (N)	1	1	0	0.0	✓
	Middleton Road (W) to Middleton Road (E)	55	39	16	2.3	✓
	Middleton Road (W) to West Street (N)	10	9	1	0.3	✓
	West Street (N) to Middleton Road (E)	2	1	1	0.8	✓
	West Street (N) to Middleton Road (W)	6	4	2	0.9	✓
Canal Street	A4260 (N) to A4260 (S)	55	82	-27	3.3	✓
	A4260 (N) to Canal Street (E)	3	0	3	2.4	✓
	A4260 (S) to A4260 (N)	101	63	38	4.2	✓
	A4260 (S) to Canal Street (E)	0	1	-1	1.4	✓
	Canal Street (E) to A4260 (N)	1	2	-1	0.8	✓
	Canal Street (E) to A4260 (S)	3	2	1	0.6	✓
Car Park	A4260 (N) to A4260 (S)	56	82	-26	3.1	✓
	A4260 (N) to Car Park (W)	1	0	1	1.4	✓
	A4260 (S) to A4260 (N)	100	63	37	4.1	✓
	A4260 (S) to Car Park (W)	0	0	0	0.0	✓
	Car Park (W) to A4260 (N)	1	0	1	1.4	✓
	Car Park (W) to A4260 (S)	0	0	0	0.0	✓

## **F. Appendix F - Traffic Flow Calibration HGV PM**

Description		Volume				
		Model	Count	Mod-Cnt	GEH	Flow Criteria
A4260 Concord Avenue / Bridge Street / A4260 Cherwell Street	A4260 Concord Avenue to Bridge Street (E)	0	0	0	0.0	✓
	A4260 Concord Avenue to Cherwell Street (S)	9	5	4	1.5	✓
	A4260 Concord Avenue to Bridge Street (W)	0	0	0	0.0	✓
	Bridge Street (E) to A4260 Concord Avenue	2	0	2	2.0	✓
	Bridge Street (E) to Cherwell Street (S)	2	0	2	2.0	✓
	Bridge Street (E) to Bridge Street (W)	0	0	0	0.0	✓
	Cherwell Street (S) to A4260 Concord Avenue	6	6	0	0.0	✓
	Cherwell Street (S) to Bridge Street (E)	9	0	9	4.2	✓
	Cherwell Street (S) to Bridge Street (W)	0	0	0	0.0	✓
	Bridge Street (W) to A4260 Concord Avenue	0	0	0	0.0	✓
	Bridge Street (W) to Bridge Street (E)	0	0	0	0.0	✓
	Bridge Street (W) to Cherwell Street (S)	0	0	0	0.0	✓
	Bridge Street (E) to Unnamed Road (S)	0	0	0	0.0	✓
Bridge Street / Unnamed Road	Bridge Street (E) to Bridge Street (W)	5	0	5	3.2	✓
	Unnamed Road (S) to Bridge Street (E)	0	0	0	0.0	✓
	Unnamed Road (S) to Bridge Street (W)	0	1	-1	1.4	✓
	Bridge Street (W) to Bridge Street (E)	9	0	9	4.2	✓
	Bridge Street (W) to Unnamed Road (S)	0	0	0	0.0	✓
	A4260 Cherwell Street (N) to A4260 Windsor Street (S)	9	5	4	1.5	✓
A4260 Cherwell Street / A4260 Windsor Street / George Street	A4260 Cherwell Street (N) to George Street (W)	2	0	2	2.0	✓
	A4260 Windsor Street (S) to A4260 Cherwell Street (N)	10	6	4	1.4	✓
	A4260 Windsor Street (S) to George Street (W)	0	0	0	0.0	✓
	George Street (W) to A4260 Cherwell Street (N)	6	0	6	3.5	✓
	George Street (W) to A4260 Windsor Street (S)	0	0	0	0.0	✓
	A4260 Upper Windsor Street (N) to Swan Close Road (E)	2	5	-3	1.6	✓
A4260 Upper Windsor Street / Swan Close Road / Gatteridge Street	A4260 Upper Windsor Street (N) to A4260 Upper Windsor Street (S)	7	3	4	1.8	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (N)	0	2	-2	2.0	✓
	Swan Close Road (E) to A4260 Upper Windsor Street (S)	1	1	0	0.0	✓
	Swan Close Road (E) to Gatteridge Street (W)	0	0	0	0.0	✓
	A4260 Upper Windsor Street (S) to A4260 Upper Windsor Street (N)	8	8	0	0.0	✓
	A4260 Upper Windsor Street (S) to Swan Close Road (E)	0	0	0	0.0	✓
	A4260 Upper Windsor Street (S) to Gatteridge Street (W)	0	0	0	0.0	✓
	Gatteridge Street (W) to A4260 Upper Windsor Street (N)	0	0	0	0.0	✓
	A4260 Concord Avenue (N) to Concord Avenue (S)	9	11	-2	0.6	✓
	A4260 Concord Avenue (N) to Cherwell Drive (W)	10	2	8	3.3	✓
Castle Roundabout	Concord Avenue (S) to A4260 Concord Avenue (N)	6	9	-3	1.1	✓
	Concord Avenue (S) to Cherwell Drive (W)	2	1	1	0.8	✓
	Cherwell Drive (W) to A4260 Concord Avenue (N)	3	1	2	1.4	✓
	Cherwell Drive (W) to Concord Avenue (S)	0	0	0	0.0	✓
	Middleton Road (E) to Merton Street (S)	0	0	0	0.0	✓
	Middleton Road (E) to Bridge Street (W)	5	1	4	2.3	✓
Middleton Road / Merton Street / Bridge Street	Merton Street (S) to Middleton Road (E)	0	0	0	0.0	✓
	Merton Street (S) to Bridge Street (W)	0	1	-1	1.4	✓
	Bridge Street (W) to Middleton Road (E)	8	4	4	1.6	✓
	Bridge Street (W) to Merton Street (S)	0	3	-3	2.4	✓
	Tramway Road (NE) to Hightown Road (SE)	0	1	-1	1.4	✓
	Tramway Road (NE) to Lambs Crescent (SW)	1	0	1	1.4	✓
Tramway Road / Hightown Road / Lambs Crescent / Swan Close Road	Tramway Road (NE) to Swan Close Road (NW)	0	3	-3	2.4	✓
	Hightown Road (SE) to Tramway Road (NE)	0	0	0	0.0	✓
	Hightown Road (SE) to Lambs Crescent (SW)	0	0	0	0.0	✓
	Hightown Road (SE) to Swan Close Road (NW)	1	0	1	1.4	✓
	Lambs Crescent (SW) to Tramway Road (NE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Hightown Road (SE)	0	0	0	0.0	✓
	Lambs Crescent (SW) to Swan Close Road (NW)	0	0	0	0.0	✓
	Swan Close Road (NW) to Tramway Road (NE)	2	3	-1	0.6	✓
	Swan Close Road (NW) to Hightown Road (SE)	1	1	0	0.0	✓
	Swan Close Road (NW) to Lambs Crescent (SW)	0	0	0	0.0	✓
	Middleton Road (E) to Middleton Road (W)	4	1	3	1.9	✓
	Middleton Road (E) to West Street (N)	0	0	0	0.0	✓
West Street	Middleton Road (W) to Middleton Road (E)	7	3	4	1.8	✓
	Middleton Road (W) to West Street (N)	2	1	1	0.8	✓
	West Street (N) to Middleton Road (E)	0	0	0	0.0	✓
	West Street (N) to Middleton Road (W)	0	1	-1	1.4	✓
	A4260 (N) to A4260 (S)	9	8	1	0.3	✓
Canal Street	A4260 (N) to Canal Street (E)	0	0	0	0.0	✓
	A4260 (S) to A4260 (N)	9	10	-1	0.3	✓
	A4260 (S) to Canal Street (E)	0	0	0	0.0	✓
	Canal Street (E) to A4260 (N)	1	0	1	1.4	✓
	Canal Street (E) to A4260 (S)	1	0	1	1.4	✓
	A4260 (N) to A4260 (S)	10	8	2	0.7	✓
Car Park	A4260 (N) to Car Park (W)	0	0	0	0.0	✓
	A4260 (S) to A4260 (N)	8	10	-2	0.7	✓
	A4260 (S) to Car Park (W)	0	0	0	0.0	✓
	Car Park (W) to A4260 (N)	1	0	1	1.4	✓
	Car Park (W) to A4260 (S)	0	0	0	0.0	✓

## G. Appendix G – 2024 All Journey Times

**Table G.1: 2024 AM Forecast Scenario Journey Times**

Route	Base	DM	Op5+	Op5+(75%)	Op5+(95%)	Op5+- Base	Op5+(75%) -Base	Op5+(95%) -Base
Cherwell SB	299	237	429	236	384	129	-64	85
Cherwell NB	241	201	212	190	208	-29	-51	-34
Cherwell Dr to Cherwell St S	293	238	403	236	364	111	-57	72
Cherwell St S to Cherwell Dr	224	183	195	176	192	-29	-48	-32
Bridge St East to Cherwell	272	269	338	236	312	66	-37	40
Cherwell to Bridge St East	327	247	275	217	253	-52	-111	-74
Cherwell Dr to Swan Cl	285	235	397	229	357	112	-56	72
Swan Cl to Cherwell Dr	333	286	265	216	259	-68	-116	-73
George St to Concord Av	202	164	168	155	164	-35	-47	-38
Concord Av to George St	268	199	400	209	355	132	-59	87
Bridge St EB	160	151	181	139	162	21	-21	2
Bridge St WB	195	183	225	151	205	30	-44	10
George St to Bridge St East	153	109	139	121	133	-14	-32	-20
Bridge St East to George St	379	332	397	258	353	18	-121	-25

**Table G.2: 2024 PM Forecast Scenario Journey Times**

Route	Base	DM	Op5+	Op5+(75%)	Op5+(95%)	Op5+- Base	Op5+(75%) -Base	Op5+(95%) -Base
Cherwell SB	292	217	440	243	399	148	-48	107
Cherwell NB	247	205	261	195	240	14	-52	-7
Cherwell Dr to Cherwell St S	290	218	428	244	392	138	-46	102
Cherwell St S to Cherwell Dr	225	185	241	178	219	16	-46	-6
Bridge St East to Cherwell	386	321	512	291	491	126	-95	105
Cherwell to Bridge St East	304	224	264	184	229	-40	-120	-75
Cherwell Dr to Swan Cl	280	221	430	249	395	151	-31	116
Swan Cl to Cherwell Dr	302	252	315	225	281	13	-77	-21
George St to Concord Av	239	185	228	185	224	-11	-54	-15
Concord Av to George St	257	195	427	234	387	170	-23	130
Bridge St EB	213	151	158	139	165	-55	-74	-48
Bridge St WB	334	244	375	174	361	40	-160	26
George St to Bridge St East	165	115	143	125	139	-22	-40	-26
Bridge St East to George St	487	376	563	304	533	76	-183	45

## H. Appendix H – 2031 All Journey Times

**Table H.1: 2031 AM Forecast Scenario Journey Times**

Route	DM	Op5+	Op5+(75%)	Op5+(95%)	Op5+-DM	Op5+(75%) -DM	Op5+(95%) -DM
Cherwell SB	276	458	259	427	182	-18	150
Cherwell NB	419	286	193	255	-133	-226	-164
Cherwell Dr to Cherwell St S	278	454	259	421	176	-19	143
Cherwell St S to Cherwell Dr	401	270	179	239	-131	-222	-162
Bridge St East to Cherwell	344	440	306	420	96	-38	77
Cherwell to Bridge St East	453	331	216	284	-122	-237	-169
Cherwell Dr to Swan Cl	271	455	263	424	184	-8	154
Swan Cl to Cherwell Dr	487	334	226	287	-153	-261	-200
George St to Concord Av	323	269	251	264	-54	-72	-59
Concord Av to George St	234	432	236	403	198	2	169
Bridge St EB	175	183	154	172	8	-21	-3
Bridge St WB	293	319	201	302	26	-92	9
George St to Bridge St East	221	223	213	219	3	-7	-2
Bridge St East to George St	434	492	326	456	58	-108	21

**Table H.2: 2031 PM Forecast Scenario Journey Times**

Route	DM	Op5+	Op5+(75%)	Op5+(95%)	Op5+-DM	Op5+(75%) -DM	Op5+(95%) -DM
Cherwell SB	231	617	357	580	386	126	349
Cherwell NB	255	309	210	283	54	-45	29
Cherwell Dr to Cherwell St S	233	638	364	601	405	131	368
Cherwell St S to Cherwell Dr	237	294	193	267	57	-44	29
Bridge St East to Cherwell	258	395	249	407	137	-9	150
Cherwell to Bridge St East	327	332	214	304	4	-113	-23
Cherwell Dr to Swan Cl	234	641	370	603	407	136	369
Swan Cl to Cherwell Dr	336	421	243	345	85	-93	9
George St to Concord Av	194	304	215	300	110	21	106
Concord Av to George St	198	596	337	559	398	139	361
Bridge St EB	213	189	155	190	-24	-59	-23
Bridge St WB	197	275	154	291	78	-43	94
George St to Bridge St East	133	237	157	233	103	24	100
Bridge St East to George St	371	456	281	467	85	-90	96

# I. Appendix I – 2040 All Journey Times

**Table I.1: 2040 AM Forecast Scenario Journey Times**

Route	DM	Op5+	Op5+(75%)	Op5+(95%)	Op5+-DM	Op5+(75%) -DM	Op5+(95%) -DM
Cherwell SB	277	514	295	443	237	18	167
Cherwell NB	475	339	203	321	-136	-272	-154
Cherwell Dr to Cherwell St S	278	490	295	430	212	17	151
Cherwell St S to Cherwell Dr	458	323	188	305	-134	-270	-153
Bridge St East to Cherwell	418	452	373	436	34	-44	18
Cherwell to Bridge St East	546	374	232	361	-172	-315	-185
Cherwell Dr to Swan Cl	269	487	296	428	218	27	158
Swan Cl to Cherwell Dr	590	409	236	365	-181	-353	-225
George St to Concord Av	286	284	255	281	-2	-31	-5
Concord Av to George St	234	482	270	413	248	36	179
Bridge St EB	198	190	165	196	-8	-33	-2
Bridge St WB	313	335	275	331	22	-38	17
George St to Bridge St East	190	233	217	231	43	27	42
Bridge St East to George St	535	497	401	487	-38	-134	-48

**Table I.2: 2040 PM Forecast Scenario Journey Times**

Route	DM	Op5+	Op5+(75%)	Op5+(95%)	Op5+-DM	Op5+(75%) -DM	Op5+(95%) -DM
Cherwell SB	306	724	457	702	418	151	396
Cherwell NB	352	348	242	335	-4	-111	-17
Cherwell Dr to Cherwell St S	306	740	471	717	434	164	411
Cherwell St S to Cherwell Dr	335	332	224	319	-3	-111	-15
Bridge St East to Cherwell	407	463	330	463	55	-78	55
Cherwell to Bridge St East	443	374	247	364	-69	-197	-79
Cherwell Dr to Swan Cl	307	747	474	724	440	167	418
Swan Cl to Cherwell Dr	556	533	283	488	-23	-273	-68
George St to Concord Av	253	315	246	310	63	-6	58
Concord Av to George St	287	704	437	683	417	149	396
Bridge St EB	242	210	184	200	-31	-58	-41
Bridge St WB	272	339	223	338	67	-50	65
George St to Bridge St East	176	242	176	241	66	0	65

