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Client: Momentum Transport Planning

Date: 02/08/18

## Olympia – Revised Proposal Testing Summary

### 1. INTRODUCTION

This technical note (TN) details the VISSIM modelling undertaken for Momentum Transport Consultancy for the proposed Olympia Exhibition Centre development in Hammersmith, London.

The VISSIM modelling has been based on Transport for London's (TfL's) model of Hammersmith, which has been used to test the Cycle Superhighways proposals (CS9) in the area.

The model extents are shown in **Figure 1**.



**Figure 1 – VISSIM Modelling Extents**

This TN builds upon TN1, which detailed initial VISSIM assessment for the Olympia development. However, since that testing, some of the flow assumptions and scenarios required have changed, which are detailed as part of this TN.

It should also be noted that all of the analysis and assessment detailed below *includes* the proposed CS9 improvements.

## 2. NEW SCENARIOS MODELLED

Following agreement between Momentum and TfL, the following scenarios have been tested as part of this VISSIM modelling exercise.

**Table 1 – Modelled VISSIM Scenarios**

Scenario		VISSIM Scenario No.
No.	Name	
1	Future Baseline (Existing TfL VISSIM model, including CS9 proposals)	19, 20
2a	Future Baseline + Proposed Blythe Road Signalisation	37, 38
3a	Future Baseline + Proposed Olympia Development	39, 40
4a	Future Baseline + Proposed Olympia Development + Proposed Blythe Road Signalisation	41, 42
5a	Future Baseline + Proposed Olympia Development + Proposed D-Gate Signalisation	43, 44
6a	Future Baseline + Proposed Olympia Development + Proposed Blythe Road Signalisation + Proposed D-Gate Signalisation	45, 46

It should be noted that, for the purposes of this TN, the following scenario has not been compared and analysed following agreement with Momentum:

- Scenario 2a – Future Baseline + Proposed Blythe Road Signalisation.

### Traffic Flows

In order to model the various scenarios detailed above, an additional traffic flow-set has been added to the VISSIM model, which is the Proposed Olympia Development.

As well as the above, an 'Adjusted Proposed' AM and PM flow-set has been produced. For scenarios which include the proposed Olympia development traffic, this flow-set reassigns traffic that travels to Olympia Way to Blythe Rd (as part of proposals to pedestrianise Olympia Way).

An adjusted flow-set has also been created for the scenarios which feature the Blythe Road signalisation. As this proposal makes Munden Street an 'IN' only link, traffic which previously exited Munden Street has been reassigned to North End Road.

The calculations for creating the vehicle inputs and static routes for these flow-sets can be found in **Appendix A**.

## 3. CHANGES TO MODEL

To create the various scenarios as detailed in **Table 1**, a number of modification files have been created or revised from the initial testing. These modification files have then been added to the relevant VISSIM scenarios, depending on the elements required.

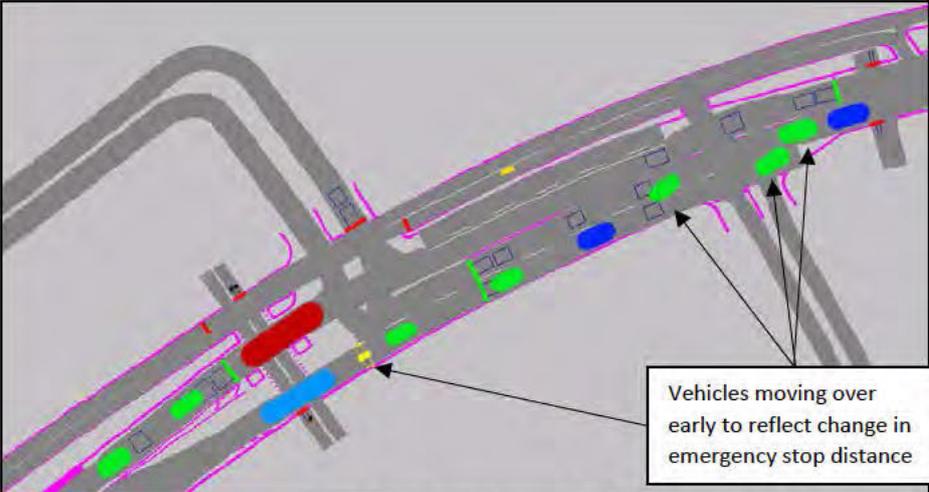
**Table 2** details the main changes within the newly created modification files. If further, more detailed information is required on the model changes, please refer to the appropriate modification files within the model folder.

**Table 2 – New VISSIM Modification File Details**

Modification		
No	Name	Description
62	MM Data Req – Base	Data collection points added and data measurements configured to collect flow and speed information for Momentum for a variety of links within the network.
65	Momentum D-Gate Access	New link and connector structure to create the D-Gate access to Olympia. This has been based on Momentum Drawing <i>M000293-HW-001</i> (see <b>Appendix B</b> for more details).

Modification		
No	Name	Description
		<p>A 20mph speed has been modelled into and out of the access, with 'High Braking' reduced speed areas for the turns.</p> <p>Additional priority rules have been coded in to account for the CS9 scheme across the mouth of the junction and a new node has been created.</p>
68, 69	Momentum – Olympia Dev – AM, Momentum – Olympia Dev – PM	<p>New vehicle types, classes, compositions for 'OlymDev' traffic, along with new vehicle inputs and static routes.</p> <p>The routing has been determined based on the Momentum flow tables provided, with traffic from the east and the west assumed to travel to/from Hammersmith Rd and Kensington high Street (see <b>Appendix A</b> for more details).</p> <p>Lane closures, desired speeds, RSAs and priority rules were all checked and updated to include the new vehicle types/classes as necessary.</p> <p>The taxi ranks on Hammersmith Rd for Olympia have been coded into the model using the PT Lines tool. An eastbound and westbound stop has been added, along with an associated PT line. The departure times have been based on randomly generated numbers within the AM and PM peak hours for the frequency specified. The dwell time distribution has been based on the default No. 1 distribution (Normal distribution with a mean value of 20s and a standard deviation of 2).</p>
73	Momentum – No Signals Layout	<p>This modification includes Momentum's changes from the proposed CS9 layout as shown in Drawing <i>M000293-HW-18-B</i> and <i>M000293-HW-19-B</i> (see <b>Appendix B</b> for more details).</p> <p>The main changes are as follows:</p> <ul style="list-style-type: none"> <li>- Two lane approach at Blythe Rd, with updated link/connector structure, desired speeds, RSAs, priority rules and conflict areas.</li> <li>- Single lane exit on Blythe Rd travelling eastbound.</li> <li>- Amended alignment for the CS9 scheme which runs across the mouth of Blythe Rd.</li> <li>- Alignment amended at the North End Rd junction, with a smaller right turn lane on Hammersmith Rd eastbound, a realigned North End Rd approach and relocated stop-lines. This required link/connector, RSA, priority rule, signal head and detector updates.</li> <li>- Removal of right turn lanes at Olympia Way and Avonmore Rd and realignment of the CS9 proposals across Olympia Way. This involved an update of the link/connector structure, RSAs and priority rules.</li> </ul>
66	Momentum – Blythe Rd signalised	<p>This modification includes Momentum's proposed signalisation of the Hammersmith Rd/ Blythe Rd junction as shown in Drawing <i>M000293-HW-14-B</i> and <i>M000293-HW-15-B</i> (see <b>Appendix B</b> for more details).</p> <p>The main changes from the 'No Signals' layout are as follows:</p> <ul style="list-style-type: none"> <li>- Creation of a new Signal Controller (No. 100) under VAP control. The configuration of the phases and stages have been based on information provided by Momentum (see <b>Appendix C</b> for more details). Timings have been adjusted from the LINSIG to manually balance queuing between all modes.</li> <li>- New signal heads and detectors have been added to suit the Signal Controller configuration.</li> <li>- RSAs have been added at each of the stop-lines for saturation flow purposes. Proposed saturation flows were calculated using RR67 and then Multimodal's Saturation Flow study note was used to assign an appropriate speed distribution. Further information can be found in <b>Appendix D</b>.</li> <li>- Priority rules have been reviewed and updated to ensure stop marker and conflict marker locations were appropriate.</li> <li>- The relocation of the 'North End Rd Hamm Rd (J)' bus stop, to a location further east. This results in a combined bus stop which includes the 'Kensington Olympia Station (K)' bus stop. To prevent existing PT lines stopping at both of these stops</li> </ul>

Modification		
No	Name	Description
		(now combined into one), PT lines 9EB and 10EB have had Stop K deactivated and PT line 27 has had Stop J deactivated.
72	Momentum – Blythe Rd + D-Gate signalised	<p>This modification includes Momentum's proposed signalisation of the Hammersmith Rd/ Blythe Rd junction and the Hammersmith Rd / D-Gate junction, as shown in Drawing <i>M000293-HW-12-B</i> and <i>M000293-HW-13-B</i> (see <b>Appendix B</b> for more details).</p> <p>The main changes from the 'Blythe Rd signalised' layout are as follows:</p> <ul style="list-style-type: none"> <li>- Creation of a new Signal Controller (No. 101) under VAP control. The configuration of the phases and stages have been based on information provided by Momentum (see <b>Appendix C</b> for more details). Timings have been adjusted from the LINSIG to manually balance queuing between all modes.</li> <li>- New signal heads and detectors have been added to suit the Signal Controller configuration.</li> <li>- RSAs have been added at each of the stop-lines for saturation flow purposes. Proposed saturation flows were calculated using RR67 and then Multimodal's Saturation Flow study note was used to assign an appropriate speed distribution. Further information can be found in <b>Appendix D</b>.</li> <li>- Priority rules have been reviewed and updated to ensure stop marker and conflict marker locations were appropriate.</li> </ul>
67	Momentum – D-Gate signalised	<p>This modification includes Momentum's proposed signalisation of the Hammersmith Rd/ D-Gate junction, as shown in Drawing <i>M000293-HW-16-B</i> and <i>M000293-HW-17-B</i> (see <b>Appendix B</b> for more details).</p> <p>The main changes from the 'Blythe Rd + D-Gate signalised' layout are as follows:</p> <ul style="list-style-type: none"> <li>- Deletion of Signal Controller 101, including all associated signal heads and detectors.</li> <li>- Deletion of signalised pedestrian crossings at the Blythe Rd junction linked to the signalisation scheme.</li> <li>- Removal of RSAs used previously for saturation flows at the Blythe Rd junction.</li> <li>- Realignment of the informal pedestrian crossing and CS9 route across the Blythe Rd junction, updating links/connectors and all priority rules and conflict area.</li> </ul>
74 - 89	MM SC2-9 - AM/PM – Routing Updates & Running Edits	<p>These modification files contain static routing updates to all of the scenarios, taking into account the associated network and network layout required. This allows each of the scenarios to play and collect results.</p> <p>There are also updates to desired speeds, RSAs, priority rules and link/connector closures to ensure all vehicle types and classes have been considered for each associated scenario.</p> <p>For SC8 and 9 (Mods 86-89), connector 10343 has an emergency stop amendment from 5m to 40m to prevent artificial capacity on the Hammersmith Rd East approach at the D-Gate junction (see <b>Figure 2</b> below).</p>

Modification		
No	Name	Description
		 <p><b>Figure 2 – Adjusted Connector for WB queuing at D-Gate Junction</b></p> <p>SC8 and 9 also features changes to priority rules 153, 153, 155 and 156. The red markers have not been set to apply to any vehicle types to allow more realistic behaviour for vehicles exiting D-Gate.</p> <p>SC6-9 (Mods 82-89) feature additional priority rules at the Avonmore Rd junction. This was done to allow traffic to turn out of Avonmore Rd in busy periods, as well as providing more opportunities for cyclists to cross over Avonmore Rd by reducing and repositioning the 'headway' conflict marker.</p>
90, 91	Momentum – Adjusted Proposed AM/PM V2 Flows	These files accompany the scenarios which contain the proposed Olympia development flows and adjust the static routes to reassign traffic that previously used Olympia Way to Blythe Rd.
96, 97	Momentum - Adjusted Proposed AM/PM V2 Flows - BlytheRdSignals	These files accompany the scenarios which contain the proposed Blythe Road signalisation and adjust the static routes to reassign traffic that previously used Munden Street to North End Road.
92, 93	SC1 AM/PM – Running Edits	These files were automatically generated in Scenario Management and contain edits to the Simulation Parameters and Evaluation files when running for results.
94-105	MM SC2a-6a AM/PM – VehInput & Running Edits	These modification files contain changes to the vehicle inputs, ensuring that flows for 'Olym_Exist' and 'ComDev' were set to zero, in line with the new flow assumptions.  The static routing, desired speeds, RSAs and priority rules have also been checked and updated where necessary to allow each of the scenarios to play and collect results.

#### 4. RESULTS

To compare the effects in the network of the various scenarios, the following outputs have been obtained as agreed with TfL:

- Journey Times (for General Traffic, Buses, Cyclists)
- Queue Lengths (Average Queues at each junction in the network)
- Saturation Flows (for each approach at each signalised junction in the network)
- Overall Network Performance

In line with previous CS9 modelling, the following random seeds have been run:

 | Transport Modelling | Associate  
**Multimodal** | Seven House | High Street | Longbridge | Birmingham | B31 2UQ  
 Mobile:   
 Email: @multimodaluk.com  
 Webpage: [Multimodal Ltd](#)

**Table 3 – Random Seed Runs**

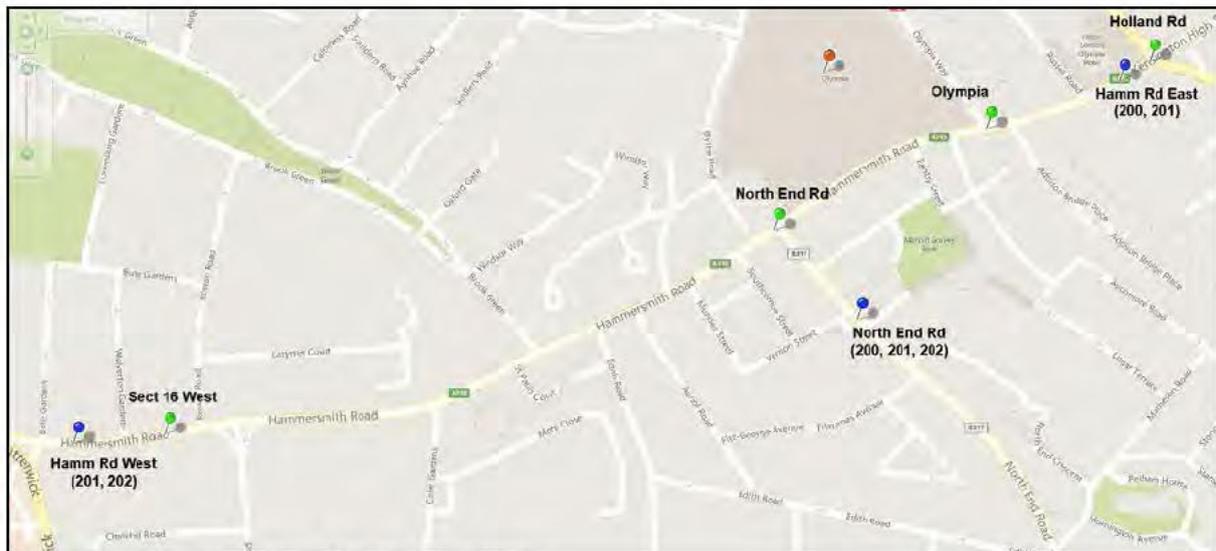
Peak	AM	PM
Starting Seed	42	42
Increment	1	19
No. of Runs	20	20

### Journey Times

Journey times 9000-9056 have been obtained for the same sections used in the CS9 assessment, as agreed with TfL. Numbers 200-202 have also been obtained following correspondence with TfL. For reference, the journey time sections are listed in **Table 4** and shown in **Figure 3**.

**Table 4 – Journey Time Sections**

No.	Journey Time	No.	Journey Time
9001	Sect 16 West to Holland Road	9049	North End Rd to Sect 16 West
9002	Holland Rd to Sect 16 West	9050	Sect 16 West to North End Rd Cyclists
9003	Sect 16 West to Holland Road Cyclists	9051	North End Rd to Sect 16 West Cyclists
9004	Holland Rd to Sect 16 West Cyclists	9055	EB_Olympia_Holland Road
9017	Sect 16 West to Olympia	9056	WB_Holland Road_Olympia
9018	Olympia to Sect 16 West	200	MM - NorthEndRd to HammRdEast
9019	Sect 16 West to Olympia Cyclists	201	MM - NorthEndRd to HammRdWest
9020	Olympia to Sect 16 West Cyclists	202	MM - NorthEndRd to HammRdWest (Cycles)
9048	Sect 16 West to North End Rd		

**Figure 3 – Journey Time Marker Locations**

The full set of AM and PM results are shown in **Tables 5 and 6**.

### AM Results

In the AM peak, **Table 5** shows that when comparing against SC1, SC3a has the least impact (adding Olympia development, no signalisation schemes) for all modes (general traffic, buses and cyclists). This seems to indicate that by reassigning traffic using Olympia Way to Blythe Rd, the network journey times are affected, but not to the same degree as the other scenarios. The maximum increases are around 2 minutes for traffic and buses and 10 seconds for cyclists. There are also some minor improvements in journey times, with 12 seconds being the highest time saving.

The introduction of signals at Blythe Rd (SC4a), D-Gate (SC5a) or both junctions (SC6a) tends to have a greater impact on the journey times for all modes of travel. This is particularly noticeable for SC4a and SC6a for westbound journey times on Hammersmith Rd (no's 9002, 9018), where increases of 1.5-2 minutes were experienced for traffic, buses and cyclists (no's 9004, 9020). In an eastbound direction, SC6a experiences significant increases for cyclists (over 16 minutes for no's 9003, 9019) and 1-3 minutes (no's 9001, 9017, 9048) for traffic and buses. SC4a and SC5a had similar increases for general traffic and buses, but less of an impact on cyclists (max times of 4-7 minutes as opposed to over 16).

SC6a was also found to have significant journey time increases from North End Road, with eastbound (No. 200) and westbound (No. 201) increases of 12-13 minutes. A potential reason for this could be the result of the reassigned traffic from Munden Street, which would likely use this approach in the event of Munden Street being 'IN' only with the Blythe Road signals in place.

Across all the scenarios, there are some slight improvements (up to 31 seconds for SC6a) to general traffic and bus journey times for traffic travelling from Olympia to Holland Rd (no. 9055). Other minor improvements are also experienced for SC3a and SC5a from North End Road to Hammersmith Road East (No. 200) for general traffic and buses.

### *PM Results*

In the PM peak, **Table 6** shows that all scenarios show increases in general traffic and bus journey times for eastbound and westbound routes on Hammersmith Rd (no's 9001, 9002, 9017, 9018, 9048). The increases range from 30 seconds to 10 minutes for traffic and buses, with SC4a and SC6a the worst performing. For cyclists, SC3a shows similar or slightly improved times eastbound (No's 9003, 9019, 9050), but increases of 18 seconds to 5 minutes for SC4a, SC5a and SC6a. In a westbound direction (No. 9004, 9020), all of the scenarios have increased times, ranging from 30 seconds to 6 minutes.

Journey time effects from North End Road were found to differ, with SC3a and SC5a having more modest effects, but SC4a and SC6a having more significant increases. As alluded to in the AM peak, a potential reason for this could be the result of the reassigned traffic from Munden Street, which would likely use this approach in the event of Munden Street being 'IN' only with the Blythe Road signals in place.

Comparing the different scenarios, SC3a and SC5a appear to have the least impact on general traffic and buses times. For cyclists, SC3a has the least impact, following by SC5a and then SC4a and SC6a.

As in the AM peak, there are some slight improvements (up to 39 seconds for SC6a) to general traffic and bus journey times for traffic travelling from Olympia to Holland Rd (no's 9055), as well as up to 39 seconds for SC3a and SC5a from North End Road to Hammersmith Road East (No. 200). However, the cyclist journey times are mixed, with only SC3a providing any comparative time from North End Road (No. 200).

Table 5 – Journey Time Results – AM

AM PEAK (0745-0845)		Traffic					Traffic - Impact of Scenarios against CS9			
Journey Time Measurement		Average Journey Time (s)					Average Journey Time (s)			
No.	Name	SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
9001	Sect 16 West to Holland Road	389	511	502	602	531	121	112	213	142
9002	Holland Rd to Sect 16 West	209	228	341	246	321	19	131	37	111
9003	Sect 16 West to Holland Road Cyclists	-	-	-	-	-	-	-	-	-
9004	Holland Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9017	Sect 16 West to Olympia	311	441	453	545	486	130	141	234	175
9018	Olympia to Sect 16 West	177	194	284	205	268	17	107	28	91
9019	Sect 16 West to Olympia Cyclists	-	-	-	-	-	-	-	-	-
9020	Olympia to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9048	Sect 16 West to North End Rd	241	380	412	489	437	139	171	247	196
9049	North End Rd to Sect 16 West	-	-	191	-	193	-	-	-	-
9050	Sect 16 West to North End Rd Cyclists	-	-	-	-	-	-	-	-	-
9051	North End Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9055	EB Olympia Holland Road	80	75	52	63	49	-5	-28	-17	-31
9056	WB Holland Road Olympia	32	33	56	40	51	1	24	8	19
200	MM - NorthEndRd to HammRdEast	480	467	841	462	1209	-12	361	-18	729
201	MM - NorthEndRd to HammRdWest	-	-	965	-	1005	-	-	-	-
202	MM - NorthEndRd to HammRdWest (Cycles)	-	-	-	-	-	-	-	-	-

AM PEAK (0745-0845)		Buses					Buses - Impact of Scenarios against CS9			
Journey Time Measurement		Average Journey Time (s)					Average Journey Time (s)			
No.	Name	SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
9001	Sect 16 West to Holland Road	444	527	512	614	556	83	69	170	112
9002	Holland Rd to Sect 16 West	259	272	380	295	368	13	121	36	110
9003	Sect 16 West to Holland Road Cyclists	-	-	-	-	-	-	-	-	-
9004	Holland Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9017	Sect 16 West to Olympia	377	469	471	567	517	92	94	190	140
9018	Olympia to Sect 16 West	222	235	322	253	316	12	99	30	94
9019	Sect 16 West to Olympia Cyclists	-	-	-	-	-	-	-	-	-
9020	Olympia to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9048	Sect 16 West to North End Rd	291	398	414	489	441	107	123	198	150
9049	North End Rd to Sect 16 West	147	151	219	150	227	4	72	3	80
9050	Sect 16 West to North End Rd Cyclists	-	-	-	-	-	-	-	-	-
9051	North End Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9055	EB Olympia Holland Road	67	60	44	52	44	-8	-23	-16	-23
9056	WB Holland Road Olympia	37	38	59	43	53	1	22	6	16
200	MM - NorthEndRd to HammRdEast	433	430	684	434	1250	-4	251	1	817
201	MM - NorthEndRd to HammRdWest	509	498	855	512	1183	-11	346	4	674
202	MM - NorthEndRd to HammRdWest (Cycles)	-	-	-	-	-	-	-	-	-

AM PEAK (0745-0845)		Cyclists					Cyclists - Impact of Scenarios against CS9			
Journey Time Measurement		Average Journey Time (s)					Average Journey Time (s)			
No.	Name	SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
9001	Sect 16 West to Holland Road	-	-	-	-	-	-	-	-	-
9002	Holland Rd to Sect 16 West	-	-	-	-	-	-	-	-	-
9003	Sect 16 West to Holland Road Cyclists	317	319	724	533	1329	2	407	216	1011
9004	Holland Rd to Sect 16 West Cyclists	260	263	313	318	340	3	53	58	80
9017	Sect 16 West to Olympia	-	-	-	-	-	-	-	-	-
9018	Olympia to Sect 16 West	-	-	-	-	-	-	-	-	-
9019	Sect 16 West to Olympia Cyclists	259	262	677	487	1289	3	419	228	1031
9020	Olympia to Sect 16 West Cyclists	219	224	263	275	294	4	44	55	75
9048	Sect 16 West to North End Rd	-	-	-	-	-	-	-	-	-
9049	North End Rd to Sect 16 West	-	-	-	-	-	-	-	-	-
9050	Sect 16 West to North End Rd Cyclists	208	207	624	207	631	0	417	-1	423
9051	North End Rd to Sect 16 West Cyclists	172	181	217	175	251	9	44	2	78
9055	EB Olympia Holland Road	-	-	-	-	-	-	-	-	-
9056	WB Holland Road Olympia	39	39	46	41	45	0	7	2	6
200	MM - NorthEndRd to HammRdEast	258	255	416	497	1430	-3	158	239	1172
201	MM - NorthEndRd to HammRdWest	-	-	-	-	-	-	-	-	-
202	MM - NorthEndRd to HammRdWest (Cycles)	348	354	540	353	724	6	192	5	376

Table 6 – Journey Time Results – PM

PM PEAK (1745-1845)		Traffic					Traffic - Impact of Scenarios against CS9			
Journey Time Measurement		Average Journey Time (s)					Average Journey Time (s)			
No.	Name	SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
9001	Sect 16 West to Holland Road	403	627	897	752	912	225	495	349	510
9002	Holland Rd to Sect 16 West	220	258	431	282	439	38	211	62	219
9003	Sect 16 West to Holland Road Cyclists	-	-	-	-	-	-	-	-	-
9004	Holland Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9017	Sect 16 West to Olympia	319	571	869	701	881	252	550	383	562
9018	Olympia to Sect 16 West	186	219	329	226	339	33	142	39	153
9019	Sect 16 West to Olympia Cyclists	-	-	-	-	-	-	-	-	-
9020	Olympia to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9048	Sect 16 West to North End Rd	247	522	842	662	855	275	595	416	608
9049	North End Rd to Sect 16 West	-	-	172	-	188	-	-	-	-
9050	Sect 16 West to North End Rd Cyclists	-	-	-	-	-	-	-	-	-
9051	North End Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9055	EB Olympia Holland Road	86	70	48	63	47	-16	-38	-23	-39
9056	WB Holland Road Olympia	34	38	112	59	111	4	78	25	78
200	MM - NorthEndRd to HammRdEast	413	374	625	382	638	-39	212	-31	225
201	MM - NorthEndRd to HammRdWest	-	-	754	-	792	-	-	-	-
202	MM - NorthEndRd to HammRdWest (Cycles)	-	-	-	-	-	-	-	-	-

PM PEAK (1745-1845)		Buses					Buses - Impact of Scenarios against CS9			
Journey Time Measurement		Average Journey Time (s)					Average Journey Time (s)			
No.	Name	SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
9001	Sect 16 West to Holland Road	470	666	939	771	946	196	469	301	475
9002	Holland Rd to Sect 16 West	282	312	455	343	465	30	173	61	183
9003	Sect 16 West to Holland Road Cyclists	-	-	-	-	-	-	-	-	-
9004	Holland Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9017	Sect 16 West to Olympia	402	631	926	752	929	229	524	350	527
9018	Olympia to Sect 16 West	246	272	365	290	375	26	119	45	129
9019	Sect 16 West to Olympia Cyclists	-	-	-	-	-	-	-	-	-
9020	Olympia to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9048	Sect 16 West to North End Rd	305	558	860	678	882	253	555	373	577
9049	North End Rd to Sect 16 West	155	168	218	158	222	13	63	3	67
9050	Sect 16 West to North End Rd Cyclists	-	-	-	-	-	-	-	-	-
9051	North End Rd to Sect 16 West Cyclists	-	-	-	-	-	-	-	-	-
9055	EB Olympia Holland Road	75	59	46	51	46	-16	-29	-23	-29
9056	WB Holland Road Olympia	37	41	106	57	105	4	69	20	68
200	MM - NorthEndRd to HammRdEast	397	370	570	373	547	-27	173	-24	150
201	MM - NorthEndRd to HammRdWest	471	478	720	490	740	7	249	19	269
202	MM - NorthEndRd to HammRdWest (Cycles)	-	-	-	-	-	-	-	-	-

PM PEAK (1745-1845)		Cyclists					Cyclists - Impact of Scenarios against CS9			
Journey Time Measurement		Average Journey Time (s)					Average Journey Time (s)			
No.	Name	SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
9001	Sect 16 West to Holland Road	-	-	-	-	-	-	-	-	-
9002	Holland Rd to Sect 16 West	-	-	-	-	-	-	-	-	-
9003	Sect 16 West to Holland Road Cyclists	271	268	289	309	539	-4	18	38	268
9004	Holland Rd to Sect 16 West Cyclists	368	402	644	528	721	34	276	160	352
9017	Sect 16 West to Olympia	-	-	-	-	-	-	-	-	-
9018	Olympia to Sect 16 West	-	-	-	-	-	-	-	-	-
9019	Sect 16 West to Olympia Cyclists	218	218	244	260	490	0	26	41	272
9020	Olympia to Sect 16 West Cyclists	325	349	581	477	660	24	256	152	335
9048	Sect 16 West to North End Rd	-	-	-	-	-	-	-	-	-
9049	North End Rd to Sect 16 West	-	-	-	-	-	-	-	-	-
9050	Sect 16 West to North End Rd Cyclists	177	176	200	175	200	-1	23	-2	23
9051	North End Rd to Sect 16 West Cyclists	199	208	601	212	563	9	402	13	364
9055	EB Olympia Holland Road	-	-	-	-	-	-	-	-	-
9056	WB Holland Road Olympia	43	54	81	55	80	11	38	12	37
200	MM - NorthEndRd to HammRdEast	194	193	315	277	590	-1	121	83	396
201	MM - NorthEndRd to HammRdWest	-	-	-	-	-	-	-	-	-
202	MM - NorthEndRd to HammRdWest (Cycles)	332	350	862	352	824	18	530	20	492

## Queue Lengths

Average queue lengths have been obtained for the junctions listed below and shown in **Figure 4**:

- J1 – Hammersmith Rd / Avonmore Rd;
- J2 – Hammersmith Rd / North End Rd;
- J3 – Hammersmith Rd / Blythe Rd;
- J4 – Hammersmith Rd / Edith Rd;
- J5 – Hammersmith Rd / Brook Green;
- J6 – Hammersmith Rd / Shortlands;
- J7 – Hammersmith Rd / D-Gate;
- J8 – Kensington High St / Warwick Rd.



**Figure 4 – Junctions Assessed**

The comparisons for each junction are shown in **Figures 5-12** under the related sections.

J1 – Hammersmith Rd / Avonmore Rd



**Figure 5 – Hammersmith Rd / Avonmore Rd Queue Comparisons**

In the AM peak, the longest queues are on the Hammersmith Rd East approach, with SC4a, SC5a and SC6a (Blythe Rd signalisation, D-Gate signalisation and both sets of signals) having the highest average queue lengths. Queues on Avonmore Road are the next longest and fairly consistent between the scenarios. Finally, the Hammersmith Road West approach has the lowest average queue lengths, with SC1 being the exception, which has longer queues on the Hammersmith Road West approach.

The pattern of the queue results suggest that the introduction of signals has a negative impact in the busier westbound direction, but a positive effect eastbound on Hammersmith Road.

In the PM peak, the Hammersmith Rd East approach has the longest queues (~250m) in SC4a and SC6a. The queues plateau at this length which suggests that the queuing is back to the Kensington High St / Warwick Rd junction for parts the PM peak period.

For the Hammersmith Rd West approach, the average queue lengths are slightly lower for all scenarios, indicating some benefit with the signalisation proposals.

## J2 – Hammersmith Rd / North End Rd



**Figure 6 – Hammersmith Rd / North End Rd Queue Comparisons**

In the AM peak, the North End Rd approach queues reach as far back as the end of the link (~180m) and maintain this level throughout. This level of queuing is likely to result in latent demand on this approach, with vehicles not able to enter the network.

For the Hammersmith Rd approaches, the results are mixed. On the East approach, SC3a and 5a have comparable queues with SC1, but SC4a and SC6a have much longer queues. However, for the West approach, SC4a and SC6a produce lower average queues (30-40m), with SC5a resulting in the highest average queue lengths (~80m). This suggests that the proposed signalisation of Blythe Rd and D-Gate have mixed effects on this junction in the AM peak.

In the PM peak, the same effects are apparent as in the AM peak for Hammersmith Road East and North End Road, but not Hammersmith Road West.

North End Rd experiences a consistent queue of ~180m, reaching back as far as the end of the link and likely leading to latent demand from this approach as a result.

For the Hammersmith Rd approaches, the East approach has longer queues in SC4a and SC6a (70-100m), with SC3a also experiencing higher queue lengths in this peak (~40m). SC5a has comparable queues with SC1, averaging out at ~30m in both scenarios.

For the West approach, SC4a and SC6a have a sharp increase in queue lengths as the PM peak progresses. These reach around 275m in length, much higher than the average queues of the other scenarios (~75-100m).

## J3 – Hammersmith Rd / Blythe Rd



**Figure 7 – Hammersmith Rd / Blythe Rd Queue Comparisons**

In the AM peak, the average queues on Blythe Road are longest for SC4a, SC6a (~80m), with SC5a performing slightly better (~60m).

For the Hammersmith Rd approaches, SC4a and 6a are significantly worse than the other scenarios for the East approach. As these scenarios propose signals on this approach, this would indicate the reason for the additional delay. For the West approach, the queue lengths for all the mitigation scenarios are similar, suggesting that there is not as much of an impact having signals on this approach (SC4a and SC6a).

For Munden St, SC5a has the highest average queue lengths (~40m). SC4a and SC6a have no queues from this approach, as a result of the approach being closed, and traffic reassigned.

In the PM peak, the Blythe Rd queues reach back to the start of the link for SC1 and SC5a (~110m). This occurs earlier in SC5a, indicating the likelihood of latent demand on this approach as a result. SC3a has the lowest queue lengths (~80m), with SC4a and SC6a having queues ~90m.

For the Hammersmith Rd approaches, the results are mixed. On the East approach, SC4a and SC6a have the longest queues (as in the AM peak). For the West approach, the queue lengths are all similar at ~80m. This suggests that the queues reach back to the Edith Rd junction on a consistent basis throughout the PM peak, except for the future baseline scenario (SC1).

On Munden St, the same results are apparent in the PM peak as the AM peak.

J4 – Hammersmith Rd / Edith Rd



**Figure 8 – Hammersmith Rd / Edith Rd Queue Comparisons**

In the AM peak, the queue lengths on the Hammersmith Rd East approach are higher for SC5a and SC3a, with SC4a and SC6a having lower queue lengths than SC1. For the West approach, the queue lengths and profiles are more consistent between SC3a, SC4a and SC6a. SC8a has the longest average queues (~50m) and SC1 has the shortest (~5m).

For Edith Rd, the queue lengths for all scenarios are minimal, at ~5m throughout the AM peak period.

In the PM peak, the Hammersmith Rd East approach follows a similar pattern as the AM peak, with SC4a and SC6a having the lowest queue lengths and SC3a and SC5a having the highest. This suggests a benefit with the Blythe Rd signals. For the West approach, the average queue lengths are higher than in the AM peak, with SC3a, SC4a, SC5a and SC6a experiencing the larger queues (55-65m on average). Scenarios with queues over 50m suggest an interaction with the Brook Green junction, which is ~50m away from the Edith Rd junction.

For Edith Rd, the average queue lengths are again minimal for all scenarios, averaging out at around 5m.

## J5 – Hammersmith Rd / Brook Green



**Figure 9 – Hammersmith Rd / Brook Green Queue Comparisons**

In the AM peak, the Brook Green approach has the longest queues in SC5a (peaking at ~50m), with the remaining scenarios having the lowest queues at around 20m. This suggests some benefit with the Blythe Rd signals in place.

For the Hammersmith Rd approaches, the results are mixed. For the East approach, the queues for all scenarios are minimal at ~15m. However, for the West approach, the average queue lengths plateau at ~300m for all scenarios (except the future baseline – SC1). This suggests heavy queuing which reaches back beyond the Shortlands junction.

In the PM peak, the queues on Brook Green for SC3a and SC5a reach back to the start of the link (~140m) and remain at that level for the whole peak period. This is likely to lead to latent demand on this approach as a result. SC4a and SC6a have queues that build, but only reach up to 75m.

For the Hammersmith Rd approaches in the PM peak, the same effects are present as in the AM peak. For the East approach, the queue lengths are slightly higher on average (at around 30-40m). For the West approach, the significant queuing is again present, maintaining a length of 300m, suggesting downstream queuing beyond the Shortlands junction. The exception is the future baseline (SC1), which has average queuing around 40m.

J6 – Hammersmith Rd / Shortlands



**Figure 10 – Hammersmith Rd / Shortlands Queue Comparisons**

In the AM peak, the Hammersmith Rd East approach has queues up to 20-30m for all scenarios.

For Hammersmith Rd West, the queues for SC4a, SC5a and SC6a scenarios reach back as far as the end of the link (~180m). This occurs earlier in the peak for SC4a and SC6a, with latent demand likely as a result. Queues for SC3a increase as the peak progresses, but do not reach as far (~160m).

For the Shortlands approach, the queues are minimal for all scenarios, averaging around 10m.

In the PM peak, both Hammersmith Rd approaches experience the same levels of queuing. For the East approach, all scenarios have average queue lengths of 20-30m. For the West approach, the queue lengths for SC4a and SC6a rise to 180m and plateau, suggesting latent demand also likely from this approach. SC5a and SC3a have lower average queue lengths, of up to 160m and 110m respectively.

The average queues on the Shortlands approach are minimal, averaging around 5m for all scenarios.

J7 – Hammersmith Rd / D-Gate



**Figure 11 – Hammersmith Rd / D-Gate Queue Comparisons**

In the AM peak, queues on the D-Gate approach are minimal, with very little traffic exiting this approach.

On the Hammersmith Rd East approach, the introduction of signals at Blythe Rd, D-Gate or both (SC4a, SC5a, SC6a) increases the queue lengths on this approach. SC4a and SC6a provide the biggest increase with queues averaging 40-50m. On the West approach, SC5a and SC6a have the longest queues (~70m), with SC5a averaging ~40m. This indicates that the introduction of signals at D-Gate does have an effect. SC1 has no queue lengths as this junction was not included within the future baseline scenario.

In the PM peak, the D-Gate queues are minimal, replicating the AM performance.

For Hammersmith Rd, the East approach has higher average queue lengths with SC4a and SC6a the longest (~60-70m). SC5a has average queues up to 30m in length, whilst SC3a has the lowest (~10m). For the West approach, SC5a and SC6a have the longest queues (40-50m), with SC3a having the lowest queue lengths with the Olympia development included.

J8 – Kensington High St / Warwick Rd



**Figure 12 – Kensington High St / Warwick Rd Queue Comparisons**

In the AM peak, all scenarios have a consistent average queue length and profile on the Kensington High Street East approach.

For Kensington High St West, SC1 is the worst performing, with average queues reaching ~140m at their peak. The scenarios with the proposed signals (SC4a, SC5a and SC6a) produce the lower queue lengths, likely due to traffic being held up further downstream in the network.

On Warwick Rd, the approach queuing is consistent for all scenarios, with an eventual build up to ~90m as queues reach back from the Avonmore Rd junction.

In the PM peak, there are big differences in queuing on the Kensington High St East approach. SC4a and 6a have queues which build back to the start of the link (~340m). This is likely due to queuing back at the Avonmore Rd junction (see **Figure 5**) and will likely lead to latent demand on this approach in these scenarios. SC3a and SC5a have much lower queuing levels, averaging 20-40m.

For the West approach of Kensington High St, the queuing profiles are similar to the AM peak, with SC1 producing the highest average queue lengths (~100m). The other scenarios have smaller queues, suggesting traffic is being held up further downstream for SC4a, SC5a and SC6a.

The Warwick Rd approach queuing is fairly consistent for SC6, 7, 8 and 9, with an eventual build up to ~150m as queues reach back from the Avonmore Rd junction.

Saturation Flows

Saturation flows have been obtained at the following signalised junctions as listed below and shown in **Figure 4**:

- J2 – Hammersmith Rd / North End Rd;
- J3 – Hammersmith Rd / Blythe Rd;
- J4 – Hammersmith Rd / Edith Rd;
- J5 – Hammersmith Rd / Brook Green;
- J6 – Hammersmith Rd / Shortlands;
- J7 – Hammersmith Rd / D-Gate;
- J8 – Kensington High St / Warwick Rd.

The results of the AM and PM comparisons are shown in **Tables 7 and 8**, which have been based on the following Saturation Flow criteria from TfL’s ‘VISSIM Saturation Flow Tool (see **Figure 13**). The criteria has been based on the TfL Guidance Notes, with adjustments made to the ‘General Parameters’ section to obtain as many readings as possible from the VISSIM results.

**Tool Settings for Saturation Flow Measurement**

General Parameters:

Number of vehicles across stopline to ignore at start of green	<input type="text" value="2"/>
Minimum number of vehicles required in a single measurement	<input type="text" value="6"/>
Minimum number of measurements for average sat flow calculation	<input type="text" value="5"/>
Global PCU Factor (adjust for specific links on survey/results sheets)	<input type="text" value="1.00"/>

Time Parameters:

Include measurements from time	<input type="text" value="0"/> s
Disregard measurements after time	<input type="text" value="7200"/> s

End of Saturation:

End of saturation is assumed when any of the following occur (tick as appropriate):

- Headway is greater than  s
- Increase between successive headways exceeds  %
- (Max headway + min headway) greater than

Do not assume the above values are 'standard' values which are correct in all cases. They must be tested for suitability on a variety of links in the network concerned, and adjusted as necessary.

Test these settings on an individual Axx/Dis file  
(Select Axx file)

Run with these settings on multiple Axx/Dis files  
(Select VISSIM model file)

Clear Survey Data

Clear Results Data

**Figure 13 – Saturation Flow Criteria for TfL’s VISSIM Saturation Flow Tool**

**Table 7 – Saturation Flow Comparisons – AM Peak**

AM PEAK (0745-0845)											
Junction		From	Saturation Flows (pcu/hr)					% Difference to SC1			
No.	Name		SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
2	Hamm Rd / North End Rd	Hamm Rd East	1700	1745	1711	1728	1721	3%	1%	2%	1%
		North End Rd	1470	1491	1907	1499	1748	1%	30%	2%	19%
		Hamm Rd West	1675	1764	1865	1801	1895	5%	11%	7%	13%
3	Blythe Rd / Hamm Rd	Blythe Rd - LT	-	-	-	-	-	-	-	-	-
		Blythe Rd - RT	-	-	-	-	-	-	-	-	-
		Hamm Rd East	-	-	1610	-	1603	-	-	-	-
		Munden St	-	-	-	-	-	-	-	-	-
		Hamm Rd West	-	-	1776	-	1770	-	-	-	-
4	Hamm Rd / Edith Rd	Hamm Rd East	1921	1894	1812	1922	1780	-1%	-6%	0%	-7%
		Edith Rd	-	-	-	-	-	-	-	-	-
		Hamm Rd West	1918	1861	1867	1778	1854	-3%	-3%	-7%	-3%
5	Brook Green / Hamm Rd	Brook Green - LT	-	-	-	-	-	-	-	-	-
		Brook Green - RT	-	-	-	-	-	-	-	-	-
		Hamm Rd East	-	-	-	-	-	-	-	-	-
		Hamm Rd West	-	-	-	-	-	-	-	-	-
6	Hamm Rd / Shortlands	Hamm Rd East	2032	2022	2031	2024	2026	0%	0%	0%	0%
		Shortlands	-	-	-	-	-	-	-	-	-
		Hamm Rd West	1805	1769	1777	1781	1768	-2%	-2%	-1%	-2%
7	D-Gate / Hamm Rd	D-Gate	-	-	-	-	-	-	-	-	-
		Hamm Rd East	-	-	-	1767	1756	-	-	-	-
		Hamm Rd West	-	-	-	2040	2020	-	-	-	-
8	Holland Rd / Kensington High St / Warwick Rd	Kens. High St East - Ahead	-	-	-	-	-	-	-	-	-
		Kens. High St East - Ahead	-	-	-	-	-	-	-	-	-
		Kens. High St East - Right	-	-	-	-	-	-	-	-	-
		Warwick Rd - Ahead	1759	1757	1755	1760	1756	0%	0%	0%	0%
		Warwick Rd - Ahead	1784	1776	1777	1775	1780	0%	0%	0%	0%
		Warwick Rd - LT	-	-	-	-	-	-	-	-	-
		Kens. High St West - Ahead	-	-	-	-	-	-	-	-	-
		Kens. High St West - Ahead	1797	1802	1812	1766	1778	0%	1%	-2%	-1%
Kens. High St West - LT	-	-	-	-	-	-	-	-	-		

From **Table 7**, the main junctions affected in a negative way by the proposals are the Hammersmith Rd junction with Edith Rd, with decreases in saturation flows of 3-7%.

At the North End Rd junction, there are some benefits over SC1, with saturation flow increases up to 30% for the North End Road approach in SC4a. This appears to be due to the proposed signals at Blythe Road, which are affecting the eastbound traffic flow and allowing more traffic out of the North End Road approach.

Comparing the different scenarios, SC3a shows the least variance in saturation flow, with the percentage changes ranging from +5% to -3%. SC4a and SC6a show the biggest variance, with ranges of 30% to -6% and +19% to -7% respectively.

For the Shortlands and Kensington High St junctions, the saturation flow changes were minimal between the scenarios.

There were a large number of stop-lines where saturation flows could not be obtained. This was due to the outputs from VISSIM not satisfying the criteria as shown in **Figure 13**.

**Table 8 – Saturation Flow Comparisons – PM Peak**

PM PEAK (1745-1845)											
Junction		From	Saturation Flows (pcu/hr)					% Difference to SC1			
No.	Name		SC1	SC3a	SC4a	SC5a	SC6a	SC3a	SC4a	SC5a	SC6a
2	Hamm Rd / North End Rd	Hamm Rd East	1715	1731	1711	1731	1693	1%	0%	1%	-1%
		North End Rd	1432	1438	1795	1434	1708	0%	25%	0%	19%
		Hamm Rd West	1552	1698	1734	1794	1841	9%	12%	16%	19%
3	Blythe Rd / Hamm Rd	Blythe Rd - LT	-	-	-	-	-	-	-	-	-
		Blythe Rd - RT	-	-	-	-	-	-	-	-	-
		Hamm Rd East	-	-	1584	-	1589	-	-	-	-
		Munden St	-	-	-	-	-	-	-	-	-
		Hamm Rd West	-	-	1764	-	1773	-	-	-	-
4	Hamm Rd / Edith Rd	Hamm Rd East	1962	1853	1907	1860	1880	-6%	-3%	-5%	-4%
		Edith Rd	-	-	-	-	-	-	-	-	-
		Hamm Rd West	1949	1742	1631	1793	1637	-11%	-16%	-8%	-16%
5	Brook Green / Hamm Rd	Brook Green - LT	1526	1506	1514	1546	1517	-1%	-1%	1%	-1%
		Brook Green - RT	-	-	-	-	-	-	-	-	-
		Hamm Rd East	-	-	-	-	-	-	-	-	-
		Hamm Rd West	-	-	-	-	1959	-	-	-	-
6	Hamm Rd / Shortlands	Hamm Rd East	1986	1989	2026	1982	2049	0%	2%	0%	3%
		Shortlands	-	-	-	-	-	-	-	-	-
		Hamm Rd West	-	1743	1821	1751	-	-	-	-	-
7	D-Gate / Hamm Rd	D-Gate	-	-	-	-	-	-	-	-	-
		Hamm Rd East	-	-	-	1766	1754	-	-	-	-
		Hamm Rd West	-	-	-	1960	1999	-	-	-	-
8	Holland Rd / Kensington High St / Warwick Rd	Kens. High St East - Ahead	-	-	1833	-	-	-	-	-	-
		Kens. High St East - Ahead	1817	1924	1996	1830	1895	6%	10%	1%	4%
		Kens. High St East - Right	-	-	-	-	-	-	-	-	-
		Warwick Rd - Ahead	1801	1802	1806	1802	1800	0%	0%	0%	0%
		Warwick Rd - Ahead	1837	1838	1840	1831	1837	0%	0%	0%	0%
		Warwick Rd - LT	-	-	-	-	-	-	-	-	-
		Kens. High St West - Ahead	-	-	-	-	-	-	-	-	-
		Kens. High St West - Ahead	-	-	-	1679	-	-	-	-	-
Kens. High St West - LT	-	-	-	-	-	-	-	-	-		

From **Table 8**, there is much more variance in the saturation flow, with higher percentage differences than in the AM peak data.

The Hammersmith Rd West approach at the Brook Green junction is most affected, particularly in SC4a and SC6a, where there is a 16% reduction in saturation flow. In terms of positive impacts, the North End Road approach in SC4a has a saturation flow which increases by 25%. As in the AM peak, this may be due to the signals at Blythe Road, which have an impact on the flow patterns on Hammersmith Road, which allows more traffic out of the North End Road approach.

When comparing the different scenarios, SC3a shows the least variety of saturation flow changes (+9% to -11%), followed by SC5a (+16% to -8%). SC4a performs better than SC6a (+25% to -16% compared to +19% to -16%), indicating that having just Blythe Rd signalised is a more suitable option than both Blythe Rd and D-Gate signals in terms of vehicle throughput

There were a large number of stop-lines where saturation flows could not be obtained, similar to the AM peak. This was due to the outputs from VISSIM not satisfying the criteria as shown in **Figure 13**.

## Overall Network Performance

The overall network performance of the scenarios has been compared, to give an overall picture of how the different networks perform in terms of average delay, average speed and latent demand and delay.

The AM and PM results are shown in **Tables 9 and 10**.

**Table 9 – Network Performance Comparisons – AM Peak**

NETWORK PERFORMANCE								
AM Peak (0745-0845)								
Scenario	Average Delay (s)			Average Speed (mph)			Latent Delay (hrs)	Latent Demand
	No.	Traffic	Buses	Cyclists	Traffic	Buses	Cyclists	All Vehs
1	136	214	154	9	7	9	1	62
3a	160	252	155	8	6	9	2	79
4a	186	336	379	8	5	5	11	424
5a	188	292	283	7	6	6	2	128
6a	187	402	803	8	5	2	13	606

NETWORK PERFORMANCE - comparison vs. SC1								
AM Peak (0745-0845)								
Scenario	Average Delay (s)			Average Speed (mph)			Latent Delay (hrs)	Latent Demand
	No.	Traffic	Buses	Cyclists	Traffic	Buses	Cyclists	All Vehs
3a	24	38	1	-1	-1	0	0	17
4a	50	121	225	-2	-2	-5	9	363
5a	52	78	129	-2	-1	-3	1	67
6a	51	188	649	-2	-3	-7	12	545

*\*Some values different due to rounding in Excel*

In the AM peak, it can be seen that in terms of average delay, SC4a and 6a appear to have the biggest impact compared to SC1. SC3a has minimal impact and SC5a is the better performing of the three mitigation scenarios (SC4a, SC5a and SC6a). Buses and cyclists are most affected, which may be due to the changes made in introducing signals at Blythe Rd and a combination of Blythe Rd and D-Gate signals.

This trend is repeated for the average speed comparisons, where the network speeds are lower for SC4a and 6a. This is particularly of note for cyclists, which are likely to have been affected by additional signals holding them within the network.

In terms of latent demand and associated latent delay, all of the scenarios show an increase over SC1. SC3a performs the best, whilst SC6a shows the greatest impact. As with the other results, SC5a (D-Gate signals only) is the better performing of the three mitigation options, with only 70 unreleased vehicles within the network during the peak period (compared to over 300 and 500 vehicles in SC4a and SC6a).

**Table 10 – Network Performance Comparisons – PM Peak**

NETWORK PERFORMANCE									
PM Peak (1745-1845)									
Scenario	Average Delay (s)			Average Speed (mph)			Latent Delay (hrs)	Latent Demand	
	No.	Traffic	Buses	Cyclists	Traffic	Buses	Cyclists	All Vehs	
1	134	219	165		9	7	8	1	37
3a	169	296	189		8	6	8	1	78
4a	247	513	432		6	3	4	14	575
5a	198	346	262		7	5	6	3	165
6a	249	526	496		6	3	3	14	577

NETWORK PERFORMANCE - comparison vs. SC1								
PM Peak (1745-1845)								
Scenario	Average Delay (s)			Average Speed (mph)			Latent Delay (hrs)	Latent Demand
	No.	Traffic	Buses	Cyclists	Traffic	Buses	Cyclists	All Vehs
3a	35	77	24	-1	-2	-1	0	41
4a	113	294	267	-3	-4	-5	13	538
5a	65	127	97	-2	-2	-2	2	128
6a	115	307	330	-4	-4	-5	13	540

\*Some values different due to rounding in Excel

In comparison to the AM peak, the average delay per vehicle is higher for all scenarios, indicating a more congested network. As a result of the congestion, the increases in average delays for all scenarios are much higher than in the AM peak. Comparing the scenarios to SC1, SC3a is again the scenario with the least impact and SC5a gives the more favourable results out of the mitigation scenarios. Scenarios 4a and 6a have the greatest impact, with both adding around 5 minutes of delay to Buses and Cyclists within the peak hour.

Due to the more congested network, the average speeds of the different modes are also lower in comparison to the AM peak. SC4a and SC6a affect speeds the most, with cyclists particularly affected by the signals proposed. SC3a and SC5a have an almost identical performance, with SC3a performing slightly better for Cyclist speeds.

In terms of latent demand and associated latent delay, all of the scenarios show an increase over SC1. Comparing the scenarios, SC3a has the least impact, whilst SC6a has the greatest overall impact. As with the other results, SC5a (D-Gate signals only) is the better performing of the three mitigation options, with around 130 unreleased vehicles within the network during the peak period.

## 5. SUMMARY & CONCLUSIONS

This technical note (TN) details the VISSIM modelling undertaken for Momentum Transport Consultancy for the proposed Olympia Exhibition Centre development in Hammersmith, London.

The VISSIM modelling has been based on Transport for London's (TfL's) model of Hammersmith, which has been used to test the Cycle Superhighways proposals (CS9) in the area.

This TN builds upon TN1, which detailed initial VISSIM assessment for the Olympia development. However, since that testing, some of the flow assumptions and scenarios required have changed, which are detailed as part of this TN.

The modelling scenarios tested and analysed in this TN were as follows:

- Scenario 1 – Future Baseline
- Scenario 3a – Future Baseline + Proposed Olympia Development
- Scenario 4a – Future Baseline + Proposed Olympia Development + Proposed Blythe Road Signalisation
- Scenario 5a – Future Baseline + Proposed Olympia Development + Proposed D-Gate Signalisation
- Scenario 6a – Future Baseline + Proposed Olympia Development + Proposed Blythe Road Signalisation + Proposed D-Gate Signalisation

To compare the effects in the network of the various scenarios, the following outputs have been obtained as agreed with TfL:

- Journey Times (for General Traffic, Buses, Cyclists)
- Queue Lengths (Average Queues at each junction in the network)
- Saturation Flows (for each approach at each signalised junction in the network)
- Overall Network Performance

From the results collected, in terms of traffic related performance and impact, there was no scenario which clearly and conclusively showed comparability with SC1 across all of the results collected.

From a network performance and journey time perspective, SC3a and SC5a appear to perform better than SC4a and SC6a, but these still result in a worsened level of performance against SC1 overall. For queue lengths and saturation flows, the results are much more varied. The different scenarios have advantages and disadvantages over SC1 and each other, depending on the junction and approach considered. This makes it difficult to draw suitable conclusions as to which scenario gives the better performance overall.

Appendix A – Vehicle Input & Static Routing Calculations

**AM Peak**

**Taxis (Hammersmith Road)**

	In	Out
Total	21	14

**Blythe Road**

	In					Out				
	Cars	Vans	MGV	HGV (rigids)	HGV (ar)	Cars	Vans	MGV	HGV (rigids)	HGV (artics)
From/To left	8	1	0	1	0	8	1	0	1	0
From/To right	8	2	0	1	0	8	2	0	1	0

**D-Gate**

	In					Out				
	Cars	Vans	MGV	HGV (rigids)	HGV (ar)	Cars	Vans	MGV	HGV (rigids)	HGV (artics)
From/To left	0	0	0	0	0	0	0	0	0	0
From/To right	0	0	0	0	0	0	0	0	0	0

**PM Peak**

**Taxis (Hammersmith Road)**

	In	Out
Total	15	20

**Blythe Road**

	In					Out				
	Cars	Vans	MGV	HGV (rigids)	HGV (ar)	Cars	Vans	MGV	HGV (rigids)	HGV (artics)
From/To left	8	1	0	1	0	8	1	0	1	0
From/To right	8	2	0	1	0	8	2	0	1	0

**D-Gate**

	In					Out				
	Cars	Vans	MGV	HGV (rigids)	HGV (ar)	Cars	Vans	MGV	HGV (rigids)	HGV (artics)
From/To left	0	0	0	0	0	3	0	0	0	0
From/To right	0	0	0	0	0	3	0	0	0	0

**Multimodal Assumptions**

- Traffic travelling to D-Gate and Blythe Road assumed to come from Hammersmith Road East and Hammersmith Road West
- Traffic travelling from D-Gate and Blythe Road assumed to travel to Hammersmith Road East and Hammersmith Road West
- Taxis travelling from Hammersmith Road West to East and vice versa

**Blythe Rd**

	In			Out		
	Cars	HGV	LGV	Cars	HGV	LGV
	8	1	1	8	1	1
	8	1	2	8	1	2

**D-Gate**

	In			Out		
	Cars	HGV	LGV	Cars	HGV	LGV
	0	0	0	0	0	0
	0	0	0	0	0	0

**Blythe Rd**

	In			Out		
	Cars	HGV	LGV	Cars	HGV	LGV
	8	1	1	8	1	1
	8	1	2	8	1	2

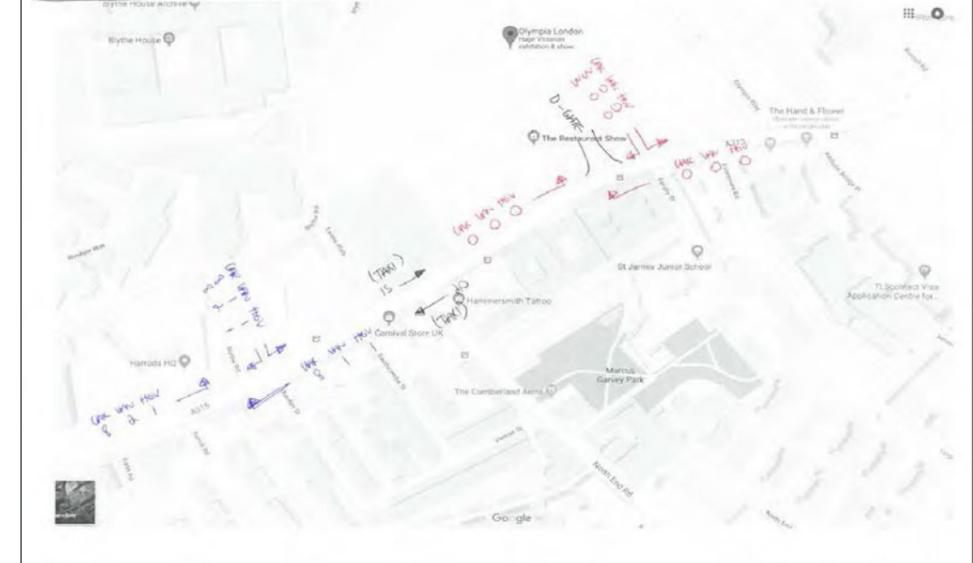
**D-Gate**

	In			Out		
	Cars	HGV	LGV	Cars	HGV	LGV
	0	0	0	3	0	0
	0	0	0	3	0	0

**OLYMPIA DEVELOPMENT - AM**



**OLYMPIA DEVELOPMENT - PM**





2000												
Veh Type OlymDev - Cars												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- Gate	30008: ORIGIN D-GATE	1 Hamm Rd East	266 106.5561	0	0	0	0	0	0	0	0	0
		2 Hamm Rd West	87 43.36515	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - HGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- Gate	30008: ORIGIN D-GATE	1 Hamm Rd East	266 106.5561	0	0	0	0	0	0	0	0	0
		2 Hamm Rd West	87 43.36515	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - Taxis												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- Gate	30008: ORIGIN D-GATE	1 Hamm Rd East	266 106.5561	0	0	0	0	0	0	0	0	0
		2 Hamm Rd West	87 43.36515	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - LGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- Gate	30008: ORIGIN D-GATE	1 Hamm Rd East	266 106.5561	0	0	0	0	0	0	0	0	0
		2 Hamm Rd West	87 43.36515	0	0	0	0	0	0	0	0	0

2000												
Veh Type OlymDev - Cars												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45 44.07453		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89 66.17183		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	47 132.8158		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	4	50 201.2484		0	0	0	0	0	0	0	0	0
From Blythe Rd	30012: ORIGIN 1000003	5	6 156.1139	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	6	43 80.37753	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	7 Hamm Rd East	266 105	8	8	8	8	8	8	8	8	8
	30012: ORIGIN 1000003	8 Hamm Rd West	87 44.10761	8	8	8	8	8	8	8	8	8
	30012: ORIGIN 1000003	9	32 39.61434	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	10	93 52.71993	0	0	0	0	0	0	0	0	0
2001												
Veh Type OlymDev - HGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45 44.07453		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89 66.17183		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	47 132.8158		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	4	50 201.2484		0	0	0	0	0	0	0	0	0
From Blythe Rd	30012: ORIGIN 1000003	5	6 156.1139	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	6	43 80.37753	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	7 Hamm Rd East	266 105	1	1	1	1	1	1	1	1	1
	30012: ORIGIN 1000003	8 Hamm Rd West	87 44.10761	1	1	1	1	1	1	1	1	1
	30012: ORIGIN 1000003	9	32 39.61434	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	10	93 52.71993	0	0	0	0	0	0	0	0	0
2002												
Veh Type OlymDev - Taxis												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45 44.07453		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89 66.17183		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	47 132.8158		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	4	50 201.2484		0	0	0	0	0	0	0	0	0
From Blythe Rd	30012: ORIGIN 1000003	5	6 156.1139	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	6	43 80.37753	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	7 Hamm Rd East	266 105	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	8 Hamm Rd West	87 44.10761	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	9	32 39.61434	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	10	93 52.71993	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - LGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45 44.07453		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89 66.17183		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	47 132.8158		0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	4	50 201.2484		0	0	0	0	0	0	0	0	0
From Blythe Rd	30012: ORIGIN 1000003	5	6 156.1139	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	6	43 80.37753	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	7 Hamm Rd East	266 105	1	1	1	1	1	1	1	1	1
	30012: ORIGIN 1000003	8 Hamm Rd West	87 44.10761	2	2	2	2	2	2	2	2	2
	30012: ORIGIN 1000003	9	32 39.61434	0	0	0	0	0	0	0	0	0
	30012: ORIGIN 1000003	10	93 52.71993	0	0	0	0	0	0	0	0	0

No.	Name	Link	0	900	1800	Volume						Veh Comp
			2700	3600	4500	5400	6300					
30000	D-Gate - Cars-OlymDev	276	0	0	0	0	0	0	0	0	0	0 200: Cars-OlymDev - 20mph
30001	D-Gate - HGVs-OlymDev	276	0	0	0	0	0	0	0	0	0	0 203: HGV-OlymDev - 20mph
30002	D-Gate - LGVs-OlymDev	276	0	0	0	0	0	0	0	0	0	0 207: LGV-OlymDev
30003	D-Gate - Taxis-OlymDev	276	0	0	0	0	0	0	0	0	0	0 206: Taxi-OlymDev

No.	Name	Link	0	900	1800	Volume						Veh Comp
			2700	3600	4500	5400	6300					
20004	Blythe Road - Cars-OlymDe	22	16	16	16	16	16	16	16	16	16	16 201: Cars-OlymDev - 30mph
20005	Blythe Road - HGVs-OlymD	22	2	2	2	2	2	2	2	2	2	2 204: HGV-OlymDev - 30mph
20006	Blythe Road - LGVs-OlymD	22	3	3	3	3	3	3	3	3	3	3 207: LGV-OlymDev
20007	Blythe Road - Taxis-OlymD	22	0	0	0	0	0	0	0	0	0	0 206: Taxi-OlymDev



2000												
Veh Type OlymDev - Cars												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- 30008: ORIGIN D-GATE	1 Hamm Rd East	266	106.5561	3	3	3	3	3	3	3	3	3
Gate 30008: ORIGIN D-GATE	2 Hamm Rd West	87	43.36515	3	3	3	3	3	3	3	3	3
2000												
Veh Type OlymDev - HGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- 30008: ORIGIN D-GATE	1 Hamm Rd East	266	106.5561	0	0	0	0	0	0	0	0	0
Gate 30008: ORIGIN D-GATE	2 Hamm Rd West	87	43.36515	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - Taxis												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- 30008: ORIGIN D-GATE	1 Hamm Rd East	266	106.5561	0	0	0	0	0	0	0	0	0
Gate 30008: ORIGIN D-GATE	2 Hamm Rd West	87	43.36515	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - LGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
From D- 30008: ORIGIN D-GATE	1 Hamm Rd East	266	106.5561	0	0	0	0	0	0	0	0	0
Gate 30008: ORIGIN D-GATE	2 Hamm Rd West	87	43.36515	0	0	0	0	0	0	0	0	0

2000												
Veh Type OlymDev - Cars												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45	44.07453	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89	66.17183	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	50	201.2484	0	0	0	0	0	0	0	0	0
From Blythe Rd 30012: ORIGIN 1000003	4	6	156.1139	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	5	43	80.37753	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	6 Hamm Rd East	266	105	8	8	8	8	8	8	8	8	8
30012: ORIGIN 1000003	7 Hamm Rd West	87	44.10761	8	8	8	8	8	8	8	8	8
30012: ORIGIN 1000003	8	32	39.61434	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	9	93	52.71993	0	0	0	0	0	0	0	0	0
2001												
Veh Type OlymDev - HGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45	44.07453	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89	66.17183	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	50	201.2484	0	0	0	0	0	0	0	0	0
From Blythe Rd 30012: ORIGIN 1000003	4	6	156.1139	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	5	43	80.37753	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	6 Hamm Rd East	266	105	1	1	1	1	1	1	1	1	1
30012: ORIGIN 1000003	7 Hamm Rd West	87	44.10761	1	1	1	1	1	1	1	1	1
30012: ORIGIN 1000003	8	32	39.61434	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	9	93	52.71993	0	0	0	0	0	0	0	0	0
2002												
Veh Type OlymDev - Taxis												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45	44.07453	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89	66.17183	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	50	201.2484	0	0	0	0	0	0	0	0	0
From Blythe Rd 30012: ORIGIN 1000003	4	6	156.1139	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	5	43	80.37753	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	6 Hamm Rd East	266	105	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	7 Hamm Rd West	87	44.10761	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	8	32	39.61434	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	9	93	52.71993	0	0	0	0	0	0	0	0	0
2000												
Veh Type OlymDev - LGVs												
No.	Name	DestLink	DestPos	0	900	1800	Rel Flow					
				2700	3600	4500	5400	6300				
30012: ORIGIN 1000003	1	45	44.07453	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	2	89	66.17183	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	3	50	201.2484	0	0	0	0	0	0	0	0	0
From Blythe Rd 30012: ORIGIN 1000003	4	6	156.1139	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	5	43	80.37753	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	6 Hamm Rd East	266	105	1	1	1	1	1	1	1	1	1
30012: ORIGIN 1000003	7 Hamm Rd West	87	44.10761	2	2	2	2	2	2	2	2	2
30012: ORIGIN 1000003	8	32	39.61434	0	0	0	0	0	0	0	0	0
30012: ORIGIN 1000003	9	93	52.71993	0	0	0	0	0	0	0	0	0

No.	Name	Link	0	900	1800	Volume						Veh Comp
			2700	3600	4500	5400	6300					
30000 D-Gate - Cars-OlymDev	276		6	6	6	6	6	6	6	6	6	6 200: Cars-OlymDev - 20mph
30001 D-Gate - HGVs-OlymDev	276		0	0	0	0	0	0	0	0	0	0 203: HGV-OlymDev - 20mph
30002 D-Gate - LGVs-OlymDev	276		0	0	0	0	0	0	0	0	0	0 207: LGV-OlymDev
30003 D-Gate - Taxis-OlymDev	276		0	0	0	0	0	0	0	0	0	0 206: Taxi-OlymDev

No.	Name	Link	0	900	1800	Volume						Veh Comp
			2700	3600	4500	5400	6300					
20004 Blythe Road - Cars-OlymDe	22		16	16	16	16	16	16	16	16	16	16 201: Cars-OlymDev - 30mph
20005 Blythe Road - HGVs-OlymD	22		2	2	2	2	2	2	2	2	2	2 204: HGV-OlymDev - 30mph
20006 Blythe Road - LGVs-OlymD	22		3	3	3	3	3	3	3	3	3	3 207: LGV-OlymDev
20007 Blythe Road - Taxis-OlymD	22		0	0	0	0	0	0	0	0	0	0 206: Taxi-OlymDev

**Olympia Development - TAXI Inputs**

Demand	AM	PM
Hammersmith Rd EB	21	15
Hammersmith Rd WB	14	14

PT Line (Taxi) Departure Times		
Direction	AM	PM
Hammersmith Rd EB*	1917	2238
	2009	2626
	2107	2684
	2159	3220
	2181	3297
	2595	3317
	2604	3334
	3247	3829
	3350	4081
	3363	4198
	3468	4511
	3701	4515
	3931	4648
	3941	4949
	4590	5128
	4825	
	4955	
	5017	
5025		
5120		
5388		
	<b>21</b>	<b>15</b>
Hammersmith Rd WB*	2496	2472
	3137	2784
	3095	2884
	4573	3127
	4563	3661
	1996	3678
	5147	3756
	3789	3765
	2150	3813
	2327	3882
	4170	3956
	2084	4486
	3357	4559
	3234	4731
	<b>14</b>	<b>14</b>

\*Demand created by randomly generated numbers to feed into 'Taxi' public transport routes



PM Peak  
Static Routes - Proposed PM V2 Flow Adjustments

CAR											
Colet Gardens											
101: ORIGIN 11068	1	6	156.11392	5	5	5	5	5	5	5	3
101: ORIGIN 11068	2	21	143.84599	32	32	32	32	32	32	32	33
101: ORIGIN 11068	3	39	37.815863	18	18	18	18	18	18	18	18
101: ORIGIN 11068	4	266	105	23	23	23	23	23	23	23	23
101: ORIGIN 11068	5	87	44.107605	22	22	22	22	22	22	22	22
101: ORIGIN 11068	6	32	39.614336	1	1	1	1	1	1	1	1
101: ORIGIN 11068	7	93	52.719925	0	0	0	0	0	0	0	0

Avonmore Road											
102: ORIGIN 1000000	1	6	156.11392	30	30	30	30	30	30	30	30
102: ORIGIN 1000000	2	21	143.84599	2	2	2	2	2	2	2	2
102: ORIGIN 1000000	3	266	105	113	113	113	113	113	113	113	113
102: ORIGIN 1000000	4	87	44.107605	3	3	3	3	3	3	3	3
102: ORIGIN 1000000	5	32	39.614336	14	14	14	14	14	14	14	14
102: ORIGIN 1000000	6	93	52.719925	0	0	0	0	0	0	0	0

North End Rd											
103: ORIGIN 1000001	1	21	143.84599	24	24	24	24	24	24	24	24
103: ORIGIN 1000001	2	266	105	233	233	233	233	233	233	233	233
103: ORIGIN 1000001	3	32	39.614336	3	3	3	3	3	3	3	3

Brook Green											
104: ORIGIN 1000002	1	45	44.074528	34	34	34	34	34	34	34	34
104: ORIGIN 1000002	2	89	66.171827	39	39	39	39	39	39	39	39
104: ORIGIN 1000002	3	50	201.2484	52	52	52	52	52	52	52	52
104: ORIGIN 1000002	4	21	143.84599	26	26	26	26	26	26	26	26
104: ORIGIN 1000002	5	43	80.377531	46	46	46	46	46	46	46	46
104: ORIGIN 1000002	6	266	105	34	34	34	34	34	34	34	34
104: ORIGIN 1000002	7	87	44.107605	38	38	38	38	38	38	38	38
104: ORIGIN 1000002	8	32	39.614336	4	4	4	4	4	4	4	4
104: ORIGIN 1000002	9	93	52.719925	7	7	7	7	7	7	7	7

Blythe Rd											
105: ORIGIN 1000003	1	45	44.074528	11	11	11	11	11	11	11	8%
105: ORIGIN 1000003	2	89	66.171827	15	15	15	15	15	15	15	8%
105: ORIGIN 1000003	3	50	201.2484	52	52	52	52	52	52	52	27%
105: ORIGIN 1000003	4	6	156.11392	2	2	2	2	2	2	2	1%
105: ORIGIN 1000003	5	43	80.377531	75	75	75	75	75	75	75	39%
105: ORIGIN 1000003	6	266	105	17	17	17	17	17	17	17	9%
105: ORIGIN 1000003	7	87	44.107605	20	20	20	20	20	20	20	10%
105: ORIGIN 1000003	8	32	39.614336	2	2	2	2	2	2	2	1%
105: ORIGIN 1000003	9	93	52.719925	1	1	1	1	1	1	1	1%

Hamm Rd East											
107: ORIGIN 1000006	1	45	44.074528	15	15	15	15	15	15	15	11
107: ORIGIN 1000006	2	89	66.171827	12	12	12	12	12	12	12	12
107: ORIGIN 1000006	3	47	132.81577	192	192	192	192	192	192	192	192
107: ORIGIN 1000006	4	50	201.2484	5	5	5	5	5	5	5	5
107: ORIGIN 1000006	5	6	156.11392	1	1	1	1	1	1	1	1
107: ORIGIN 1000006	6	43	80.377531	58	58	58	58	58	58	58	58
107: ORIGIN 1000006	7	87	44.107605	184	184	184	184	184	184	184	184
107: ORIGIN 1000006	8	32	39.614336	137	137	137	137	137	137	137	137
107: ORIGIN 1000006	9	93	52.719925	4	4	4	4	4	4	4	4
				21							

Hamm Rd West											
108: ORIGIN 1000007	1	45	44.074528	4	4	4	4	4	4	4	4
108: ORIGIN 1000007	2	89	66.171827	13	13	13	13	13	13	13	13
108: ORIGIN 1000007	3	50	201.2484	1	1	1	1	1	1	1	1
108: ORIGIN 1000007	4	6	156.11392	15	15	15	15	15	15	15	15
108: ORIGIN 1000007	5	21	143.84599	6	6	6	6	6	6	6	6
108: ORIGIN 1000007	6	43	80.377531	15	15	15	15	15	15	15	15
108: ORIGIN 1000007	7	266	105	175	175	175	175	175	175	175	175
108: ORIGIN 1000007	8	32	39.614336	12	12	12	12	12	12	12	12

HGV											
Hamm Rd East											
207: ORIGIN 1000006	1	45	44.074528	0	0	0	0	0	0	0	0
207: ORIGIN 1000006	2	89	66.171827	0	0	0	0	0	0	0	0
207: ORIGIN 1000006	3	47	132.81577	5	5	5	5	5	5	5	5
207: ORIGIN 1000006	4	50	201.2484	0	0	0	0	0	0	0	0
207: ORIGIN 1000006	5	6	156.11392	0	0	0	0	0	0	0	0
207: ORIGIN 1000006	6	43	80.377531	1	1	1	1	1	1	1	1
207: ORIGIN 1000006	7	87	44.107605	5	5	5	5	5	5	5	5
207: ORIGIN 1000006	8	32	39.614336	2	2	2	2	2	2	2	2
207: ORIGIN 1000006	9	93	52.719925	0	0	0	0	0	0	0	0
				21							

TAXI											
Hamm Rd East											
307: ORIGIN 1000006	1	45	44.074528	2	2	2	2	2	2	2	2
307: ORIGIN 1000006	2	89	66.171827	1	1	1	1	1	1	1	1
307: ORIGIN 1000006	3	47	132.81577	19	19	19	19	19	19	19	19
307: ORIGIN 1000006	4	50	201.2484	2	2	2	2	2	2	2	2
307: ORIGIN 1000006	5	6	156.11392	0	0	0	0	0	0	0	0
307: ORIGIN 1000006	6	43	80.377531	3	3	3	3	3	3	3	3
307: ORIGIN 1000006	7	87	44.107605	6	6	6	6	6	6	6	6
307: ORIGIN 1000006	8	32	39.614336	7	7	7	7	7	7	7	7
307: ORIGIN 1000006	9	93	52.719925	1	1	1	1	1	1	1	1
				21							

Hamm Rd West											
308: ORIGIN 1000007	1	45	44.074528	1	1	1	1	1	1	1	1
308: ORIGIN 1000007	2	89	66.171827	1	1	1	1	1	1	1	1
308: ORIGIN 1000007	3	50	201.2484	0	0	0	0	0	0	0	0
308: ORIGIN 1000007	4	6	156.11392	2	2	2	2	2	2	2	2
308: ORIGIN 1000007	5	21	143.84599	0	0	0	0	0	0	0	0
308: ORIGIN 1000007	6	43	80.377531	1	1	1	1	1	1	1	1
308: ORIGIN 1000007	7	266	105	37	37	37	37	37	37	37	37
308: ORIGIN 1000007	8	32	39.614336	1	1	1	1	1	1	1	1
				21							

Vehicle Inputs - Proposed PM V2 Flow Adjustments

36 Blythe Roa	22	189	145	195	172	185	192	205	205 11: Cars - 30mph
37 Blythe Roa	22	0	5	10	5	5	10	5	21: HGV - 30mph
38 Blythe Roa	22	0	11	21	11	21	21	21	50: Cyclists
39 Blythe Roa	22	0	0	0	0	0	0	0	80: LGV
40 Blythe Roa	22	0	0	0	0	0	0	0	70: Coach
41 Blythe Roa	22	43	55	36	48	43	36	35	80: Taxi
42 Blythe Roa	22	0	0	0	0	0	0	0	31: Motorbikes - 30mph

CAR											
Colet Gardens											
101: ORIGIN 11068	1	6	156.11392	5	5	5	5	5	5	5	3
101: ORIGIN 11068	2	21	143.84599	32	32	32	32	32	32	32	33
101: ORIGIN 11068	3	39	37.815863	18	18	18	18	18	18	18	18
101: ORIGIN 11068	4	266	105	23	23	23	23	23	23	23	23
101: ORIGIN 11068	5	87	44.107605	22	22	22	22	22	22	22	22
101: ORIGIN 11068	6	32	39.614336	1	1	1	1	1	1	1	1
101: ORIGIN 11068	7	93	52.719925	0	0	0	0	0	0	0	0

Avonmore Road											
102: ORIGIN 1000000	1	6	156.11392	30	30	30	30	30	30	30	30
102: ORIGIN 1000000	2	21	143.84599	16	16	16	16	16	16	16	16
102: ORIGIN 1000000	3	266	105	113	113	113	113	113	113	113	113
102: ORIGIN 1000000	4	87	44.107605	3	3	3	3	3	3	3	3
102: ORIGIN 1000000	5	32	39.614336	0	0	0	0	0	0	0	0
102: ORIGIN 1000000	6	93	52.71992								

Appendix B – Network Layout Drawings

- G-GATE**
- Currently the primary vehicle access for exhibition vehicles
  - Access to be retained as the primary point of access to the logistics area in the central building .

- BLYTHE ROAD**
- Currently used as an exit route for exhibition vehicles from G-Gate
  - To be used as both an entry and exit route to and from G-Gate as part of the redevelopment.
  - Intensification of use

- D-GATE**
- Currently used a secondary access route for exhibition traffic
  - To be used as a secondary access for exhibition traffic, emergency vehicle access and a primary point of access to the proposed basement carpark
  - Intensification of use

- F-GATE**
- Currently used as an emergency vehicle access for the exhibition
  - To be removed as part of the redevelopment

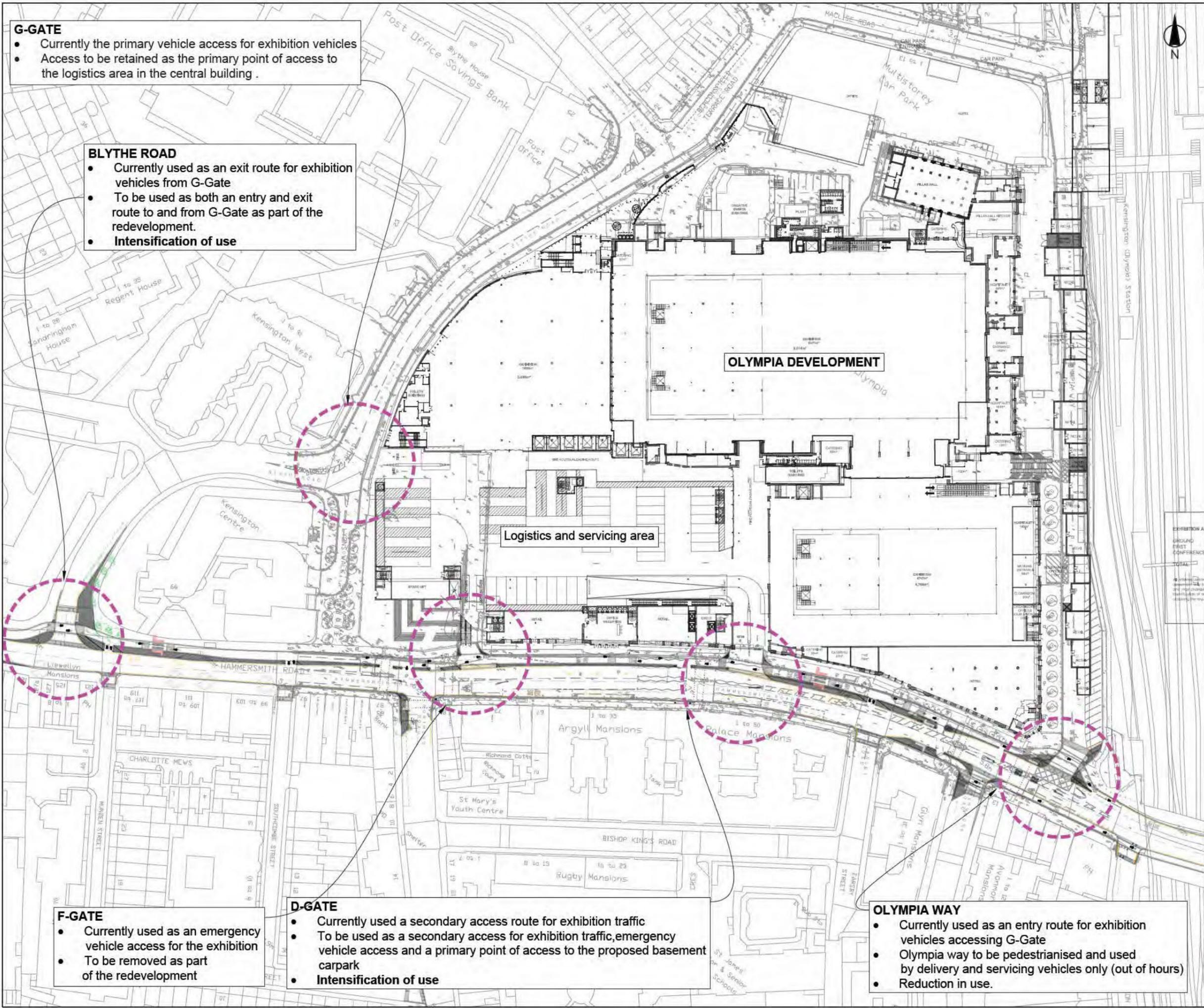
- OLYMPIA WAY**
- Currently used as an entry route for exhibition vehicles accessing G-Gate
  - Olympia way to be pedestrianised and used by delivery and servicing vehicles only (out of hours)
  - Reduction in use.

Logistics and servicing area

OLYMPIA DEVELOPMENT

**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.



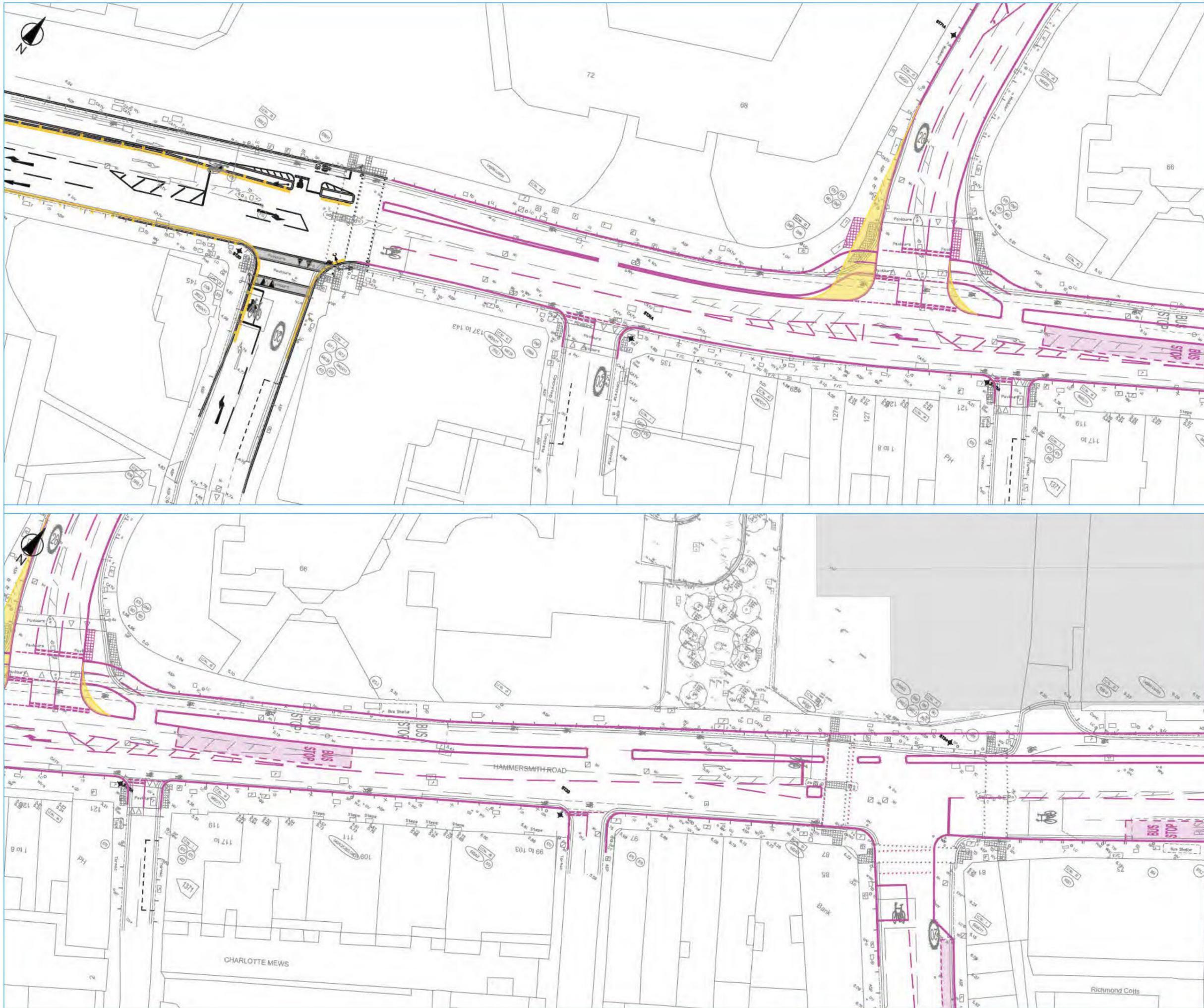
Rev	Date	By	Remarks	Chkd	Appd
A	11/04/18		First Issue		



Job Title  
**OLYMPIA**

Drawing Title  
**ACCESS SUMMARY  
CS9 INTERFACE**

Drawing Status  
**SKETCH**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	04/06/18		First Issue		



Client



Job Title

**OLYMPIA**

Drawing Title

**CS9 INTEGRATION  
LAYOUT 1  
BLYTHE ROAD PRIORITY  
D-GATE PRIORITY**

Drawing Status

**SKETCH**

Scale at A3

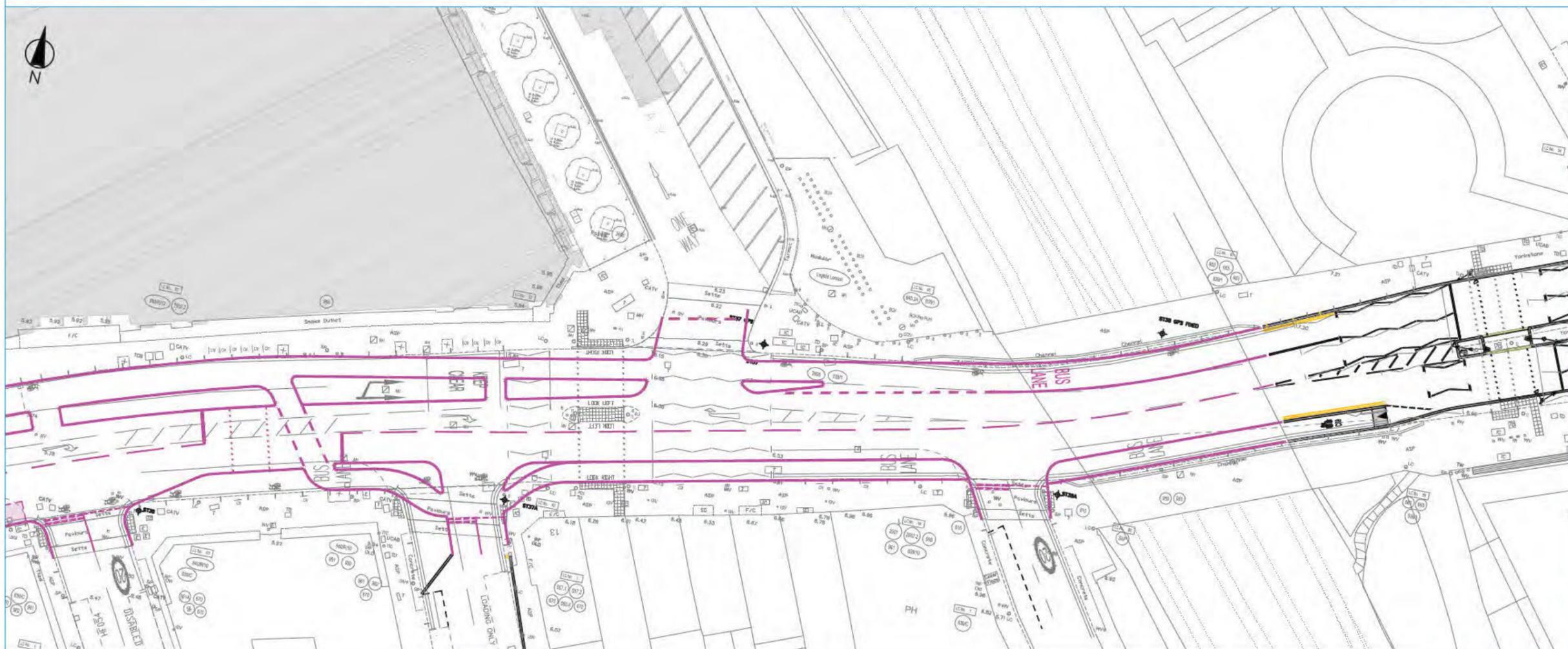
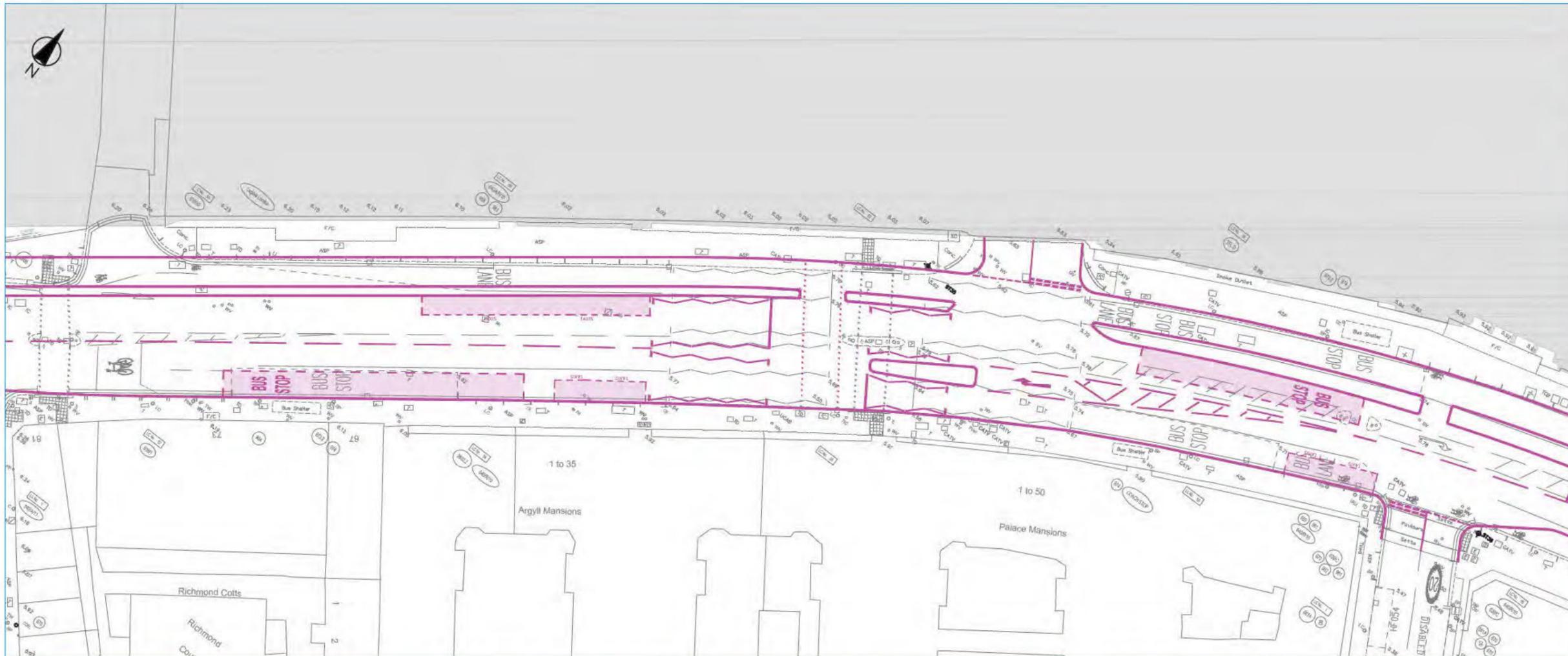
**1:500**

Drawing No

**M000293-HW-018**

Issue

**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	04/06/18		First Issue		



Client  
**OLYMPIA**

Job Title  
**OLYMPIA**

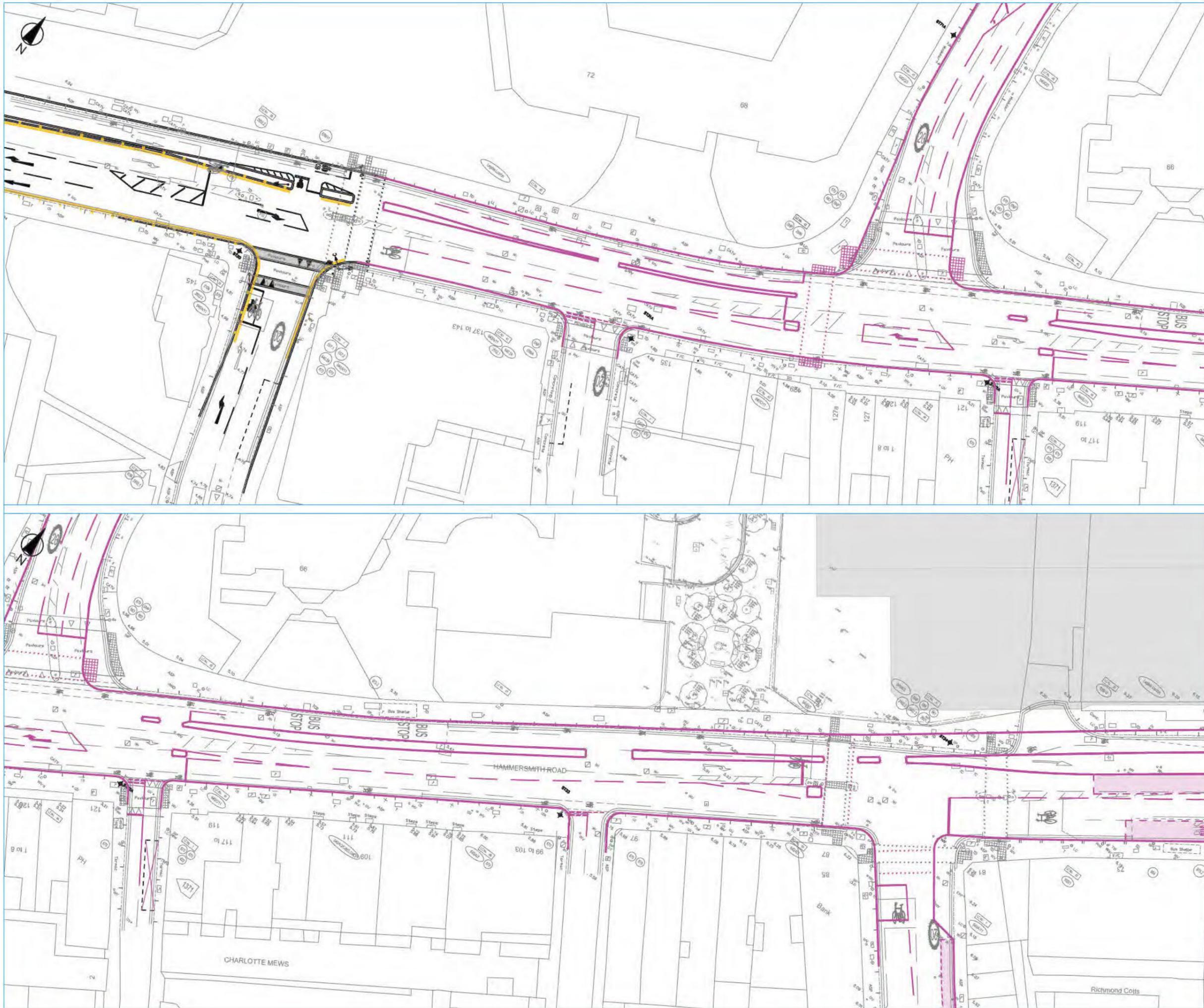
Drawing Title  
**CS9 INTEGRATION  
LAYOUT 1  
BLYTHE ROAD PRIORITY  
D-GATE PRIORITY**

Drawing Status  
**SKETCH**

Scale at A3  
**1:500**

Drawing No  
**M000293-HW-019**

Issue  
**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	31/05/18		First Issue		



Client



Job Title

**OLYMPIA**

Drawing Title

**CS9 INTEGRATION  
LAYOUT 2  
BLYTHE ROAD SIGNALISED  
D-GATE PRIORITY**

Drawing Status

SKETCH

Scale at A3

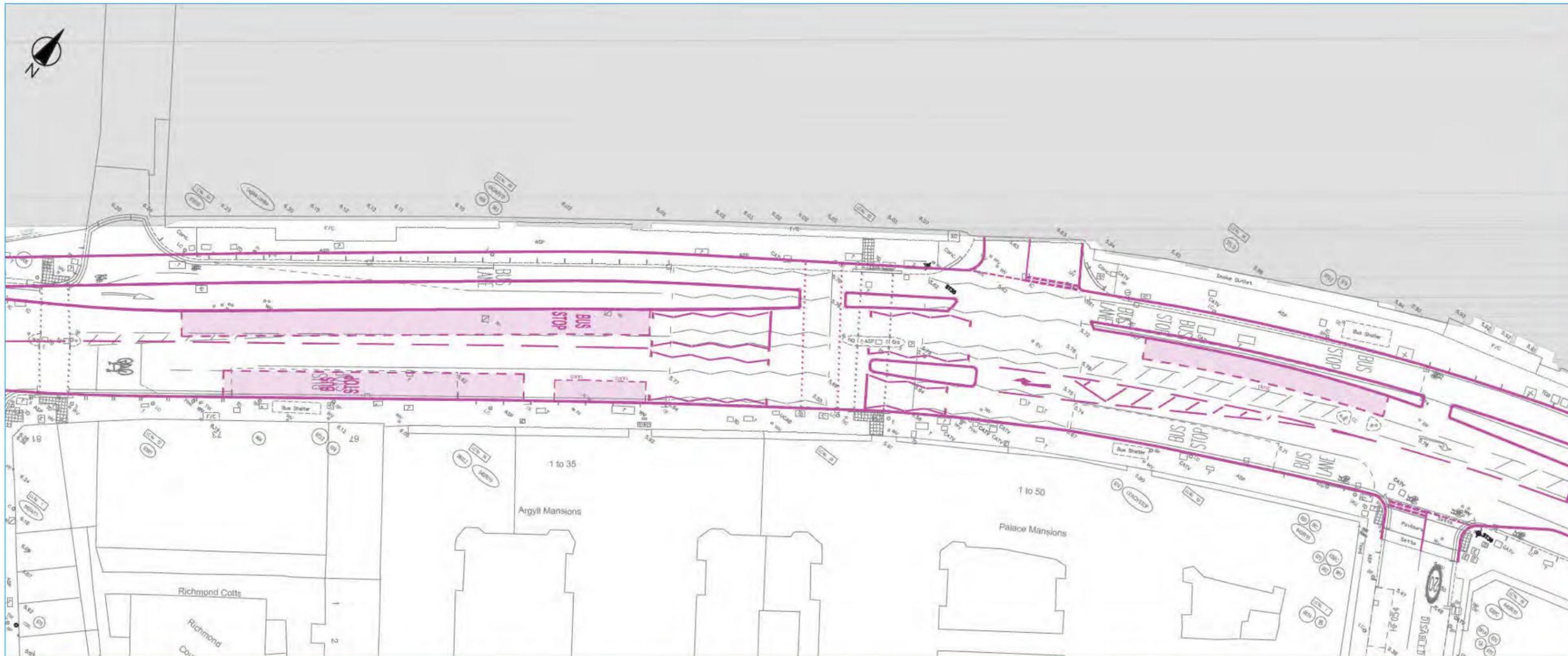
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Drawing No

**M000293-HW-014**

Issue

**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	31/05/18		First Issue		

**momentum**  
transport consultancy

Client

**yoo**  
capital

Job Title

**OLYMPIA**

Drawing Title

**CS9 INTEGRATION  
LAYOUT 2  
BLYTHE ROAD SIGNALISED  
D-GATE PRIORITY**

Drawing Status

**SKETCH**

Scale at A3

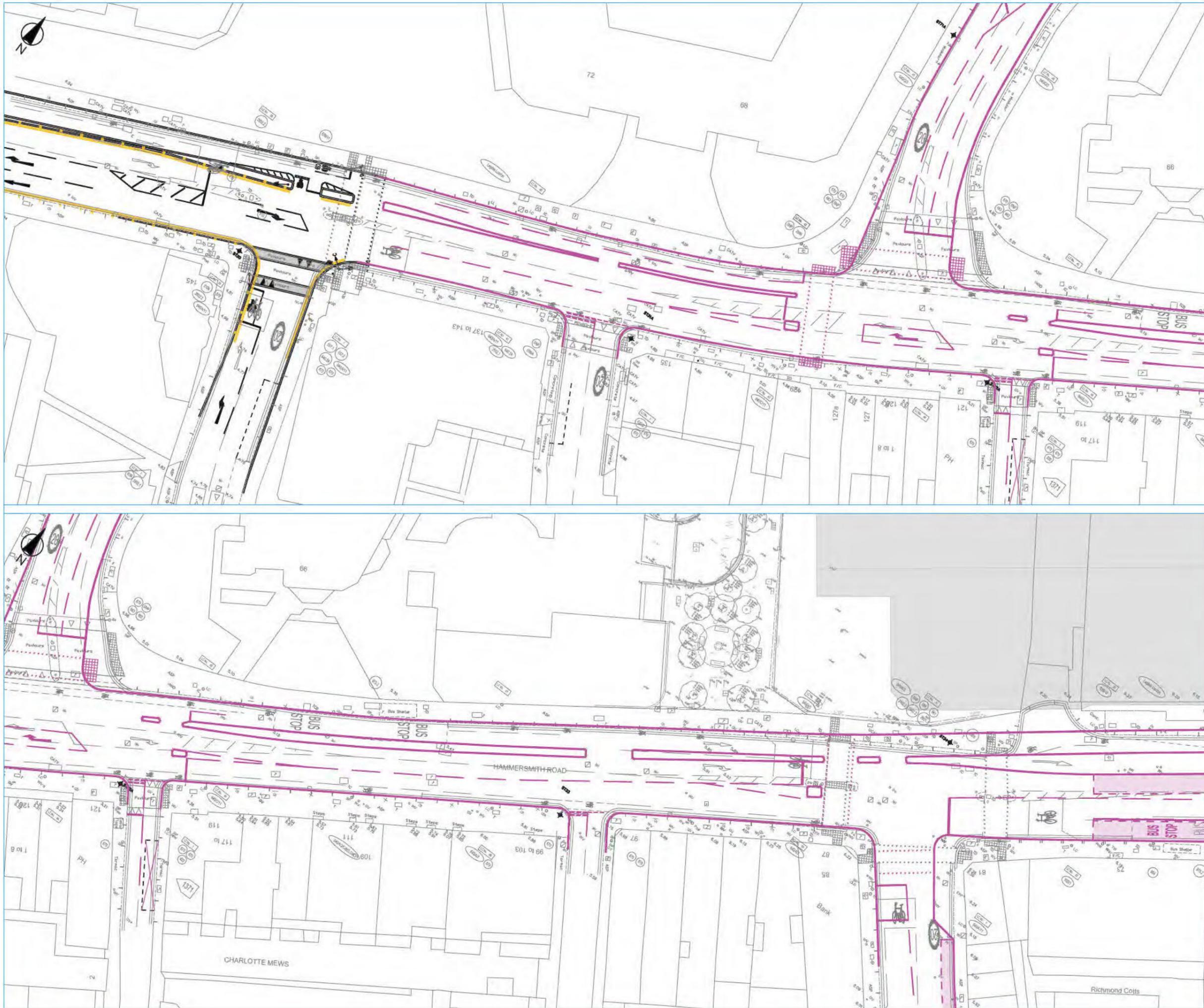
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Drawing No

**M000293-HW-015**

Issue

**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	31/05/18		First Issue		



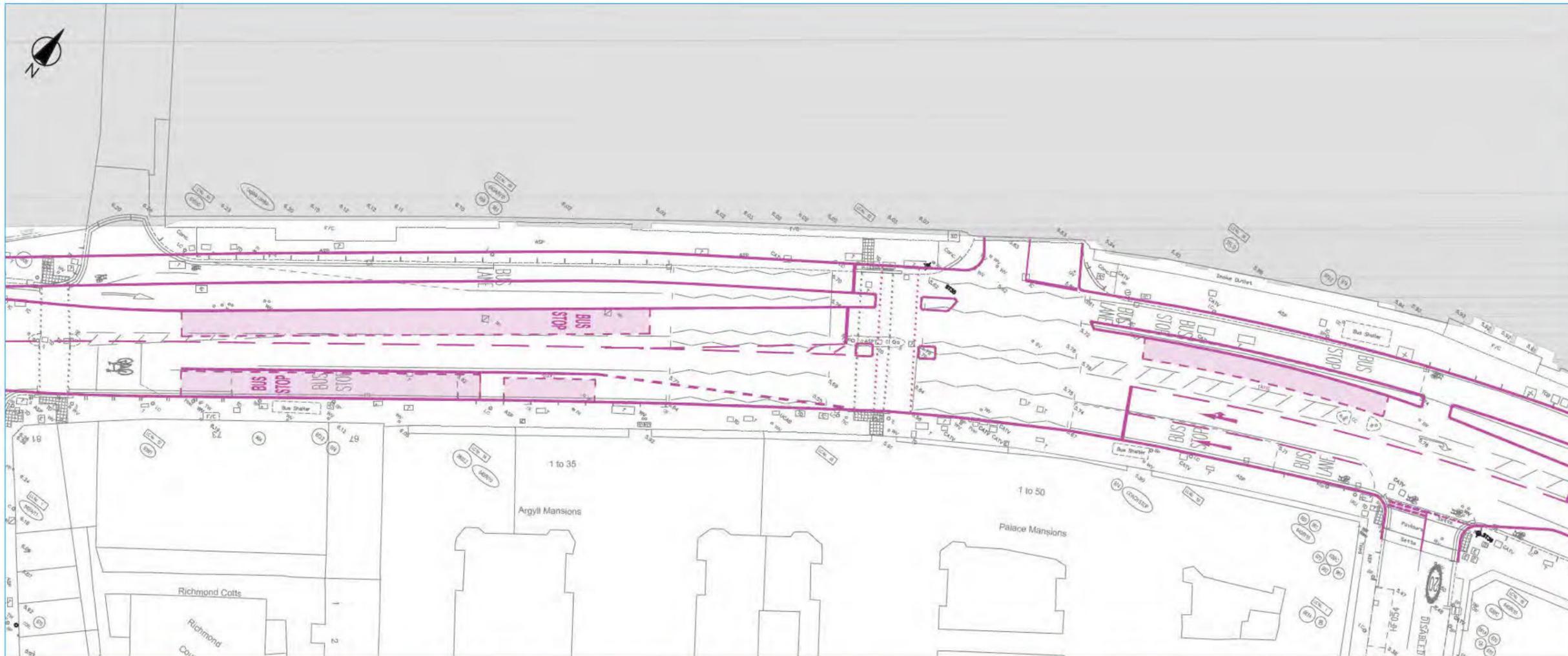
Client  
**OLYMPIA**

Job Title  
**CS9 INTEGRATION  
LAYOUT 4  
BLYTHE ROAD SIGNALISED  
D-GATE SIGNALISED**

Drawing Status  
**SKETCH**

Scale at A3  
**1:500**  
Drawing No  
**M000293-HW-012**

Issue  
**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	31/05/18		First Issue		



Client  
**OLYMPIA**

Job Title  
**OLYMPIA**

Drawing Title  
**CS9 INTEGRATION  
LAYOUT 4  
BLYTHE ROAD SIGNALISED  
D-GATE SIGNALISED**

Drawing Status  
**SKETCH**

Scale at A3  
**1:500**

Drawing No  
**M000293-HW-013**

Issue  
**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

Rev	Date	By	Remarks	Chkd	Appd
B	22/06/18		Right turn added		
A	31/05/18		First Issue		



Client



Job Title

**OLYMPIA**

Drawing Title

**CS9 INTEGRATION  
LAYOUT 3  
BLYTHE ROAD PRIORITY  
D-GATE SIGNALISED**

Drawing Status

**SKETCH**

Scale at A3

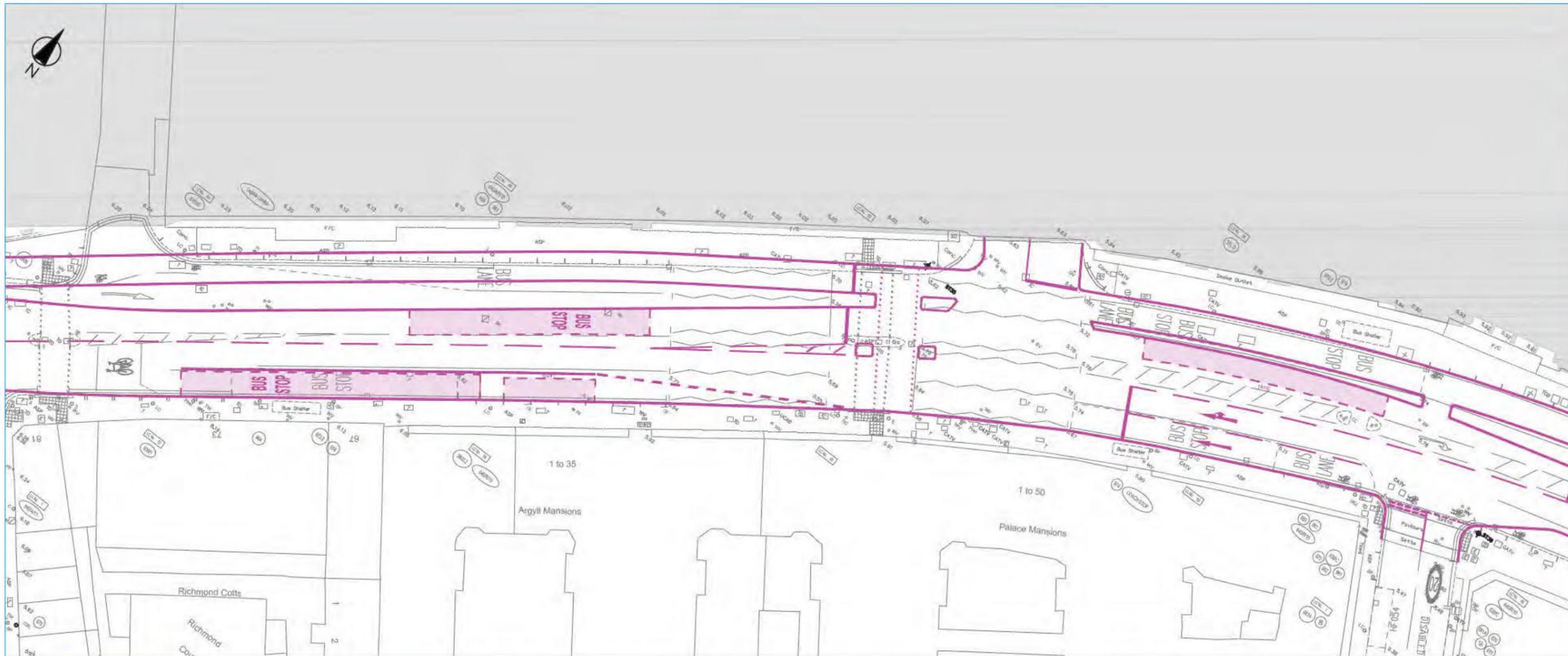
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Drawing No

**M000293-HW-016**

Issue

**B**



**NOTES**

1. Do not scale from this drawing, work to figured dimensions only.
2. Dimensions are in metres unless stated otherwise.
3. This drawing is for discussion purposes only.

B	22/06/18		Right turn added		
A	31/05/18		First Issue		
Rev	Date	By	Remarks	Chkd	Appd

**momentum**  
transport consultancy

Client



Job Title  
**OLYMPIA**

Drawing Title  
**CS9 INTEGRATION  
LAYOUT 3  
BLYTHE ROAD PRIORITY  
D-GATE SIGNALISED**

Drawing Status

**SKETCH**

Scale at A3  
**1:500**

Drawing No  
**M000293-HW-017**

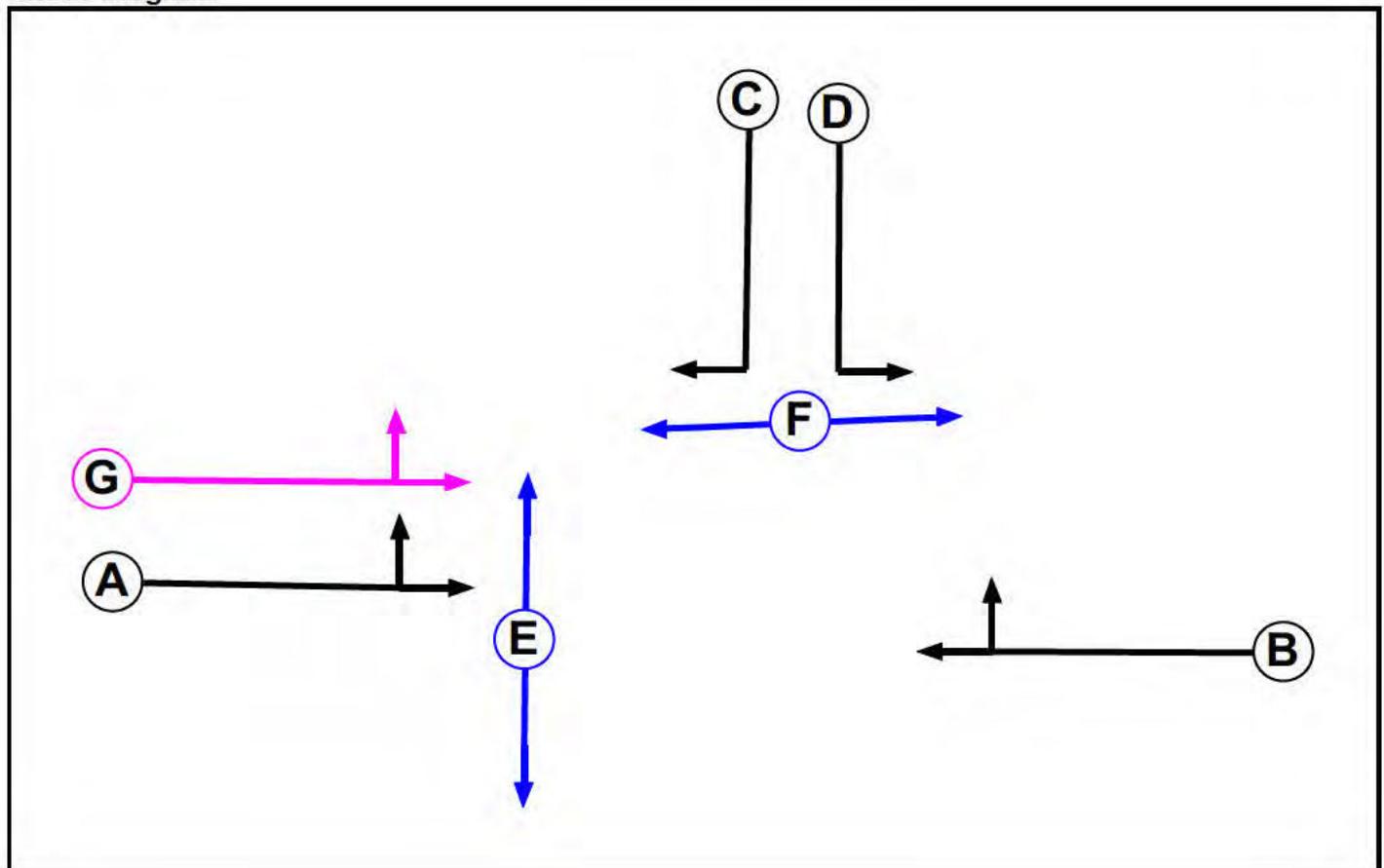
Issue  
**B**

Appendix C – Proposed Blythe Road and D-Gate Signalisation Details

**User and Project Details**

<b>Project:</b>	
<b>Title:</b>	
<b>Location:</b>	
<b>Additional detail:</b>	
<b>File name:</b>	Momentum BlytheRd Sc100 MMEditedTimes.lsg3x
<b>Author:</b>	
<b>Company:</b>	
<b>Address:</b>	

**Phase Diagram**



**Phase Input Data**

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Traffic		7	7
C	Traffic		7	7
D	Traffic		7	7
E	Pedestrian		6	6
F	Pedestrian		6	6
G	Cycle		6	6

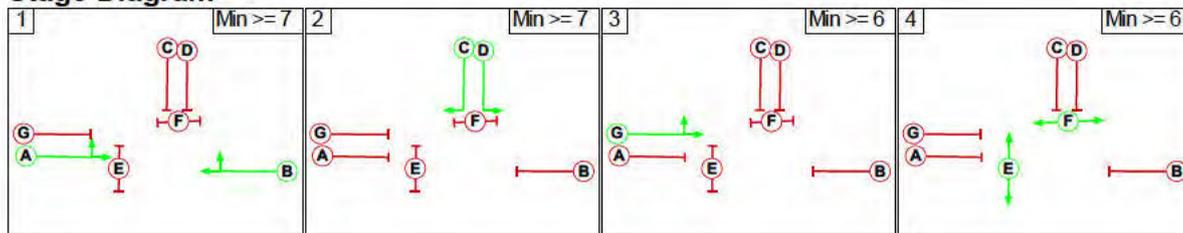
**Phase Intergrens Matrix**

		Starting Phase						
		A	B	C	D	E	F	G
Terminating Phase	A	-	5	6	5	7	5	
	B	-	6	-	8	10	8	
	C	5	5	-	9	5	5	
	D	5	-	-	-	5	5	
	E	12	12	12	-	-	12	
	F	15	15	15	15	-	-	15
	G	5	5	5	6	5	7	

**Phases in Stage**

Stage No.	Phases in Stage
1	A B
2	C D
3	G
4	E F

**Stage Diagram**



**Phase Delays**

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

**Prohibited Stage Change**

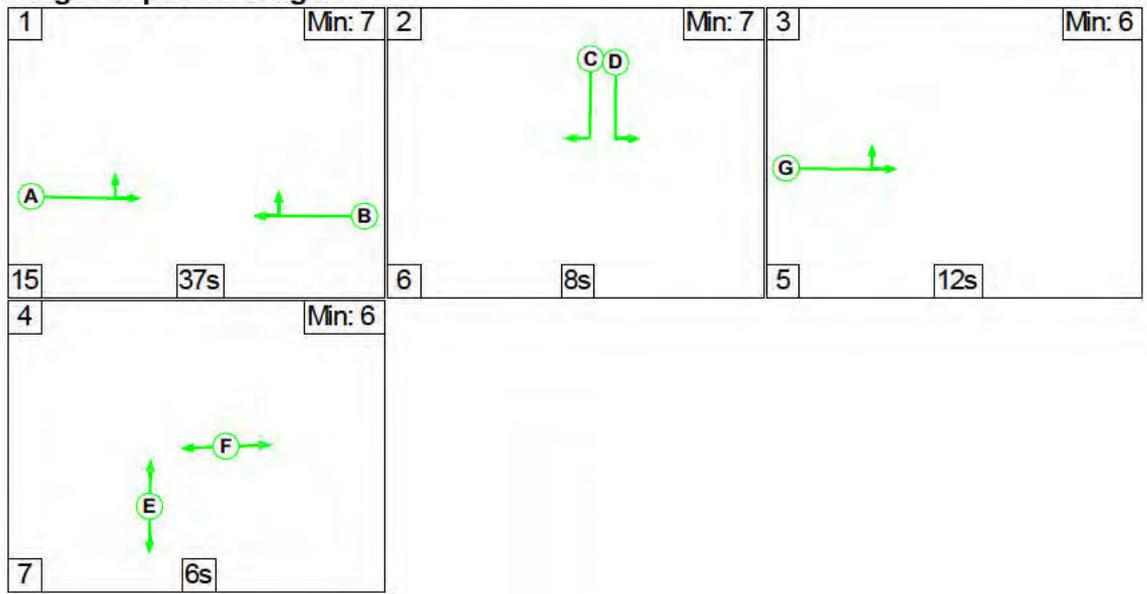
		To Stage			
		1	2	3	4
From Stage	1	-	6	8	10
	2	5	-	5	9
	3	5	6	-	7
	4	15	15	15	-

Signal Timings  
**Signal Timings**

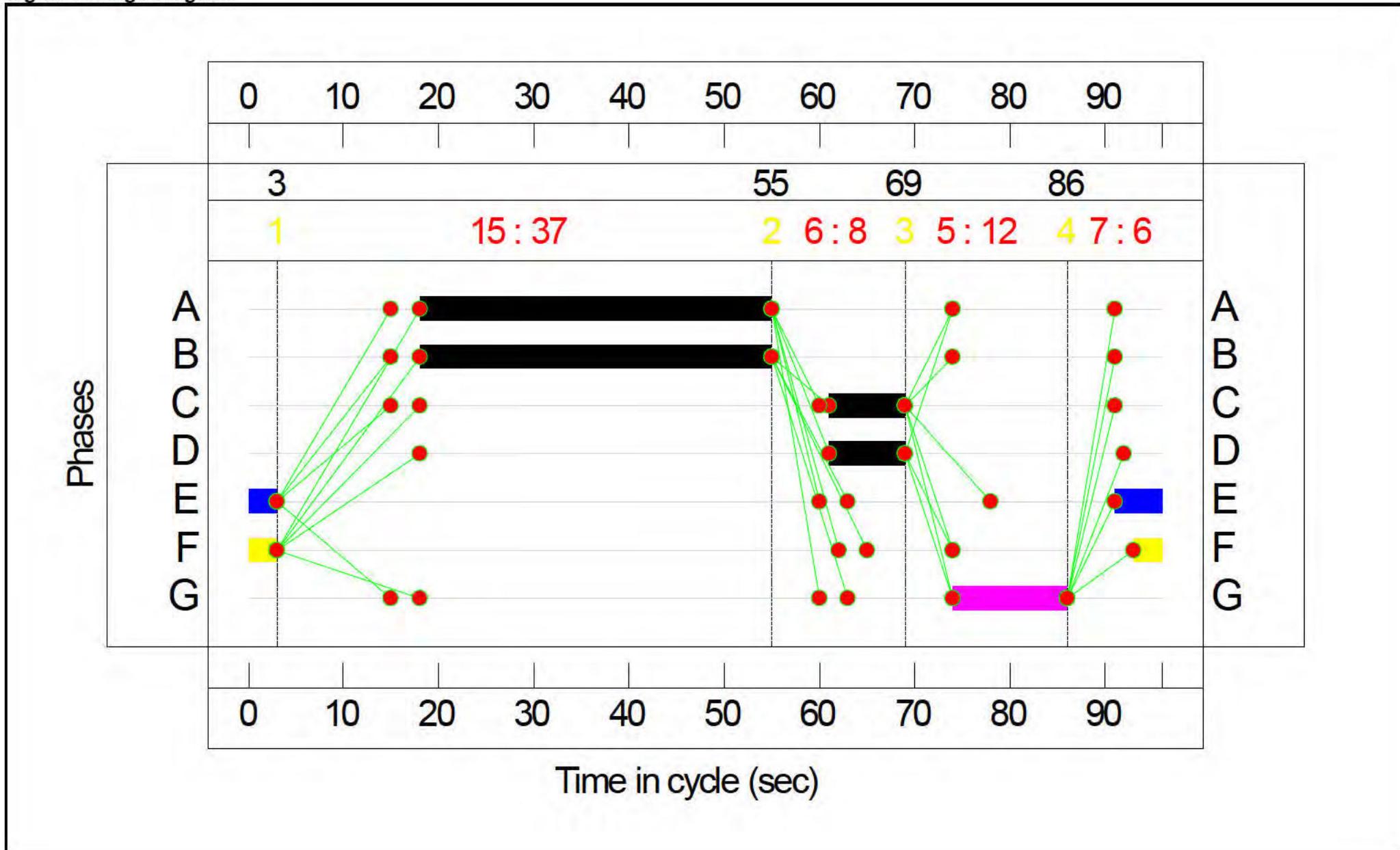
**User and Project Details**

<b>Project:</b>	
<b>Title:</b>	
<b>Location:</b>	
<b>Additional detail:</b>	
<b>File name:</b>	Momentum BlytheRd Sc100 MMEditedTimes.lsg3x
<b>Author:</b>	
<b>Company:</b>	
<b>Address:</b>	

**Scenario 1: 'AM' (FG1: 'Flow Group 1', Plan 1: 'AM')**  
**Stage Sequence Diagram**



Signal Timings  
Signal Timings Diagram



Signal Timings  
Phase Timings

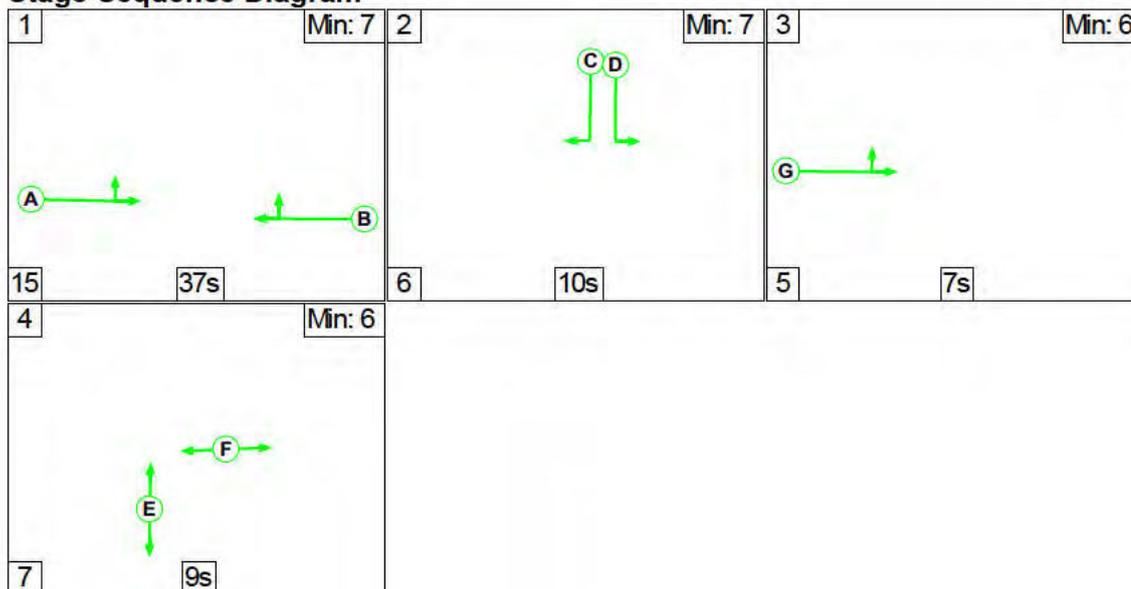
Phase Name	Description	Phase	Green Period 1		
			Total Green	Start Time	End Time
A	Ahead Left	Traffic	37	18	55
B	Ahead Right	Traffic	37	18	55
C	Right	Traffic	8	61	69
D	Left	Traffic	8	61	69
E	Pedestrians across	Pedestrian	8	91	3
F	Pedestrians across	Pedestrian	6	93	3
G	Left Ahead Cycles	Cycle	12	74	86

Lane Green Times

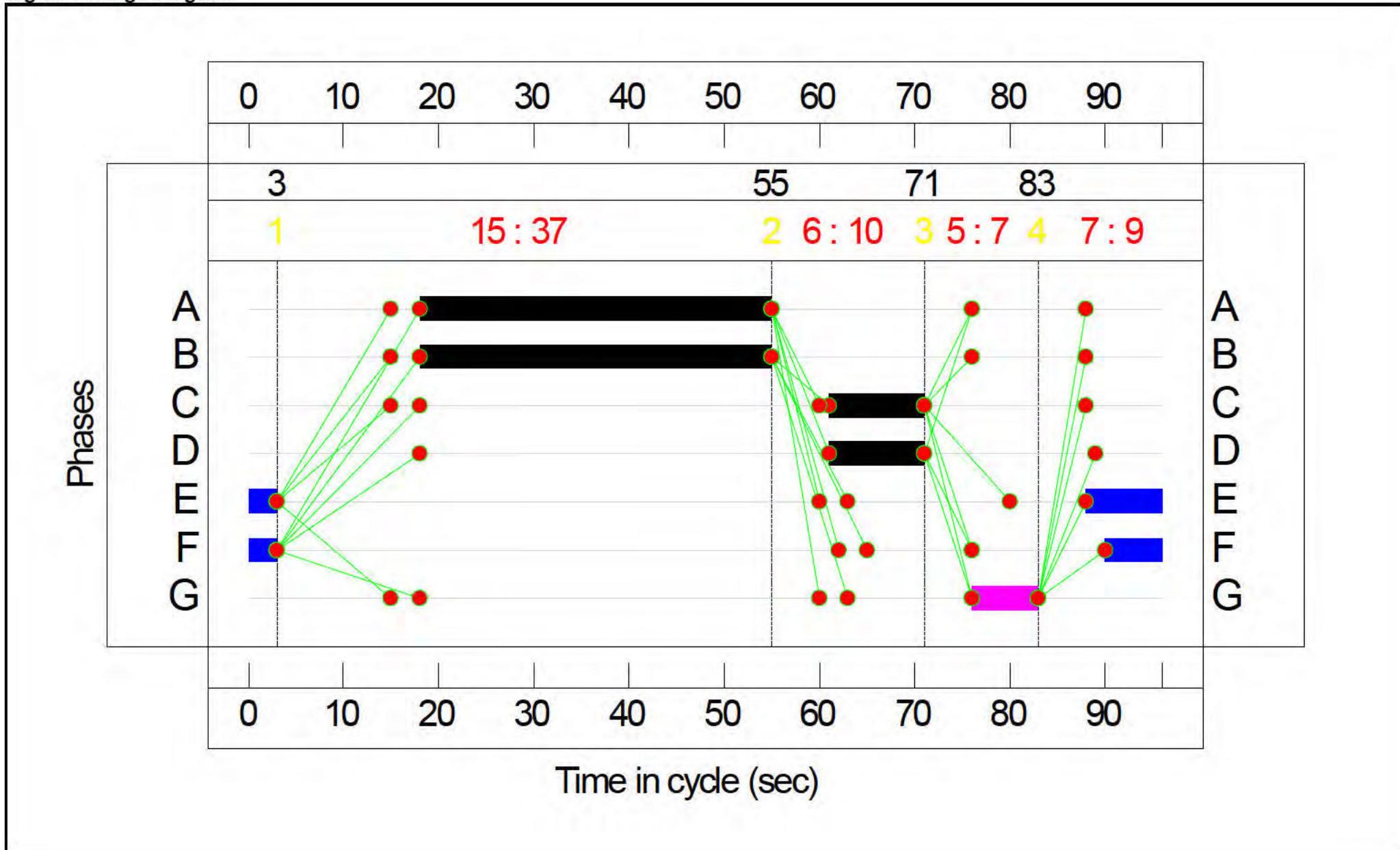
Junction: Unnamed Junction					
Lane	Description	Type	Phases	Start Green	End Green
1/1	Ahead Left	U	A	18	55
2/1	Left Ahead	U	G	74	86
3/1	Ahead Right	O	B	18	55
4/1	Right	U	C	61	69
5/1	Left	U	D	61	69

Scenario 2: 'PM' (FG1: 'Flow Group 1', Plan 2: 'PM')

Stage Sequence Diagram



Signal Timings  
Signal Timings Diagram



Signal Timings

**Phase Timings**

Phase Name	Description	Phase	Green Period 1		
			Total Green	Start Time	End Time
A	Ahead Left	Traffic	37	18	55
B	Ahead Right	Traffic	37	18	55
C	Right	Traffic	10	61	71
D	Left	Traffic	10	61	71
E	Pedestrians across	Pedestrian	11	88	3
F	Pedestrians across	Pedestrian	9	90	3
G	Left Ahead Cycles	Cycle	7	76	83

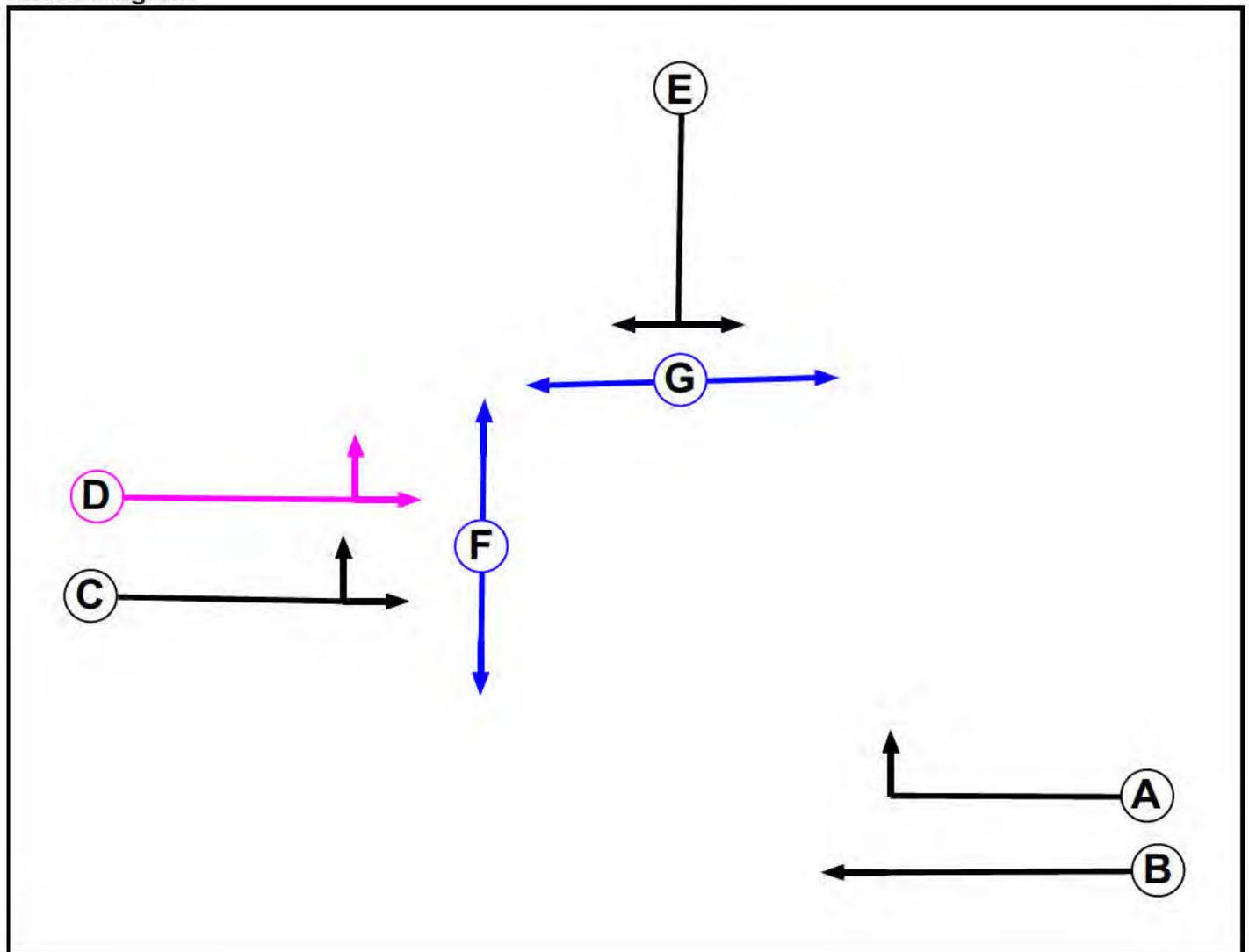
**Lane Green Times**

Junction: Unnamed Junction					
Lane	Description	Type	Phases	Start Green	End Green
1/1	Ahead Left	U	A	18	55
2/1	Left Ahead	U	G	76	83
3/1	Ahead Right	O	B	18	55
4/1	Right	U	C	61	71
5/1	Left	U	D	61	71

User and Project Details

Project:	
Title:	
Location:	
Additional detail:	
File name:	Momentum D-Gate Sc101 MMEditedTimes.lsg3x
Author:	
Company:	
Address:	

Phase Diagram



**Phase Input Data**

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Traffic		7	7
C	Traffic		7	7
D	Cycle		5	5
E	Traffic		7	7
F	Pedestrian		5	5
G	Pedestrian		5	5

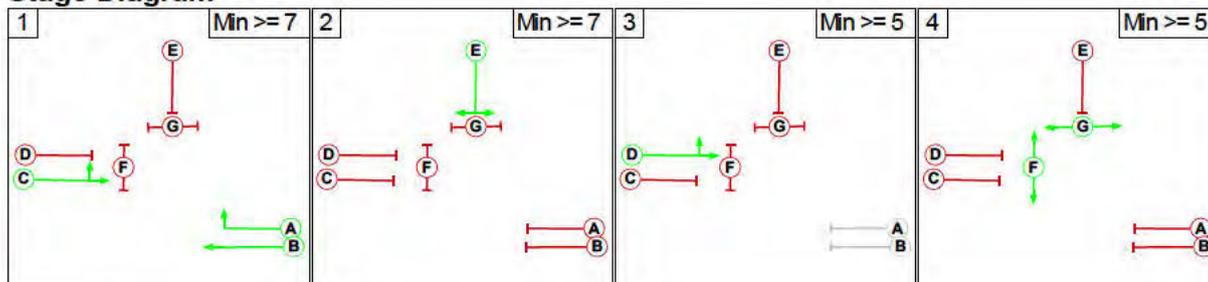
**Phase Intergreens Matrix**

Terminating Phase	Starting Phase						
	A	B	C	D	E	F	G
A	-	-	-	-	5	-	8
B	-	-	-	-	5	7	-
C	-	-	-	5	6	5	8
D	-	-	5	-	6	5	7
E	5	5	5	5	-	9	5
F	-	16	16	16	16	-	-
G	12	-	12	12	12	-	-

**Phases in Stage**

Stage No.	Phases in Stage
1	A B C
2	E
3	D
4	F G

**Stage Diagram**



**Phase Delays**

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

**Prohibited Stage Change**

From Stage	To Stage			
	1	2	3	4
1	■	6	5	8
2	5	■	5	9
3	5	6	■	7
4	16	16	16	■

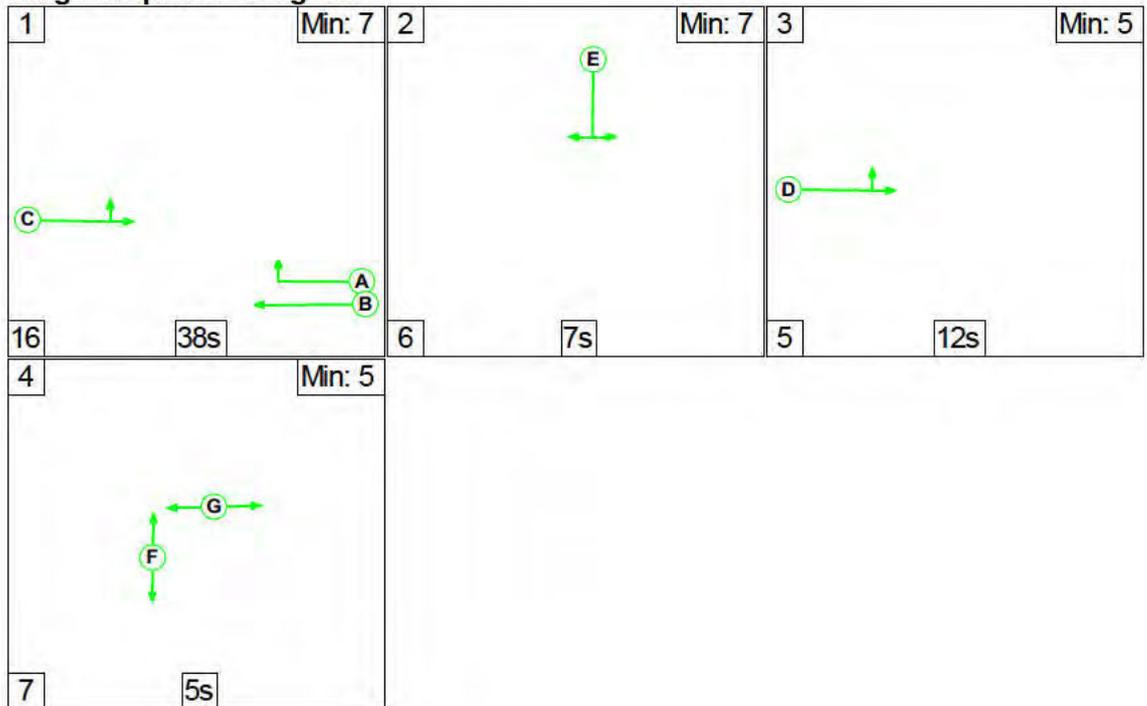
Signal Timings  
**Signal Timings**

**User and Project Details**

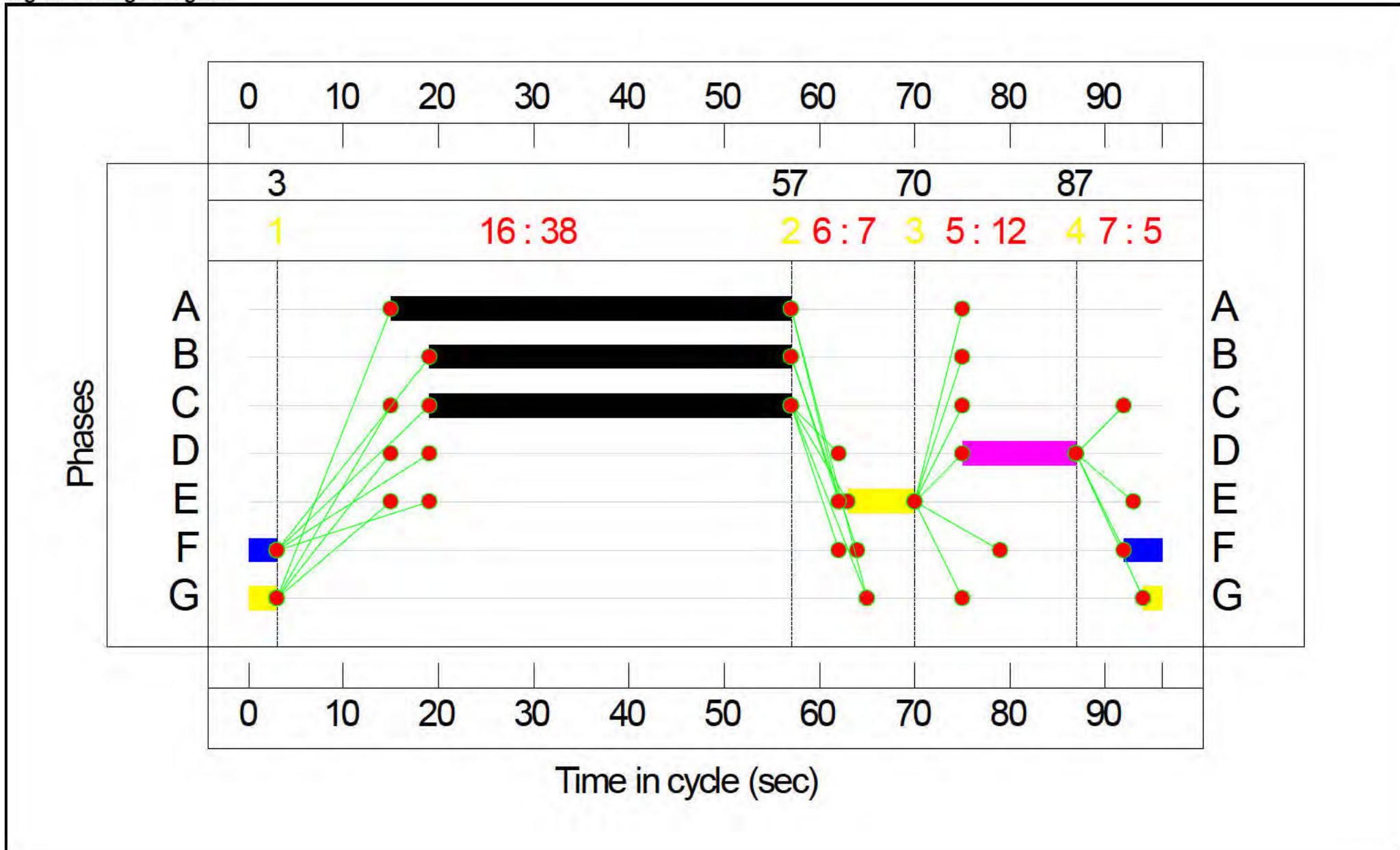
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<b>Location:</b>	
<b>Additional detail:</b>	
<b>File name:</b>	Momentum D-Gate Sc101 MMEditedTimes.lsg3x
<b>Author:</b>	
<b>Company:</b>	
<b>Address:</b>	

Scenario 1: 'AM' (FG1: 'Flow Group 1', Plan 1: 'Network Control Plan 1')

**Stage Sequence Diagram**



Signal Timings  
Signal Timings Diagram



Signal Timings  
Phase Timings

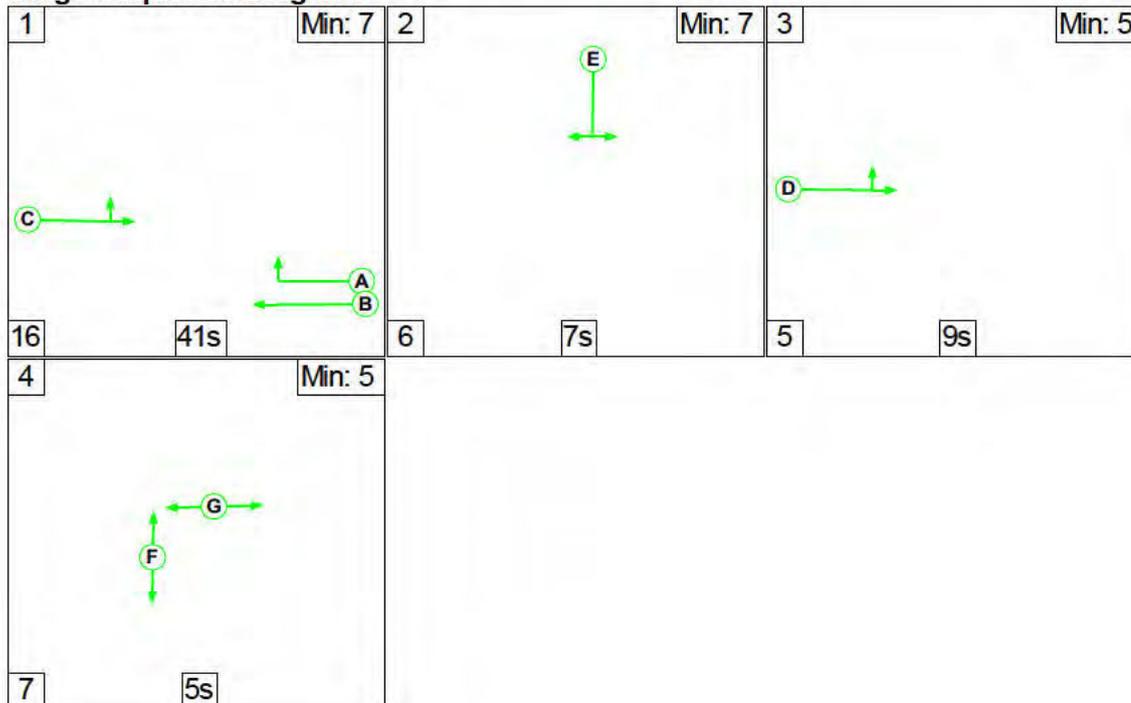
Phase Name	Description	Phase	Green Period 1		
			Total Green	Start Time	End Time
A	Right	Traffic	42	15	57
B	Ahead	Traffic	38	19	57
C	Ahead Left	Traffic	38	19	57
D	Left Ahead Cycles	Cycle	12	75	87
E	Right Left	Traffic	7	63	70
F	Pedestrians across	Pedestrian	7	92	3
G	Pedestrians across	Pedestrian	5	94	3

Lane Green Times

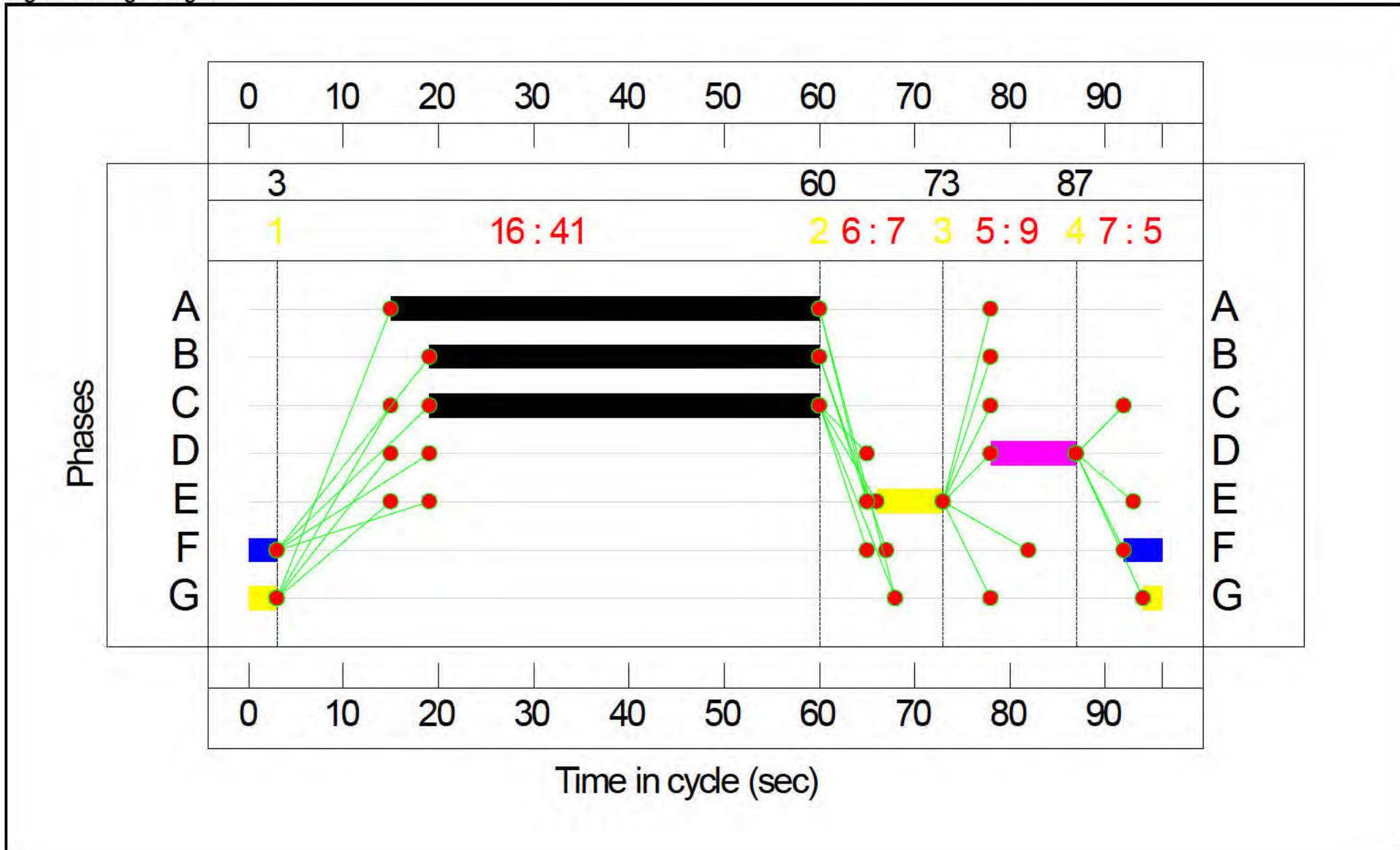
Junction: Unnamed Junction					
Lane	Description	Type	Phases	Start Green	End Green
1/1	Ahead Left	U	C	19	57
2/1	Left Ahead	U	D	75	87
3/1	Ahead	U	B	19	57
3/2	Right	O	A	15	57
4/1	Right Left	U	E	63	70

Scenario 2: 'PM' (FG1: 'Flow Group 1', Plan 1: 'Network Control Plan 1')

Stage Sequence Diagram



Signal Timings  
Signal Timings Diagram



Signal Timings  
**Phase Timings**

Phase Name	Description	Phase	Green Period 1		
			Total Green	Start Time	End Time
A	Right	Traffic	45	15	60
B	Ahead	Traffic	41	19	60
C	Ahead Left	Traffic	41	19	60
D	Left Ahead Cycles	Cycle	9	78	87
E	Right Left	Traffic	7	66	73
F	Pedestrians across	Pedestrian	7	92	3
G	Pedestrians across	Pedestrian	5	94	3

**Lane Green Times**

Junction: Unnamed Junction					
Lane	Description	Type	Phases	Start Green	End Green
1/1	Ahead Left	U	C	19	60
2/1	Left Ahead	U	D	78	87
3/1	Ahead	U	B	19	60
3/2	Right	O	A	15	60
4/1	Right Left	U	E	66	73

Appendix D – Proposed Blythe Road and D-Gate Signalisation – Saturation Flow Calculations

