

TRAFFIC MODEL TESTING SUMMARY REPORT



ABERDEEN CITY CENTRE MASTERPLAN

ABERDEEN CITY CENTRE BUS GATE APPRAISAL

IDENTIFICATION TABLE

Client/Project owner	Aberdeen City Council
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1. INTRODUCTION

1.1 Background

1.1.1 Aberdeen City Council (ACC) commissioned SYSTRA Ltd (SYSTRA) to undertake a traffic modelling assessment of proposed amendments to the current traffic management operation within Aberdeen City Centre, namely to:

- Re-open Bridge Street to all vehicles in one or both directions
- Remove the right turn ban from Union Terrace to Rosemount Viaduct

1.1.2 ACC instructed SYSTRA to consider the impact of these changes under the following network scenario:

- **2025 Scenario** - Union Street Central works are complete with buses, taxis and service vehicles permitted through the re-aligned corridor between Bridge Street and Market Street. The measures also include a segregated cycle lane provided throughout the length of the corridor with controlled connection to the wider network at the Bridge Street and Market Street junctions.

1.1.3 This report details SYSTRA's model testing programme and outcomes from the model testing assessment.

2. TRAFFIC MODEL TESTING

2.1 Introduction

2.1.1 The key impacts of the changes to the traffic management operation within the city centre are the changes to general traffic flows and the subsequent impact to public transport journey times.

2.1.2 The model outputs collated for this study are:

- Model traffic flow changes around the core area of the city centre
- Model bus journey times for services that are impacted by the Bridge Street and Union Terrace traffic management changes – both directly and in-directly

2.2 Model Test Programme

2.2.1 Through discussions with ACC officers, the model test scenarios were required to assess the impact of the following:

- Bridge Street open to general traffic – in either and in both directions
- Union Terrace right turn to Rosemount Viaduct re-opened - assessed individually and in parallel with the various Bridge Street scenarios
- All test scenarios undertaken on a 2025 scenario reflecting completion of the Central Union Street streetscape works with bus, taxi and service vehicles permitted along this corridor.

2.2.2 A table summarising the model test scenarios is provided below:

Table 1. Model Test Scenarios

Test	City Centre Restriction			Scenario Description
	Bridge Street		Union Terrace	
	Bus Gate NB	Bus Gate SB	R/T Banned	
1	✓		✓	All Traffic Permitted SB on Bridge St
2		✓	✓	All Traffic Permitted NB on Bridge St
3		✓		All Traffic Permitted NB on Bridge St + R/T allowed for all traffic on Union Terr
4			✓	All Traffic Permitted NB & SB on Bridge St
5				All Traffic Permitted NB & SB on Bridge St + R/T allowed for all traffic on Union Terr
6	✓	✓		R/T allowed for all traffic on Union Terr

2.3 Traffic Flow Assessment

2.3.1 Table 2 and Table 3 provide the modelled traffic flow changes between the 2025 Reference Case and the various test scenarios in the AM and PM peaks respectively.

2.3.2 The tables provide the model flows for the Reference Case and provide the difference to the 2025 Reference Case for the test scenarios.

Table 2. AM Peak Hour Traffic Flow Changes – 2025 Scenario

AM Peak Hour (08:00-09:00)	Direction	Difference to Reference Case						
		2025 Ref Case	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Bridge Street	Northbound	51	-7	76	81	73	101	6
	Southbound	61	90	0	4	81	86	6
Union Street West	Eastbound	117	50	-4	25	47	67	41
	Westbound	153	-5	37	35	35	49	3
Union Terrace	Northbound	53	-14	24	63	14	47	37
	Southbound	95	22	-12	-8	7	15	3
Rosemount Viaduct	Eastbound	207	-5	-6	-5	-7	-8	4
	Westbound	110	9	-2	-5	4	0	-3
Blackfriars Street	Northbound	30	-9	0	6	-4	-3	14
	Southbound	86	1	5	-6	-2	-1	4
College Street	Northbound	530	-22	63	43	33	33	-6
	Southbound	460	19	-17	-13	12	20	9

Table 3. PM Peak Hour Traffic Flow Changes – 2025 Scenario

PM Peak Hour (17:00-18:00)	Direction	Difference to Reference Case						
		2025 Ref Case	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Bridge Street	Northbound	42	1	66	106	69	118	4
	Southbound	51	123	-1	-3	128	125	3
Union Street West	Eastbound	139	52	3	35	56	72	46
	Westbound	146	-2	35	49	42	36	-3
Union Terrace	Northbound	89	-37	24	93	-21	54	48
	Southbound	98	29	-8	-3	26	22	-3
Rosemount Viaduct	Eastbound	212	14	-1	21	0	21	19
	Westbound	240	5	-7	-9	-10	7	10
Blackfriars Street	Northbound	27	11	2	24	3	17	17
	Southbound	199	-7	-13	-10	-11	-1	0
College Street	Northbound	667	-1	44	30	27	11	-28
	Southbound	465	17	0	-27	0	-6	-6

2.3.3 The model results suggest the following:

- Opening Bridge Street to general traffic in either or both directions results in traffic flow increases through this corridor.

- Northbound, up to 120 vehicles per hour increase and up to 1200 vehicle increase over the model 12 hour period (when Bridge Street is open northbound to all traffic)
- Southbound, up to 130 vehicles per hour increase and up to 1600 vehicle increase over the model 12 hour period (when Bridge Street is open southbound to all traffic)
- Traffic flows on Union Street West are generally observed to increase in both directions under nearly all the test scenarios
- Allowing northbound traffic to turn right from Union Terrace on its own (Test 6), results in a small increase in traffic flows through the city centre (<50 vehicle increase per hour)
 - If Union Terrace right turn is allowed with Bridge Street open to all traffic northbound (Test 3 and 5), the Union Terrace northbound traffic flows increase by approximately 60 to 90 vehicles per hour
 - In this scenario, there is not an obvious increase in traffic continuing through Blackfriars Street and on through the George Street area (<25 vehicles per hour)
- AM Peak and PM Peak results show similar patterns, with higher traffic flows through Bridge Street southbound in the PM Peak hour.

2.3.4 The traffic flow tables do not tell the full story of the general traffic behaviour in the model test scenarios. Model observations show high traffic queuing on Union Street West on approach to Bridge Street in the scenarios that include Bridge Street open southbound.

2.3.5 Figure 1 provides a model snapshot from the Test 5 scenario (Bridge Street fully open in both direction with no restrictions on Union Terrace)

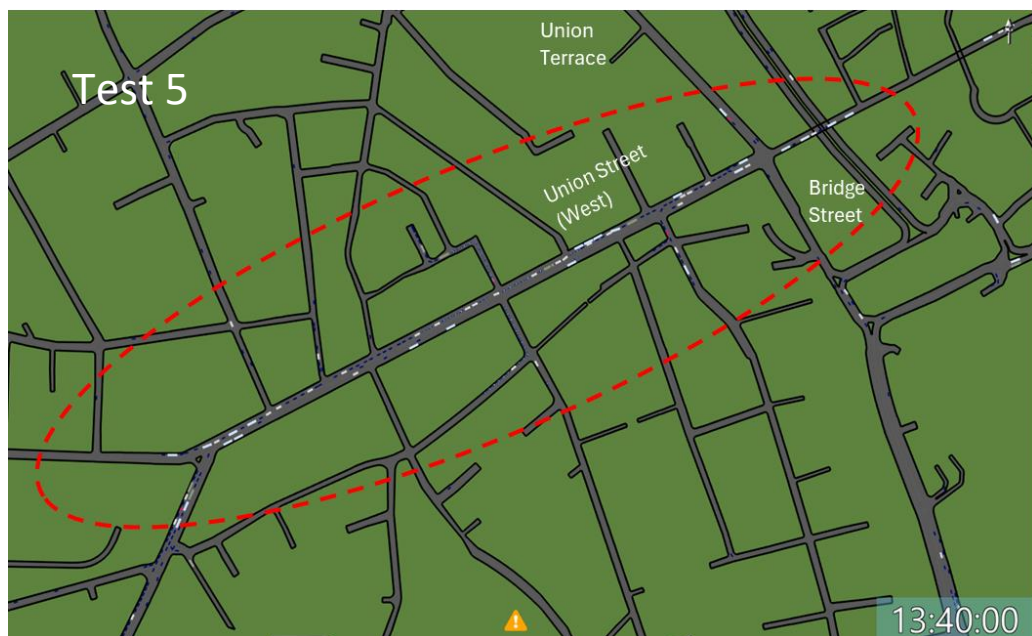


Figure 1. 2025 Scenario, Bridge St open to general traffic in both directions (Test 5)



- 2.3.6 The above figure shows that, when traffic is permitted to route southbound on Bridge Street, there is significant queuing on Union Street (West) on approach to the Bridge Street junction.
- 2.3.7 The traffic queuing on Union Street is a direct result of the volume of traffic seeking to turn right from Union Street (west) to Bridge Street. The limited time available in the traffic signals at Bridge Street / Union Street cannot cater for the volume of traffic seeking to turn right, hence large queues develop through the model period.
- 2.3.8 Separately, when allowing general traffic to route northbound on Bridge Street there does not appear to be any significant queue issues on Union Street West or Bridge Street in the 2025 scenario.

2.4 Bus Journey Time Assessment

- 2.4.1 Public transport journey times were extracted from the model through the routes detailed in Figure 2.

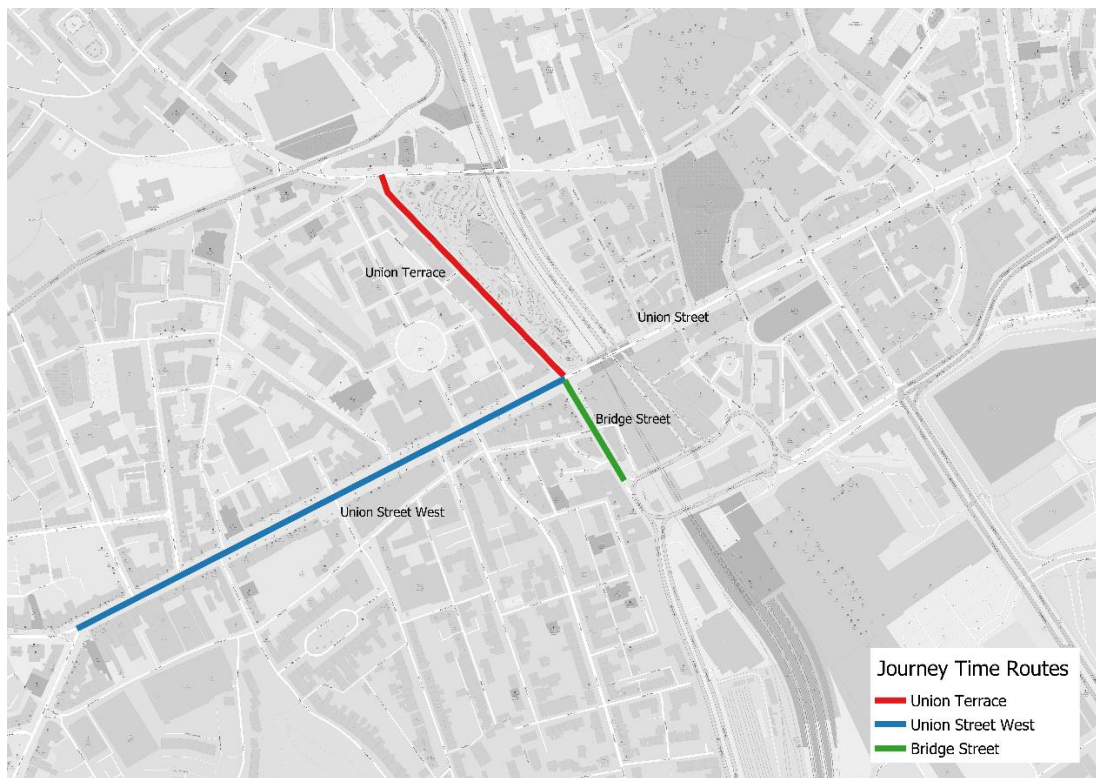


Figure 2. Bus Journey Times Routes

- 2.4.2 **Appendix A** provides the average bus journey times for buses to traverse the above corridors in each peak period for the various traffic restriction scenarios.
- 2.4.3 Table 4 specifically provides the average bus journey times through Union Street (west), eastbound. The 2025 Reference Case journey times are shown in the table with the flow difference to the Reference Case provided for each of the test scenarios.



Table 4. Average Bus Journey Times through Union Street West, 2025 - Eastbound

Union Street West Average PT Journey Times Eastbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:05:26	00:05:05	00:05:21	00:05:17
Test 1 - Difference from Reference Case	00:00:31	00:12:57	00:01:49	00:05:06
Test 2 - Difference from Reference Case	00:00:00	00:00:00	-00:00:04	-00:00:01
Test 3 - Difference from Reference Case	00:00:00	-00:00:01	-00:00:03	-00:00:01
Test 4 - Difference from Reference Case	00:00:12	00:14:10	00:02:46	00:05:43
Test 5 - Difference from Reference Case	00:00:21	00:08:06	00:01:05	00:03:11
Test 6 - Difference from Reference Case	00:00:06	00:00:00	-00:00:01	00:00:02

2.4.4 Average journey times through Bridge Street and Union Terrace remain relatively consistent through all test scenarios. However, the bus journey times through Union Street West heading towards Bridge Street show some significant delays in the scenarios where Bridge Street is open to general traffic southbound (Tests 1, 4, and 5).

2.4.5 From the model observations, and the journey time test results, it is clear that the Bridge Street / Union Street traffic signals do not have the capacity to accommodate the heavy right turn demand from Union Street (west). Given the traffic signal constraints for phasing requirements for pedestrians, cyclists, and general traffic separately, there is no capacity to provide Union Street west with more signal green time to facilitate this manoeuvre.

Bus Journey Times through Wider Model Network Area

2.4.6 A second bus journey time statistic was extracted from the traffic model scenarios. This considered the average journey time for buses to traverse their full route through the traffic model area. This would theoretically pick up any wider impacts of the various traffic restriction changes within the city centre area.

2.4.7 The bus services selected for analysis were all services that routed through the Bridge Street /Union Street junction in any direction.

2.4.8 Table 5 summarises the average journey time for all services to route through the model network. The table provides the AM, interpeak and PM peak results along with the full 12 hour model period. Each of the test model scenarios are presented as a difference to the 2025 Reference Case model.

Table 5. Average Bus Journey Time through Model Area (2025)

Bus Routes - Average Journey Times (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:28:20	00:28:27	00:29:57	00:28:55
Test 1 - Difference from Reference Case	-00:00:09	00:04:53	00:01:10	00:01:58
Test 2 - Difference from Reference Case	-00:00:21	-00:00:02	-00:00:09	-00:00:11
Test 3 - Difference from Reference Case	-00:00:05	00:00:13	-00:00:03	00:00:02
Test 4 - Difference from Reference Case	-00:00:12	00:04:40	00:01:13	00:01:54
Test 5 - Difference from Reference Case	-00:00:04	00:02:37	00:00:46	00:01:07
Test 6 - Difference from Reference Case	-00:00:04	00:00:17	00:00:46	00:00:19



2.4.9 The bus journey time table provides further suggested evidence that the removal of restrictions on Bridge St southbound result in significant impacts to the journey time of buses routing through the city centre area.

2.5 Bus Reliability Assessment

2.5.1 The third bus journey time statistic analysed relates to bus reliability. Bus operators require journey times to be relatively consistent throughout the day in order to retain consistent timetables and retain passenger confidence.

2.5.2 Within this traffic modelling exercise, the bus reliability was considered as the difference between the maximum and minimum journey time for buses routing throughout the modelled 12 hr period. An increase in the difference between the maximum and minimum journey time represents reduced reliability, and vice versa.

2.5.3 The analysis focused on bus services that traverse the three key corridors as previously detailed (Union Street West, Bridge Street, and Union Terrace).

2.5.4 **Appendix B** provides bus reliability graphs (maximum, minimum, and average journey time comparison) for all the test scenarios under the 2025 network scenario.

2.5.5 With the exception of the Union Street West arm, the model results are all fairly similar. Figure 3 provides the reliability (journey time spread) for buses routing eastbound along Union Street (west) over the modelled 12 hour period.

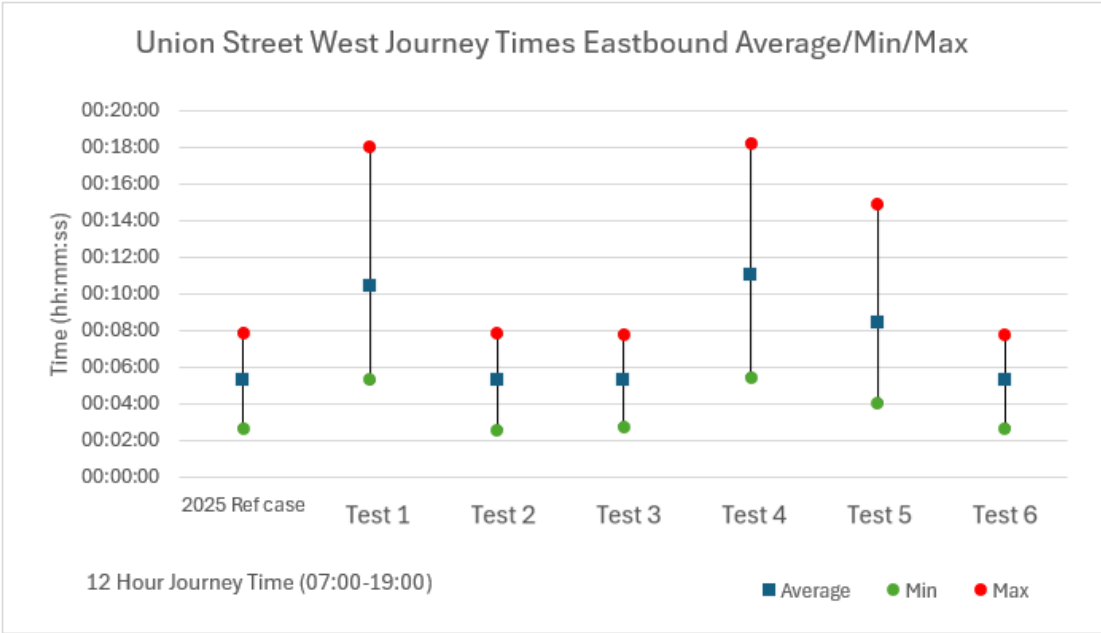


Figure 3. PT Journey Time Reliability – Union Street West (eastbound)

2.5.6 The graph shows that when Bridge Street is open to general traffic southbound (Tests 1, 4, and 5), then the average and maximum bus journey times are detrimentally impacted as well as the reliability spread (difference between maximum and minimum journey time). This is in line with the large queueing observed in these model scenarios along Union Street West.



3. TRAFFIC MODELLING CONCLUSIONS

- 3.1.1 The traffic modelling assessment suggests that the removal of the bus gates on Bridge Street would naturally result in an immediate increase in general traffic through the Bridge Street and Union Terrace corridors. The opening of Bridge Street southbound results in traffic queuing and congestion on Union Street (West). This further impacts on the bus network reliability.
- 3.1.2 The limited traffic capacity at the Bridge St / Union Street junction means that, if there was even a marginally higher traffic demand in reality compared to the model flows, there would very likely be higher traffic queuing and delays to the PT network through this corridor.
- 3.1.3 It is also worth noting that the impact of removal of these restrictions has not been assessed for a Saturday Peak (only a weekday period model exists). Traffic demand through Bridge Street and Union Terrace may be higher at the weekend due to a higher volume of city centre car parking traffic.
- 3.1.4 Beyond 2025, there is no certainty that traffic volumes within Aberdeen city centre will not increase. What is known, is that there will be a gradual reduction in the impact of the Low Emission Zone (LEZ), which only has a limited time dependant impact. As the proportion of compliant vehicles increases over time, then traffic volumes may gradually increase within the LEZ area.
- 3.1.5 The current traffic restrictions implemented within the city centre have allowed a high degree of futureproofing and resilience against future traffic growth as well as enabling future plans for an Aberdeen Rapid Transit network by providing the bus priority on which it will depend. If any of these restrictions are removed in the short term, there is an increased risk that any future traffic growth may impact on the envisioned operation of the city centre in terms of air quality, active and sustainable transport operation, and placemaking.



APPENDIX A: PT JOURNEY TIME PATHS

Union Street West Average PT Journey Times Eastbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:05:26	00:05:05	00:05:21	00:05:17
Test 1 - Difference from Reference Case	00:00:31	00:12:57	00:01:49	00:05:06
Test 2 - Difference from Reference Case	00:00:00	00:00:00	-00:00:04	-00:00:01
Test 3 - Difference from Reference Case	00:00:00	-00:00:01	-00:00:03	-00:00:01
Test 4 - Difference from Reference Case	00:00:12	00:14:10	00:02:46	00:05:43
Test 5 - Difference from Reference Case	00:00:21	00:08:06	00:01:05	00:03:11
Test 6 - Difference from Reference Case	00:00:06	00:00:00	-00:00:01	00:00:02

Union Street West Average PT Journey Times Westbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:04:36	00:05:02	00:04:42	00:04:47
Test 1 - Difference from Reference Case	00:00:01	00:00:01	00:00:00	00:00:01
Test 2 - Difference from Reference Case	00:00:04	00:00:01	00:00:04	00:00:03
Test 3 - Difference from Reference Case	00:00:01	00:00:01	00:00:00	00:00:01
Test 4 - Difference from Reference Case	00:00:04	00:00:02	00:00:02	00:00:03
Test 5 - Difference from Reference Case	00:00:02	00:00:00	00:00:00	00:00:01
Test 6 - Difference from Reference Case	-00:00:01	-00:00:01	00:00:00	-00:00:01

Bridge Street Average PT Journey Times Northbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:01:49	00:01:32	00:01:27	00:01:36
Test 1 - Difference from Reference Case	-00:00:02	-00:00:02	00:00:00	-00:00:01
Test 2 - Difference from Reference Case	00:00:00	00:00:01	00:00:01	00:00:01
Test 3 - Difference from Reference Case	00:00:03	00:00:02	00:00:07	00:00:04
Test 4 - Difference from Reference Case	00:00:07	00:00:00	00:00:04	00:00:04
Test 5 - Difference from Reference Case	00:00:05	00:00:03	00:00:06	00:00:05
Test 6 - Difference from Reference Case	00:00:02	-00:00:01	00:00:02	00:00:01

Bridge Street Average PT Journey Times Southbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:02:45	00:02:14	00:02:16	00:02:25
Test 1 - Difference from Reference Case	00:00:15	00:00:03	00:00:01	00:00:06
Test 2 - Difference from Reference Case	00:00:01	-00:00:01	00:00:01	00:00:00
Test 3 - Difference from Reference Case	00:00:01	00:00:00	00:00:01	00:00:01
Test 4 - Difference from Reference Case	00:00:11	00:00:03	00:00:03	00:00:06
Test 5 - Difference from Reference Case	00:00:08	00:00:04	-00:00:01	00:00:04
Test 6 - Difference from Reference Case	00:00:04	-00:00:01	-00:00:01	00:00:01

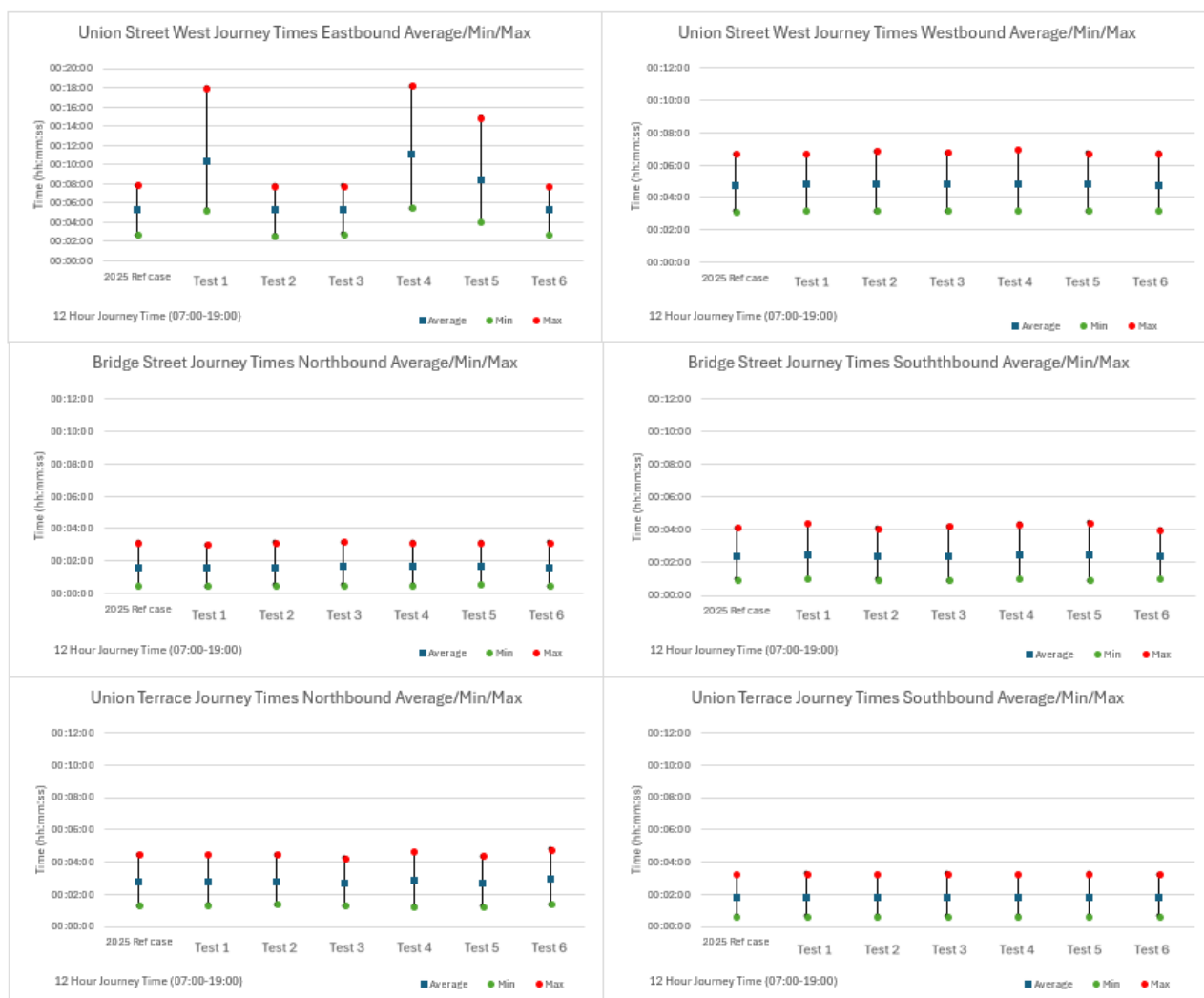


Union Terrace Average PT Journey Times Northbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:02:52	00:02:34	00:02:51	00:02:46
Test 1 - Difference from Reference Case	-00:00:03	-00:00:04	-00:00:03	-00:00:01
Test 2 - Difference from Reference Case	-00:00:02	00:00:00	00:00:07	00:00:02
Test 3 - Difference from Reference Case	-00:00:12	00:00:00	00:00:02	-00:00:03
Test 4 - Difference from Reference Case	00:00:06	-00:00:03	00:00:08	00:00:04
Test 5 - Difference from Reference Case	-00:00:12	-00:00:04	00:00:01	-00:00:05
Test 6 - Difference from Reference Case	00:00:16	00:00:05	00:00:18	00:00:13

Union Terrace Average PT Journey Times Southbound (hh:mm:ss)	AM 07:00-10:00	IP 10:00-16:00	PM 16:00-19:00	12 Hour 07:00-19:00
2025 Reference Case	00:01:41	00:01:49	00:01:51	00:01:47
Test 1 - Difference from Reference Case	00:00:02	00:00:04	00:00:00	00:00:02
Test 2 - Difference from Reference Case	00:00:02	-00:00:01	-00:00:02	-00:00:00
Test 3 - Difference from Reference Case	00:00:03	-00:00:01	00:00:00	00:00:01
Test 4 - Difference from Reference Case	00:00:01	00:00:03	-00:00:02	00:00:01
Test 5 - Difference from Reference Case	00:00:01	00:00:01	-00:00:01	00:00:00
Test 6 - Difference from Reference Case	00:00:03	-00:00:02	-00:00:04	-00:00:01



APPENDIX B: PT RELIABILITY GRAPHS



APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Callum Guild	Associate Director	17/09/2024	
	Checked by	David Murtagh	Associate	18/09/2024	
	Approved by	Malcolm Neil	Director	19/09/2024	
2	Author				
	Checked by				
	Approved by				

