

# ABERDEEN LEZ & CCMP MODEL TESTING

## ABERDEEN CITY CENTRE MASTERPLAN - SENSITIVITY TESTING

### IDENTIFICATION TABLE

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### TABLE OF CONTENTS

<b>1.</b>	<b>INTRODUCTION</b>	<b>3</b>
<b>1.1</b>	<b>STUDY BRIEF</b>	<b>3</b>
<b>2.</b>	<b>PHASE 1 - MODEL TEST SCENARIOS</b>	<b>5</b>
<b>2.1</b>	<b>SCENARIOS</b>	<b>5</b>
<b>2.2</b>	<b>MODELLING THE FULL PEDESTRIANISATION OF UNION STREET</b>	<b>6</b>
<b>2.3</b>	<b>MODELLING BUS ONLY CORRIDOR</b>	<b>10</b>
<b>3.</b>	<b>PHASE 1 - MODEL OUTPUTS</b>	<b>13</b>
<b>3.1</b>	<b>TRAFFIC DEMAND LEVEL</b>	<b>13</b>
<b>3.2</b>	<b>TRAFFIC FLOW ANALYSIS</b>	<b>13</b>
<b>3.3</b>	<b>NO<sub>2</sub> EXCEEDANCE LOCATION ANALYSIS</b>	<b>17</b>
<b>3.4</b>	<b>BUS JOURNEY TIME</b>	<b>19</b>
<b>4.</b>	<b>PHASE 2 – MODEL TEST SCENARIO</b>	<b>21</b>
<b>4.1</b>	<b>SCENARIO DETAIL</b>	<b>21</b>
<b>4.2</b>	<b>PUBLIC TRANSPORT NETWORK</b>	<b>26</b>
<b>4.3</b>	<b>TRAFFIC DEMAND SCENARIO</b>	<b>27</b>
<b>5.</b>	<b>PHASE 2 – MODEL OUTPUTS</b>	<b>28</b>
<b>5.1</b>	<b>INTRODUCTION</b>	<b>29</b>

5.2	TRAFFIC DEMAND LEVEL	29
5.3	NETWORK CONGESTION	31
5.4	BUS JOURNEY TIMES	34
5.5	BUS RELIABILITY	35
5.6	NETWORK SUMMARY STATISTICS	36
5.7	NETWORK WIDE TRAFFIC QUEUEING	37
<b>6.</b>	<b>PHASE 3 –CITY CENTRE TRAFFIC MANAGEMENT PLAN TESTING</b>	<b>40</b>
6.1	INTRODUCTION	41
6.2	CENTRAL UNION STREET OPTION 1 – ROAD RECLASSIFICATION	41
<b>7.</b>	<b>SCHOOLHILL &amp; UNION TERRACE OPTION TESTING</b>	<b>45</b>
7.1	INTRODUCTION	45
7.2	UNION TERRACE OPEN TO GENERAL TRAFFIC	45
7.3	UNION TERRACE OPEN SOUTHBOUND ONLY	46
7.4	SCHOOLHILL MODEL TESTING RESULTS	47
7.5	UNION TERRACE OPEN WITH TURNING MOVEMENT RESTRICTIONS	48
7.6	NETWORK SUMMARY STATISTICS	49
<b>8.</b>	<b>CENTRAL UNION ST OPTION TESTING</b>	<b>51</b>
8.1	INTRODUCTION	51
8.2	CENTRAL UNION ST: BUS AND CYCLE ONLY	51
8.3	UNION ST BUS AND CYCLE ONLY WITH WIDER CCMP	55
8.4	COMPARISON OF CENTRAL UNION ST OPTIONS 1 AND 2	56
<b>9.</b>	<b>PHASE 3 – UNION SQUARE ACCESS TESTING</b>	<b>60</b>
9.1	INTRODUCTION	61
<b>10.</b>	<b>SUMMARY AND CONCLUSIONS</b>	<b>63</b>
10.1	SUMMARY	63
10.2	CONCLUSIONS	65



# 1. INTRODUCTION

## 1.1 Study Brief

- 1.1.1 SYSTRA Ltd (SYSTRA) was requested by Aberdeen City Council to undertake sensitivity testing on the proposed traffic restrictions to the city centre as part of the wider package of measures associated with the implementation of a Low Emission Zone (LEZ) in Aberdeen.
- 1.1.2 The LEZ model testing has identified that a LEZ on its own would not be sufficient to reduce emission levels to the required NO<sub>2</sub> adherence levels. Through a series of model tests, the 'Union Street Scheme' was identified as being the most appropriate package of measures from the City Centre Masterplan proposals to address the remaining NO<sub>2</sub> exceedances within the city centre area.
- 1.1.3 The City Centre Masterplan (CCMP) 'Union Street Scheme' primarily consists of Bus and Taxi only restrictions on Union Terrace and a section of Union Street (between Bridge St. and Market St)- See Figure 1.



**Figure 1. City Centre Masterplan - Union Street Scheme**

- 1.1.4 ACC have requested that further testing of the CCMP elements, in combination with the LEZ, are required to compliment a parallel study on the future operation of the city centre, following the COVID-19 pandemic spaces for people measures.
- 1.1.5 The further testing of CCMP options is split into three separate phases relating to the scale of CCMP measures proposed, these are:
- **Phase 1 – Revised interventions on Union St and Union Terrace**
  - **Phase 2 – Wider CCMP Measures**
  - **Phase 3 – Additional Schoolhill, Union Terrace and Union St Option Testing**
- 1.1.6 For Phase 1 - ACC requested that the Aberdeen City Centre traffic model be used to assess two alternative vehicle restriction options for Union Terrace and Union Street – namely:

- Bus only on Union St and Union Terrace (no taxis allowed)
  - Pedestrianisation of Union St, between Bridge St. and Market St.
- 1.1.7 Chapters 2 and 3 detail the high level model assessment of the alternative restrictions for Union Street and Union Terrace. The key focus of these tests are to understand the impact to the air quality exceedance areas when the restrictions on Union Terrace and Union Street are revised.
- 1.1.8 For Phase 2, ACC requested that the Aberdeen City Centre traffic model be used to assess further CCMP measures including:
- Pedestrianisation of Union St, between Bridge St. and Market St.
  - Bus and Taxi Only on Union Terrace
  - Bus and Taxi Only on Market St (Between Union St and Guild St)
  - Bus Only on Bridge Street
  - Bus only on Guild Street (East of Wapping St Gyrotory)
- 1.1.9 Chapters 4 and 5 detail the high level model assessment of the wider CCCMP restrictions. The key focus of these tests is to assess whether the network can cater for the higher volume of interventions within the city centre as well as the impact of the measures to public transport.
- 1.1.10 For Phase 3, ACC requested that the Aberdeen City Centre Traffic Model be used to assess further Union Terrace, Union Street and Schoolhill options with the Wider CCMP in place including:
- Unrestricting Union Terrace.
  - Unrestricting Union Terrace in the Southbound direction.
  - The effect closing Schoolhill has on the above Union Terrace options.
  - Restricting vehicles using the right turn from Union Terrace to Rosemount Viaduct to Bus and Taxi only.
  - Bus Only on Union Street
  - Additional Test of the effect of closing the right turn from Market Street to the Union Square Car Park.



## 2. PHASE 1 - MODEL TEST SCENARIOS

### 2.1 Scenarios

2.1.1 Model testing of the CCMP in isolation to the LEZ is detailed in the report 'City Centre Masterplan Model Testing Report (SYSTRA, Ref: GB01T20D62/3).

2.1.2 The development of the LEZ boundary and requirement for the CCMP measures is detailed in the report: *Aberdeen LEZ Option Testing Report(SYSTRA, Ref: GB01T20D62/2).*

2.1.3 ACC have requested that the proposed alternative interventions be tested with the LEZ in place and without the LEZ on the Aberdeen City Centre - 2024 Reference Case Model (ACCPM24)

2.1.4 The model scenarios are therefore detailed as:

- 1A: Union St Scheme - Option 1: Union St & Union Ter. - Bus and Taxi Only
- 1B:LEZ & Union St Scheme - Option 1: Union St & Union Ter.- Bus and Taxi Only
- 2A :Union St Scheme - Option 2: Union Street Pedestrianised
- 2B: LEZ & Union St Scheme - Option 2: Union Street Pedestrianised
- 3A: Union St Scheme - Option 3: Union St & Union Ter. - Bus Only
- 3B: LEZ & Union St Scheme - Option 3: Union St & Union Ter.- Bus Only

2.1.5 Figures 2-3 show the details of the scenarios.

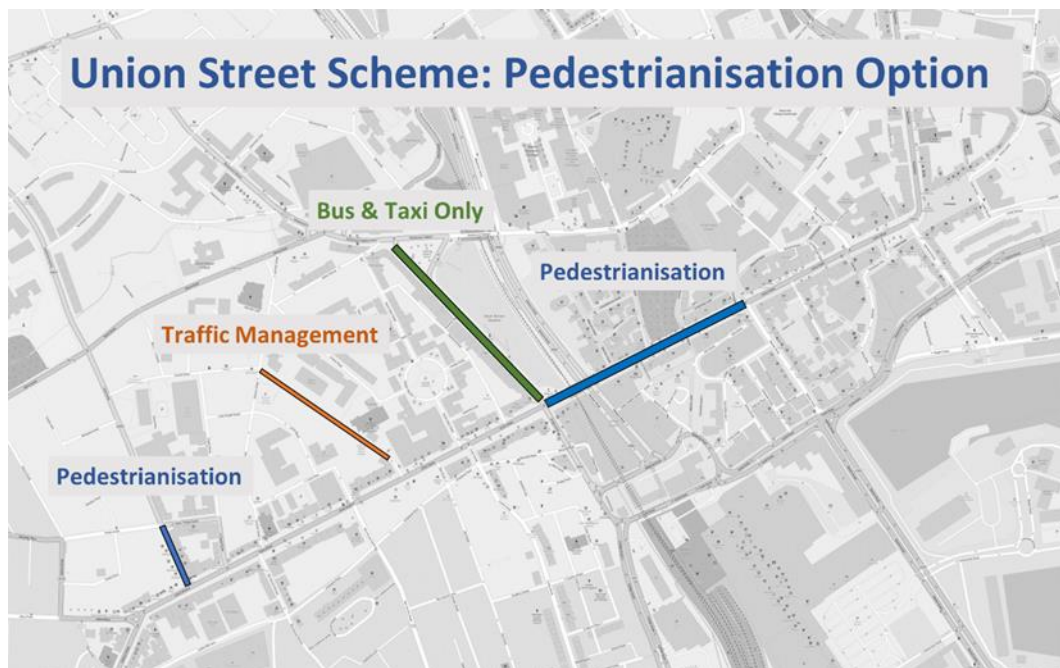


Figure 2. Union St Pedestrianised Scenario (Option 2)



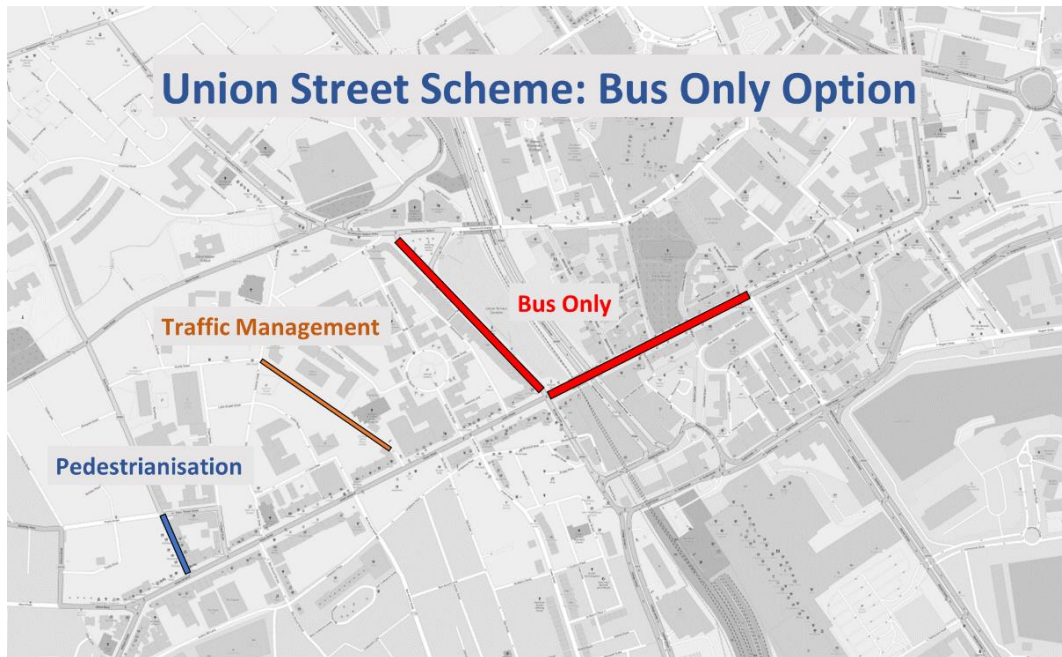


Figure 3. Union Street and Union Terrace Bus Only Scenario (Option 3)

## 2.2 Modelling the Full Pedestrianisation of Union Street

- 2.2.1 There are currently measures in place on-site to facilitate the temporary closure of Union Street for the COVID19 related ‘Spaces for People’ measures. It is understood that these network changes are temporary and would not essentially be considered on a long term bases – For example, temporary bus stops on Union St which are not in a layby or bus lane (See Figure 4) would, in the long term, potentially cause additional traffic congestion when the network recovers and the PT patronage recovers.



Figure 4. Typical Temporary Bus Stop Configuration on Union St.

- 2.2.2 Some of the current temporary measures have been utilised for the traffic modelling as an initial estimate of how the PT network might operate on a more permanent basis if Union



Street was to become permanently pedestrianised. The bus route network currently in operation was applied in the modelling to re-route the affected services appropriately.

2.2.3 Additional bus stops were added to the network on approach to the pedestrian area at locations where the current 2-lane traffic approach would no longer be required.– see following detail.

2.2.4 If a full pedestrianisation of Union St was to be made permanent, it is recommended that further and more detailed consideration of the PT network would be required.

2.2.5 In order to implement full Union St pedestrianisation into the relevant scenarios, the following changes were made to the model network:

- Re-routing of Public Transport (PT) routes through the affected area by applying the revised routes implemented by the ‘Spaces for People Network’ bus route Pdf shown in Figure 5.
- Removal and redistribution of bus dwell time from PT Stops F1-F9 shown in Figure 5.
- Adding four additional PT Stops and Peak Time Bus and Taxi only lanes based on the locations of new PT stops shown in Figure 5 Figure 1 to enable the stops to function without overloading existing stops. These locations are shown in Figure 6 and Figure 7.
- Amend traffic signals at Union St/Bridge St and Union St/Market St Junctions for revised vehicle operation.

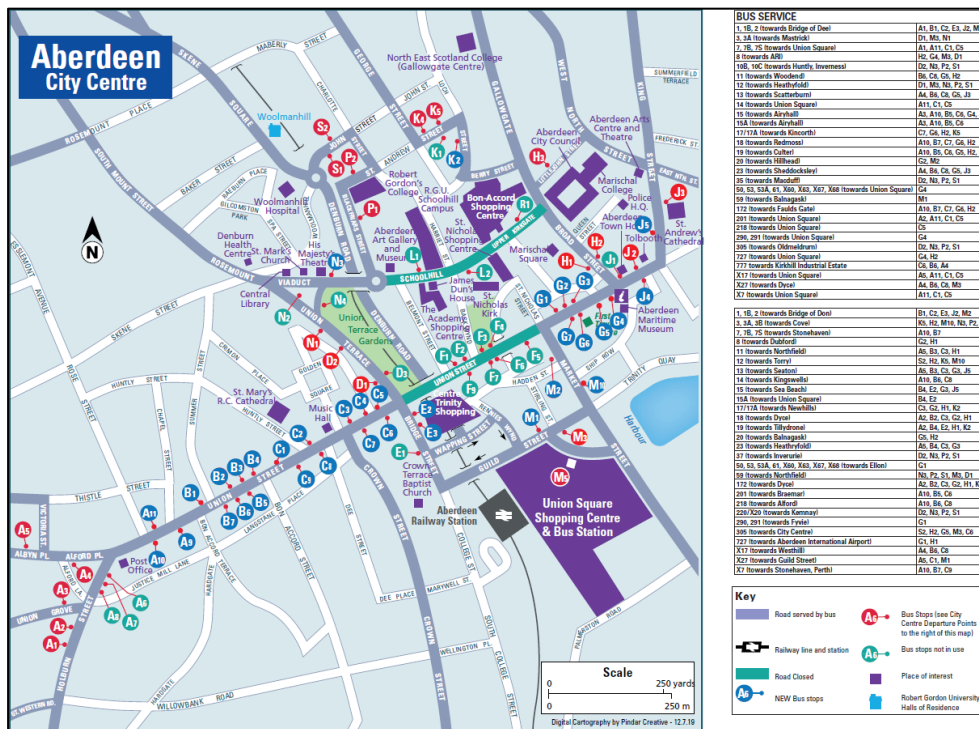


Figure 5. Spaces for People Network Pdf

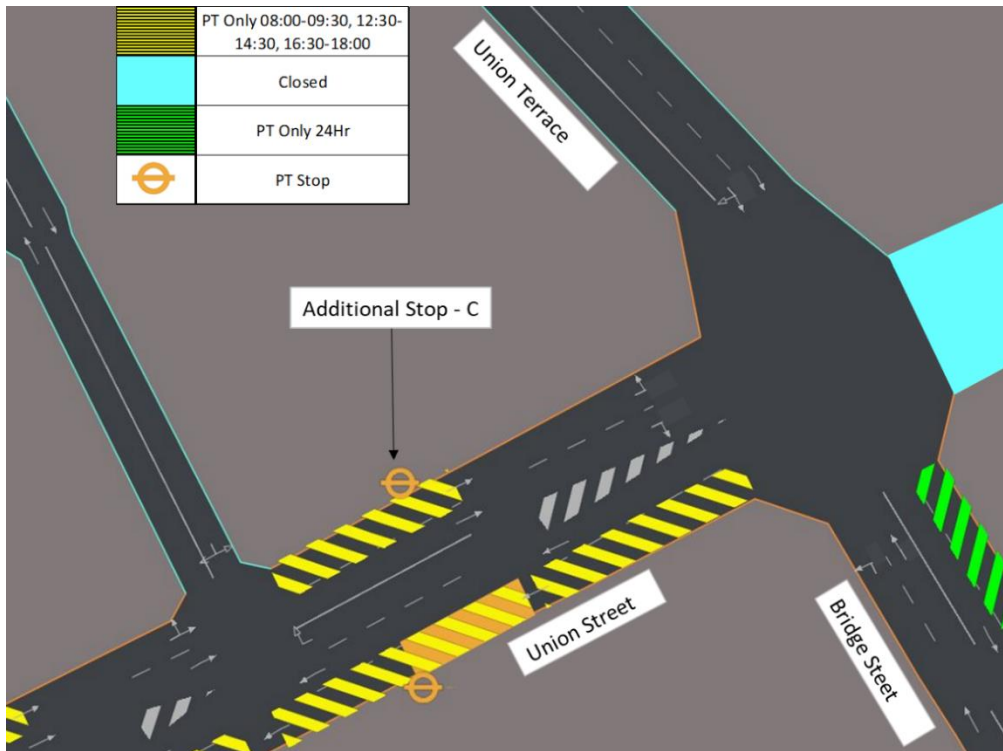


Figure 6. Union St West End of Closure Changes

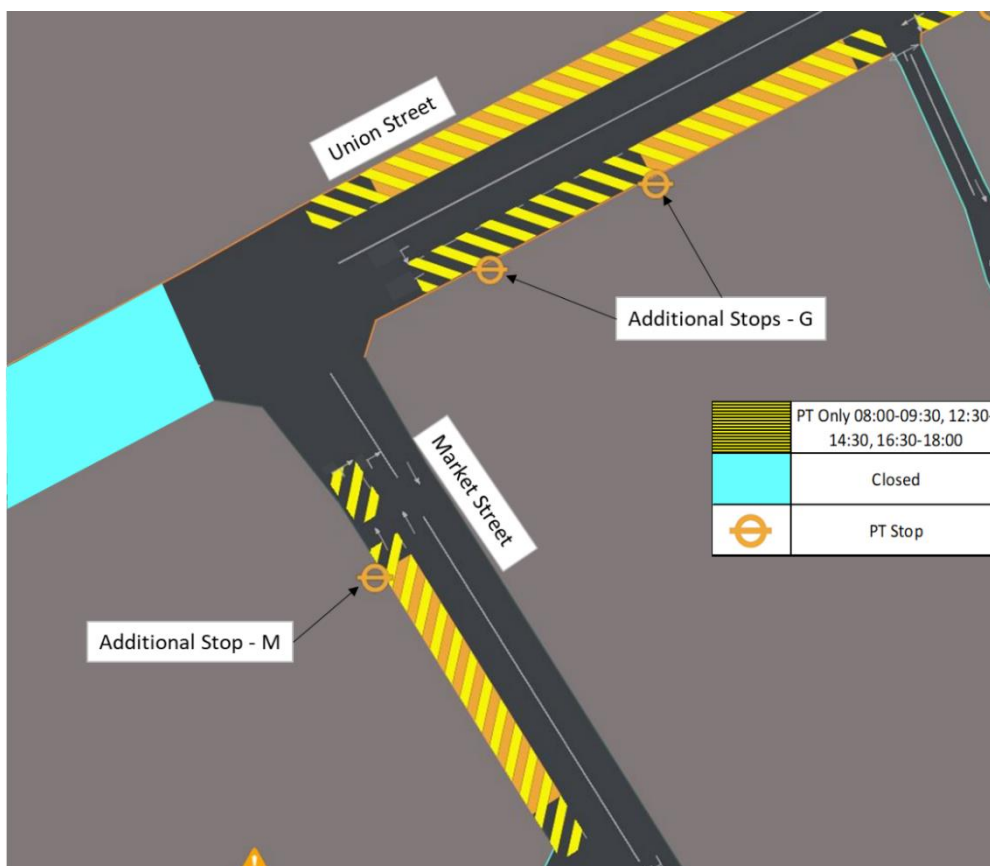


Figure 7. Union St East End of Closure Changes

2.2.6 Table 1 shows the total bus dwell time that was redistributed from stops F1 to F9 (Union St restriction section) .





**Table 1. Redistributed Dwell Time (hh:mm:ss)**

Stop	Dwell per Hour		
	AM	IP	PM
F1	0:12:57	0:13:29	0:13:13
F2	0:15:47	0:14:16	0:12:29
F3	0:10:44	0:10:43	0:11:45
F4	0:22:38	0:20:00	0:14:52
F5	0:12:21	0:15:55	0:13:14
F6	0:08:57	0:13:54	0:12:47
F7	0:22:54	0:28:26	0:24:41
F9	0:22:50	0:13:28	0:16:00
Total EB	1:07:02	1:11:43	1:06:42
Total WB	1:02:06	0:58:28	0:52:19
Total	2:09:08	2:10:11	1:59:01

- 2.2.7 The bus dwell times shown in Table 1 were redistributed along the revised bus stops whilst ensuring that the dwell time did not overwhelm existing PT stops (by keeping total dwell time per hour at a stop to below 30mins).
- 2.2.8 As part of the current spaces for people measures, the right turn from Union St to Bridge St was re-opened to all traffic (See Figure 8). This is normally a banned movement but has been re-opened to allow general traffic a route around the temporary pedestrianised section of Union St.





**Figure 8. On-site Changes to General Traffic Movements between 2019 & 2020**

2.2.9 Whilst allowing this right turn movement has not been considered in any previous model testing of the bus and taxi only restriction proposals, it has been applied in these model scenarios relating to the full pedestrianisation of Union St for consistency with the on-site measures.

## 2.3 Modelling Bus Only Corridor

2.3.1 For the model tests where taxis are removed from the proposed restrictions on Union Street and Union Terrace, it is important to firstly highlight the limitations of modelling taxis in the network. Taxis are applied in the traffic model as a total proportion of 'lights' vehicles (Cars , Taxis, LGVs). The reason for this approach is in the difficulty in identifying taxis (private, not black cab) through a traffic survey.



- 2.3.2 The number of taxis in the traffic model was applied globally as 3% of light vehicles. In reality, there is likely to be a higher proportion of taxis within the city centre area.
- 2.3.3 There is therefore a likelihood that the traffic model taxi flows are lighter than reality through the city centre area. This is a limitation of the traffic model network.
- 2.3.4 The taxis were removed from Union St by changing the restrictions on Union St and Union Terrace to bus only as opposed to Bus and Taxi only.
- 2.3.5 Table 2 shows the taxi flow comparison over the full 12hr at key points in the model for the bus only restrictions compared to the bus and taxi only restrictions.

**Table 2. Taxi flow comparison**

Location	Bus & Taxi Restrictions (Veh)	Bus Only Restrictions (Veh)	Flow Change (Veh)	Percentage Change
Guild St (EB)	41	60	19	47.94%
John St (WB)	49	65	16	32.88%
Victoria St (SB)	39	49	10	25.27%
Victoria St (NB)	57	69	13	22.09%
Virginia St (WB)	218	263	45	20.72%
Guild St (WB)	126	151	26	20.32%
John St (EB)	79	93	14	17.21%
Schoolhill (EB)	92	105	13	13.78%
North Esplanade West (WB)	232	260	28	12.26%
North Esplanade West (EB)	262	277	14	5.50%
Virginia St (EB)	297	313	16	5.27%
Schoolhill (WB)	95	87	-7	-7.66%
East North St (WB)	172	158	-14	-8.04%
East North St (EB)	190	174	-16	-8.27%
Bridge St (NB)	38	32	-5	-14.41%
Bridge St (SB)	18	0	-18	-100.00%
Union St (EB)	129	0	-129	-100.00%
Union St (WB)	73	0	-73	-100.00%

- 2.3.6 The restriction of taxis along Union St has had little effect on the model operation, due to the relatively low volumes of Traffic (total of 202 taxis 2-way along the Union St restriction over 12 hours).
- 2.3.7 Table 3 shows the same comparison when the LEZ is in place.



**Table 3. Taxi flow comparison (with LEZ)**

Location	Bus & Taxi Restrictions (Veh)	Bus Only Restrictions (Veh)	Flow Change (Veh)	Percentage Change
Guild St (EB)	65	97	32	48.46%
Victoria St (SB)	42	53	11	25.79%
Victoria St (NB)	58	72	14	24.13%
John St (WB)	43	54	10	23.46%
Guild St (WB)	160	190	29	18.19%
Virginia St (WB)	268	311	43	15.89%
North Esplanade West (EB)	235	263	28	11.84%
Virginia St (EB)	320	347	27	8.40%
John St (EB)	83	89	6	7.66%
Schoolhill (EB)	139	148	9	6.22%
North Esplanade West (WB)	294	312	18	6.19%
Schoolhill (WB)	100	101	2	1.76%
East North St (EB)	205	204	-1	-0.69%
East North St (WB)	155	138	-17	-10.99%
Bridge St (NB)	58	41	-18	-30.29%
Bridge St (SB)	13	0	-13	-100.00%
Union St (EB)	114	0	-114	-100.00%
Union St (WB)	76	0	-76	-100.00%

- 2.3.8 When the LEZ is in place, there are slightly different taxi flow changes. This is due to the fact there is less general traffic routing around the city centre as non-compliant vehicles have been displaced. The volume of taxis re-routing is very low in either case.
- 2.3.9 If more detailed modelling work is required on the impact of removing taxis from the core area of the city centre, observed taxi flow data would be of benefit to the assessment.



### 3. PHASE 1 - MODEL OUTPUTS

#### 3.1 Traffic Demand Level

- 3.1.1 Table 4 shows the demand level that each Union St test scenario was able to run in each peak.
- 3.1.2 A model run was deemed successful at a demand level if the majority of the runs ended with no significant congestion and no gridlocking.

**Table 4. Union St Model Scenarios – Demand Level Achieved**

Peak	Without LEZ			With LEZ		
	Bus & Taxi	Bus	Ped	Bus & Taxi	Bus	Ped
AM	100%	100%	95%	100%	100%	100%
IP	100%	100%	100%	100%	100%	100%
PM	95%	95%	90%	95%	95%	95%

- 3.1.3 These high level test results suggest that the Bus-only restriction scenario has no effect on the demand level the network can operate compared to the Bus and Taxi restriction scenario. This is the case whether the LEZ is in place or not.
- 3.1.4 The full pedestrianisation scenario showed an impact to the demand level achieved when the LEZ was not in place. This suggests that the displacement of buses from Union St to alternative routes which carry general traffic (Guild St/Market St/Bridge St) causes additional congestion through these corridors.
- 3.1.5 However, in the scenario with the LEZ in Place, the model is able to run at the same demand level in all options for Union Street restrictions. This difference is because there is less traffic routing around the core area of the city centre when the LEZ is in place. That’s not to say there is not more congestion around the Guild St area in this scenario (this would require further investigation), but it does show that the LEZ allows more capacity within the core area of the city centre to accommodate more restrictive measures on Union St.

#### 3.2 Traffic Flow Analysis

- 3.2.1 Traffic model flow difference plots have been collated which show geographically where traffic is displaced within each of the test scenarios.
- 3.2.2 As the taxi flow comparisons have shown, there is little difference in general traffic flow between a bus and taxi only restriction and a bus only restriction, therefore the following traffic flow analysis is only concerned with the impact of the full pedestrianisation of Union St option.
- 3.2.3 The following section therefore provides:
  - Model flow difference plots (between the test scenario and ACCPM24 Ref Case)
  - Traffic flow tables detailing the key PM Peak traffic flow changes (between the test scenario and ACCPM24 Ref Case)
  - Model observations
- 3.2.4 It is important to consider the following when reviewing the flow comparison data:
  - For the flow plot differences blue bars represent a decrease in traffic flows and red bars represent an increase in traffic flows

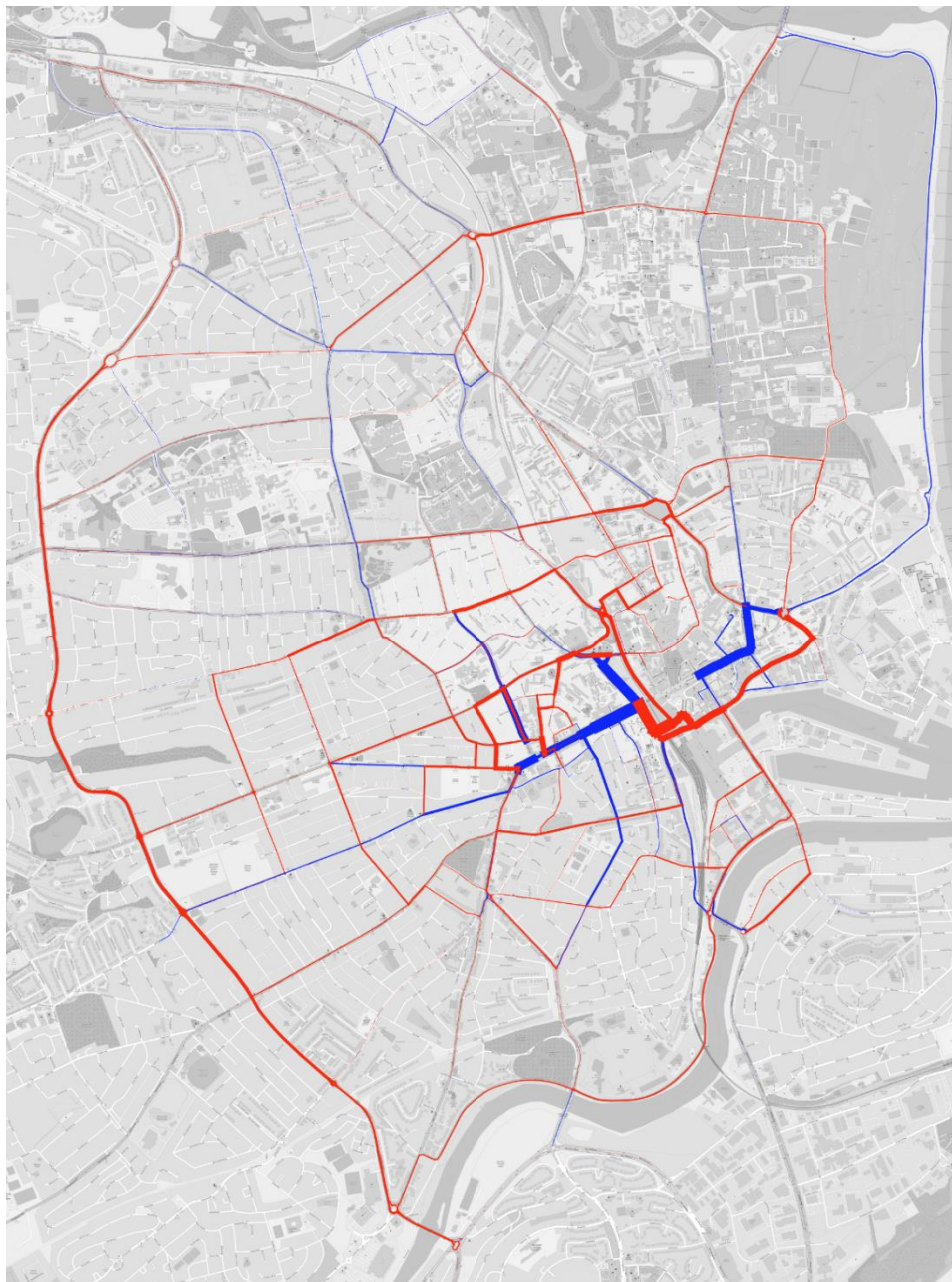




- The results are presented for the PM Peak Period 16:00-19:00, as this is the critical operational period
- The model flow difference plots have been generated from model runs at the same demand level.

**Model Scenario: 2A Union Street Pedestrianised (Without LEZ)**

3.2.5 Figure 9 provides the flow plot difference between the CCMP scheme with Union St pedestrianised and the ACCPM24 Ref Case Model. Table 5 provides key flow comparisons.



**Figure 9. Option 2A: Union St Pedestrianised - PM Peak Period Traffic Flow Difference Plot**

(Blue Bars = Traffic flow decrease; Red Bars = Traffic flow increase)



**Table 5. Test: Union St Pedestrianised PM Peak Period Key Traffic Flows**

Location	Ref Case Flow at 90% Demand (Veh)	Test Flow (Veh)	Flow Change (Veh)	Percentage Change
Bridge St (SB)	362	1386	1024	282.52%
Victoria St (NB)	290	614	325	112.08%
Guild St (EB)	1047	1686	639	61.06%
John St (WB)	499	796	297	59.41%
Guild St (WB)	969	1448	479	49.38%
Bridge St (NB)	590	795	205	34.82%
Victoria St (SB)	264	347	83	31.31%
John St (EB)	696	871	175	25.13%
Virginia St (WB)	2177	2541	364	16.74%
Schoolhill (WB)	625	718	93	14.93%
Virginia St (EB)	3240	3670	430	13.28%
North Esplanade West (EB)	1932	2094	163	8.42%
North Esplanade West (WB)	2827	2878	51	1.82%
East North St (WB)	1976	1814	-162	-8.20%
Schoolhill (EB)	532	479	-54	-10.08%
East North St (EB)	2095	1711	-384	-18.31%
Union St (EB)	1416	0	-1416	-100.00%
Union St (WB)	1334	0	-1334	-100.00%

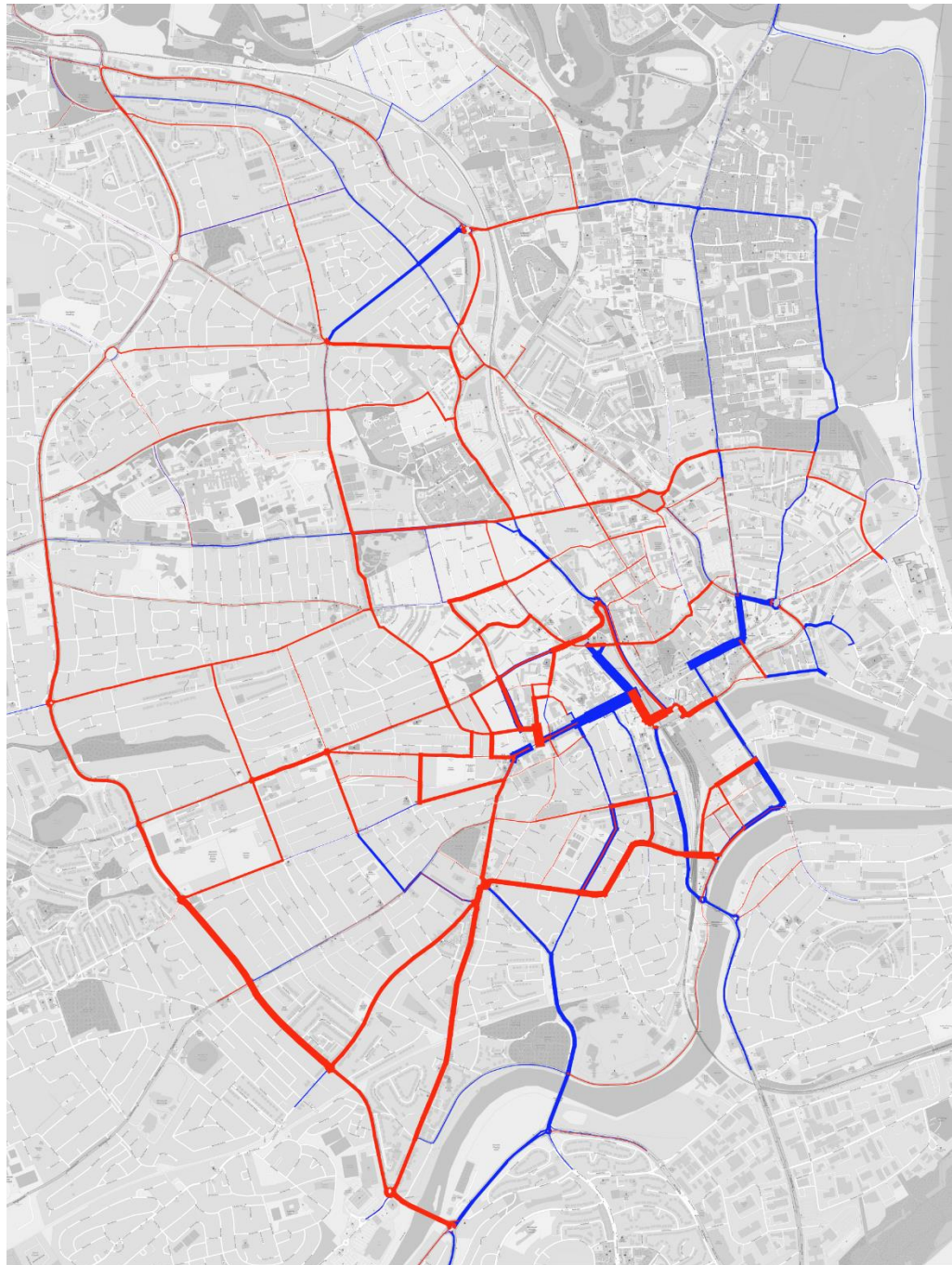
### 3.2.6 Key Model Findings:

- There is a noted increase in traffic routing southbound through Bridge St compared to the Reference Case scenario due to changes in the Union St/Bridge St junction to allow vehicles to turn right onto Bridge St from Union St
- This increase in traffic flow puts significant pressure on the West approach to the Guild St/Market St Junction and causes increased queueing through Guild St.

### Model Scenario: 2B: Union Street Pedestrianised (With LEZ)

3.2.7 Figure 10 provides the flow plot difference between the LEZ + CCMP scheme with Union St pedestrianised and the ACCPM24 Ref Case Model. Table 6 provides key flow comparisons.





**Figure 10. LEZ & CCMP with Union St Pedestrianised- PM Peak Period Traffic Flow Difference Plot**

(Blue Bars = Traffic flow decrease; Red Bars = Traffic flow increase)





**Table 6. LEZ+ Union St pedestrianised - PM Peak Period Key Traffic Flows**

Location	Ref Case Flow at 95% Demand (Veh)	Test Flow (Veh)	Flow Change (Veh)	Percentage Change
Bridge St (SB)	441	1458	1017	230.54%
Victoria St (NB)	361	647	286	79.13%
Guild St (EB)	1080	1688	608	56.34%
Schoolhill (EB)	595	862	268	45.01%
Guild St (WB)	1198	1525	328	27.36%
Victoria St (SB)	265	334	68	25.75%
John St (WB)	560	651	91	16.19%
John St (EB)	736	842	106	14.40%
Bridge St (NB)	661	753	92	13.91%
North Esplanade West (WB)	2744	2827	82	3.00%
Virginia St (EB)	3275	3319	44	1.34%
Virginia St (WB)	2167	2176	9	0.43%
Schoolhill (WB)	747	705	-42	-5.62%
East North St (EB)	2306	1934	-371	-16.11%
East North St (WB)	2186	1708	-479	-21.89%
North Esplanade West (EB)	2068	1506	-562	-27.16%
Union St (EB)	1494	0	-1494	-100.00%
Union St (WB)	1460	0	-1460	-100.00%

### 3.2.8 Key Model Findings:

- There is a noted increase in traffic routing southbound through Bridge St compared to the Reference Case scenario due to changes in the Union St/Bridge St junction to allow vehicles to turn right onto Bridge St from Union St.
- The flow increases through Bridge St and Guild St are not as severe in this test 2B (with ELZ) as the network scenario without the LEZ (Test 2A).

## 3.3 NO<sub>2</sub> Exceedance Location Analysis

- 3.3.1 Chapter 4 of the Aberdeen NLEF Report (SYSTRA, Ref: GB01T19I15/281119, 01/06/20), details the 14 NO<sub>2</sub> exceedance locations within Aberdeen which has recorded NO<sub>2</sub> levels greater than 36µg/m<sup>3</sup> in 2019.
- 3.3.2 Table 7 and Table 8 provide a traffic flow percentage difference comparison between the various Union St scenarios and the 2019 Base Model at each of the exceedance locations in the network. The data is based upon the 12 Hr model flows.
- 3.3.3 As this comparison is required between the 2019 base model and the 2024 future year model scenarios, the comparison includes background traffic growth.



**Table 7. Traffic Flow Analysis at Air Quality Exceedance Location Without LEZ**

Exceedance Location	Without LEZ		
	Bus & Taxi	Bus	Ped
335 Union St	-23%	-24%	-13%
61 Skene Square	-8%	-7%	-6%
14 Holburn St	-10%	-11%	-4%
Union Street	-37%	-37%	-27%
1 Trinity Quay	14%	15%	20%
27 Skene Square	-8%	-7%	-6%
105 King St	-3%	-2%	-4%
184/192 Market St	7%	8%	8%
39 Market St	-19%	-20%	-9%
469 Union St	-31%	-32%	-22%
40 Union St	-55%	-56%	-57%
43/45 Union St	-55%	-56%	-57%
7 Virginia Street	15%	16%	20%
468 Union St	-31%	-32%	-22%

**3.3.4 Key Findings:**

- Model testing suggests that the impact on the NO<sub>2</sub> exceedances between the Bus and Taxi and Bus only scenarios is negligible at all exceedance locations.
- It is also important to note that taxis are all assumed to be complaint vehicles (to the NO<sub>2</sub> adherence levels) by 2024. Therefore taxis displaced from Union St will have a limited impact on air quality exceedance locations
- The results suggests that, for the Union St pedestrianisation scenario, the traffic flow impact at the exceedance locations is slightly higher than the bus and taxi only scenario. This suggest that the air quality at some of the exceedance locations may be worse if Union St is fully pedestrianised.
- The opening of the right turn movement from Union St to Bridge St is potentially a factor in the poorer results for the pedestrianisation scenario.
- Note that the buses themselves are assumed to be complaint but the relocation of buses and bus stops may cause additional congestion at other locations not detailed in the above table (i.e. Guild St). This would require further investigation to more fully understand the wider impact to air quality of diverting buses away from Union St.

3.3.5 Table 8 shows the results for the with-LEZ scenario.





**Table 8. Traffic Flow Analysis at Air Quality Exceedance Location With LEZ**

Exceedance Location	With LEZ		
	Bus & Taxi	Bus	Ped
335 Union St	-25%	-26%	-12%
61 Skene Square	-10%	-10%	-8%
14 Holburn St	-14%	-15%	-5%
Union Street	-41%	-42%	-29%
1 Trinity Quay	8%	8%	7%
27 Skene Square	-10%	-10%	-8%
105 King St	4%	3%	7%
184/192 Market St	-2%	-2%	-4%
39 Market St	-36%	-38%	-18%
469 Union St	-32%	-33%	-22%
40 Union St	-61%	-63%	-60%
43/45 Union St	-61%	-63%	-60%
7 Virginia Street	5%	6%	5%
468 Union St	-32%	-33%	-22%

**3.3.6 Key Findings:**

- The traffic flow impact at the exceedance locations is almost identical to the bus and taxi only scenario. This is an improvement on the network scenario where the LEZ is not included.
- It is important to note that the above results do not take into account any additional delays at other locations in the network (i.e. Guild St) caused by increases in buses dwelling and causing additional delay to general traffic. Further analysis of the impact to air quality across the wider network for this option is therefore advised.

**3.4 Bus Journey Time**

3.4.1 For the pedestrianisation scenario, there will obviously be an impact to the public transport network with the requirement for longer routing, fewer dedicated bus lanes, and more interaction with general traffic through the core area of the town centre,

3.4.2 Table 9 shows the average bus journey time of the services re-routed compared against the Bus & taxi only option for Union St. These results are for the without-LEZ scenarios.

**Table 9. PT Journey Time for Union St Pedestrianisation Scenarios (Without LEZ)**

Peak	Avg Bus Journey Time (hh:mm:ss)-Without LEZ			
	Bus & Taxi	Ped	Diff	%
AM Period	00:30:23	00:35:23	00:05:00	16%
IP Period	00:28:27	00:31:24	00:02:57	10%
PM Period	00:33:49	00:37:46	00:03:57	12%

3.4.3 Displacing the buses away from Union St results in an average journey time increase of approximately 10-16% compare to retaining the buses on Union St under the without-LEZ scenario.



3.4.4 Table 10 shows the average bus journey time of the services re-routed compared against the Bus & taxi only option for Union St. These results are for the with-LEZ scenarios.

**Table 10. PT Journey Time for Union St Pedestrianisation Scenarios (With LEZ)**

Peak	Avg Bus Journey Time (hh:mm:ss)-With LEZ			
	Bus & Taxi	Ped	Diff	%
AM Period	00:31:58	00:34:58	00:03:00	9%
IP Period	00:29:40	00:31:36	00:01:56	7%
PM Period	00:31:13	00:36:04	00:04:51	16%

3.4.5 Displacing the buses away from Union Street results in an average journey time increase of approximately 7-16% compared to retaining the buses on Union St under the with-LEZ scenario.

3.4.6 The results are fairly similar between the with and without LEZ background scenarios. The increase in journey time for the buses affected by the pedestrianisation of Union St will likely be a combination of an actual increase in routing and the impact of additional sections of the network where the buses are interacting with general traffic.

3.4.7 Further model work could be undertaken to consider the impact to the reliability of the bus services affected. This is essentially assessing the variation of bus journey times throughout the day. If the buses are caught up in congestion with general traffic, this will impact on their reliability.



## 4. PHASE 2 – MODEL TEST SCENARIO

### 4.1 Scenario Detail

4.1.1 For Phase 2, ACC requested that the Aberdeen City Centre traffic model be used to assess further CCMP measures within a single scenario, including:

- Pedestrianisation of Union St, between Bridge St. and Market St.
- Bus, Taxi and cycle only on Union Terrace. Both directions
- Bus, Taxi and cycle only on Market St (Between Union St and Guild St). Both directions.

4.1.2 In addition, further CCMP schemes identified in a separate A944 corridor study (to improve transport connections between Westhill and the City Centre) were also to be incorporated into the scenario, these are:

- Bus and cycle only on Bridge Street – Bus gate between Wapping St. and Union Street. Both directions
- Bus and cycle only on Guild Street (East of Stirling Street), both directions.

4.1.3 Figure 11 shows a schematic of the key elements of the proposed CCMP scenario to be tested in combination with the proposed LEZ boundary.

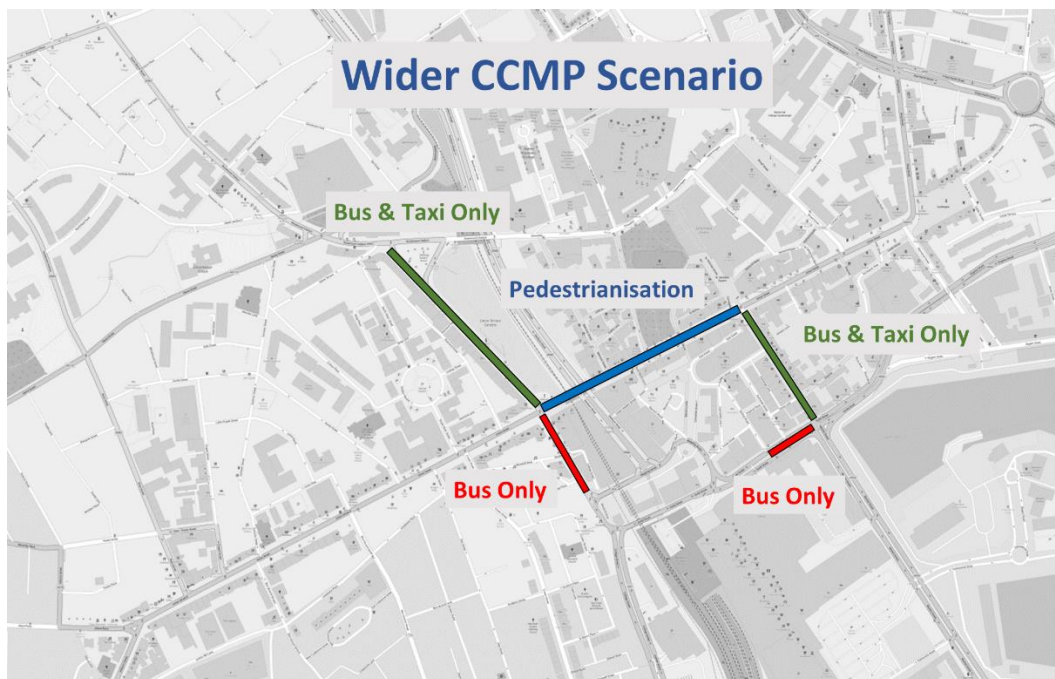


Figure 11. Wider CCMP Measures

4.1.4 Small scale schemes identified in the A944 corridor study were also to be incorporated into the model, these are as follows:

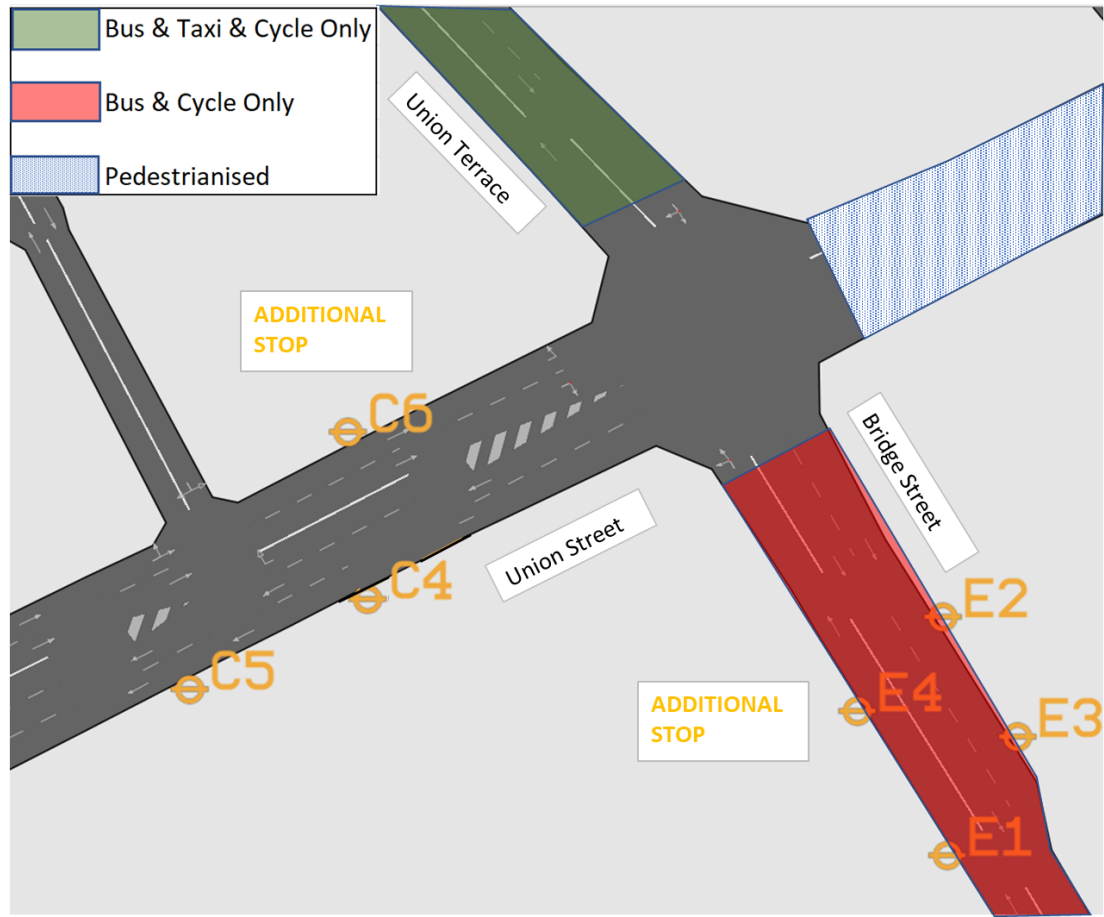
- Conversion of the right turn from Union St to Bridge St to bus and cycle only (as part of the proposed bus gate on Bridge St)
- Revising the ahead movement from Trinity Quay to Guild St to bus and cycle only



- Conversion of the right turn from West North St to Castle Street to buses and cycles only
- Conversion of the eastbound left-turn dedicated lane from Union Street into Rose St to also allow left and ahead for buses, taxis and cycles only

4.1.5 The following details the model coding of the key junctions and corridors of the proposed CCMP scenario:

**Union Street / Bridge Street / Union Terrace**



**Figure 12. Model Coding of Union St / Bridge St Junction**

- Right turn from Union St to Bridge St for buses and cycles only
- Left turn from Union Street to Union Terrace for buses, taxis and cycles only
- One lane exit on Bridge St to Union St and on Union Terrace to Union St
- 60 second cycle signalised junction with extended pedestrian phase applied
- Additional Bus Stops on Union St EB (C6) and Bridge St NB (E4)



## Union Street / Market Street

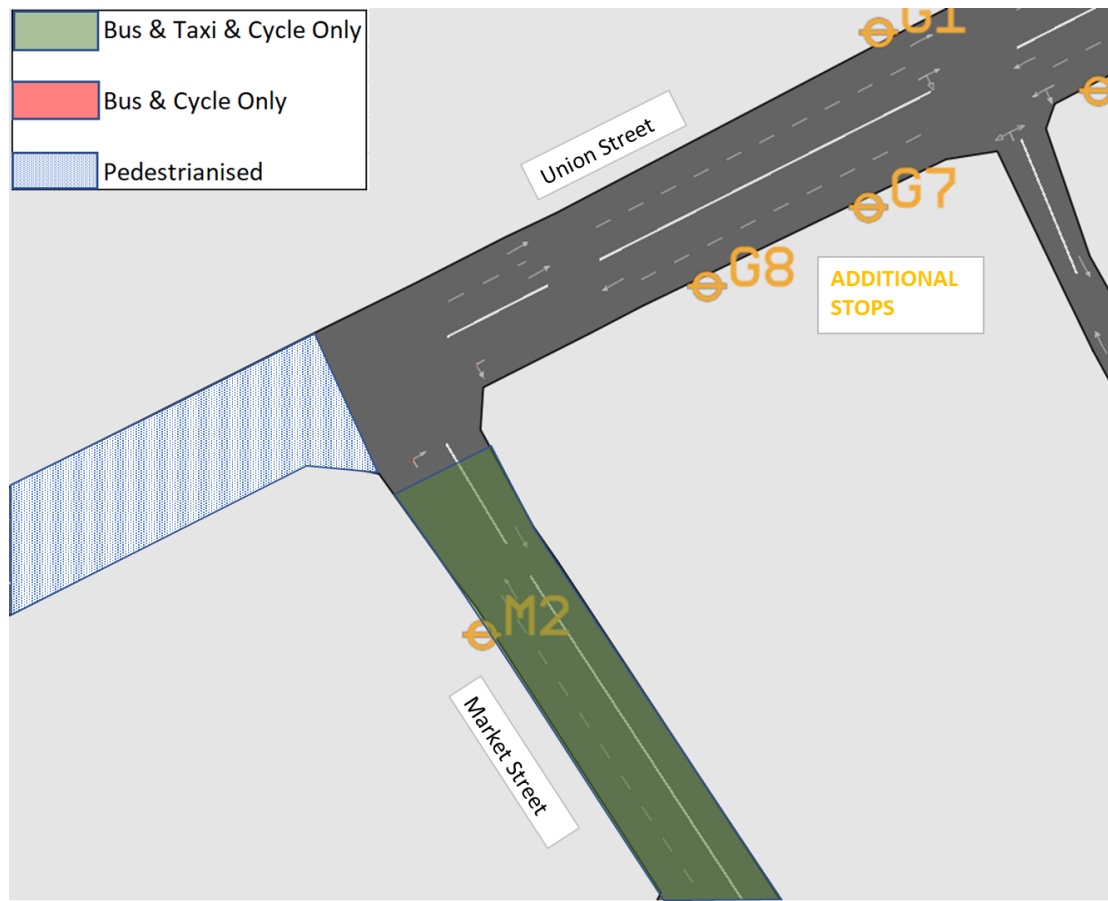


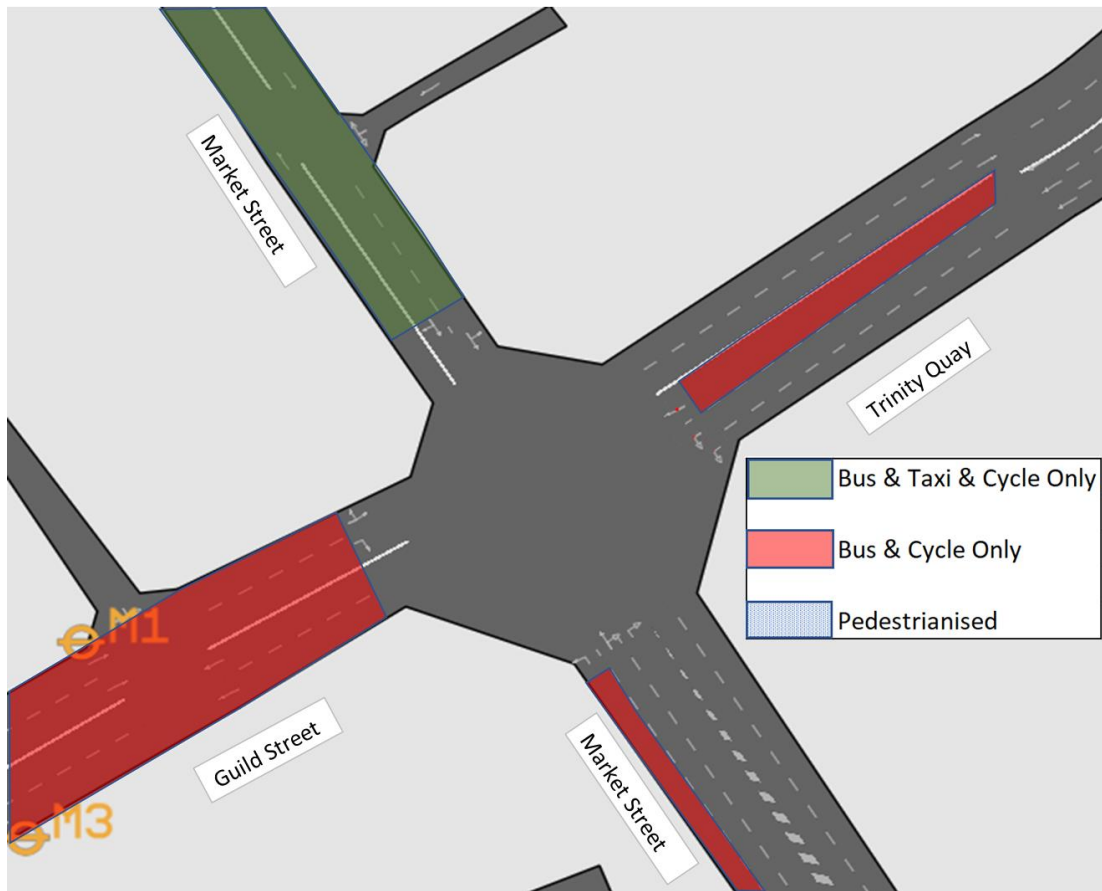
Figure 13. Model Coding of Union St / Market St Junction

- Single lane exit from Market Street to Union St (East) and Union St (East) to Market St
- Additional Bus Stops on Union St WB (G7 & G8)
- 60 second cycle signalised junction modelled with extended pedestrian phase





## Guild Street / Market Street



**Figure 14. Model Coding of Guild St / Market St junction**

- Bus and cycle only on Guild Street between Stirling St and Market St (Wapping St gyratory still open to all traffic)
- Ahead movement from Trinity Quay to Guild St for bus and cycle only
- Effective bus and cycle only on Market St NB approach to Guild St in lane 1.



## King Street / East North Street

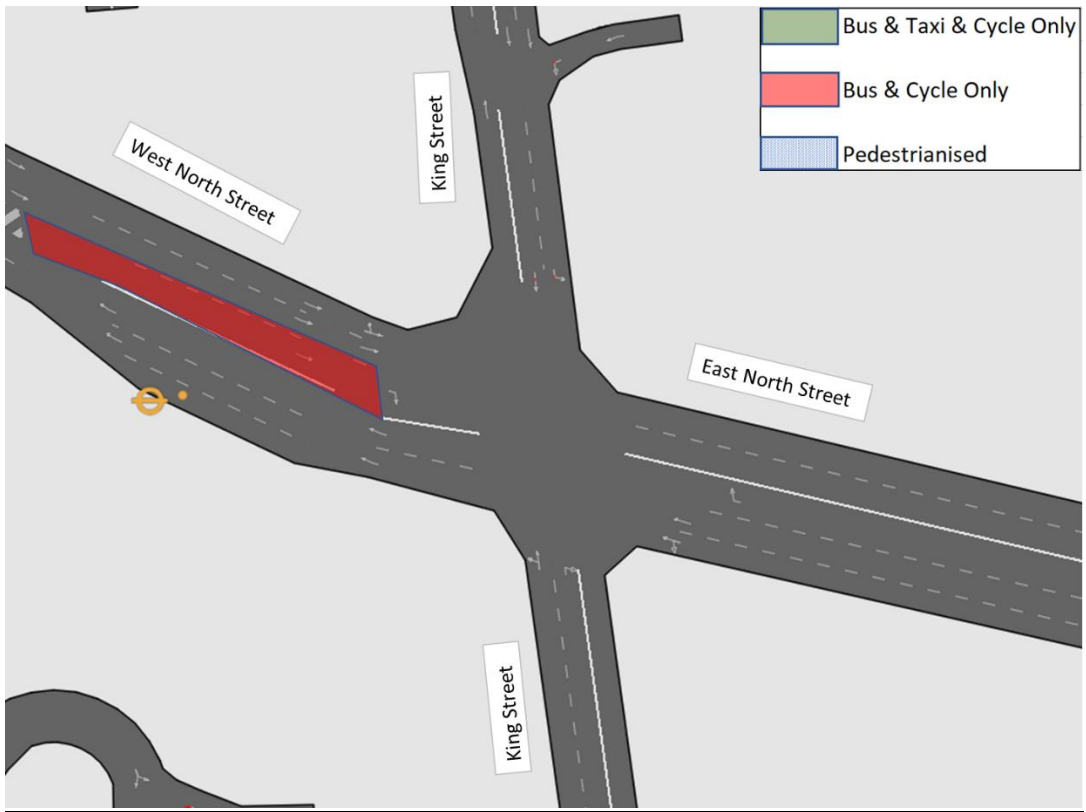


Figure 15. Model Coding of King Street / East North Street

- Right turn from West North Street to King St (leading to Castle St / Union St) for buses and cycles only



## Union Street / Rose Street

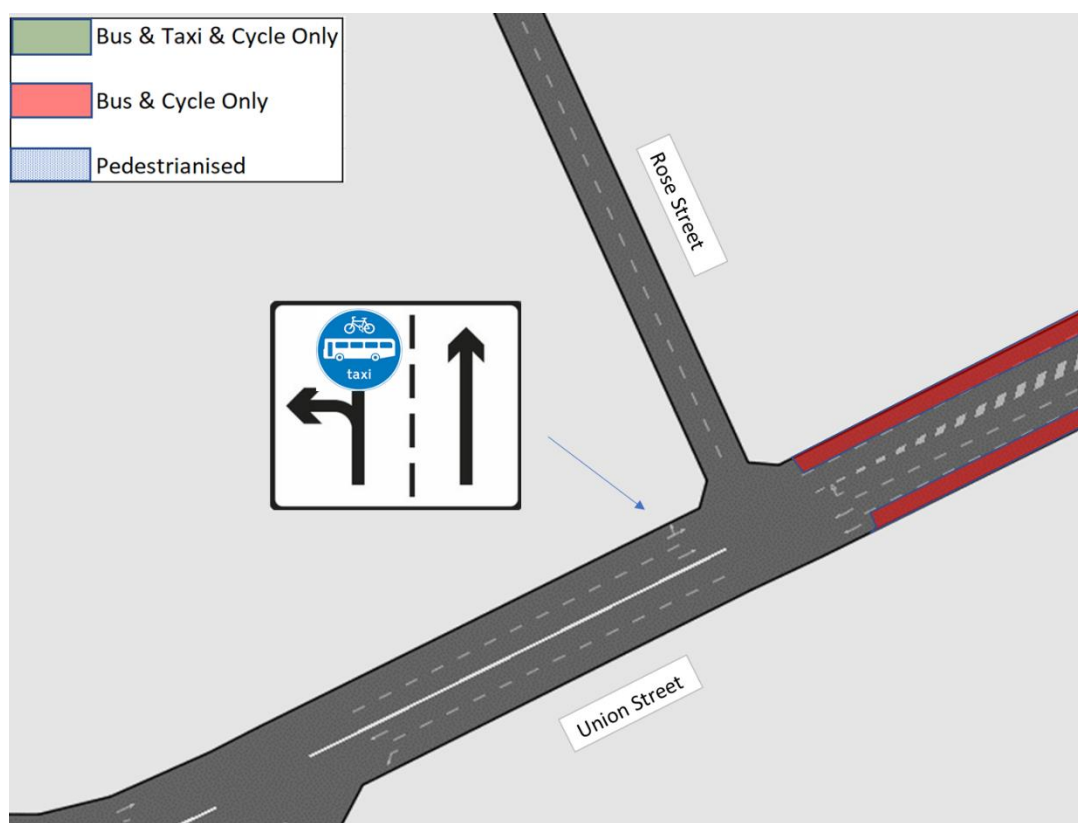


Figure 16. Model Coding of Union St / King St

- Conversion of the eastbound left-turn dedicated lane from Union Street into Rose St to also allow left and ahead for buses, taxis and cycles only (Indicative sign shown)

## 4.2 Public Transport Network

- 4.2.1 The Public Transport (PT) network has been modelled as per the Phase 1 testing with Union Street Pedestrianised.
- 4.2.2 As noted in Section 2.2, re-routing of PT routes through the affected area was undertaken by applying the revised routes currently implemented for the 'Spaces for People' PT network (in July/Aug 2021).
- 4.2.3 To offset the impact of removing all 9 of the bus stops (F1-F9) through the pedestrianised area of Union Street, additional bus stops were applied around the core area of the city centre. This was considered within the model to enable the PT network to operate without overloading existing stops.
- 4.2.4 Further work may be required to finalise the revised PT network routes and stops if the CCMP proposals are taken further into the design stage.

### 4.3 Traffic Demand Scenario

- 4.3.1 All model testing to date on the LEZ and CCMP has been undertaken using the Aberdeen City Centre - 2024 Reference Case Model (ACCPM24). This model includes background traffic growth of 7% - 8% over the 2019 baseline levels.
- 4.3.2 The background traffic growth is based upon the Local Development Plan (LDP) and includes consideration of the development and infrastructure elements that were predicted to be in place by 2024. These predictions were developed pre-COVID 19.
- 4.3.3 The model testing of the LEZ with CCMP, as detailed in the report: *Aberdeen LEZ Option Testing Report(SYSTRA, Ref: GB01T20D62/3)*, showed that the model was able to cater for 95% of this future growth scenario. This is therefore equivalent to an approximate 2% growth in traffic demand over the 2019 baseline.
- 4.3.4 Due to the uncertainty over what the future traffic network will be post-COVID, the proposed LEZ scheme was tested under alternative future demand scenarios. These included a network shrinkage scenario, where the traffic levels reduce to below that of the 2019 baseline and another where traffic levels remain at the 2019 baseline level but the traffic fleet projections continue as anticipated.
- 4.3.5 ACC advised that they would prefer the wider CCMP measures detailed above to be tested under the zero growth scenario.
- 4.3.6 It should be noted that the zero growth scenario does not anticipate zero further LDP build-out. Instead it is an anticipation that post-Covid behavioural changes (e.g. working from home on a permanent or part-time basis) will off-set housing growth, resulting in traffic levels remaining relatively consistent with pre-Covid levels.
- 4.3.7 It is worth noting that, at the time of this report (August 2021), traffic levels in Aberdeen City are currently sitting at 79% compared to July 2019 (*C-19 Urban Realm Taskforce Transport Data Monthly Report, July 2021*)

ACC requested that the LEZ plus wider CCMP measures scenario be assessed in a future network with traffic demands set at 2019 level (zero growth).

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## 5. PHASE 2 TESTING – MODEL OUTPUTS

### 5.1 Introduction

- 5.1.1 The new model test scenario: 'LEZ with wider CCMP measures' has been assessed against a 2024 Ref Case and other interim and alternative scenarios as detailed in Table 11:

**Table 11. Model Test Scenarios**

Ref.	Scenario	Background Growth		Detail
		from 2019	LEZ	CCMP Measures
1	2024 Ref Case (0G)	Zero Growth	No	None
2	2024 + LEZ (0G)	Zero Growth	Yes	None
3	2024 + LEZ + USC (0G)	Zero Growth	Yes	'Union Street Scheme' Union St & Union Terrace Bus and Taxi Only
4	2024 + LEZ + USC-Ped (0G)	Zero Growth	Yes	'Revised Union Street Scheme' Union Street Pedestrianised  Union Terrace Bus and Taxi Only
5	2024 + LEZ + Wider CCMP (0G)	Zero Growth	Yes	New Test Scenario Wider CCMP Measures

2024 = Year; LEZ=with Low Emission Zone; (0G) = Zero Growth; USC=Union Street Scheme (Union St & Union Terrace restrictions); Wider CCMP = Bridge St, Market St, Guild St restrictions.

- 5.1.2 Table 11 shows that the key model outputs from the new test scenario (2024+LEZ+Wider CCMP–0G) has been compared against alternative scenarios with gradually increasing measures from a reference case scenario without the LEZ or any CCMP measures included.
- 5.1.3 All these scenarios have been run with the zero growth assumptions to allow a consistent comparison of results.
- 5.1.4 This approach allows the test model outputs to be assessed against the Reference Case scenario but also to see the impact of varying levels of infrastructure change in the city centre network, building up to the LEZ plus wider CCMP measures.

### 5.2 Traffic Demand Level

- 5.2.1 Table 12 shows the demand level that each scenario was able to run at in each peak. The table shows the results for each of the zero growth scenarios developed. In addition, the table shows the results for the previously tested scenarios under the higher background growth (7%).



**Table 12. Model Test Scenarios – Network Demand Level**

Future Year Scenario	Growth	Network Detail	Demand Level Attained				
			AM	IP	PM	Overall	
1	2024	No Growth (2019 Levels)	-	100%	100%	100%	<b>100%</b>
2	2024	No Growth (2019 Levels)	With LEZ	100%	100%	100%	<b>100%</b>
3	2024	No Growth (2019 Levels)	LEZ Union St (B&T only) Union Ter. (B&T only)	100%	100%	100%	<b>100%</b>
4	2024	No Growth (2019 Levels)	LEZ Union St (Pedestrianised) Union Ter. (B&T only)	100%	100%	100%	<b>100%</b>
5 NEW	2024	No Growth (2019 Levels)	LEZ Union St (Pedestrianised) Union Ter. (B&T only) Guild St. - East (B only) Bridge St (B only) Market St - North (B&T only)	100%	100%	95%	<b>95%</b>
(Previous Testing 'with-growth' scenarios)							
6	2024	LDP 7% Growth	LEZ Union St (B&T only) Union Ter. (B&T only)	100%	100%	95%	<b>95%</b>
7	2024	LDP 7% Growth	LEZ Union St (Pedestrianised) Union Ter. (B&T only)	100%	100%	95%	<b>95%</b>
8	2024	LDP 7% Growth	Full CCMP (without LEZ)	90%	90%	85%	<b>85%</b>

5.2.2 The demand level attained is the primary statistic extracted from the traffic model scenarios. The above results show that the model scenario including the LEZ and wider CCMP measures (No. 5 in the table) is able to run at 100% demand (zero growth) in the AM and Interpeak periods, but only 95% in the PM Peak period.

5.2.3 All other scenarios that were run with zero growth were able to run at 100% demand as they included fewer restrictions in the network.

5.2.4 These high level results suggest that the additional CCMP restrictions on Bridge Street, Market Street, and Guild Street, in addition to those on Union Street and Union Terrace, result in traffic displacement that the network cannot accommodate at 100% of the 2019 traffic levels.

5.2.5 When considering this in the context of previous testing of the CCMP measures (model ran at 85% of high growth scenario, without the LEZ) then these results fit in with the general trend of results highlighted in the above table.

The model scenario including the LEZ and wider CCMP measures is able to run at 95% demand of the 2019 baseline traffic demand.

5.2.6 Through the various model testing of the CCMP with and without the LEZ, it is clear that the LEZ helps to facilitate the CCMP by removing some traffic from the city centre area. The impact of the LEZ on traffic displacement from the city centre will diminish over time as the fleet emission compliance levels improve. The rate of fleet improvement is another uncertainty in a post COVID world.

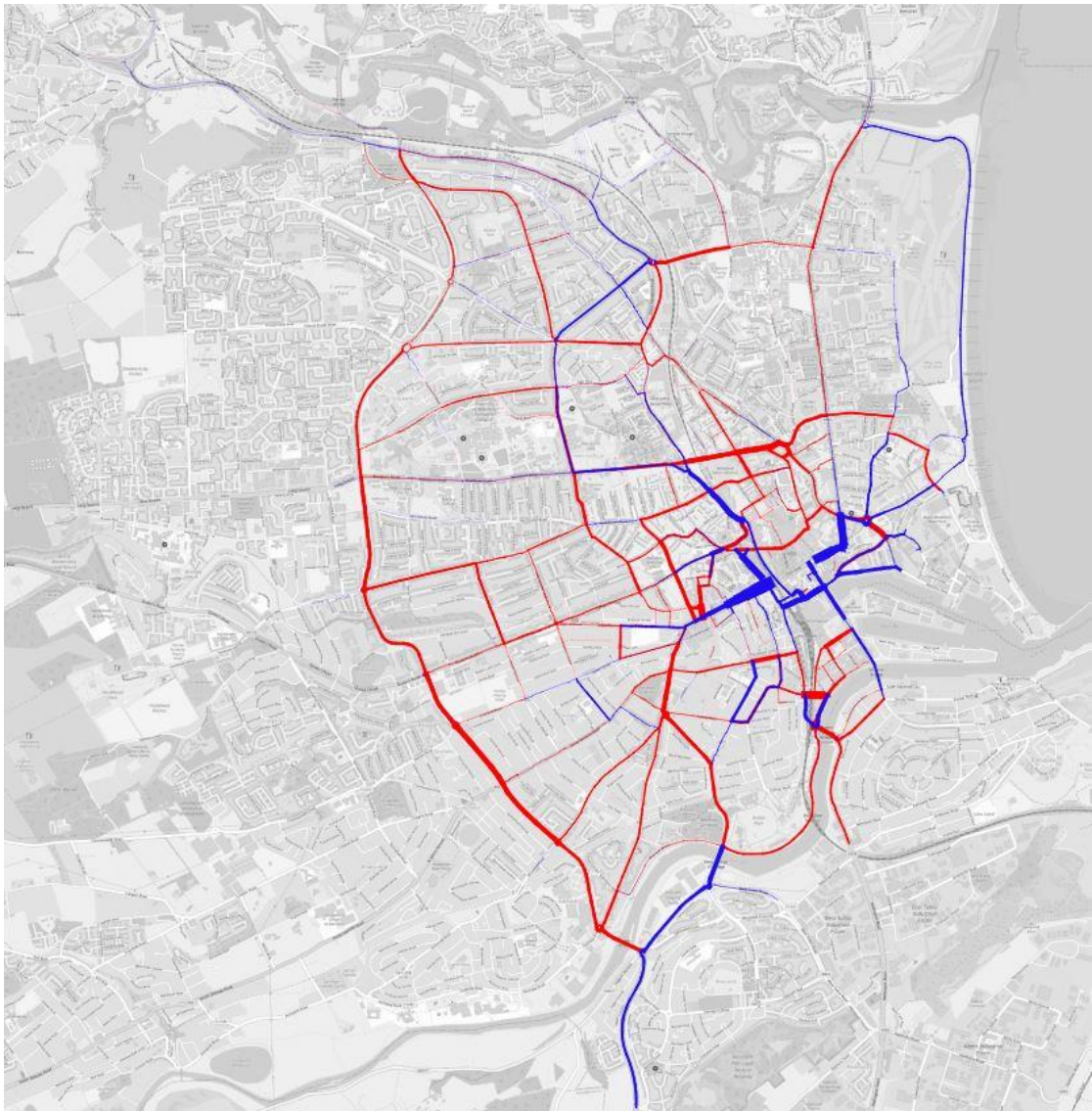


- 5.2.7 As noted in Section 4.3.7, traffic levels at the end of July 2021 were at 79% of the 2019 baseline. It is for ACC to consider whether traffic levels will remain below 2019 traffic levels in the short term (<3 years) due to the travel demand changes resulting from COVID-19, or if the traffic network will bounce back to pre-COVID levels with the resumption of development growth.
- 5.2.8 In the medium to long term, there are likely to be other infrastructure and policy measures considered for Aberdeen which will manage the general traffic demand coming into the city centre area.

### 5.3 Network Congestion

- 5.3.1 Traffic model flow difference plots have been collated which show geographically where traffic is displaced within the test scenario: (2024+LEZ+Wider CCMP (0G)) .
- 5.3.2 The following section therefore provides:
- Model flow difference plots (between the test scenario and ACCPM24 Ref Case)
  - Traffic flow tables detailing the key 12 hour traffic flow changes (between the test scenario and ACCPM24 Ref Case)
  - Model observations
- 5.3.3 It is important to consider the following when reviewing the flow comparison data:
- For the flow plot differences, blue bars represent a decrease in traffic flows and red bars represent an increase in traffic flows,
  - The results are presented for the 12 Hour Period 07:00-19:00,
  - The model flow difference plots have been generated from model runs at the same demand level.
- 5.3.4 Figure 17 provides the flow plot difference between the test scenario (2024+LEZ+Wider CCMP (0G)) and the ACCPM24 Ref Case Model. Table 13 provides key flow comparisons at locations of note.





**Figure 17. Additional Test - PM Peak Period Traffic Flow Difference Plot**

(Blue Bars = Traffic flow decrease; Red Bars = Traffic flow increase)



**Table 13. Traffic Flow Change at Key Locations of Note**

Location	Ref Case 12 Hr Flow (95% demand level)	Wider CCMP Test 12 Hr Flow (95% demand level)	Flow Change (Vehicle)	Percentage Change
Argyll PI NB	3945	4427	482	12%
Argyll PI SB	4671	5235	564	12%
Esslemont Ave NB	2638	3523	885	34%
Esslemont Ave SB	2916	3160	244	8%
George St NB	1810	2691	881	49%
George St SB	2326	2717	391	17%
Hutcheon St EB	4178	6529	2350	56%
Hutcheon St WB	4879	5579	700	14%
Maberly St EB	1992	3049	1057	53%
Maberly St WB	2372	4175	1803	76%
Palmerston PI EB	1955	3805	1850	95%
Palmerston PI WB	2640	5581	2940	111%
Rose St NB	3431	5156	1725	50%
Rose St SB	3067	4408	1341	44%
Rosemount PI EB	2701	4028	1327	49%
Rosemount PI WB	3230	4451	1221	38%
Schoolhill EB	3641	4469	828	23%
Schoolhill WB	1346	1574	227	17%
Springbank Ter EB	2732	3686	954	35%
Springbank Ter WB	1854	2562	708	38%
<b>2 Way Flow</b>				
Argyll PI	8616	9662	1045	12%
Esslemont Ave	5553	6683	1129	20%
George St	4136	5407	1271	31%
Hutcheon St	9057	12108	3050	34%
Maberly St	4364	7224	2860	66%
Palmerston PI	4595	9385	4790	104%
Rose St	6497	9564	3067	47%
Rosemount PI	5931	8479	2548	43%
Schoolhill	4987	6043	1056	21%
Springbank Ter	4586	6248	1662	36%

5.3.5 Key Model Findings:

- There is a noted increase in traffic routing northbound through Rose St and Esslemont Ave compared to the Reference Case scenario due to the restrictions in the city centre
- There is a noted increase in traffic routing in both directions through Rosemount PI and Maberly St compared to the Reference Case scenario due to the restrictions within the city centre.
- There is also a noted increase in traffic routing westbound through the Palmerston Place link road (South College Street junction).
- Traffic flow increases on Schoolhill were anticipated due to the interventions on other east-west routes of Union St and Guild St, however, these remain relatively low at an approximate 20% increase compared to the Reference Case.





## 5.4 Bus Journey Times

5.4.1 For the test scenario (2024+LEZ+Wider CCMP (OG)), there will be an impact to the public transport network with the requirement for longer routing for services diverted from Union Street.

5.4.2 The modelled bus services directly affected by the Union St restrictions include the following:

**Table 14. Bus Routes Directly Affected by Union St Pedestrianisation**

Operator	
First	Stagecoach
1	7
2	14
8	119
11	201
13	202
15	203
17	218
18	7A
19	7B
20	7S
23	X17
181	X6
16B	X7
17A	
18A	
1B	
X27	

5.4.3 Table 15 shows the average bus journey time of the services re-routed compared against the various network scenarios

**Table 15. PT Journey Time for Affected Bus Services on Union St**

	Average Bus Journey Time (hh:mm:ss)				
	2024 Ref Case (OG)	2024 + LEZ (OG)	2024 + LEZ + USC (OG)	2024 + LEZ + USC- Ped (OG)	2024 + LEZ + Wider CCMP (OG)
12 Hour	00:25:27	00:25:35	00:25:37	00:28:44	00:24:37
Compared to Ref	-	1%	1%	13%	-3%

2024 = Year; LEZ=with Low Emission Zone; (OG) = Zero Growth; USC=Union Street Scheme (Union St & Union Terrace restrictions); Wider CCMP = Bridge St, Market St, Guild St restrictions.

5.4.4 The results show that when the buses are retained through Union Street, there is very little difference in average journey time compared to the Reference Case scenario. Traffic displaced from the city centre due to the LEZ or the USC does not appear to impact significantly on the PT service journey times.

5.4.5 When Union Street is pedestrianised, the affected bus services require to traverse a longer route via Market Street, Guild Street and Bridge Street. In the scenario '2024+LEZ+USC-Ped', the journey times are on average 13% higher than the Reference Case. In addition, the buses

are required to interact with general traffic on these alternative routes compared to utilising the bus lanes on Union St in the Reference Case.

- 5.4.6 In the final test scenario, the addition of traffic restrictions on Bridge St, Market St and Guild St have a positive impact on the average bus journey times to the extent that the overall impact is a 3% reduction on the Reference Case scenario.
- 5.4.7 It may be that in the wider CCMP scenario, the spreading out of bus stops combined with the implementation of bus only and bus & taxi only corridors result in slightly faster routing through the city centre compared to the existing PT operation. This would require further detailed analysis to confirm, but overall, it does suggest a marked improvement over the other Union Street pedestrianised scenario.
- 5.4.8 Further model work has been undertaken to consider the impact to the reliability of the bus services affected. This is essentially assessing the variation of bus journey times throughout the day. If the buses are caught up in congestion with general traffic, this will impact on their reliability.

## 5.5 Bus Reliability

- 5.5.1 Table 16 shows the Bus Reliability Time\* of the services re-routed compared against the 2024 Reference Case scenario, the LEZ scenario and the LEZ and CCMP scenario all with no growth to vehicle demand of the 2019 Base scenario.

\* Bus Reliability Time = difference between the quickest and slowest journey time for a bus service to route through the model in a 12 hour period (07:00-19:00). The smaller the time value, the better the reliability.

**Table 16. Average PT Reliability Time for Affected Bus Services on Union St**

	Bus Reliability Time (hh:mm:ss)				
	2024 Ref Case (0G)	2024 + LEZ (0G)	2024 + LEZ + USC (0G)	2024 + LEZ +USC- Ped (0G)	2024 + LEZ + Wider CCMP (0G)
12 Hour	00:01:12	00:01:11	00:01:19	00:01:36	00:01:21
Compared to Ref	-	-1%	10%	34%	13%

2024 = Year; LEZ=with Low Emission Zone; (0G) = Zero Growth; USC=Union Street Scheme (Union St & Union Terrace restrictions); Wider CCMP = Bridge St, Market St, Guild St restrictions.

- 5.5.2 The bus reliability statistics suggest that the implementation of the LEZ has almost no impact on the reliability of the buses routing through Union Street on average. However, when Union Street and Union Terrace include bus and taxi only interventions, the reliability (or spread of journey times) increases by 10% in the model. It may be that traffic displaced from the city centre area impacts on the buses routing out-with the LEZ area.
- 5.5.3 It should be noted that, in this scenario, the difference between the maximum and minimum journey time is only 10 seconds worse than the Reference case on average. There are fluctuations in the reliability within individual services which may highlight issues along specific routes. For the purposes of this report, the average of all the affected services is provided. Further, more detailed analysis can be undertaken if required.



- 5.5.4 When buses are diverted away from Union Street and through Guild Street, if no further mitigation is applied, then there is an increase in the spread of journey times throughout the day. The model outputs suggest that the difference between the maximum and minimum journey time is 34% higher than the Reference Case.
- 5.5.5 Finally, for the wider CCMP test scenario, the spread of PT journey times through the day are significantly reduced when the PT measures on Bridge St, Guild St, and Market St are introduced. The results are almost identical to the scenario where Union St includes a bus and taxi only restriction.
- 5.5.6 Overall, the model outputs relating to the PT network suggest that if Union St is to be pedestrianised, then the additional bus priority measures on Bridge St, Guild St, and Market St would significantly benefit the PT network operation for reliability and average journey times.

## 5.6 Network Summary Statistics

- 5.6.1 Network summary statistics report on the overall network performance of a model. Four key global network statistics that can be extracted from the models are:
- Total Distance Travelled
  - Average Time Taken
  - Mean Speed
  - Average Number of Vehicles in a Queue.
- 5.6.2 The total distance travelled statistic is based upon the cumulative travelled distance for all vehicles in the model. An increase in the total distance travelled is usually representative of an increase in travel demand.
- 5.6.3 The average time taken statistic is based upon the average time for all trips in the network to make their journey. An increase in this statistic represents a deterioration in the operation of the network.
- 5.6.4 The mean speed statistic represents the average speed for all vehicles in the model network. A decrease in average speed represents a deterioration in the operation of the model network.
- 5.6.5 Table 17 provides a summary of the total distance travelled, the average time taken and the average speed for all scenarios compared to the Reference Case.



**Table 17. Network Summary Statistics**

Network Summary Statistics						
Peak	Percentage demand level	Scenario	Number of Vehicles	Total Distance Travelled (km)	Average Time Taken (hh:mm:ss)	Mean Speed (mph)
AM	95%	2024 Ref Case (OG)	73509	242559	00:06:39	18.50
	95%	2024 + LEZ (OG)	-0.4%	0.9%	9.4%	-7.4%
	95%	2024 + LEZ + USC (OG)	-0.6%	1.8%	17.0%	-12.4%
	95%	2024 + LEZ +USC-Ped (OG)	-0.2%	2.1%	10.8%	-7.7%
	95%	2024 + LEZ + Wider CCMP (OG)	-0.7%	2.5%	23.9%	-16.7%
IP	95%	2024 Ref Case (OG)	153910	439923	00:05:34	19.16
	95%	2024 + LEZ (OG)	-0.4%	1.4%	6.5%	-4.5%
	95%	2024 + LEZ + USC (OG)	-0.5%	1.8%	8.9%	-6.0%
	95%	2024 + LEZ +USC-Ped (OG)	-0.2%	1.8%	4.1%	-2.1%
	95%	2024 + LEZ + Wider CCMP (OG)	-0.7%	2.6%	16.1%	-11.0%
PM	95%	2024 Ref Case (OG)	88211	278896	00:06:50	17.23
	95%	2024 + LEZ (OG)	-0.7%	0.8%	9.8%	-7.6%
	95%	2024 + LEZ + USC (OG)	-0.7%	1.9%	14.7%	-10.4%
	95%	2024 + LEZ +USC-Ped (OG)	-0.7%	1.6%	16.6%	-12.3%
	95%	2024 + LEZ + Wider CCMP (OG)	-1.3%	0.8%	18.4%	-14.4%
12 Hr	95%	2024 Ref Case (OG)	<b>315630</b>	<b>961378</b>	<b>00:06:21</b>	<b>18.30</b>
	95%	2024 + LEZ (OG)	<b>0%</b>	<b>1%</b>	<b>9%</b>	<b>-6%</b>
	95%	2024 + LEZ + USC (OG)	<b>-1%</b>	<b>2%</b>	<b>14%</b>	<b>-10%</b>
	95%	2024 + LEZ +USC-Ped (OG)	<b>0%</b>	<b>2%</b>	<b>11%</b>	<b>-7%</b>
	95%	2024 + LEZ + Wider CCMP (OG)	<b>-1%</b>	<b>3%</b>	<b>26%</b>	<b>-17%</b>

2024 = Year; LEZ=with Low Emission Zone; (OG) = Zero Growth; USC=Union Street Scheme (Union St & Union Terrace restrictions); Wider CCMP = Bridge St, Market St, Guild St restrictions.

5.6.6 The following comments can be drawn from the global network statistics:

- The gradual increase in total distance travelled through the various scenarios is partially due to the displacement of vehicles from the LEZ but also the gradual increase in restrictions within the city centre.
- The average time taken and mean speed in the wider CCMP scenario is much higher than all other scenario compared to the Reference Case (26% increase in average time taken over 12 hrs)
- The various model scenarios show how the network congestion and delay is partly due to the LEZ (9% increase in average time taken), a further 5% increase due to the Union Street Scheme, and a further 12% due to the wider CCMP measures

## 5.7 Network Wide Traffic Queueing

5.7.1 In addition to the network summary statistics, a further metric which provides a global comparison of the model network performance is the average number of queued vehicles in the model.

5.7.2 This statistic shows the total number of queued vehicles across the whole model, in this case, in hourly bins. A higher number means that there is more queued traffic in the network.



5.7.3 Figure 18 provides a graph of the comparison all scenarios and the Reference Case. Table 18 provides this comparison in a table.

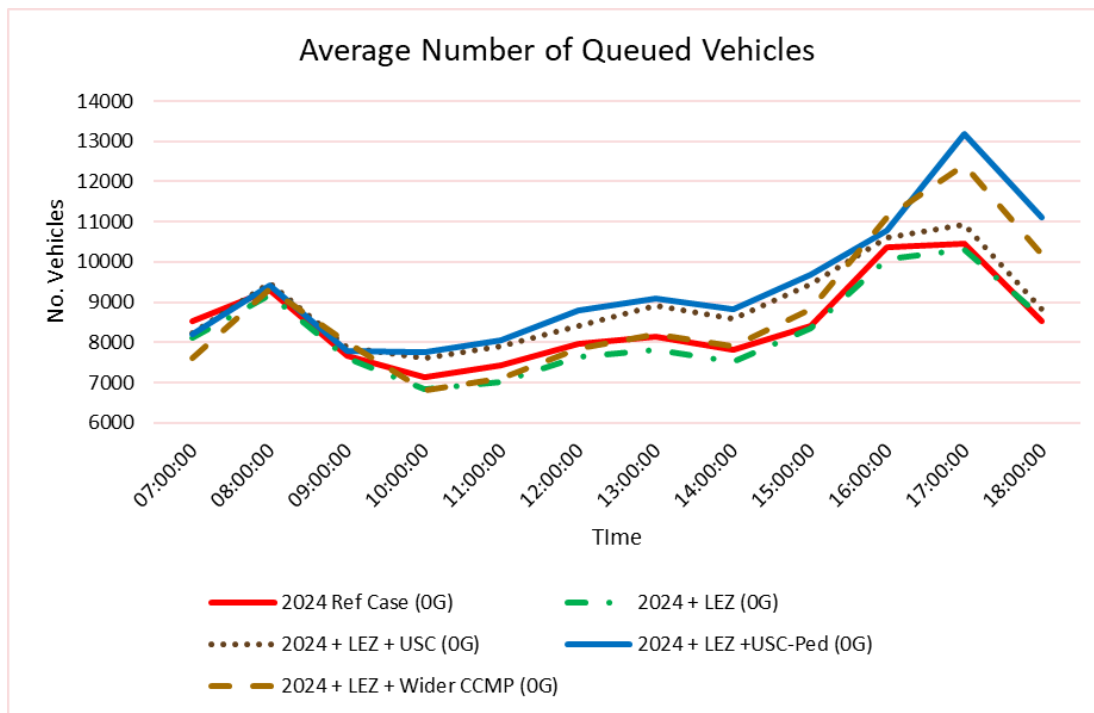


Figure 18. Average Number of Queued Vehicles Graph

Table 18. Average Number of Queued Vehicles

Peak	Average No. of Vehicles in a Queue								
	2024 Ref Case (OG)	2024 + LEZ (OG)		2024 + LEZ + USC (OG)		2024 + LEZ +USC-Ped		2024 + LEZ + Wider	
		No. of Vehicles	% Dif to Test	No. of Vehicles	% Dif to Test	No. of Vehicles	% Dif to Test	No. of Vehicles	% Dif to Test
AM	25505	24910	-2%	25578	0%	25404	0%	24918	-2%
IP	46886	45185	-4%	50904	9%	52228	11%	46704	0%
PM	29346	29021	-1%	30356	3%	35055	19%	33719	15%
Total	101738	99116	-3%	106838	5%	112687	11%	105340	4%

2024 = Year; LEZ=with Low Emission Zone; (OG) = Zero Growth; USC=Union Street Scheme (Union St & Union Terrace restrictions); Wider CCMP = Bridge St, Market St, Guild St restrictions.

5.7.4 The results of the average number of queued vehicle scenarios suggest that the wider CCMP measures with the LEZ has 4% more queuing compared to the Reference Case, whereas, the scenario with Union St pedestrianised but excluding the additional restrictions on Guild Street, Market St and Bridge Street has higher queuing levels.

5.7.5 This trend doesn't quite follow the results of the other global statistics. The results therefore suggest that the higher values observed for the average time taken in the wider CCMP scenario is more related to the additional distance that vehicles are required to route through the city centre rather than additional delay.





### **Comment on Modelled Traffic Displacement**

- 5.7.6 As detailed in the main LEZ modelling report, the modelled application of traffic restrictions within the city centre requires all the displaced traffic to route elsewhere within the model network.
- 5.7.7 In reality, traffic evaporation and alternative routing is likely to occur if the current spaces for people measures are retained as the network recovers post-COVID. The wider CCMP measures would very likely encourage revised car park destinations, where traffic may be encouraged to park close to the route of entry to the city centre as opposed to routing across the city centre to destinate in a preferred car park. This effect has not been included within the model scenarios to date.
- 5.7.8 The traffic model outputs therefore represent a worst case scenario regarding traffic displacement, as it effectively models a scenario where the restrictions are suddenly put in place without any prior warning.



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## 6. PHASE 3 –CITY CENTRE TRAFFIC MANAGEMENT PLAN TESTING

### 6.1 Introduction

- 6.1.1 A report detailing the proposed Aberdeen City Vision for improved streetscaping has been developed ( LDA Design / Ryder Aug 2021) which includes a review of the CCMP implementation programme and fast-tracking of measures following the COVID-19 pandemic and the temporary *Spaces for People* measures applied in the network.
- 6.1.2 On 25<sup>th</sup> August 2021, Aberdeen City Council’s City Growth and Resources Committee considered a report on the outcomes of the review of the Aberdeen City Centre Masterplan and requested that a Traffic Management Plan be developed to provide more detail on the operation of the city centre.
- 6.1.3 The Phase 3 model testing was developed following the commissioning of SYSTRA by Aberdeen City Council in September 2021 to develop a Traffic Management Plan to facilitate the next stage of delivery of the Aberdeen City Centre Masterplan (CCMP).
- 6.1.4 As part of the Streetscape improvement proposals on central Union St (section between Bridge St junction and Market St junction), there are two potential operational scenarios, these are:
- **Option 1** – Full pedestrianisation of Central Union St (except for cycle and time limited servicing)
  - **Option 2** – Buses and cycle only (except for time limited servicing)
- 6.1.5 Through traffic model testing detailed in Phase 2, a package of measures was identified to support the pedestrianisation of Central Union St (Option 1 above ) and minimise the impacts to bus journey times and reliability. The modelling concluded that if buses are to be removed from Union St, then additional bus priority measures on the following routes would have significant benefits for bus reliability and journey times:
- Bridge St – Bus, taxi and Cycle only (both directions)
  - Guild St (east of Carmelite St) – Bus, taxi and Cycle only (both directions)
  - Market St (north of Guild Street) – Bus, taxi and Cycle only (both directions)
- 6.1.6 The modelling tasks detailed in this third phase of testing include:
- Revised Testing of Central Union St-Option 1 - Road Reclassification
  - Sensitivity Testing of Union Terrace & Schoolhill
  - Model Testing of Central Union St–Option 2
  - Union Square Access Testing
- 6.1.7 Detail of the model test scenario and results are provided in the following 4 chapters with the revised model testing of Option 1 detailed below.

### 6.2 Central Union Street Option 1 – Road Reclassification

- 6.2.1 The Aberdeen City Centre Streetscape Report details the high level vision for key urban streetscape interventions in the city centre. The model test scenario ‘Option 1’ sits within this visioning exercise as full pedestrianisation of Union Street forms a key part of the visioning proposals.
- 6.2.2 The model testing of Central Union Street Option 1 is detailed in previous chapter as: ‘2024 + LEZ + Wider CCMP’.

- 6.2.3 The model testing of the CCMP 'wider measure's requires to be updated to better reflect the impact of the streetscape proposals on traffic demand through the city centre.
- 6.2.4 The streetscape proposals will require the new network hierarchy signing to route strategic traffic away from the city centre area. In addition, the streetscape itself, with revised priorities and road surfacing will be designed in a way as to deter traffic from routing through the City Centre Area.
- 6.2.5 With that in mind, the hierarchy of the roads within the Aberdeen City Centre Model were reviewed and the following road classification amended from a major road classification to a minor road classification::
- Union St/Kings St from Alford Pl to West North St
  - Union Terrace
- 6.2.6 This model was then re-run and the outputs compared against the Reference Case Model scenario (all 95% of 2019 base levels).
- 6.2.7 Figure 19 provides the flow plot difference between the test scenario (2024+LEZ+Wider CCMP-Rerun) and the ACCPM24 Ref Case Model. Table 19 provides key flow comparisons at locations of note.



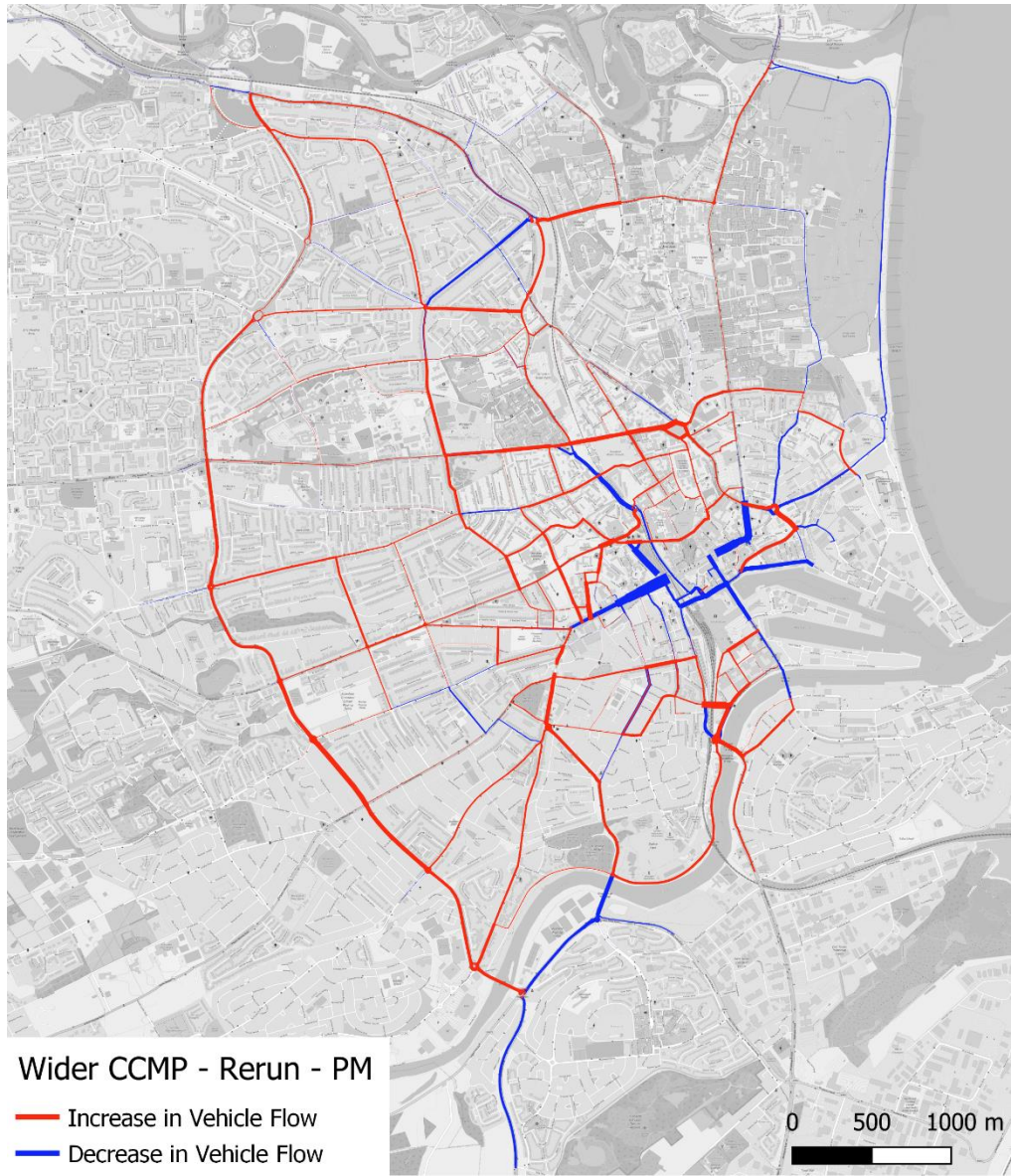


Figure 19. 2024+LEZ+Wider CCMP-Rerun – PM



Table 19. 2024+LEZ+Wider CCMP-Rerun – Notable Flow Differences

Location	Ref Case (95% demand level)				LEZ+WIDER_CCMP Rerun (95% demand level) - Percentage Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
George St NB	360	992	457	1810	56%	36%	90%	53%
George St SB	467	1278	581	2326	48%	-8%	36%	14%
Hutcheon St EB	965	1917	1297	4178	65%	49%	57%	55%
Hutcheon St WB	954	2449	1477	4879	14%	8%	25%	14%
Maberly St EB	456	931	605	1992	94%	48%	31%	54%
Maberly St WB	426	1254	692	2372	159%	72%	46%	80%
Palmerston Place EB	617	742	596	1955	81%	148%	60%	100%
Palmerston Place WB	467	1190	983	2640	153%	105%	89%	107%
Schoolhill EB	507	1121	521	2148	31%	17%	73%	34%
Schoolhill WB	446	739	625	1811	7%	5%	19%	10%
Springbank Terrace EB	996	1140	596	2732	0%	47%	99%	41%
Springbank Terrace WB	308	929	616	1854	84%	43%	24%	43%
Union Terrace NB	495	1261	617	2372	-86%	-89%	-87%	-88%
Union Terrace SB	777	1819	1017	3613	-89%	-92%	-93%	-92%
<b>2 Way Flow</b>								
George St	827	2270	1038	4136	51%	11%	60%	31%
Hutcheon St	1918	4365	2774	9057	39%	26%	40%	33%
Maberly St	881	2185	1297	4364	125%	62%	39%	68%
Palmerston Place	1084	1932	1579	4595	112%	121%	78%	104%
Schoolhill	953	1860	1146	3959	20%	12%	43%	23%
Springbank Terrace	1304	2070	1212	4586	20%	45%	60%	42%
Union Terrace	1272	3080	1633	5985	-88%	-91%	-91%	-90%

6.2.8 Key Model Findings:

- The results suggest that when the wider CCMP measures are in place with Central Union St pedestrianisation, a large volume of traffic is redistributed throughout the network.
- Some of these routes have high volumes of pedestrians e.g. Schoolhill where there is a noted increase in traffic flow of 23% for both directions over the 12 hours (34% in the EB) when compared to the Reference Case.





## 7. SCHOOLHILL & UNION TERRACE OPTION TESTING

### 7.1 Introduction

- 7.1.1 The original proposal to restrict general traffic on Union Terrace was developed for a CCMP implementation scenario where traffic restrictions were included on central Union Street only. The purpose of the Union Terrace restriction was to protect Schoolhill from being used as an alternative east-west corridor. This is the key reason why the Low Emission Zone package of measures included general restrictions on central Union Street and Union Terrace.
- 7.1.2 The Union Terrace Gardens Project (UTG Project) includes proposals for accessible parking and loading bays along the eastern carriageway (southbound). This presented a conflict with the consideration for general traffic restriction on Union Terrace as vehicles would not be able to access the proposed parking measures.
- 7.1.3 A series of traffic model tests were developed to consider a range of options on Union Terrace (including one-way restrictions, and banned movements), this was undertaken in combination with restrictions on Schoolhill and the wider CCMP measures on Union Street, Bridge St, Guild St and Market St.
- 7.1.4 The traffic model tests included the following options:
- Union Terrace Fully Open
  - Union Terrace Open Southbound
  - Union Terrace Fully Open with turning movement restrictions
- 7.1.5 Within each of these scenarios, the variable of Schoolhill open or closed to through routing was included.

### 7.2 Union Terrace Open to General Traffic

- 7.2.1 The first test considered the impact of opening Union Terrace to general traffic in both directions. These tests are undertaken using the Central Union Street Option 1 scenario, which includes traffic restrictions on Union Street, Bridge St, Guild St and Market St (north).
- 7.2.2 Table 20 provides traffic flow comparisons at key locations.



**Table 20. Union Terrace Open - Key Flow Comparisons**

Location	Ref Case (95% demand level)				Union Terrace Open & Schoolhill Open (95% demand level) - Percentage Change				Union Terrace Open & Schoolhill Closed (95% demand level) - Percentage Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
	George St NB	360	992	457	1810	47%	28%	108%	52%	65%	19%	103%
George St SB	467	1278	581	2326	38%	-8%	37%	13%	30%	-17%	12%	-1%
Hutcheon St EB	965	1917	1297	4178	60%	51%	59%	55%	76%	63%	76%	70%
Hutcheon St WB	954	2449	1477	4879	14%	9%	23%	14%	29%	18%	28%	23%
Maberly St EB	456	931	605	1992	90%	45%	42%	54%	81%	31%	11%	36%
Maberly St WB	426	1254	692	2372	128%	73%	39%	73%	121%	64%	21%	62%
Palmerston Place EB	617	742	596	1955	72%	136%	52%	90%	91%	153%	70%	108%
Palmerston Place WB	467	1190	983	2640	148%	101%	93%	107%	156%	98%	89%	105%
Schoolhill EB	507	1121	521	2148	37%	26%	72%	40%	-100%	-100%	-100%	-100%
Schoolhill WB	446	739	625	1811	20%	8%	25%	17%	-100%	-100%	-100%	-100%
Springbank Terrace EB	996	1140	596	2732	-3%	42%	88%	36%	5%	49%	98%	44%
Springbank Terrace WB	308	929	616	1854	89%	45%	19%	44%	108%	45%	23%	48%
Union Terrace NB	495	1261	617	2372	-41%	-37%	-29%	-36%	-52%	-42%	-32%	-41%
Union Terrace SB	777	1819	1017	3613	-43%	-70%	-48%	-58%	-55%	-77%	-66%	-69%
John St EB	739	1414	672	2824	-5%	28%	31%	20%	32%	58%	55%	51%
John St WB	268	937	487	1692	10%	-1%	-7%	-1%	51%	0%	3%	9%
St Andrew St EB	28	59	27	114	-1%	0%	-1%	0%	28%	1%	19%	12%
St Andrew St WB	214	782	428	1424	25%	5%	21%	13%	129%	28%	88%	61%
<b>2 Way Flow</b>												
George St	827	2270	1038	4136	42%	8%	68%	30%	45%	-1%	52%	21%
Hutcheon St	1918	4365	2774	9057	37%	27%	40%	33%	53%	38%	51%	45%
Maberly St	881	2185	1297	4364	109%	61%	40%	65%	101%	50%	16%	50%
Palmerston Place	1084	1932	1579	4595	105%	115%	78%	100%	119%	119%	82%	106%
Schoolhill	953	1860	1146	3959	29%	19%	46%	29%	-100%	-100%	-100%	-100%
Springbank Terrace	1304	2070	1212	4586	19%	43%	53%	39%	30%	47%	60%	46%
Union Terrace	1272	3080	1633	5985	-42%	-57%	-41%	-49%	-54%	-63%	-53%	-58%
John St	1007	2351	1158	4516	-1%	16%	15%	12%	37%	35%	33%	35%
St Andrew St	242	842	455	1538	22%	4%	20%	12%	117%	26%	84%	57%

**7.2.3 Key Model Findings**

- The result suggests that traffic flows on Schoolhill slightly increase from 23% in both directions (34% in the EB) to 29% (40% in the EB) when Union Terrace is open to all vehicles.
- This suggests that the main contributing factor to the anticipated traffic increase on Schoolhill is from restrictions other than Union Terrace.
- Union Terrace has a 49% reduction in traffic flow compared to the Ref Case. (A 90% reduction was observed when Union Terrace is Bus and Taxi only). This suggests that the Wider CCMP restrictions and the LEZ have made Union Terrace a less desirable route when open to all traffic.
- When Schoolhill is closed to all vehicles, the effect on the wider network is small, except for John St and St Andrew St which shows an increased flow from 12% to 35%, and 12% to 57% over the 12 hour period respectively.

**7.3 Union Terrace Open Southbound Only**

- 7.3.1 An alternative scenario was modelled where Union Terrace was open southbound to all vehicles to access the on-street parking, but restricted northbound to Bus and Taxi Only.
- 7.3.2 The variable of Schoolhill open or closed to through routing was considered within the test scenario.
- 7.3.3 Table 21 provides traffic flow comparisons at key locations.



**Table 21. Union Terrace Open SB Only - Key Flow Comparisons**

Location	Ref Case (95% demand level)				Union Terrace Open SB & Schoolhill Open (95% demand level) - Percentage Change				Union Terrace Open SB & Schoolhill Closed (95% demand level) - Percentage Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
George St NB	360	992	457	1810	63%	72%	153%	91%	51%	40%	99%	57%
George St SB	467	1278	581	2326	126%	27%	76%	59%	29%	-27%	17%	-5%
Hutcheon St EB	965	1917	1297	4178	63%	53%	48%	54%	72%	63%	65%	66%
Hutcheon St WB	954	2449	1477	4879	29%	12%	29%	21%	38%	22%	27%	27%
Maberly St EB	456	931	605	1992	101%	52%	46%	61%	78%	48%	14%	44%
Maberly St WB	426	1254	692	2372	146%	76%	34%	76%	120%	62%	20%	60%
Palmerston Place EB	617	742	596	1955	81%	140%	56%	96%	89%	157%	82%	113%
Palmerston Place WB	467	1190	983	2640	148%	106%	95%	109%	155%	101%	109%	114%
Schoolhill EB	507	1121	521	2148	36%	18%	84%	39%	-100%	-100%	-100%	-100%
Schoolhill WB	446	739	625	1811	22%	3%	20%	14%	-100%	-100%	-100%	-100%
Springbank Terrace EB	996	1140	596	2732	5%	43%	103%	43%	2%	46%	106%	43%
Springbank Terrace WB	308	929	616	1854	82%	45%	20%	43%	104%	52%	34%	54%
Union Terrace NB	495	1261	617	2372	-86%	-89%	-88%	-88%	-86%	-89%	-88%	-88%
Union Terrace SB	777	1819	1017	3613	-33%	-68%	-49%	-55%	-52%	-77%	-68%	-69%
John St EB	739	1414	672	2824	1%	40%	45%	31%	37%	81%	55%	64%
John St WB	268	937	487	1692	12%	-10%	-2%	-4%	42%	-5%	7%	6%
St Andrew St EB	28	59	27	114	1%	-1%	-1%	0%	30%	2%	23%	14%
St Andrew St WB	214	782	428	1424	15%	9%	39%	19%	125%	16%	126%	65%
<b>2 Way Flow</b>												
George St	827	2270	1038	4136	99%	47%	110%	73%	39%	2%	53%	22%
Hutcheon St	1918	4365	2774	9057	46%	30%	38%	36%	55%	40%	45%	45%
Maberly St	881	2185	1297	4364	123%	66%	40%	70%	99%	56%	17%	53%
Palmerston Place	1084	1932	1579	4595	110%	119%	80%	103%	118%	122%	99%	113%
Schoolhill	953	1860	1146	3959	30%	12%	49%	27%	-100%	-100%	-100%	-100%
Springbank Terrace	1304	2070	1212	4586	24%	44%	61%	43%	26%	49%	69%	48%
Union Terrace	1272	3080	1633	5985	-54%	-77%	-64%	-68%	-65%	-82%	-76%	-77%
John St	1007	2351	1158	4516	4%	20%	26%	18%	39%	47%	35%	42%
St Andrew St	242	842	455	1538	13%	9%	36%	18%	115%	15%	120%	62%

**7.3.4 Key Model Findings:**

- The results show a similar pattern compared to the Union Terrace fully open scenario for southbound flows on Union Terrace and similar to the bus and taxi only scenario for the northbound flows.
- The 12 hr traffic flow SB on Union Terrace suggest a reduction of approximately 2500 vehicles from 3613 vehicles (-69%). This suggests that Union Terrace SB would operate primarily as a route for local traffic

**7.4 Schoolhill Model Testing Results**

7.4.1 From the above testing of various restrictions on Schoolhill and Union Terrace, the traffic modelling has shown that regardless of the operation of Union Terrace, traffic flows through Schoolhill increased by at least 20-30%. This is primarily because general traffic restrictions are also in place on other key east-west routes of Union St and Guild St.

7.4.2 Given the high pedestrian movement between the St. Nicholas and Bon Accord shopping centres, and the shared space streetscaping in place at the Upperkirkgate / Broad Street junction, it was considered that the traffic restrictions included on Schoolhill as part of the *Spaces For People* measures should be made permanent, primarily from a pedestrian safety and placemaking perspective.

Traffic modelling suggests that Schoolhill should be closed to routing traffic as part of the wider CCMP measures on the grounds of pedestrian safety and placemaking opportunities.



## 7.5 Union Terrace Open with Turning Movement Restrictions

- 7.5.1 A variation on the scenario to restrict traffic northbound only was developed to reduce the traffic volume of Union Terrace but not go as far as a full restriction to general traffic.
- 7.5.2 An option was developed to restrict the right turn movement from Union Terrace to Rosemount Viaduct for Bus, Taxi, and cycle only.
- 7.5.3 The benefits of this scenario are:
- Union Terrace open in both directions
  - Southbound access to parking bays on east side of Union Terrace
  - Northbound access provides an exit strategy for general traffic routing eastbound on Union Street (from west end)
- 7.5.4 The right turn ban effectively prevents a rat run between Union Street and Mounthooly Roundabout (east-west and north-south routing)
- 7.5.5 Table 22 provides traffic flow comparisons at key locations.



Table 22. Union Terrace Open with R/T Bus and Taxi Only Key Flow Comparison

Location	Ref Case (95% demand level)				Union Terrace Open R/T B&T Only & Schoolhill Closed (95% demand level) - Percentage Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
George St NB	360	992	457	1810	73%	46%	89%	62%
George St SB	467	1278	581	2326	26%	-28%	6%	-9%
Hutcheon St EB	965	1917	1297	4178	79%	64%	68%	69%
Hutcheon St WB	954	2449	1477	4879	35%	25%	29%	28%
Maberly St EB	456	931	605	1992	81%	53%	14%	47%
Maberly St WB	426	1254	692	2372	115%	58%	17%	56%
Palmerston Place EB	617	742	596	1955	83%	151%	76%	107%
Palmerston Place WB	467	1190	983	2640	150%	99%	107%	111%
Schoolhill EB	507	1121	521	2148	-100%	-100%	-100%	-100%
Schoolhill WB	446	739	625	1811	-100%	-100%	-100%	-100%
Springbank Terrace EB	996	1140	596	2732	4%	49%	95%	43%
Springbank Terrace WB	308	929	616	1854	100%	51%	31%	53%
Guild St EB	951	1936	1047	3935	-76%	-73%	-76%	-75%
Guild St WB	415	1499	937	2851	-63%	-79%	-83%	-78%
Union Terrace NB	495	1261	617	2372	-65%	-56%	-58%	-58%
Union Terrace SB	777	1819	1017	3613	-52%	-78%	-71%	-71%
John St EB	739	1414	672	2824	40%	76%	65%	64%
John St WB	268	937	487	1692	61%	-3%	14%	12%
St Andrew St EB	28	59	27	114	30%	3%	23%	14%
St Andrew St WB	214	782	428	1424	143%	21%	146%	77%
<b>2 Way Flow</b>								
George St	827	2270	1038	4136	46%	4%	42%	22%
Hutcheon St	1918	4365	2774	9057	57%	42%	47%	47%
Maberly St	881	2185	1297	4364	97%	56%	16%	52%
Palmerston Place	1084	1932	1579	4595	112%	119%	95%	109%
Schoolhill	953	1860	1146	3959	-100%	-100%	-100%	-100%
Springbank Terrace	1304	2070	1212	4586	27%	50%	63%	47%
Guild St	1367	3435	1984	6785	-72%	-76%	-80%	-76%
Union Terrace	1272	3080	1633	5985	-57%	-69%	-66%	-66%
John St	1007	2351	1158	4516	45%	45%	43%	44%
St Andrew St	242	842	455	1538	130%	20%	138%	72%

#### 7.5.6 Key Model Findings:

- The results suggest a more balanced flow between NB and SB Union Terrace with a net reduction in traffic of almost 66% over the Ref Case
- Northbound flows drop improve from a reduction of 40% when fully open to 60% when the R?T is banned.
- The remaining traffic on Union Terrace is therefore mainly buses, taxis and local traffic.

## 7.6 Network Summary Statistics

7.6.1 The same methodology that was used in Phase 2 to determine the network wide performance was also extracted for the Union Terrace / Schoolhill Scenarios.

7.6.2 Table 23 provides a summary of the total distance travelled, the average time taken and the average speed for all scenarios compared to the Reference Case.



**Table 23. Network Summary Statistics – Union Terrace Testing**

Percentage Difference to Reference Case						
Peak	Percentage demand level	Scenario	Number of Vehicles	Distance Travelled (km)	Average Time Taken (hh:mm:ss)	Mean Speed (mph)
AM	95%	2024 Ref Case	73509	242559	00:06:39	18.50
	95%	2024 LEZ + Wider CCMP Rerun	-0.8%	2.4%	25.9%	-18.0%
	95%	Union Terr Open	-1.8%	0.7%	30.2%	-21.3%
	95%	Union Terr Open, Schoolhill Closed	-0.7%	2.8%	25.4%	-17.5%
	95%	Union Terr Open SB	-0.5%	2.8%	24.6%	-17.1%
	95%	Union Terr Open SB, Schoolhill Closed	-0.4%	3.4%	23.0%	-15.7%
	95%	Union Terr Open, R/T B&T Only, Schoolhill Closed	-0.6%	2.9%	25.4%	-17.4%
IP	95%	2024 Ref Case	153910	439923	00:05:34	19.16
	95%	2024 LEZ + Wider CCMP Rerun	-0.9%	2.4%	15.6%	-10.6%
	95%	Union Terr Open	-0.8%	2.4%	16.0%	-11.0%
	95%	Union Terr Open, Schoolhill Closed	-0.8%	2.7%	17.7%	-12.0%
	95%	Union Terr Open SB	-0.9%	2.3%	17.2%	-11.9%
	95%	Union Terr Open SB, Schoolhill Closed	-0.4%	3.0%	12.3%	-7.8%
	95%	Union Terr Open, R/T B&T Only, Schoolhill Closed	-0.5%	2.9%	12.2%	-7.9%
PM	95%	2024 Ref Case	88211	278896	00:06:50	17.23
	95%	2024 LEZ + Wider CCMP Rerun	-1.3%	2.8%	34.1%	-22.3%
	95%	Union Terr Open	-1.2%	2.5%	33.7%	-22.3%
	95%	Union Terr Open, Schoolhill Closed	-1.8%	2.5%	38.4%	-24.6%
	95%	Union Terr Open SB	-1.3%	2.8%	34.4%	-22.5%
	95%	Union Terr Open SB, Schoolhill Closed	-1.3%	3.1%	35.7%	-23.1%
	95%	Union Terr Open, R/T B&T Only, Schoolhill Closed	-1.2%	3.0%	31.3%	-20.6%
12 Hr	95%	2024 Ref Case	315630	961378	00:06:21	18.30
	95%	2024 LEZ + Wider CCMP Rerun	-1%	3%	26%	-17%
	95%	Union Terr Open	-1%	2%	27%	-18%
	95%	Union Terr Open, Schoolhill Closed	-1%	3%	28%	-18%
	95%	Union Terr Open SB	-1%	3%	26%	-17%
	95%	Union Terr Open SB, Schoolhill Closed	-1%	3%	24%	-15%
	95%	Union Terr Open, R/T B&T Only, Schoolhill Closed	-1%	3%	24%	-15%

7.6.3 Key Model Findings:

- All measures network wide statistics are largely consistent over all of the Union Terrace Scenarios:
  - No. of vehicles – All -1% compared to the Ref Case.
  - Distance Travelled – All a 2-3% increase over the reference case, due to the LEZ and CCMP measures.
  - Average Time Taken – Within a 24% to 28% range compared to the base primarily due to the LEZ and CCMP measures.
  - Mean Speed – Within -15% to -18% range compared to the base primarily due to the LEZ and CCMP measures.
- The slightly improved Average Time Taken and Mean Speed observed in the 2 final scenarios are potentially due to a slight adjustment of model signals in the George St area.
- Effectively, the various restrictions tested on Union Terrace and Schoolhill do not significantly alter the operation of the wider network.

8.





## 8. CENTRAL UNION ST OPTION TESTING

### 8.1 Introduction

8.1.1 As noted in Chapter 6, as part of the Streetscape improvement proposals on central Union St (section between Bridge St junction and Market St junction), there are two potential operational scenarios, these are:

- **Option 1** – Full pedestrianisation of Central Union St (except for cycle and time limited servicing)
- **Option 2** – Buses and cycle only (except for time limited servicing)

8.1.2 This chapter details the model testing of Option 2 for Central Union Street – Buses and Cycles only.

### 8.2 Central Union St: Bus and Cycle Only

8.2.1 This scenario includes:

- Central Union St between Bridge St and Market St- 2 lane operating Bus and Cycle Only (1 lane in each direction)
- Union Terrace Bus Taxi and Cycle Only (tested before considerations of Chapter 7)
- Union St between Bon-accord St and Bridge St 4 lane operating with additional Bus Stops in both directions shown in Figure 20
- Union St between Market St and Marischal St 4 lane operating with additional Bus Stops in both directions shown in Figure 21
- Redistributing the Bus Dwell time from the 8 Central Union St Bus Stops as shown in Table 1 to the additional bus stops created on either side of Central Union St.

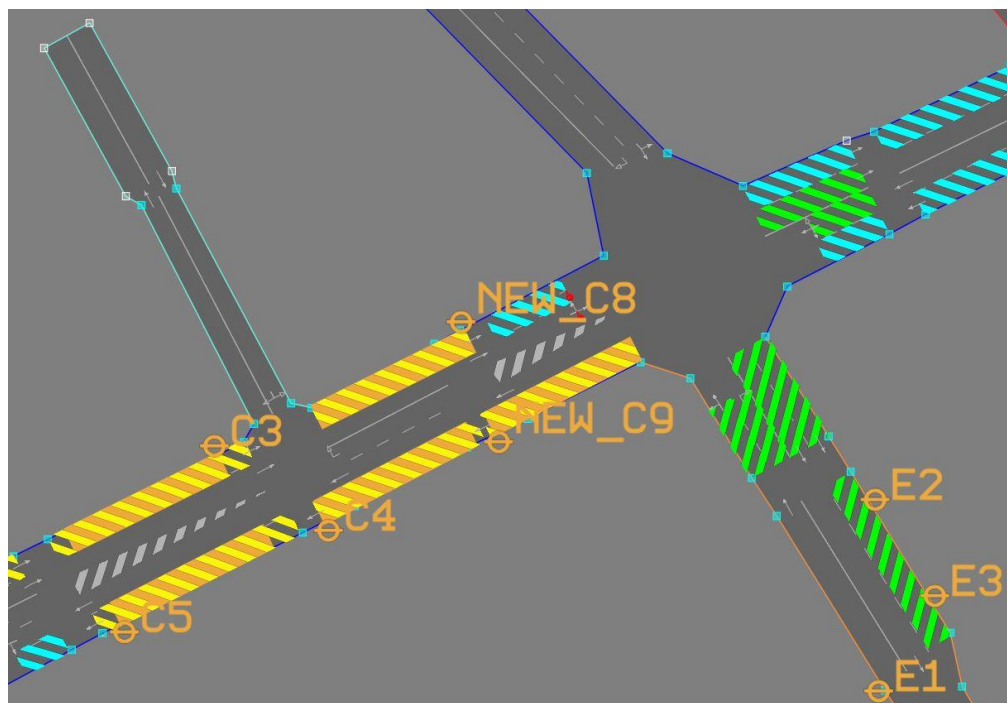
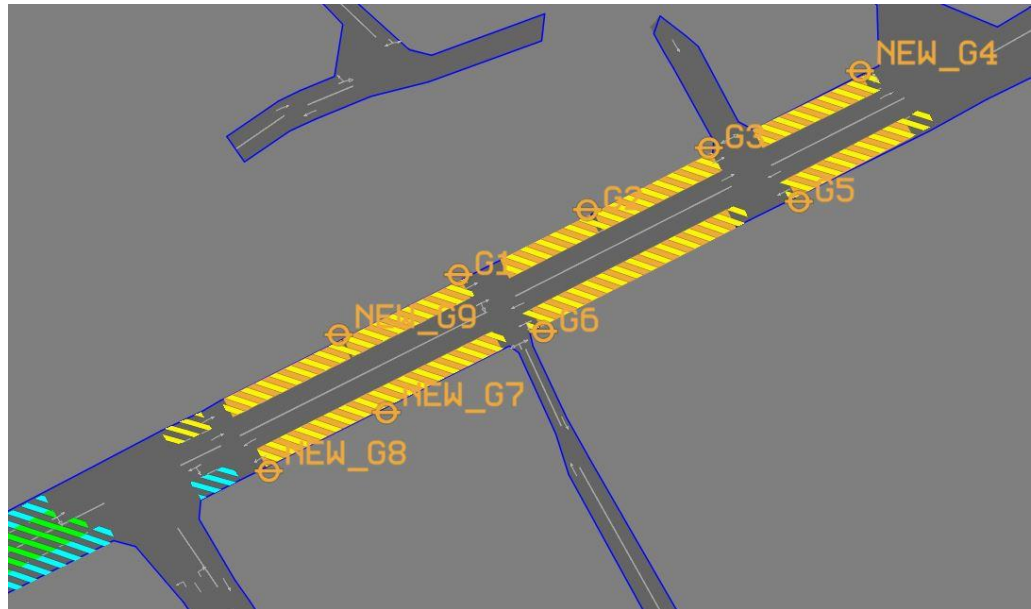


Figure 20. West End of Union St New Bus Stop Layout

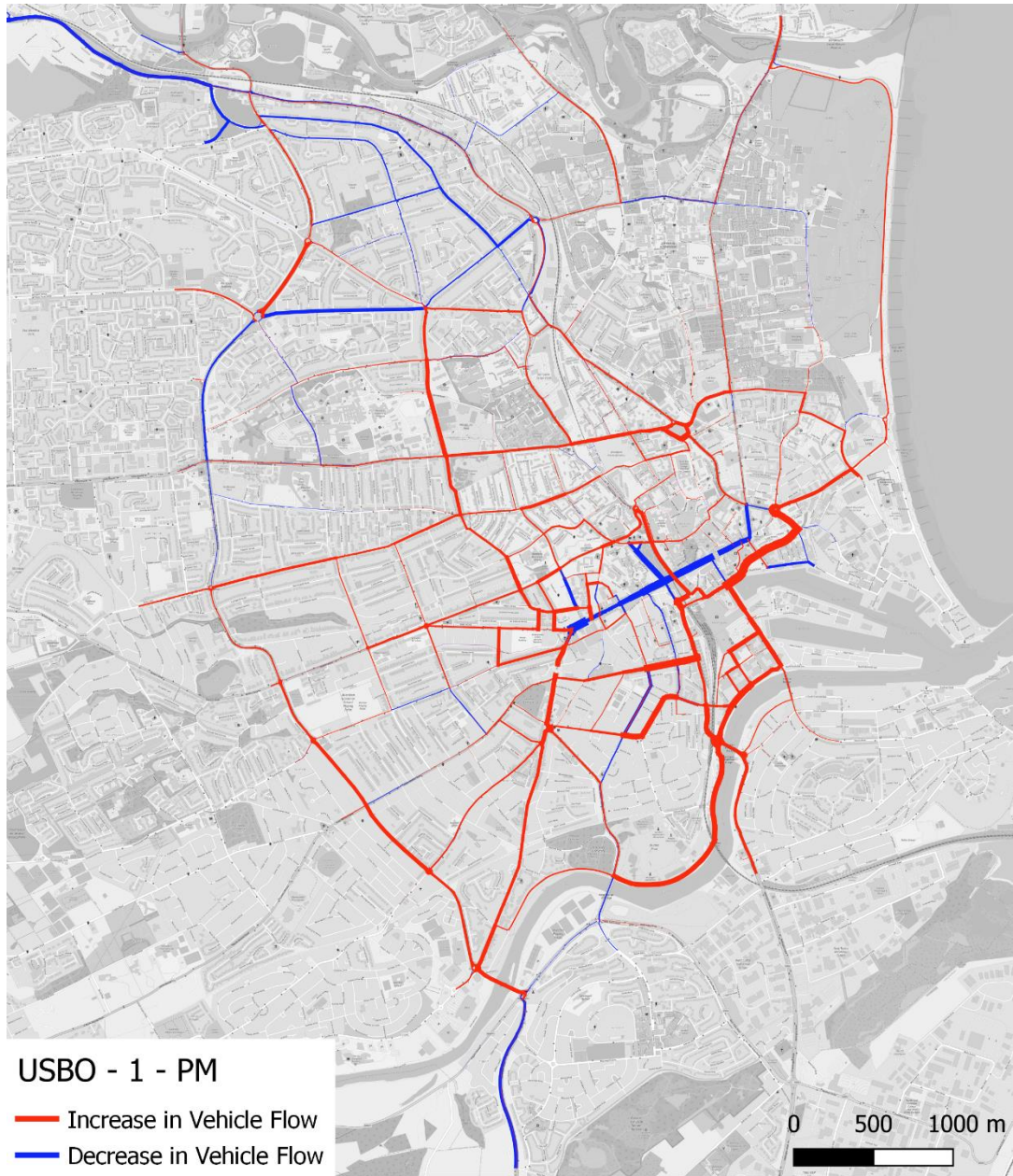


**Figure 21.** East End of Union St New Bus Stop Layout

### Traffic Flows

8.2.2 Figure 22 provides the flow plot difference between the test scenario and the ACCPM24 Ref Case Model. Table 24 provides traffic flow comparisons at key locations.





**Figure 22. Central Union St: Bus and Cycle Only PM Flow Comparison**



**Table 24. Central Union St Bus and Taxi Only: Key Flow Comparison**

Location	Ref Case (100% demand level)				Union St Bus and Cycle Only (No Wider CCMP) (100% demand level) - Percentage Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
George St NB	413	1102	519	2034	17%	9%	40%	19%
George St SB	644	1430	748	2821	-16%	-13%	0%	-10%
Hutcheon St EB	1184	2191	1408	4782	12%	8%	29%	15%
Hutcheon St WB	1082	2733	1161	4975	9%	-13%	43%	5%
Maberly St EB	517	962	590	2069	55%	35%	19%	35%
Maberly St WB	515	1460	698	2673	42%	44%	22%	38%
Palmerston Place EB	697	813	510	2019	3%	-14%	14%	-1%
Palmerston Place WB	467	1316	799	2582	18%	-2%	45%	16%
Schoolhill EB	971	2193	906	4070	12%	9%	27%	14%
Schoolhill WB	420	705	590	1714	-4%	-27%	-13%	-17%
Springbank Terrace EB	1196	1260	501	2956	27%	67%	218%	76%
Springbank Terrace WB	373	1058	585	2016	59%	38%	55%	47%
Guild St EB	856	2063	780	3698	43%	25%	77%	40%
Guild St WB	588	1650	1050	3287	43%	40%	38%	40%
Union Terrace NB	618	1398	649	2665	-88%	-90%	-86%	-89%
Union Terrace SB	878	2144	927	3948	-92%	-93%	-92%	-93%
John St EB	849	1551	680	3079	-10%	16%	27%	11%
John St WB	383	1019	637	2038	-16%	7%	7%	3%
St Andrew St EB	28	58	24	109	-1%	3%	15%	5%
St Andrew St WB	373	863	562	1797	-18%	-6%	5%	-5%
<b>2 Way Flow</b>								
George St	1057	2532	1267	4855	-3%	-4%	17%	2%
Hutcheon St	2266	4924	2568	9757	11%	-3%	35%	10%
Maberly St	1032	2422	1288	4742	48%	40%	20%	37%
Palmerston Place	1164	2128	1309	4601	9%	-6%	33%	9%
Schoolhill	1391	2898	1496	5784	7%	0%	11%	5%
Springbank Terrace	1569	2317	1086	4972	35%	54%	130%	64%
Guild St	1443	3713	1829	6985	43%	32%	54%	40%
Union Terrace	1496	3541	1576	6613	-90%	-92%	-90%	-91%
John St	1231	2570	1316	5117	-12%	12%	17%	8%
St Andrew St	401	921	585	1906	-17%	-5%	5%	-5%

8.2.3 The results suggest that retaining the buses through Union Street but providing no additional network restrictions through the Bridge St / Guild St/ Market St corridor resulted in the following issues:

- 40% increase in traffic flow through Guild Street (due to restrictions on Union St and Schoolhill)
- Difficulty for buses egressing the station on Guild Street due to traffic queuing along Guild Street

8.2.4 In addition, through consultation on the proposals with various stakeholders, including cycle groups and PT operators, they all highlighted the congestion levels experienced through Guild St and the lack of safe and easy connection between the bus/rail station and the city centre for cyclists and pedestrians. The operation of Guild Street as a primary traffic route essentially cuts off the bus and rail station from the city centre.

**PT Model Statistics**



8.2.5 Table 25 shows the Average Bus Journey Time and Bus Reliability of the services re-routed in the Central Union St Option 2 Scenario, compared against the Reference Case.

**Table 25. PT Journey Time/Bus Reliability for Affected Bus Services on Union St**

	2024 Ref Case	Union St Bus and Cycle Only
12 Hour	00:25:27	00:23:25
Compared to Ref	-	-8%
Bus Reliability Time (hh:mm:ss)		
	2024 Ref Case	Union St Bus and Cycle Only
12 Hour	00:01:12	00:01:12
Compared to Ref	-	1%

8.2.6 Key Model Findings:

- The results show a reduction in the Average Bus Journey time of 8%. This is potentially due to the reduction of vehicles using the Union St and Union Terrace corridors
- The results show a bus reliability almost identical to the Ref Case. It should be borne in mind that a significant number of new bus stops have been added to this scenario, which, in reality may not be able to be provided.

From the above model testing, the additional bus priority measures on Bridge St, Guild St and Market St should also be applied under the Central Union Street Option 2: Bus & Cycle Only

### 8.3 Union St Bus and Cycle Only With Wider CCMP

8.3.1 The Wider CCMP were therefore applied to the Central Union St-Option 2 Bus and Cycle Only. In addition, the Union Terrace and Schoolhill measures were also included in this scenario.

8.3.2 The resultant network restrictions are therefore exactly the same as the Central Union Street-Option 1 scenario (pedestrianisation), with the following wider restrictions applied:

- Bridge St, Bus, Taxi & Cycle Only
- Guild St (East of Carmelite St) Bus, Taxi & Cycle Only
- Market St (North of Guild St) Bus, Taxi & Cycle Only
- Union Terrace R/T to Rosemount Viaduct for Bus, Taxi & Cycle Only
- Schoolhill – pedestrianised between Flourmill Lane and Harriet St

8.3.3 Table 26 provides traffic flow comparisons at key locations.





Table 26. Union St Bus and Cycle Only With Wider CCMP Measures

Location	Ref Case (95% demand level)				Union Street Bus and Cycle Only With Wider CCMP (95% demand level) - Percentage Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
George St NB	360	992	457	1810	53%	64%	97%	70%
George St SB	467	1278	581	2326	43%	-4%	21%	12%
Hutcheon St EB	965	1917	1297	4178	69%	50%	64%	59%
Hutcheon St WB	954	2449	1477	4879	34%	19%	24%	23%
Maberly St EB	456	931	605	1992	94%	80%	12%	62%
Maberly St WB	426	1254	692	2372	101%	76%	23%	65%
Palmerston Place EB	617	742	596	1955	72%	117%	62%	86%
Palmerston Place WB	467	1190	983	2640	84%	80%	40%	66%
Schoolhill EB	507	1121	521	2148	-100%	-100%	-100%	-100%
Schoolhill WB	446	739	625	1811	-100%	-100%	-100%	-100%
Springbank Terrace EB	996	1140	596	2732	28%	53%	111%	57%
Springbank Terrace WB	308	929	616	1854	86%	42%	29%	45%
Guild St EB	951	1936	1047	3935	-88%	-86%	-88%	-87%
Guild St WB	415	1499	937	2851	-86%	-92%	-94%	-91%
Union Terrace NB	495	1261	617	2372	-64%	-58%	-62%	-60%
Union Terrace SB	777	1819	1017	3613	-50%	-70%	-72%	-66%
John St EB	739	1414	672	2824	36%	76%	60%	62%
John St WB	268	937	487	1692	82%	1%	30%	22%
St Andrew St EB	28	59	27	114	17%	4%	17%	10%
St Andrew St WB	214	782	428	1424	209%	37%	167%	102%
<b>2 Way Flow</b>								
George St	827	2270	1038	4136	48%	25%	54%	37%
Hutcheon St	1918	4365	2774	9057	51%	32%	43%	40%
Maberly St	881	2185	1297	4364	97%	77%	18%	64%
Palmerston Place	1084	1932	1579	4595	77%	94%	48%	74%
Schoolhill	953	1860	1146	3959	-100%	-100%	-100%	-100%
Springbank Terrace	1304	2070	1212	4586	42%	49%	69%	52%
Guild St	1367	3435	1984	6785	-87%	-89%	-91%	-89%
Union Terrace	1272	3080	1633	5985	-55%	-65%	-68%	-64%
John St	1007	2351	1158	4516	48%	46%	47%	47%
St Andrew St	242	842	455	1538	187%	35%	158%	95%

8.3.4 Key Model Findings:

- The results indicate the same pattern as the Central Union St Option 1. with higher traffic flows on East-West routes such as Hutcheon St and Palmerston Place
- Due to the inclusion of the wider CCMP measures, the PM Peak was unable to run at 100% demand, therefore the model was run at 95% demand as per the Central Union Street Option 1.

8.4 Comparison of Central Union St Options 1 and 2

8.4.1 The following section provides a comparison between the two Central Union Street options, in terms of traffic model outputs for: traffic flows, PT statistics, and network wide operation.

**Traffic Flows**

8.4.2 Table 27 provides key flow comparisons at locations of note between the 2 options.





**Table 27. Central Union St Option 1 and Option 2 - Key Flow Comparison**

Location	Ref Case (95% demand level)				Central Union Street Option 1 - % Change				Central Union Street Option 2 - % Change			
	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour	AM	IP	PM	12 Hour
George St NB	360	992	457	1810	73%	46%	89%	62%	53%	64%	97%	70%
George St SB	467	1278	581	2326	26%	-28%	6%	-9%	43%	-4%	21%	12%
Hutcheon St EB	965	1917	1297	4178	79%	64%	68%	69%	69%	50%	64%	59%
Hutcheon St WB	954	2449	1477	4879	35%	25%	29%	28%	34%	19%	24%	23%
Maberly St EB	456	931	605	1992	81%	53%	14%	47%	94%	80%	12%	62%
Maberly St WB	426	1254	692	2372	115%	58%	17%	56%	101%	76%	23%	65%
Palmerston Place EB	617	742	596	1955	83%	151%	76%	107%	72%	117%	62%	86%
Palmerston Place WB	467	1190	983	2640	150%	99%	107%	111%	84%	80%	40%	66%
Schoolhill EB	507	1121	521	2148	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
Schoolhill WB	446	739	625	1811	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
Springbank Terrace EB	996	1140	596	2732	4%	49%	95%	43%	28%	53%	111%	57%
Springbank Terrace WB	308	929	616	1854	100%	51%	31%	53%	86%	42%	29%	45%
Guild St EB	951	1936	1047	3935	-76%	-73%	-76%	-75%	-88%	-86%	-88%	-87%
Guild St WB	415	1499	937	2851	-63%	-79%	-83%	-78%	-86%	-92%	-94%	-91%
Union Terrace NB	495	1261	617	2372	-65%	-56%	-58%	-58%	-64%	-58%	-62%	-60%
Union Terrace SB	777	1819	1017	3613	-52%	-78%	-71%	-71%	-50%	-70%	-72%	-66%
John St EB	739	1414	672	2824	40%	76%	65%	64%	36%	76%	60%	62%
John St WB	268	937	487	1692	61%	-3%	14%	12%	82%	1%	30%	22%
St Andrew St EB	28	59	27	114	30%	3%	23%	14%	17%	4%	17%	10%
St Andrew St WB	214	782	428	1424	143%	21%	146%	77%	209%	37%	167%	102%
<b>2 Way Flow</b>												
George St	827	2270	1038	4136	46%	4%	42%	22%	48%	25%	54%	37%
Hutcheon St	1918	4365	2774	9057	57%	42%	47%	47%	51%	32%	43%	40%
Maberly St	881	2185	1297	4364	97%	56%	16%	52%	97%	77%	18%	64%
Palmerston Place	1084	1932	1579	4595	112%	119%	95%	109%	77%	94%	48%	74%
Schoolhill	953	1860	1146	3959	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
Springbank Terrace	1304	2070	1212	4586	27%	50%	63%	47%	42%	49%	69%	52%
Guild St	1367	3435	1984	6785	-72%	-76%	-80%	-76%	-87%	-89%	-91%	-89%
Union Terrace	1272	3080	1633	5985	-57%	-69%	-66%	-66%	-55%	-65%	-68%	-64%
John St	1007	2351	1158	4516	45%	45%	43%	44%	48%	46%	47%	47%
St Andrew St	242	842	455	1538	130%	20%	138%	72%	187%	35%	158%	95%

**8.4.3 Key Model Findings:**

- The model flow comparison suggests that there are slightly different re-routing impacts of the two Central Union Street options. There is probably an element of run variability in the results also.
- Overall, the flow change pattern is very similar between the two scenarios.

**PT Statistics**

8.4.4 Table 28 shows the average bus journey time and bus reliability for the two Central Union St options.



**Table 28. Central Union St Option 1 and Option 2 - PT Journey Time/Bus Reliability**

	Average Bus Journey Time (hh:mm:ss)		
	2024 Ref Case	Central Union St - Option 1	Central Union St - Option 2
12 Hour	00:25:27	00:26:54	00:25:04
Compared to Ref	-	6%	-1%
	Bus Reliability Time (hh:mm:ss)		
	2024 Ref Case	Central Union St - Option 1	Central Union St - Option 2
12 Hour	00:01:12	00:01:21	00:01:17
Compared to Ref	-	13%	8%

8.4.5 Key Model Findings:

- For the full pedestrianisation - Option 1, the results show an average increase in Bus Journey time of 6% due to the rerouting of buses via Guild street
- For Option 2, the results are very similar to the Ref Case but noting that there are numerous new stops applied in the model network along Union St.
- In terms of bus reliability, the re-routing of buses to Guild St in Option 1 has a slightly higher variation but note that this is significantly better than when the supporting measures on Guild St, Market St and Bridge St are not included (See Table 16)

**Network Summary Statistics**

8.4.6 Table 29 provides a summary of the total distance travelled, the average time taken and the average speed for the two Central Union Street Options compared to the Reference Case.

**Table 29. Central Union St Option 1 and Option 2 - Network Summary Statistics**

Percentage Difference to Reference Case						
Peak	Percentage demand level	Scenario	Number of Vehicles	Total Distance Travelled (km)	Average Time Taken (hh:mm:ss)	Mean Speed (mph)
AM	95%	2024 Ref Case	73509	242559	00:06:39	18.50
	95%	Central Union St - Option 1	-0.6%	2.9%	25.4%	-17.4%
	95%	Central Union St - Option 2	0.0%	3.5%	18.9%	-12.9%
IP	95%	2024 Ref Case	153910	439923	00:05:34	19.16
	95%	Central Union St - Option 1	-0.5%	2.9%	12.2%	-7.9%
	95%	Central Union St - Option 2	-0.3%	3.1%	10.4%	-6.4%
PM	95%	2024 Ref Case	88211	278896	00:06:50	17.23
	95%	Central Union St - Option 1	-1.2%	3.0%	31.3%	-20.6%
	95%	Central Union St - Option 2	-1.3%	2.5%	34.1%	-22.5%
12 Hr	95%	2024 Ref Case	315630	961378	00:06:21	18.30
	95%	Central Union St - Option 1	<b>-1%</b>	<b>3%</b>	<b>24%</b>	<b>-15%</b>
	95%	Central Union St - Option 2	<b>-1%</b>	<b>3%</b>	<b>22%</b>	<b>-14%</b>



#### 8.4.7 Key Model Findings:

- All the network wide statistics are largely consistent between the Central Union Street Option 1 and Option 2
- This suggests that the network wide impact of the proposed city centre measures is the same regardless of whether Central Union Street is pedestrianised or allows buses to route through.



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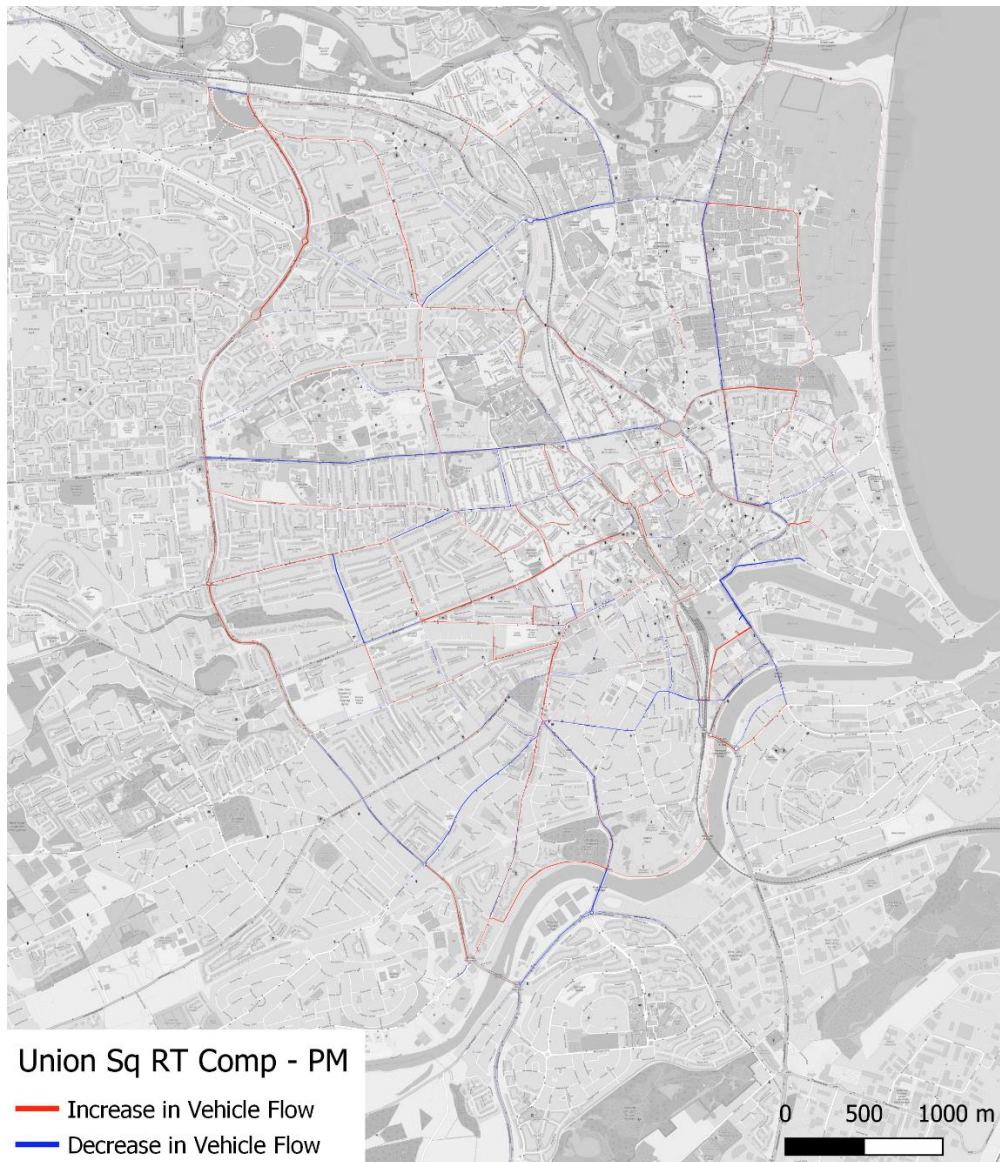


## 9. PHASE 3 – UNION SQUARE ACCESS TESTING

### 9.1 Introduction

- 9.1.1 SYSTRA were requested to assess a variation to the Union Square access on Market Street (at Commercial Quay).
- 9.1.2 A known issue for buses accessing the station on Market St, particularly during the weekend or peak shopping periods, is traffic queueing southbound on Market Street can block back from the right turn filter lane through to Market St. This therefore impacts upon buses routing to the station.
- 9.1.3 The requested test scenario involves the banning of the southbound right turn movement into Union Square from Market Street southbound.
- 9.1.4 Unfortunately, as the issues generally occurs on the weekend, this is not a noticeable issue within the weekday 12hr model that has been developed. Nevertheless, this test was undertaken with the Central Union Street – Option 1 scenario.
- 9.1.5 Figure 1 provides the flow plot difference between the right turn into Union Terrace banned and the right turn allowed.. The scale was adjusted to match prior flow comparisons.





**Figure 23. Union Square Closed Right Turn Flow Comparison- PM**

9.1.6 Key Model Findings:

- The results suggest that the effect the closure of the right turn is almost negligible on the network as a whole, with the maximum flow difference being 200 vehicles over the whole PM period (16:00-19:00)
- The results do suggest that the closure of the right turn access into Union Square results in a displacement of traffic through Denburn Road, College Street and finally through Palmerston Road at the new South College Street junction (opening 2022).

9.1.7 This network configuration is certainly an option to consider, but the weekend impact on the operation of the South College Street junction proposals is unknown. An alternative consideration would be to allow 3 full lanes southbound on Market Street and 2 northbound between Guild Street and Commercial Quay. This would require the dedicated left and ahead NB flair at Guild Street to be removed and the movements incorporated into lane 2 with general traffic routing to Trinity Quay. (Noting that there are very few bus services on this northbound section of Market St).





## 10. SUMMARY AND CONCLUSIONS

### 10.1 Summary

- 10.1.1 SYSTRA Ltd (SYSTRA) was requested by Aberdeen City Council to undertake sensitivity testing on the proposed city centre traffic restrictions as part of the wider package of measures associated with the implementation of a Low Emission Zone (LEZ) in Aberdeen
- 10.1.2 The LEZ model testing has identified that a LEZ on its own would not be sufficient to reduce emission levels to the required NO<sub>2</sub> adherence levels. Through a series of model tests, the 'Union Street Scheme' was identified as being the most appropriate package of measures from the City Centre Masterplan proposals to address the remaining NO<sub>2</sub> exceedances within the city centre area.
- 10.1.3 ACC have requested that further testing of the CCMP elements, in combination with the LEZ, are required to compliment a parallel study on the future operation of the city centre, following the COVID-19 pandemic spaces for people measures.
- 10.1.4 The further testing of CCMP options is split into three separate phases relating to the scale of CCMP measures proposed, these are:
- Phase 1 – Revised interventions on Union Street and Union Terrace
  - Phase 2 – Wider CCMP Measures
  - Phase 3 – Additional Schoolhill, Union Terrace and Union St Option Testing

#### **Phase 1 Testing: Revised Interventions on Union Street & Union Terrace**

- 10.1.5 ACC requested that the traffic models be used to assess two alternative options for Union Terrace and Union Street – namely:
- Bus only on Union St and Union Terrace (no taxis allowed)
  - Pedestrianisation of Union St, between Bridge St. and Market St.
- 10.1.6 The key focus of these tests was to understand the impact to the air quality exceedance areas when the restrictions on Union Terrace and Union Street are revised.
- 10.1.7 The traffic modelling suggests the following:

#### **Bus Only Restrictions**

- Taxis are assumed to be fully compliant for the LEZ by 2024
- There is little impact to the network operation or air quality exceedances if taxis were not allowed through the proposed restrictions on Union St and Union Terrace.
- There are limitations to the model on the absolute volume of taxis that route through the city centre, so this has to be factored in to any decisions on this option.

#### **Union St Pedestrianisation**

- There is less traffic routing around the core area of the city centre when the LEZ is in place, therefore the LEZ allows more capacity within the core area of the city centre to accommodate more restrictive measures on Union St

- If the LEZ was not in place, there would potentially be a higher impact to the network operation if Union St was pedestrianised
- The air quality exceedance areas are not detrimentally affected if Union St is pedestrianised. However, a wider assessment might identify other locations where congestion increases as a result of the measure, for example, on Guild St where there would be more interaction between buses and general traffic.
- The PT services affected by the pedestrianisation are likely to incur an additional journey time of between 2 and 5 minutes on average. This will likely be higher during the peaks. This may also have an impact to bus reliability (not assessed)

### **Phase 2 Testing: Wider CCMP Measures**

10.1.8 ACC requested that the traffic models be used to assess further CCMP measures including:

- Pedestrianisation of Union St, between Bridge St. and Market St.
- Bus and Taxi Only on Union Terrace
- Bus and Taxi Only on Market St (Between Union St and Guild St)
- Bus Only on Bridge Street
- Bus only on Guild Street (East of Wapping St Gyratory)

10.1.9 The key focus of these tests was to assess whether the network can cater for the higher volume of interventions within the city centre as well as the impact to public transport.

10.1.10 The traffic modelling suggests the following:

- The model scenario including the LEZ and wider CCMP measures is able to run at 95% demand of a zero-growth scenario (2019 traffic levels)
- The additional interventions on Market St. Bridge St and Guild St result in improvements to the PT network journey times and reliability through the city centre.
- Traffic diverted from the city centre area finds some routes that are not consistent with the network hierarchy. The modelling represents a worst-case scenario regarding traffic displacement, as it effectively models a scenario where the restrictions are suddenly put in place without any prior warning.
- Vehicles trips through the city centre take longer on average as they are required to route a longer distance to avoid the city centre restrictions. Traffic queue levels are slightly higher than the Reference Case (4% in the model) but are lower than if restrictions were only applied on Union St and Union Terrace.

### **Phase 3 – City Centre Traffic Management Plan Testing**

10.1.11 Phase 3 model testing was developed following the commissioning of SYSTRA by Aberdeen City Council in September 2021 to develop a Traffic Management Plan to facilitate the next stage of delivery of the Aberdeen City Centre Masterplan (CCMP).

10.1.12 As part of the Streetscape improvement proposals on central Union St (section between Bridge St junction and Market St junction), there are two potential operational scenarios, these are:

- **Option 1** – Full pedestrianisation of Central Union St (except for cycle and time limited servicing)
- **Option 2** – Buses and cycle only (except for time limited servicing)

10.1.13 Option 1 model scenario is detailed in Phase 2 of the model testing programme, but the scenario was updated to better replicate the proposed hierarchy of the city centre network.

10.1.14 For Option 2, the traffic modelling showed the following issues:

- 40% increase in traffic flow through Guild Street (due to restrictions on Union St and Schoolhill)
- Difficulty for buses egressing the station on Guild Street due to traffic queuing along Guild Street

10.1.15 In addition, through consultation on the proposals with various stakeholders, including cycle groups and PT operators, they all highlighted the congestion levels experienced through Guild St and the lack of safe and easy connection between the bus/rail station and the city centre for cyclists and pedestrians. The operation of Guild Street as a primary traffic route essentially cuts off the bus and rail station from the city centre.

10.1.16 The additional bus priority measures on Bridge St, Guild St and Market St should therefore also be applied under the Central Union Street Option 2: Bus & Cycle Only

#### *Union Terrace & Schoolhill Testing*

10.1.17 Sensitivity testing around Union Terrace and Schoolhill restrictions was required to facilitate the Union Terrace Gardens Project proposals for accessible parking on Union Terrace.

10.1.18 Traffic Modelling suggests that there is an increase in traffic levels through Schoolhill within all scenarios that require general traffic restrictions on Union St and Guild Street.

10.1.19 For Union Terrace, various traffic restriction options were tested. Allowing general traffic to route along his corridor in both directions but restrict the northbound movement to only be able to turn left to Rosemount Viaduct (bus, taxis and cycles still able to turn right) results in the following benefits:

- Union Terrace open in both directions for local traffic
- Southbound access to parking bays on east side of Union Terrace
- Northbound access provides an exit strategy for general traffic routing eastbound on Union Street (from west end)

## **10.2 Conclusions**

### *Phase 1 Testing*

10.2.1 If Bus-only restrictions were considered through the proposed restriction areas, this would be consistent with the current restrictions on Broad St but may have other implication to accessibility and safety (e.g. night-time lone person considerations) that needs to be borne in mind.

10.2.2 If a full pedestrianisation of Union St was to be made permanent, it is recommended that further and more detailed consideration of the PT network would be required. – i.e. location of bus stops, potential for any additional bus lanes or extended bays to cater for the additional PT demand on the local network.

10.2.3 In addition, the design of the junctions approaching the restrictions require careful consideration, for example, allowing the right turn from Union St to Bridge St for all traffic allows an east-west alternative route through the core section of the city centre which may impact on congestion levels and air quality through Guild Street.

10.2.4 There is potential to consider other or hybrid restriction proposals through Union St, for example, retaining a bus only corridor through the restriction section but removal of all bus stops. This would allow more space for pedestrians whilst allowing the buses to remain on



their current routes. This would still require consideration of alternative bus stop arrangements.

#### *Phase 2 Testing*

- 10.2.5 If full pedestrianisation of Union St (between Bridge St and Market St) is to be considered then the model testing of wider CCMP measures has shown that the additional interventions on Bridge St, Market St and Guild St would enhance the PT network in terms of journey times and reliability through the city centre.
- 10.2.6 Whilst the model scenario including wider CCMP measure with the LEZ could only run at 95% of 2019 traffic levels, observed traffic levels at the end of July 2021 were at 79% of the 2019 baseline. It is for ACC to consider whether traffic levels will remain below or around the 2019 levels in the short to medium term due to the travel demand changes resulting from COVID-19, or if the traffic network will bounce back to pre-COVID levels with the resumption of development growth. In the medium to long term, there are likely to be other infrastructure and policy measures considered for Aberdeen which will manage the general traffic demand coming into the city centre area.
- 10.2.7 The traffic modelling represents a worst-case scenario regarding traffic displacement, as it effectively models a scenario where the restrictions are suddenly put in place without any prior warning. In reality, there is likely to be some vehicle evaporation and alternative routing (e.g. reduced cross city centre car parking traffic). The traffic model testing however, does show increases in traffic demand through some routes that are not consistent with the road network hierarchy. It is for ACC to consider whether these should be addressed as part of a CCMP package of measures or through a post implementation network monitoring process.

#### *Phase 3 Testing*

- 10.2.8 The conclusion from the Phase 3 model testing were:
- For the option to retain buses on Central Union Street (Option 2), the additional bus priority measures on Bridge St, Guild St and Market St are also required.
  - There is therefore very little difference in the network restrictions required for the two Central Union Street Options. A preferred option will therefore require to be based upon other factors not related to traffic network operation.
  - In all CCMP scenarios, it is recommended that Schoolhill be pedestrianised between Flourmill Lane and Harriet St on the grounds of pedestrian safety and placemaking opportunities

#### *Further Work*

- 10.2.9 Ultimately, any decisions made on a preferred level of CCMP intervention through the city centre will require to consider wide-ranging impacts and varying consequences to the general traffic network as well as finer details of the PT network operation.
- 10.2.10 The ongoing development of the CCMP proposals and Streetscape considerations will next include the wider consideration of the full Union Street corridor, which has not been developed beyond conceptual considerations to date. Traffic modelling will again be useful in the testing of various layout options on Union Street, particularly concerning the operation of the PT network.
- 10.2.11 In addition, any consideration of wider CCMP measures may have an impact on some the NO<sub>2</sub> emission exceedance locations. This has not been assessed within the current traffic modelling exercises.

The decisions on a final CCMP scheme to compliment the LEZ will ultimately require to balance competing priorities for the city centre relating to placemaking, accessibility, and air quality.



## APPROVAL

Version	Name	Position	Date	Modifications	
1	Author	Craig Bean	Assistant Transport Consultant	27/04/2021	
	Checked by	Callum Guild	Associate	29/04/2021	
	Approved by	Callum Guild	Associate	29/04/2021	
2	Author	Eilidh Stirling / Callum Guild	Assistant Transport Consultant	10/08/2021	
	Checked by	Callum Guild	Associate	30/08/2021	
	Approved by	Callum Guild	Associate	30/08/2021	
3	Author	Craig Bean / Callum Guild	Assistant Transport Consultant	06/10/2021	
	Checked by	Callum Guild	Associate	11/10/2021	
	Approved by	Callum Guild	Associate	11/10/2021	

